SUPREMA – Fire and Gas Warning Unit

Operation Manual

p/n: 10067124 / REV 0 / June 2005

Contents

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* With regard to fire and smoke detection, the SUPREMA has not been evaluated to any Canadian standard by a third party agency.

* With regard to fire and smoke detection, the SUPREMA has not been evaluated to any Canadian standard by a third party agency.

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1. General Information

Safety Advice

The SUPREMA Gas Warning Unit is a product supporting life and health!

- This manual must be carefully read, understood and followed by all individuals who have or will have the responsibility for selecting, using, servicing or maintaining this product.
- This manual contains instructions for the optimal use of the product as well as important safety information.
- Before use, the acting persons have to decide in accordance with this manual, whether the product is suitable for the intended application

Liability Information

- The liability of MSA AUER is excluded if the product is not used appropriately and for the intended purpose. Choice and use are in the sole responsibility of the acting persons.
- Warranties also as guarantees made by MSA AUER with respect to the product are voided, if it is not used, serviced or maintained in accordance with the instructions in this manual.
- The above corresponds to the terms and conditions of sale regarding the warranty and liability of MSA AUER. It does not alter them.

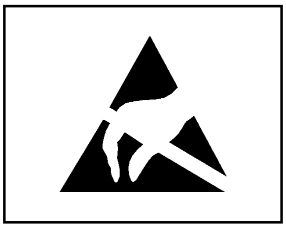
Maintenance Advice

- This product must be inspected and maintained in regular intervals by trained specialists, records are to be kept. For service and repairs original MSA AUER spare must be used only. Inspections and maintenance must be made exclusively by authorised service shops or MSA AUER. The authorised service shops are responsible for procurement of valid technical information for the product, components thereof and maintenance instructions. Modifications to the product or components thereof are not permissible and violate the approvals.
- The liability of MSA AUER extends exclusively to service and maintenance made by MSA AUER.

Handling Instructions

This unit contains assemblies that are sensitive to static electricity. The unit should be opened for maintenance or repair only by technically trained personnel..

Electrostatic discharge caused by touching the assemblies without protection should be avoided. The warranty is void in the event of damage to components by electrostatic discharge.



Attention!

Follow the Handling Instructions.

Components Subject to Damage from Static Electricity!

1.1 Areas of Installation and Use of the SUPREMA

The AUER SUPREMA is a stationary gas warning system with multiple measurement sites, which operates continuously to monitor work sites for the presence of combustible, explosive, and toxic mixtures of gas and/or vapour with air and to monitor the ambient air for oxygen content. The system supplies power to the sensors, displays the measured concentrations, and monitors the limit values, but it also actuates alarm devices. The various functions of the gas warning system, that is, the acquisition of the measurement values, the evaluation of the signals, the actuation of the alarm devices, etc., are performed by the various modules of the SUPREMA.

The SUPREMA can process the standardised current and voltage outputs of various types of sensors. This means that the system can display and evaluate not only gas measurements but other measurement variables as well (e.g., temperature and pressure).

Typical areas where the SUPREMA can be used include:

- The chemical and petrochemical industry
- The paint and solvent-processing industry
- The gas-processing industry
- The steel-processing industry
- Municipal areas

Monitoring functions are called for in the following areas:

- Production
- Warehousing
- Distribution
- Shipping
- The processing of gases and vapours
- **Explosion monitoring for the protection of industrial plant and the workers.**
  Continuous monitoring of the atmosphere to detect the formation of explosive gas/ vapour-air mixtures and to give early warning, long before the lower explosion limit is reached (LEL).
- **Toxicity monitoring for the protection of the workers.**
  Continuous monitoring of the atmosphere to detect the formation of toxic gas concentrations. Early warning prior to or on reaching the limit values.
- **Oxygen monitoring for protection of the workers.**
  Continuous monitoring of the atmosphere to detect oxygen enrichment or deficiency. Early warning prior to or on reaching the limit values.
- **Oxygen monitoring for protection of industrial plant.**
  Continuous monitoring of inerted atmospheres to detect the presence of oxygen. Early warning prior to or on reaching the limit values.

1.2 Sensors Which Can Be Connected to the Unit

The following types of active and passive MSA sensors can be connected to the SUPREMA system:

Designation	Module Type	Measuring Principle	Use	Active	Passive
DF-7100	MCI	catalytic	EX	X	
DF-7010	MCI	catalytic	EX	X	
DF-9500	MCI	electrochemical	TOX/OX	X	
DF-9200	MCI	electrochemical	TOX/OX	X	
DF-8510	MCI	electrochemical	Fire Detection*	X	
DF-8501	MCI	semiconductor	Fire Detection*	X	
DF-8502	MCI	semiconductor	Fire Detection*	X	
DF-8401	MCI	semiconductor	TOX	X	
DF-8603	MCI	semiconductor	TOX	X	
DF-8201	MCI	semiconductor	TOX	X	
DF-8250	MCI	semiconductor	EX	X	
GD10	MCI	infrared	EX	X	
SafEye 2 and 4	MCI	infrated/ultraviolet	EX/TOX	X	
IR-3600	MCI	infrared	CO_2	X	
D-7010	MPI-WT10	catalytic	EX		X
D-7100	MPI-WT100	catalytic	EX		X
D-7600	MPI-WT100	catalytic	EX		X
D-7602	MPI-WT100	catalytic	EX		X
D-7606	MPI-WT100	catalytic	EX		X
D-7400	MPI-WT100	catalytic	EX		X
D-7711	MPI-WT100	catalytic	EX		X
D-715	MPI-WT100	catalytic	EX		X
D-7152	MPI-WT100	catalytic	EX		X
Series 47K	MPI-WT100	catalytic	EX		X
D-8101	MPI-HL8101	semiconductor	TOX/EX		X
D-8113	MPI-HL8113	semiconductor	TOX/EX		X
D-8201	MPI-HL8101	semiconductor	TOX/EX		X
D-8213	MPI-HL8113	semiconductor	TOX/EX		X
Type 410	MPI-WT100	catalytic	EX		X
Type 451	MCI	electrochemical	TOX	X	
Ultima	MCI		EX	X	
Ultima IR	MCI	infrared	EX	X	
Ultima XE	MCI	catalytic	EX	X	
Ultima X IR	MCI	infrared	EX	X	
FlameGard	MCI	infrared	Flame*	X	

Table 1-1: Sensors available for connection

(EX: Explosive gases or vapors; TOX: Toxic gases; OX: Oxygen; Fire Detection: Smoldering Fire Detection; Flame: Flame Detector)

* With regard to fire and smoke detection, the SUPREMA has not been evaluated to any Canadian standard by a third party agency.

Attention! Other types of sensors may be operated in conjunction with the SUPREMA only after consulting with MSA.

1.3 Software Status

The operation manual refers to the following software status:

Module	Software version	Software version
	Flash resp. EPROM	**CPLD**
MCP 10	2.02.18	
MDO 10	2.02.18	
MDA 10	1.02.02	MDA MA01
MAO 10	2.02.01	MAO MA01
MGO 10	2.02.06	MGO MA01
MAI 20	MAIEA02	MAI MA01
MAR 10		MAR MA01

Table 1-2: Software status ATEX

Module	Software version	Software version
	Flash resp. EPROM	**CPLD**
MCP 10	2.02.15	
MDO 10	2.02.15b	
MDA 10	1.02.02	MDA MA01
MAO 10	2.02.01	MAO MA01
MGO 10	2.02.06	MGO MA01
MAI 20		MAI MA01
MAR 10		MAR MA01

Table 1-3: Allowed Software versions TÜV SIL 3

2. System Concept

2.1 Introduction

The SUPREMA control system, which is used in the area of gas measuring technology, is characterised by the following properties:

- modular system design
- compact construction
- highly flexible
- minimal installation work (bus system)
- high availability

At the maximum degree of expansion, 256 sensors can be connected. The system can drive up to 512 relay outputs.

For higher safety levels, the system can be built with redundancy.

Via a CAN bus interface, an industrial PC can be connected to tie the system into the company communications network, for example.

2.2 Features of the System

- 19” rack system for the connection of up to 256 sensors.
- Output of up to 512 alarm messages.
- Complete system for up to 64 sensors with common alarm in one 19” rack.
- Modular system.
- Compact construction.
- High flexibility.
- Minimal installation work (bus system).
- External voltage operation (85 ... 265 VAC) no switching necessary.
- Power supply unit on the rack, 150 W.
- For higher power requirements, external power supplies can be connected.
- Battery connection for emergency power operation.
- Operating voltage of the modules = 24 VDC; voltage controller for 5 V, etc., on the modules.
- The system is laid out so that card coding is no longer necessary.
- Operating voltage range of the system modules: 19.2 VDC ... 32 VDC.
- Operation of passive catalytic-/semiconductor-sensors (D-7600, D-7100, D-7010, etc.), 3- or 5-wire.
- Operation of active sensors with 4 ... 20 mA output, 2- or 3-wire (DF-7100, DF-9500, etc.).
- Maximum number of sensors in the system: 256.
- Maximum number of sensors in one rack: 64.

- Maximum number of switching outputs in the system: 512.
- System operation via a graphic display screen with a resolution of 240 x 64 pixels, cursor keys and individual function keys.
- System operation optionally via laptop (Windows-oriented user interface).
- Option for connection of an external PC (data evaluation, data display, etc.).
- Key switch connection or password for access control.
- Key switch connection for relay inhibiting.
- Common alarm LEDs for 1st to 4th alarm, signal failure (sensor), horn, inhibit, power supply failure.
- Protocol printout of status changes + system operations (standard ASCII, 80 CHR).
- 3 x RS 232 interfaces for data transfer to an industrial PC/laptop/printer.
- RS 232 interfaces are electrically isolated.
- RS 232/RS 485 converters used for longer transmission distances.
- The 8 MRO-Module common alarm relays supplied by the rack power supply unit.
- External relays are supplied with power separately.

2.3 Construction of the Unit

The modules of the SUPREMA are mounted in a rack. For expanded systems, additional modules can be placed in a second rack or installed on top hat rails in a switch box. Data is exchanged between the modules over a CAN bus, which makes it possible to transmit data over distances of up to 1,000 m. For measurement tasks that require redundant signal input and processing, additional modules can be added at any time to expand the gas warning system.

The installation site of the modules must be outside Explosion Zones 0, 1, and 2 and be free of ignitable, explosive, or corrosive gases.

The sensors must have the type of protection against ignition prescribed for the installation site. The connection between the input module of the SUPREMA and the sensors is established by a screened remote-measurement cable of the 2-, 3-, 4- or 5-wire type.

The SUPREMA system must be operated at a voltage in the range of: 19.2 VDC to 32 VDC.

For servicing, the sensors can be electrically isolated from the SUPREMA by mechanically disconnecting the plug-in connection (MAT, MAT-TS modules).

The following block circuit diagram shows the possible layout of a non-redundant system.

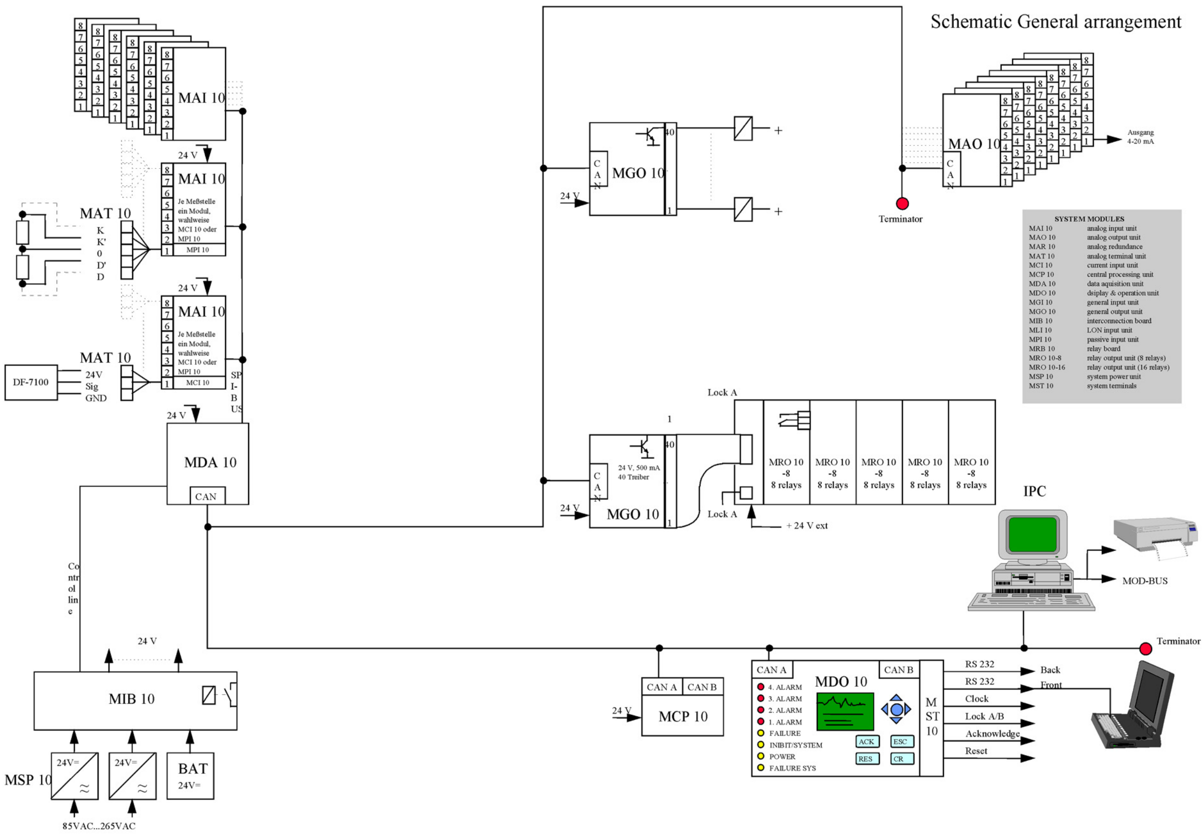


Figure 2-1: Block circuit diagram of a system layout (non-redundant)

2.4 Safety Concept

The individual functional modules are connected to each other by a CAN bus. The CAN bus is designed to be virtually error-proof. Every module can detect errors on the bus and handle them. The probability of an undiscovered communications error on the bus is $4.7 \cdot 10^{-14}$. Error states on the CAN bus are indicated on the DISPLAY + OPERATION unit.

Each module with a microcomputer module has a ”watchdog timer”, which actuates a ”wired OR” signal line when the module fails. As a result, the SYSTEM FAILURE common relays on the interconnection board (MIB module) are de-activated. This common failure signal is monitored by the DISPLAY + OPERATION unit (MDO module).

All the modules are checked for signs of life at fixed, periodic time intervals by the CENTRAL PROCESSING unit (MCP module) via the CAN bus. The failure of a module can thus be recognised, and the appropriate messages will be generated. In addition, the DISPLAY + OPERATION unit (MDO module) and at least one GENERAL OUTPUT Module (MGO module) are able to detect at the local level when these regular checks do not occur, and they then pass this information on. The operating voltages of the connected voltage supply units (EXT, INT and BAT) are monitored by special inputs of the DATA ACQUISITION unit (MDA module). If a malfunction occurs here, the POWER-FAIL common relay is released.

For gas warning systems with higher safety requirements according to EN 61508 SIL 3 the system can be provided with redundancy by the use of additional modules. Redundant signal processing has the same structure and functions the same way as standard non-redundant processing. Communications between the modules proceed over an internal connection, which is designed as a redundant CAN bus. If one of the two signal processing routes malfunctions, an error message to this effect appears on the DISPLAY + OPERATION unit (MDO module) (SYSTEM FAIL). The remaining signal processing channel takes over all of the necessary functions until the defective module can be replaced. The failure of individual modules does not lead automatically to the failure of the entire system. Only the functions assigned to the specific module in question are not available.

In the simpler expansion stages of the safety requirements according to EN 61508, the gas warning system can be operated via one of the two possible CAN bus connections. Starting with SIL 3, both CAN bus connections are generally required. In this case, at least two CENTRAL PROCESSING units (MCP modules) are present and all of the input and output signals important for system operations are available over additional modules on both CAN buses in parallel. If one of these CAN bus connections fails, an error signal is generated by the SYSTEM FAIL message. The system still remains functional by using the remaining CAN bus connection.

The message SYSTEM FAIL is leading to flash up the SYSTEM FAIL LED and the system failure relays change to the failure condition. A permanent lasting System fail message indicates a urgent needs of service (for example the malfunction ones Module). Therefore the connection of the switching outputs of the system failure relays must be that way that the message triggering comes promt.

3. Description of the System

3.1 Structure of the System

The modular control system contains two different types of modules. Each type is equipped with a microcomputer and is connected to the CAN bus.

Modules with complex tasks and multitasking:

- MCP Module: CENTRAL PROCESSING Module
  (system control and signal processing)
- MDO Module: DISPLAY + OPERATION Module
  (system status display + operation)

Modules with simple tasks without multitasking:

- MDA Module: DATA ACQUISITION Module
  (measurement signal input + preliminary processing)
- MGO Module: GENERAL OUTPUT Module
  (driver outputs for system messages)
- MAO Module: ANALOGUE OUTPUT Module
  (0 ... 20 mA outputs)

In addition, the following modules without microcomputers and without direct access to the CAN bus are present:

- MAI Module: ANALOGUE INPUT Module
  (signal processing + digitisation for 8 measuring sites)
- MCI Module: CURRENT INPUT Module
  - MCI 10 (signal processing for 0 ... 20 mA, 0 ... 24 V, contact)
  - MCI 20 (signal processing for 0 ... 20 mA)
  - MCI 20 BFE (BFE = Smoldering Fire Detection)
    (Signal processing for 0 ... 20 mA especially for DF 8501, DF 8502, DF8510 fire detectors)
- MPI Module: PASSIVE INPUT Module
  (power supply + signal processing for catalytic and semiconductor sensors)
- MRO Module: RELAY OUTPUT Module
  (2 models, 8/16 relays)
- MIB Module: INTERCONNECTION BOARD
- MFI Module: Fire Input Module (Power supply and signal processing for automatic and push-button fire detectors)
- MSI-Module: Switch Input Module (Power supply and signal processing for external switches)
- Connection modules etc.

3.2 Expansion Stages

In the minimal version for 8 inputs, the following units are to be used:

- MDA Module — Data Acquisition Module
- MAI Module — Analogue Input Module
- MCI and/or MPI Module — (maximum of 8 on one MAI card)
- MCP Module — Central Processing Module
- MGO Module — General Output Module
- MRO 8 Module — Relay Output Module (Common Alarms)
- MDO Module — Display + Operation Module
- MFI Module — Fire Input Module
- MSI Module — Switch Input Module
- Rack
- Supply Voltage

By integrating additional units of the type listed above, a system can be expanded to handle as many as 256 sensors and as many as 512 relay driver outputs.

Redundant systems for higher safety classes are realised by adding up to two more CENTRAL PROCESSING units (MCP modules), a double set of the appropriate data acquisition (MAR and MDA) and alarm control modules (MGO), a second CAN bus and a second or third voltage supply. (see section Redundant Systems)

3.3 System Design Variants

- 19” racks for 8, 16, 24, 32, or 64 sensors
- System modules installed in racks and wall assembly

3.4 Data Exchange between the Modules

The field bus for the gas warning system has the following features:

- Defined standards (ISO, OSI)
- Secure transmission
- Supportive manufacturers and users
- Readily available hardware and software components
- Widespread acceptance and use
- Rapid data exchange
- Low cost per network node in future expandable

The CAN bus satisfies all these criteria. It is therefore obvious that this bus is a safe decision for the future. An increasing number of applications in other branches of industry demonstrates that the CAN bus is being recognised as an economical platform for nearly any type of communications in mobile systems, industrial automation, and measurement technology.

The data is exchanged between the modules over the CAN bus. All modules use standardised device profiles according to CANopen (CiA-DS 301, CiA-DS 302, CiA-DSP 401 and CiA-DSP 403). Two CAN bus connections are provided, which are operated in parallel in the redundant system design.

3.5 Bus Protocol

On layers 1 and 2 of the ISO/OSI model according to ISO Standard 11,898, the CAN bus protocol 2.0A is used with 11 bit long identifiers. On the Interconnection Board (MIB module), the DIL switch can be used to set the transfer speed to 10, 20, 50, 125, 250, 500 or 1,000 kBits/s for all of the connected modules. All modules on one bus must operate at the same bit rate; if one of the modules uses a different rate, an error state occurs on the bus. This is detected, and appropriate messages are displayed.

Each module receives a code (Node ID) in the range of 1 ... 127 by the use of the DIL switch of the MIB module board on the basis of its slot in the rack. Each of the modules on one bus must have its own code. If duplicate codes are detected, an error message is generated.

3.6 Descriptions of the Modules

3.6.1 Measurement Value Input (MDA-/MAI-/MAR-/MPI-/MFI-/MSI-/MCI-Module)

The measurement values are acquired by means of the following units:

- MAI Module: ANALOGUE INPUT Module
  (signal processing + digitisation for 8 inputs)
- MAR Module: ANALOGUE REDUNDANT UNIT
  (redundant signal input, digitisation)
- MPI Module: PASSIVE INPUT UNIT
  (signal processing for passive catalytic and semiconductor sensors)
- MCI Module: CURRENT INPUT UNIT
  - MCI 10 (signal processing for 0 ... 20 mA, 0 ... 24 V, contact)
  - MCI 20 (signal processing for 0 ... 20 mA)
  - MCI 20 BFE (BFE = Smoldering Fire Detection)
    (Signal processing for 0 ... 20 mA especially for DF 8501, DF 8502, DF8510 fire detectors)
- MFI Module: Fire Input Module
  (Power supply and signal processing for automatic and push-button fire detectors)
- MSI-Module: Switch Input Module
  (Power supply and signal processing for external switches)
- MDA Module: DATA ACQUISITION UNIT
  (measurement signal processing)

MAI Module: Analogue Input Unit

The MAI module is provided to operate 8 sensors and to process the input signals of those sensors. The power supply outputs for the sensors and the signal inputs are protected against short-circuits and overloads in the 24 VDC power system.

An MCI or an MPI module can be plugged into the MAI module for each input to ensure that each sensor is supplied with the correct power and that the associated signals are evaluated correctly.

The bridge current, zero point, and sensitivity of the MPI modules can be adjusted by the use of the display and the adjusting elements on the MAI module (required only when a sensor is replaced).

Instead of sensors, switching contacts can also be connected to the MCI module for signal input via the sensor power supply terminal and the signal input. The signal to be evaluated now changes between the ”closed circuit” state (approximately 4 mA) and the ”alarm signal” state (approximately 15 mA).

Functions:

- 8 slots for MPI, MCI, MFI or MSI modules.
- 1 slot for the MAR module (redundancy).
- Display and operating elements (bridge current, zero, sensitivity)
- 12-bit ADC, 11 channels, measurement of the signal voltage + sensor supply (24 VDC).
- Connection terminals for the sensors are on the MAT module (power supply, signals).
- Status LEDs for supply voltage, AD conversion, adjusting procedures.
- Sensors are monitored by evaluation of the measurement signals on the MDA module.
- Data transfer to the MDA module over the SPI bus.
- Euro card with a 96-way connector.

Up to 8 MAI modules can be installed in one rack for the evaluation of 64 input signals.

MCI Module (Current Input Unit)

When the following input signals are to be processed, one of these modules must be plugged into the MAI module for each input signal:

MCI 10	0 ... 20 mA switching contact 0 ... 24 V	MCI 20	0 ... 20 mA

MCI 20 BFE (BFE = Smoldering Fire Detection)*
(Signal processing for 0 ... 20 mA especially for DF 8501, DF 8502, DF 8510 fire detectors)

The module must be configured for the specific application. (see section 5.3.3 Configuration of the MCI-Module)

Functions:

- Current/voltage source for active sensors with outputs of 0(4) ... 20 mA
- Short-circuit current limitation for the power supply to the sensors (0.7 ... 2 A)
- Current limitation for the 0 ... 20 mA signal input (approximately 30 mA)
- Multiplier resistor, 100 Ohm (0 ... 20 mA = 0.0 ... 2.00 V)
- Signal input, 0 ... 20 mA, contact, or 0 ... 24 V

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MPI Module (Passive Input Unit)

Functions:

- Current/voltage source for passive sensors (constant current)
- Signal processing for passive catalytic or semiconductor sensors
- Sensor specific pre-adjustment of the zero point
- Preliminary setting of the signal amplification
- Setting of the constant current

MFI Module (FIRE INPUT UNIT)*

One MFI module must be plugged into the MAI module for each automatic or manual fire detector being monitored.The module must be configured for the relevant application. (see section 5.3.18 „Configuration of the MFI Module“)

Functions:

- Power supply for up to 20 fire detectors.
- The output voltage of the module is limited to approximately 22 V and the output current is limited to approximately 42 mA.
- Evaluate the status of each fire detector.
- In normal operation, the module output voltage (UA) is approximately 0.4 V.
- In an alarm situation the output is approximately 1.6 V and for fault approximately 0 V.
- In an alarm situation the module is non-latching.
- If a latching function is required, it must be programmed in the SUPREMA settings..
- The fire detectors connected have a latching function included.

Line monitor

At the last fire detector, an „END OF LINE” resistor must be installed. In the case of short-circuit or failure, the output voltage (UA) of the module switches to approximately 0 V.

Connection of a zener barrier or current separator is optional.

Operation by an external power supply is optional.

Earth current fault monitor of the line.

An earth current fault is reported if the current is >100 mA between the terminals 3 and 4 at one side and terminal 5 at the other side.

If there is an earth current fault, the output signal is approximately 0 V.

Output for earth current fault

The output terminal S1 has an open-collector transistor. The emitter of the transistor is connected with S5.

If there is no failure, the pull-up resistor between S_1 and S_2

In the case of failure, the open-collector transistor is conducting.

The maximum current is 250 mA, and the output is protected against current, voltage and temperature.

* With regard to fire and smoke detection, the SUPREMA has not been evaluated to any Canadian standard by a third party agency.

Reset of the Latching Alarms

- The fire detectors connected can be reset by a separate RESET button.
- The RESET button is short-circuiting terminals 3 and 3, this makes the supply voltage of the fire detectors drop below the holding level.

MSI Module (SWITCH INPUT UNIT)

One MSI module must be plugged into the MAI module for each external switch being monitored. The module must be configured for the relevant application. (see section 5.3.19 „Configuration of the MSI Module“)

Functions:

- Power supply for the switches.
- The output voltage of the module is limited to approximately 14 V and the output current is limited to approximately 8 mA.
- Evaluate the status of the switches.
- In normal operation, the output voltage (UA) of the module is approximately 0,4 V, in an alarm situation approximately 1,6 V, and at failures approximately 0 V.
- In an alarm situation the module is non-latching.
- If a latching function is required, it must be programmed in the SUPREMA settings.

Line control

At the last switch, an „END OF LINE” resistor must be installed.

In addition, each switch must be provided with a resistor connected in series.

If there is a short circuit or a failure, the output voltage switches to approximately 0 V.

Operation by an external power supply is optional.

MAR Module (Analogue Redundant Unit)

This module is used for the redundant processing of input signals in conjunction with a second, redundant MDA module.

It is plugged into the MAI module. The analogue output signals of the MPI or MCI module are digitised in parallel with the MAI module by a 12-bit ADC and transmitted over a separate SPI bus to the second MDA module.

The function here is identical to that of the MAI module.

MDA Module (Data Acquisition Unit)

This module accepts the measurement values generated by the preceding Analogue Input Modules (MAI modules), of which there can be a maximum of 8. This provides the signal processing (calculates the mean) for a maximum of 64 sensors and the results are passed to the MCP module via the CAN bus.

- Measurement values from the preceding MAI modules are read via the SPI bus.
- Measurement signals are processed in 100-ms cycles; the mean value is calculated over a period of 1 sec.
- Data is transmitted to the MCP Module over the CAN bus.
- All supply voltages are monitored (EXT, INT and BAT).

- (A Power-Fail relay is activated when the operating voltage is < 19.2 V or when the status becomes different from that of the power-on condition) function at the moment not available.
- System Failure relay is activated when a processor error occurs.
- Euro card with a 96-way connector.

3.6.2 Data Processing/MCP Module (Central Processing Unit)

The data is processed by the Central Processing Unit (MCP Module).

This module controls all system functions. The CPU communicates with the other system modules over one or more CAN buses. The measurement values are acquired via the MDA module, and the results of the signal evaluation are output via the MGO module (relay driver outputs) and the MDO Module (Display).

For higher safety requirements a second additional MCP modules can be integrated into the system for redundant processing and signal evaluation.

- Monitoring and control of all system functions
- Evaluation of the signals from up to 256 sensors
- Control of up to 512 switching outputs (relay driver outputs)
- Storage of the system parameters.
- Data output (MDO module, Graphic-LCD, MAO module 4 ... 20 mA, MGO module, relays, printer, etc.)
- Communication with the other modules over the CAN bus
- Storage of the history of the calibration data, measurement values, and temperature values
- Sensor calibration
- Linearisation of characteristic curves
- System Fail relay activated when a system malfunction occurs
- Euro card with a 96-way connector

3.6.3 Display + Operation/MDO Module (Display + Operating Unit)

The Display + Operation Unit (MDO module) is used to display information and for entering commands by hand.

The system is operated from the MDO module; status messages are displayed (common alarm LEDs) and alarm messages are shown in plain text. The system is operated with cursor keys in conjunction with a Windows like user interface (configuration, performance of calibrations, etc.).

- Graphic display (240 x 64 pixels) with backlit LCD screen
- System operated from a keypad with 4 cursor keys, ESC and ENTER
- Individual function keys for horn acknowledgement and alarm reset
- Plain text messages for alarms and malfunctions at the sensors
- Graphic display of alarm and failure states (”LED field”)
- Bar graphs of the measurement values

- Display of the system status (common LEDs for alarms, signal failure, system failure, inhibit)
- PC control (data display, printer control)
- System clock (RTC) with backup battery
- 3 x RS 232, electrically isolated (laptop/PC/printer interface)
- System Failure Relay is activated when a system malfunction occurs

3.6.4 Digital + Analogue Output: MGO/MRC-TS/MRO/MRO-TS/MAO Modules

- MGO Module: GENERAL OUTPUT UNIT
  (40 switching outputs, 24 V/0.5 A)
- MRO-8 Module: RELAY OUTPUT UNIT
  (rack relay module, 8 relays, 230 VAC/3 A contacts)
- MRC-TS Module 10: RELAY CONNECTION Module
  (5 x MRO, 2 x 40 channels, ribbon cable)
- MRO-8-TS Module: RELAY OUTPUT Module
  (rail-mount relay module, 8 relays, 230 VAC/3 A contacts)
- MRO-16-TS Module: RELAY OUTPUT Module
  (rail-mount relay module, redundant, 16 relays, 230 VAC/3 A contacts)
- MAO Module: ANALOGUE OUTPUT Module
  (source 0 ... 20 mA/500 Ohms load/electrically isolated from system power supply)

MGO Module (General Output Unit)

The MGO module is provided to display alarm messages or other control signals. It receives the switching data for the relay output drivers from the MCP module via the CAN bus. The output is protected against short-circuits and overloads. Driver outputs 1–8 of the first MGO module present in the system are used to control the 8 common alarms (Alarms 1–4, horn, signal failure, inhibit, power).

In redundant versions of the system, each of the two MGO modules controls 8 relays on the MRO-16-TS module (16 common alarm relays/redundant), the working contacts of these relays are connected in series.

- 40 relay driver outputs for relays, contactors, magnetic valves, lamps, or LEDs
  (24 V/0.3 A).
- The data is transmitted via the CAN bus from the MCP module.
- The System Failure Relay is activated when a system error occurs.
- Euro card with a 96-way connector.

MRC-TS Module (Relay Connection) / MRO-TS Module (Relay Output)

The output signals of the MGO module are sent over a 40-way ribbon cable from the MUT module to the MRC-TS module and from there over 20-way ribbon cables to the MRO-TS modules and the relays.

MAO Module (Analogue Output)

This module is used when analogue outputs are installed in the system. Each MAO module has 8 analogue signal outputs for 0(4) ... 20 mA current loops. The outputs are assigned directly to the signal inputs. (measuring point 17 = analogue output 17).

- 0 ... 20 mA output drivers, measurement signal outputs (galvanic isolated from system)

  Measurement signal output: 4 ... 20 mA
  Measuring range overshoot: 22 mA
  INHIBIT: 3.0 mA
  Signal failure: 3.2 mA
  Fail dependent of Free A/Free B (see Tab. 5-8)

- Maximum load: 500 Ohm
- Data transmitted from the MDO module via the CAN bus
- The System Failure Relay is activated when a processor error occurs
- Euro card with a 96-way connector

3.6.5 Power Supply, Bus Connections, Connecting Technique

- MSP Module: System Power Unit
  (power supply unit, 85 ... 253 VAC/24 VDC)
- MIB Module: Interconnection Board
  (rack, bus circuit board)
- MST Module: System Terminals
  (RS 232, RES, ACK, LOCK, CAN)
- MAT Module: Analogue Terminal Unit
  (terminals for sensors on the rack)
- MAT TS Module: ANALOGUE TERMINAL UNIT
  (terminals for sensors on the rack)
- MUT Module: Universal Terminals
  (40-way ribbon cable connection)

MSP Module (System Power Unit)

- Rack power supply unit, 150 VA
- Wide range input, 85 ... 265 VAC
- Output voltage, 24 VDC

MIB Module (Interconnection Board)

This circuit board handles the system wiring of the rack. There are 15 slots for modules. Some of these slots are intended only for certain module types. The modules installed in the rack can be connected by plugging in ”terminal modules” (MAT module, MUT module, etc.) at the rear of the rack.

- Rack rear-panel wiring for 3 x MCP modules, 2 x MDA modules, 8 x MAI modules, and 2 x MGO modules
- Power supply for all modules (EXT, INT and BAT)
- Connections for 3 x 24 VDC power supplies, screw terminals (4 mm^2)
- Provision for uninterruptible 24 VDC system power supply
- Data transfer between the modules over the CAN bus or the SPI bus
- System Failure Relay, 1 changeover contact, 3 connection terminals
- DIL switch for CAN rack ID and Baud rate

- 5 dedicated slots for 3 x MCP, 2 x MDA modules
- 10 undedicated slots for MAI, MAO, or MGO modules, etc.
- Electrical connection of the inserted modules
- Terminal modules (MST, MAT, MUT, etc.) are plugged into the rear of the MIB module

MST Module (System Terminals)

- Connection module for system expansions.
- Installed at the rear of the rack.
- Ports: CAN A, CAN B, RS 232 (PC), RS 232 (laptop operation) printer, alarm reset, horn reset, relay inhibit, key switch (password).

MAT Module (Analogue Terminal Unit)

- Terminals for sensors, 0 ... 20 mA outputs, etc. (1.5 mm^2).
- 8 inputs, each with 5 terminal connections.
- Solder bridges for the 3-wire connection of passive catalytic sensors.
- Up to 4 MAT modules can be provided for the connection of up to 32 sensors.

MAT Module TS (Analogue Terminal Unit)

Similar to the MAT module but for installation on C-type or top-hat rail separate from the rack. A 40-way ribbon cable and a MUT module are required to connect it to the rack.

MUT-Module (Universal Terminals)

This module is used to connect modules which are separate from the rack (MRC-TS module, MAT-TS module, etc.) to the module inserted in the rack by means of a 40-way ribbon cable.

(Adapter plug, 96-way to 40-way.)

Relay Outputs

Up to 512 switching outputs can be controlled by the system via MGO module driver cards (40 open collector drivers each). These switching outputs can be used to drive relays, magnetic valves, contactors, lamps, LEDs (24 VDC/0.3 A). If relay outputs are required, various relay modules can be used:

- MRO-8 module: 8 common alarm relays on the rack
- MRC-TS module: relay connection, actuation of 5 relay modules
- MRO-8-TS module: 8 relays, installed on mounting rail
- MRO-16-TS module: 16 relays, redundant layout, installed on mounting rail

MRO-8 Module (Relay Output Unit: Common Alarms)

This module must be used when relays alone are required for actuating common alarms and installation is to be accomplished directly in the rack. The module can be plugged directly into the MIB module (rear of the rack). It then makes the 8 common alarm relays available. If more relay outputs are to be provided, then MRO-8-TS modules are to be used together with the MRC-TS module (installed on the mounting rail). Each relay has a changeover contact connected to screw terminals.

Function of the Module

- The module is plugged into the rear of the rack.
- It is driven by the MGO module in the rack.
- 8 relays for giving common alarms, i.e., 1st alarm, 2nd alarm, 3rd alarm, 4th alarm, failure horn, inhibit, power supply.
- One changeover contact, connected to screw terminals, is provided for each relay.
- Standard design:
  Relay energised = no alarm. The relay is de-energised when an alarm is triggered at one or more measuring point (normally energised).
- Custom design: (not allowed for relevant safety applications)
  Relay de-energised = no alarm. The relay is energised when an alarm is triggered at one or more measuring point (normally de-energised).
- The relays can be inhibited via the MST module (to prevent alarms).

MRO-8 Module: Relay Assignment

Relay 1:	1st Alarm
Relay 2:	2nd Alarm
Relay 3:	3rd Alarm
Relay 4:	4th Alarm
Relay 5:	signal failure (sensor)
Relay 6:	horn
Relay 7:	Inhibit
Relay 8:	power supply failure

MRC-TS Module (Relay Connection Module)

This module is used when relay modules separate from the rack are installed on a mounting rail. An MRC-TS module is used to connect up to 5 TS-Relay modules. The relay power supply and the ribbon cable, which are required for the control of the relays by the MGO module, are attached to this MRC-TS module. It is possible to control 5 MRO modules (with alternatively 8 or 16 Relays each). The MRC-TS-module is connected to the MGO-module over a 40-way ribbon cable (2 for the redundant version) and a rack mounted MUT-module. In the redundant version each 2 MGO-module are connected via 2 MUT modules and 2 ribbon cables to the MRC-TS module.

- Connections for the relay power supply (3 x 24 VDC)
- Connections for relay inhibiting
- Bridge (BR1) for the selected type of inhibit (normally energised/normally de-energised)

MRO-8-TS Module (Relay Output Unit: Non-redundant)

This module is provided when not only common alarms but also other messages are required. Each relay has a changeover contact (230 VAC/3 A). The module makes 8 relays available, each with its own changeover contact. The relays are controlled by an MGO module, operating via the MRC-TS module.

MRO-8-TS Module: Function of the Module

- The module is controlled by an MGO module operating via the MRC module.
- 8 relays for alarms or control functions.
- 1 changeover contact per relay (230 VAC/3 A) connected to terminals.
- The relays can be inhibited by the LOCK function (no alarm). The LOCK function can be controlled via the MRC-TS module.

MRO-8-TS Module: Relay Assignment

The first 8 outputs of the system are allocated to the common alarm signals. The other outputs can be assigned to any desired signal.

Relay 1:	1^{st} Alarm
Relay 2:	2^{nd} Alarm
Relay 3:	3^{rd} Alarm
Relay 4:	4^{th} Alarm
Relay 5:	signal failure (sensor)
Relay 6:	horn
Relay 7:	Inhibit
Relay 8:	power supply failure

MRO-16-TS Module (Relay Output Module (Redundant))

For systems that are designed for redundancy, the MRO-16-TS module is used. To transmit a message, the working contacts of 2 relays are connected in series and connected to 2 terminals. The relays are controlled by different MGO modules and are configured in such a way that the relay is de-energised when an alarm is triggered (normally energised).

MRO-16-TS-MODULE: Module Function

- Relay module for a redundant system.
- 2 x 8 relays for alarms or control functions.
- The module is controlled by 2 MGO modules, operating via the MRC module.
- The two working contacts of 2 relays are connected in series on the MRO-16-TS module and connected to 2 terminals. In an alarm situation, one or both contacts open.
- Relays energised = no alarm. The relays are de-energised when an alarm is triggered at one or more measuring points.
- Controlled by 2 separate MGO modules.
- Relays can be inhibited via the MRC-TS module (no alarm).

MRO-16-TS-Module: Relay Assignment

The first 8 outputs of the system are allocated to the common alarm signals. The other outputs can be assigned to any desired signal.

Relay 1:	1^{st} Alarm
Relay 2:	2^{nd} Alarm
Relay 3:	3^{rd} Alarm
Relay 4:	4^{th} Alarm
Relay 5:	signal failure (sensor)
Relay 6:	horn
Relay 7:	Inhibit
Relay 8:	power supply failure

3.7 System Power Supply

The system is supplied with 24 VDC Three pairs of terminals are provided, so that the power can be taken from 3 different sources (redundancy). The supplies are functionally equivalent, but the power draw is prioritised as follows: 1^{st} = EXT, 2^{nd} = INT, 3^{rd} = BAT. The changeover from one source to another is accomplished by hardware means in the system modules.

When an external power pack or battery supply is used, the power should be filtered through an appropriate EMC [electromagnetic compatibility] filter. The EMC and low-voltage guidelines should be followed.

3.7.1 EXT Terminals (External Power Supply, 24 VDC)

- Connection for voltage supply from an external power supply unit; power is sent to all units in the rack.
- Required when a redundant power supply is provided or when the internal rack power supply is not sufficient to operate all of the sensors.
- Maximum supply current of 20 A for one rack.

3.7.2 INT Terminals (MSP-module, 24 VDC, 150 W)

- Connection for voltage supply from an internal rack power supply or an external power supply unit.
- Power supplied to all rack units and the sensors.
- The internal power supply unit (MSP-module) has a supply voltage input of 85 ... 265 VAC (47 ... 63 Hz) or 120 ... 330 VDC.
- If the rack power supply unit cannot supply enough power, the sensors, modules, or relays must be supplied by external power supply units.
- The internal rack power supply can be omitted if, because of a high power requirement or a redundant design, the power is being supplied by an external power supply via the INT terminals.
- Maximum supply current of 20 A.

3.7.3 BAT Terminals (Backup Battery Power Supply)

- Backup battery power supply for all units of a rack (20 ...28 VDC).
- If the internal and/or the external power supply fails, the system receives its power here.
- Maximum supply current of 20 A.

3.7.4 Features of the System Power Supply

- The customer is responsible for providing a safety cut-out (maximum rack power, 480 W).
- The 85 ... 256 VAC is supplied via screw terminals directly on the power supply unit.
- The system is supplied with an operating voltage of 24 VDC (19.2 ... 32 VDC).
- 3 pairs of terminals for the connection of three 24 VDC power supply sources (EXT, INT, BAT) are provided on the Interconnection Board (MIB module).
- The EXT, INT and BAT voltages are supplied to each system module.

- If all three voltages (EXT, INT and BAT) are being supplied, only one of them is allowed through to supply the module. The prioritisation of this connection is as follows: 1st = EXT, 2nd = INT, 3rd = BAT. Example: If the EXT, INT and BAT voltages are all present, it is the EXT voltage that is passed through.
- The voltages required for the individual modules are obtained in the modules themselves from the 24 V.
- The power requirement that must be met is derived from the type and number of sensors connected and from the components installed in the system.
- The maximum power provided for one rack is 480 W (maximum current of 20 A).
- The MDA module measures all the input voltages and can generate error messages, which can be shown on the display unit. In addition, a POWER FAIL relay is de-energised when the status of the system power supply changes.

3.7.5 Power Supply Plans

Three (functionally equivalent) pairs of terminals (EXT, INT, BAT) are provided on the MIB Module card for supplying power to the system and the sensors. All of the system cards and the sensors can be supplied from each of these connections. A voltage changeover switch is provided on each system card, which ensures that only one of the voltages being applied is actually accepted. Various power supply plans are available to suit the number and type of sensors and/or the required degree of redundancy in the power supply.

If the internal rack power supply unit is not sufficient to power all the sensors, an external unit must be provided. The internal unit must then be disconnected. A redundant power supply is then provided by external units via the BAT or INT terminals.

Supply Plan A: Internal Power Supply Unit

All of the units of the system and the sensors are supplied by the rack power supply unit (INT terminals). This variant is used when no power supply redundancy is required and the power which can be supplied by the unit installed in the rack (150 W) is sufficient to supply all of the rack modules and the connected sensors.

Supply Plan B: External Power Supply Unit

All modules of the system housed in the rack and the sensors are supplied by the external power supply unit (EXT terminals). This variant is used when no redundancy is required in the power supply and the power of the unit installed in the rack (150 W) is not sufficient to supply all of the system modules and the connected sensors. A maximum of 20 A can be supplied across the terminals (480 W system power).

Supply Plan C: Internal Power Supply Unit + Battery

All units of the system and the sensors are supplied by the rack power supply unit (INT terminals) or by the backup power supply (BAT terminals). This variant is used when there must be redundancy in the power supply and the power of the unit installed in the rack (150 W) is sufficient for all rack modules and the connected sensors.

Supply Plan D: External Power Supply Unit + Battery

All modules of the system and the sensors are supplied by the external power supply unit (EXT terminals) or by the backup power supply (BAT terminals). This variant is used when the power supply must be redundant and the power that can be supplied by the unit installed in the rack is not sufficient to supply the system modules and the connected sensors. A maximum of 10 A can be supplied across the terminals (240 W system power).

Voltage Change-Over

Each module has a switch, which allows one of the available voltages (EXT, INT, BAT) through to the module. The electronic components of the card and possibly the sensors connected to it are supplied with this voltage.

Function:

- If all the voltages are present, EXT is passed through.
- If EXT fails, INT is connected.
- If INT fails, BAT is connected.

The voltage change over is delay free.

Power Supply Type	Voltages Present	Voltage Passed Through
A	INT	INT
B	EXT	EXT
C	INT BAT	INT
D	EXT BAT	EXT
E	BAT	BAT
F	EXT INT	EXT
G	EXT INT BAT	EXT

Table 3-1: Voltage Changeover

Overload Control

If the 24 V power supply collapses because of excessive demand from the connected sensors, the power supply to the heads is cut off. The switching threshold for the shutoff of the sensor supply is approximately 19.2 V. The system modules (MCP module, MDA module, MDO module) can work on an operating voltage as low as approximately 12 V.

The supply to the sensors is turned on in a staggered manner based on slot locations. As a result, the power supply during the power-on phase is not overloaded as a result of the relatively large initial current taken by the sensors.

4. Operation of the System

4.1 Operation

4.1.1 General

The modular control system's user interface is the integrated operation/display unit (MDO-module – see section 4.2). This unit displays alarms and warnings as well as system parameters. Connecting the operating unit to a PC permits a user friendly operator interface (see section 4.3 PC Operation).

Both the PC program and the SUPREMA system use window-based operating platforms. The input fields are set up as selection fields as much as possible, with all known inputs displayed. Selection is cursor-controlled, which makes use of the integrated operation/display unit very easy.

4.2 Integrated Operation/Display unit MDO10

4.2.1 General

The integrated operation/display unit includes the following display and operation components:

- LCD with 240 x 64 resolution
- 8 keys
- 8 LED's

The LCD screen has 8 rows with 40 characters per row. Character height is approximately 4 mm. The menus and output lists are structured so that operation is similar to that on a PC.

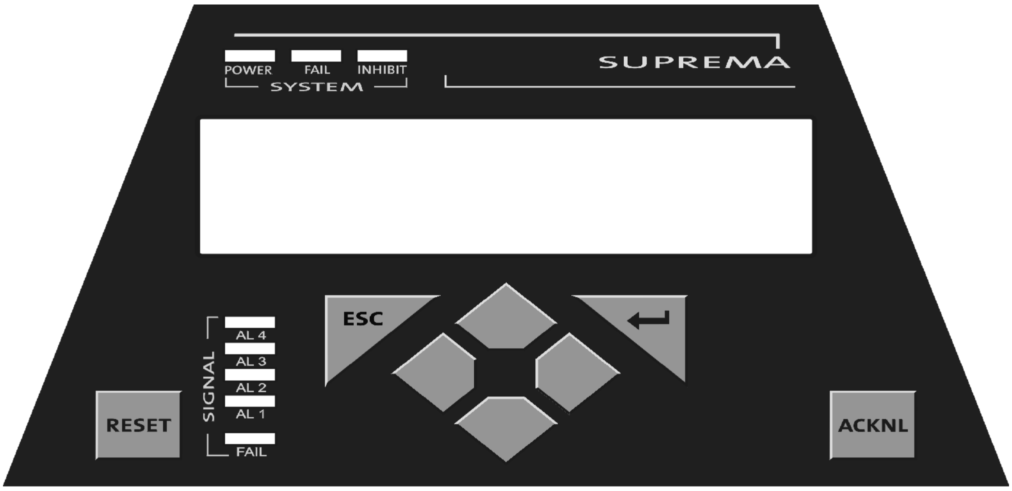


Figure 4-1: Integrated operation/Display unit-MDO-module

4.2.2 Displaying and cancelling messages

The messages displayed using LED's are divided into messages that affect the whole system (SYSTEM) and messages that affect the measurement signals (SIGNAL).

SYSTEM:

- POWER: power supply on/off
- FAIL: system-specific error (e.g. defective CPU)
- INHIBIT: one or more inputs are inhibited or require calibration

SIGNAL:

- AL 1–AL 4: collective messages for the input alarms
  (each input can trigger up to four alarms)
- FAIL: collective message for specific input problems
  (measurement values that are over the full-scale range, measurement values below the measurement range and signal failures)

Alarm types are latching or non-latching (also see Measure Points).

Non-latching alarms:

As soon as a new alarm is triggered, the corresponding LED flashes at a frequency of 0.5 Hz. Pressing the ACKNL key makes the LED change to 'steady state'. When the signal is within the limits again, the LED will be extinguished, regardless of whether the alarm has been acknowledged or not. For non-latching alarms, the RESET key has no effect.

Latching alarms:

As soon as a new alarm is triggered, the corresponding LED flashes at a frequency of 0.5 Hz. Pressing the ACKNL key makes the LED change to 'steady state'. When the signal is within the limits again, the LED remains at 'steady state' if the alarm has been acknowledged, or in the 'flashing state' if the alarm has not yet been acknowledged. If the signal is within the limits again and the alarm has been acknowledged, the LED is extinguished by pressing the RESET key. If the signal is still beyond the limit, or if the alarm has not yet been acknowledged, pressing the RESET has no effect.

Signals that are above full-scale or signal failures, are latched alarms. All signals that have exceeded the limit values are latching alarms. Signals below the measurement range are non-latched.

If an audible alarm device is connected to the system, it sounds as soon as a new alarm is triggered. It continues to sound even when the alarm condition no longer exists. Pressing the ACKNL key silences the horn, regardless of whether or not the alarm condition still exists. The RESET key has no effect on the horn.

Note: When a redundant system is used, the RESET resp. ACKNL buttons have to be pressed for at least 1 second.

4.2.3 Entering System Parameters

Establishing the Operator Dialogue

The following keys on the front of the control system are used to establish the operator dialogue through the LCD screen:

←	Back
→	Forward
↑	Up
↓	Down
ESC	Cancel
↵	Execute

At the top of the screen is a menu list, in which a menu item can be selected using the ← or → cursor keys and then pressing the ↵ key. There are three types of menu options:

- Display a submenu
- Returns to the previous menu
- Opens an input menu

A menu can contain input fields, output fields, and „buttons". Buttons are enclosed in square brackets for easy recognition (e.g., [OK]). The ↑, ↓, ← and → cursor keys are used to navigate between the elements of a menu.

```
MeasurePoints RelayOutputs System Menu A

Language:        English
Date/Time:       05/04/2003    14:56:23
Password:        ________
Confirmation:    ________
Signal if Inhibited hold
           [Ok]     [Cancel]
```

Figure 4-2: Menu list and input menu

To open an input field for data entry, select it using the cursor keys and then press the ↵ key. There are two ways to leave the field: pressing ↵ to accept the changed field contents or pressing ESC to cancel them.

Pressing buttons initiates an action. To press a button, select it with the cursor keys and then press the ↵ key.

Press ESC to return from a menu back to the menu list.

The following types of fields can displayed:

<u>Selection Fields</u>

Selection fields contain lists of possible values that can be selected using ↑ and ↓.

<u>Number Fields</u>

Number fields can contain whole or decimal numbers. The number values can be increased or decreased by pressing ↑ or ↓. For decimal numbers, ← and → can be used to change the position of the decimal point.

Text Fields

In text fields the operator can enter text and choose between overwrite and insert mode. When the field is opened, it defaults to overwrite mode. In this mode, 🡐 and 🡒 move between the character positions and 🡑 and 🡓 select the desired characters.
Pressing 🡑 and 🡓 simultaneously switches to insert mode. In this mode, pressing 🡒 inserts a space at the cursor's position and moves the character under the cursor and all characters to the right of the cursor one position to the right. Pressing 🡐 lmoves the character under the cursor and all characters to the right of the cursor one position to the left. Pressing 🡑 or 🡓 leaves insert mode.

Display Fields

Display fields simply display information and are not affected by the cursor keys.

Check Boxes

Check boxes represent options that can be enabled or disabled. Pressing the ↵ key switches between enabled and disabled.

[x] enabled check box

[ ] disabled check box

Option Fields

An option field represents an individual choice within a set of mutually exclusive choices. Pressing ↵ in a disabled option field enables it and disables the previously enabled field.

List Displays

List displays simply display information. No parameters can be entered The cursor keys can be used to scroll through list displays. Press ESC to leave the list display.

Overview of Operator Keys

Key	**Name**	**Function in a menu**	**Function in an input field**
🡐	Back	Move back one field	Move back one character position, move decimal point to the left
🡒	Forward	Move forward one field	Move forward one character position, move decimal point to the right
🡑	Up	Move to field above	Previous selection value or higher number value
🡓	Down	Move to field below	Next selection value or lower number value
ESC	Cancel	Without changing the menu list	Leave field without changing
↵	Execute	Open current field to change, execute field function (button)	Accept changed field contents and leave field

Table 4-1: Overview of operator keys

4.2.3.1 Operation menu structure

The operation menu is divided into four submenus:

- Measure
- Setup
- Maintain
- Diagnosis

These submenus can be called up by selecting the corresponding menu item. The „Measure" submenu is automatically activated at system startup.

If another menu is active and there is no operator activity for 5 minutes, the system returns to menu mode. If an alarm occurs, alarm mode is automatically activated.

Access authorisation

In the “Setup” and “Maintain” submenus, data can be displayed and entered and certain actions can be initiated by pressing buttons (e.g., starting a calibration procedure). However, the last two items require access authorisation by entering a password or introducing a key into a switch, if so equipped.

If the user wishes to change a value or press a restricted access button and does not have authorisation, he must enter the password or activate the key switch. Password authorisation remains in effect until measurement mode is activated either through operator input or automatically due to inactivity. Pressing the key switch will be requested for each data input.

The system is delivered with the default password “AUER”.

All of the operator functions are available through both control units, the integral operation/display unit and the PC, if connected. However, certain actions such as changing parameters or calibration cannot be performed simultaneously through both control units. Therefore, to perform an action of that type, modification authorisation will be required and verified. It will remain exclusive for that control unit until measurement mode is activated either through operator input or automatically due to inactivity, after which it will again be possible to switch between the control units. If modification authorisation is at the PC and there has not been any communication between the PC and SUPREMA system for more than 5 minutes, modification authorisation will be released automatically.

In the “Measure” and “Diagnosis” submenus, data is only displayed, and so there is no access control.

Measure

When system configuration is complete, the “Measure” menu for displaying measurement data will appear automatically when the system is started. For display of measurement values, it is possible to choose from three display types in the menu list:

- List
- Bar
- LED

Displayed measurement data and status values are updated at intervals.

If the operator is in the menu list and does not hit any key for 5 seconds, the value display will cycle to a picture. To scroll through the picture content manually press the ↵ key to enable 🡅 and 🡇. Press ESC to return to the menu list.

Choice of display type is independent of whether the device is operating in measurement or alarm mode. The system always returns to List display after a restart.

<u>Measure Mode</u>

During normal operation the system is in measure mode, which displays all of the inputs available in the system.

Contrary to the common alarm LED at the MDO front panel, the display of failures does not flash. Measurement values that are over the full-scale range, or signal failures, are latched. Measurement values below the measurement range behave as if they were non-latching alarms.

Alarm Mode

As soon as alarms are triggered, only the inputs in alarm status are displayed, arranged by input number. Contrary to the alarm LED's at the MDO front panel, the display of alarms does not flash.

Measurement values that are over the full-scale range will trigger all alarms caused by values exceeding the limits.

Alarm types are latching or non-latching. All signals that have exceeded the limit values are latching alarms. It is possible during measure mode to change between alarm list display and list display by pressing the ENTER button. If during list display new alarms are triggered, alarm list display is not switched automatically.

Non-latching alarms

As soon as a new alarm is triggered, it is displayed according to the three display types described below. When the signal is within the limits again, the alarm is no longer displayed, regardless of whether the alarm has been acknowledged or not. For non-latching alarms, the RESET key has no effect.

Latching alarms

As soon as a new alarm is triggered, it is displayed according to the three display types described below. When the signal is within the limits again, the alarm continues being displayed, because it is latching. If the signal is within the limits again and the alarm has been acknowledged, the alarm display is stopped by pressing the RESET key. If the signal is still beyond the limit, or if the alarm has not yet been acknowledged, pressing the RESET key has no effect.

List Display

In this display mode, the current input data is displayed in a list. If more inputs are available than can be displayed at the same time, flashing arrows appear to the far right of the title bar (↑ and/or ↓) The portion of the list to be displayed can be selected by the operator using the vertical ↑ ↓ or horizontal ← → scroll keys.

```
List Bars LEDs Menu                         A
No. Tag        Value       Status ↑↓
 17 Q-4711      0,56% LEL    Meassure
 18 Q-4712      -----% LEL   SignalErr.
 19 Q-4713     50,00% LEL    kalib.
 20 Q-4251      0,21% LEL    Messure
 21 Q-4252      0,44% LEL    Measure
 22 Q-4253     -----% LEL    suppressed
```

Figure 4-3: List display

The following input data is shown in this display:

No	Number of the input in the system. This number is set by the System and cannot be changed by the user.
Tag	The customer-defined input number is displayed here.
Value	Numerical value and unit of measurement. The measured values are displayed in intervals, as long as they are within the measuring range. If the measuring range is exceeded, the highest value reached is retained. In the case of signal failure or an alarm supression (during warm-up period of specific sensor types), dashes are displayed instead of the measured value.
Status	Current status of the input The status is updated at intervals and the following values can be displayed: - Measure - Calib. (calibrating) - inhibit - Overflow (Measured value above full scale) - Signal Err. (Measuring value below measurement range, measuring value missing) - Suppressed (alarm suppression during warm-up period of specific sensor types) - 1st to 4th alams - Free (sensor has not yet been installed)

Bar Display

This display shows the measurement values as vertical bars, where each bar represents the relative measurement value of an input with respect to full scale. The value range that can be displayed is 0 ... 100%.

The corresponding input number is shown under each bar.

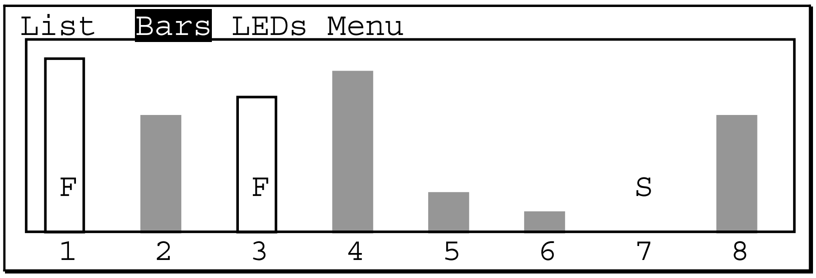


Figure 4-4: Bar display

Measurement values are normally displayed as solid bars. In error-free operation with no alarms, they are grey. Any alarm will cause the corresponding bar to change to black.

When a status message occurs for an input, the affected bar is shown only as an outline and there is an identification letter for the status value.

Legend:

L	Inhibit
C	calibrating
F	Fault (measuring value below range, measuring value missing)
O	measurement range exceeded (overflow)
S	Alarm suppressed (during the warm-up period of special sensor types)

If an input is selected using the cursor keys and the ↵ key then the data for the selected input, at the moment the key was pressed, is displayed for as long as the key is held down. There is no graphic updating of input data during this time.

LED display

This display shows the status values of the inputs as LED's. Each LED column has the corresponding input number under it.

○: Off (not inhibited, no alarm, no failure)

◎: On (inhibited, alarm, failure)

If an input is not yet configured no LEDs are displayed in that column.

```
List Bars  LEDs Menu
Inhibit.   ◎   ○   ◎   ○   ○   ○   ○   ○
4th Al.    ○   ○   ○   ○   ○   ○   ○   ○
3rd Al.    ○   ○   ○   ○   ○   ○   ○   ○
2nd Al.    ○   ○   ○   ○   ○   ○   ○   ○
1st Al.    ○   ○   ○   ○   ○   ○   ○   ○
Failure    ○   ○   ○   ○   ○   ○   ◎   ○
           1   2   3   4   5   6   7   8
```

Figure 4-5: Display as LED Field

Setup

Using the "Setup" menu, the operator can set parameters for inputs and relay outputs, as well as system parameters. The menu includes three menu items:

- Measure point
- Relay output
- System

Measure Points

This menu shows all of the parameters that describe an input. Input parameters can be viewed and changed here.

The Measure Point menu is divided into three submenus:

- Information
- Sensor data
- Alarms

```
MeasurePoints RelayOutput System Menu  A
Measure Point No.:  1       Inhibit [ ]
[Information]   [Sensor Data]   [Alarms]
Tag:                Q-123
Marking:            SP-05
Sensor Ser. Nr.:    115
Install Area:       Feld 14
      [OK]      [Cancel]      [Clear]
```

Figure 4-6: Measure Point Setup menu

The following paragraphs describe the functions of the individual menu items. The first items discussed are those that are identical in all three submenus.

Measure Point No.

Field type: Selection field

The field contains a list of all configured inputs. It also contains inputs which no longer physically exist, but whose parameters are still stored in the system. Those inputs are only removed from selection when the user deletes them in the Measure Point menu.

After an input number is selected, the rest of the menu is filled, if that input has already been configured. If an input number is selected that has not been configured before, the settings from the last displayed input remain and are used as the preliminary settings for the new input.

This makes it easy to copy the settings from one input to another. If an input is displayed that has not yet been configured, default values are used as the preliminary settings for the input of certain fields. This selection field can be accessed without a key switch or password if an input is entered for which input parameters have already been set. If a number is entered that has not been used before, authorisation by means of password or key switch is required.

All parameter changes using the menu items described below apply to the inputs selected in that field.

Inhibit

Field type: Check box

If this check box is enabled, the selected inputs cannot trigger alarms.

Information, Sensor Data, Alarms

Field type: list

Pressing the appropriate button will display the corresponding submenu.

“Information” submenu

The “Information” submenu contains general data on the selected input.

```
MeasurePoints RelayOutput System Menu  A
Measure Point No.:  1       Inhibit [ ]
[Information]   [Sensor Data]   [Alarms]
Tag:                Q-123
Marking:            SP-05
Sensor Ser. Nr.:    115
Install Area:       Feld 14
      [OK]       [Cancel]       [Clear]
```

Figure 4-7: “Information” submenu

Tag

Field type: text

Enter a customer-specific designation for the selected input

Marking

Field type: text

Enter a customer-specific description for the selected input

Serial No. Head

Field type: text

Enter the serial number of the input device for the selected input.

Installation Area

Field type: text

Enter a customer-specific description of the installation location of the input device for the selected input.

OK

Field type: Button

Press this button to accept the settings entered in all three submenus for the selected input. After the button is pressed, the parameters are immediately checked to see if they are valid. If the parameters are valid, they become part of the system's parameter set. If not valid, a warning appears.

Cancel

Field type: Button

Press this button to cancel the settings entered in all three submenus for the selected input.

Clear

Field type: Button

Press this button to delete all of the parameters for the selected input. The input will then return to the way it was before its first configuration. Default values are used as the preliminary settings for the input of certain fields. The delete function will not work if the input is being calibrated. If an input is contributing to the setup parameters of a relay output, those parameters do not change after the input parameters have been deleted.

"Sensor data" submenu

The "Sensor data" submenu contains settings for the sensor at the selected input.

```
MeassurePoints RelayOutputs System Menu A
Measure Point No.:   1     Inhibit [ ]
[Information]   [Sensor Data]   [Alarms]
Sensor Type: DF-7100
Dimension:  %LEL          Range: 0-  500
Meas. Gas:  Ethane               Valve-
Zero Gas:   Air                  No.: 22
Test Gas:   Ethane               No.: 23
```

Figure 4-8: "Sensor data" submenu

Sensor

Field type: Selection

The field contains a list of recognised input device types. Set the type of device used for the selected input.

Units

Field type: Selection

The field contains a list of units of measurement. Set the unit of measurement for the selected input.

<u>Range</u>

Field type: Selection

The field contains a list if measurement ranges appropriate for the sensors. Set the measurement range that applies for the selected input.

<u>Meas. Gas</u>

Field type: Selection

The field contains a list of gases that can be measured with the recognised gas sensors. Set the gas that will be measured with the sensor for the selected input.

<u>Zero gas</u>

Field type: Selection

The field contains a list of ‘Zero’ gases that are used to calibrate gas sensors. Set the zero gas that will be used to calibrate the gas sensor for the selected input.

<u>(Zero gas) valve No.</u>

Not available at present.

<u>Reference</u>

Field type: Selection

The field contains a list of ‘Reference gases’ used to calibrate sensors. Set the reference gas that will be used to calibrate the sensor at the selected input.

<u>(Reference gas) Valve No.</u>

Field type: Selection

Not available at present.

“Alarms” submenu

In the “Alarms” submenu, parameters can be set for up to four alarm levels for the selected input. A limit value can be set for each alarm to trigger either on a rising or falling input signal. In addition, relay outputs can be selected to operate if an alarm occurs. For every alarm, the “atching” or “non-latching” parameters can be set.

```
MeassurePoints RelayOutputs System Menu A
Measure Point No.:   1       Inhibit [ ]
[Information]   [Sensor Data]   [Alarms]
           Upper Latched Limit        Relay
1st Al.: [X]     [X]    20.00 % LEL   ---
2nd Al.: [X]     [X]    30.00 % LEL    ---
3rd Al.: [X]     [X]    40.00 % LEL    ---
4th Al.: [ ]     [ ]    50.00 % LEL    ---
```

Figure 4-9: “Alarms” submenu

<u>Limit</u>

Field type: decimal number

A limit value can be set here for each alarm at the selected input to trigger on either a rising or falling input signal.

In this field, it is also possible to deactivate an alarm. Press the ←key until only zeros are displayed in the field. If the ↓key is now pressed, the alarm is deactivated, which is indicated by the contents of the field being deleted.

<u>Upper (Rising/Falling Alarm)</u>

Field type: Check box

For each alarm at the selected input, set whether the alarm will trip when the signal is rising or falling. If this check box is enabled it is a rising alarm, if not checked, it is a falling alarm.

<u>Latched</u>

Field type: Check box

The alarm is latching if the check box is enabled, if not, it is non-latching.

This feature has an effect on the behaviour of the MDO front panel LED’s, what is shown in the “Measure“ menu, and on the relay outputs assigned to an alarm.

<u>Relay</u>

Field type: Selection

These fields contain a list of available relay outputs. Set relay outputs, that will be used, for the individual alarms at the selected input. Link to this <u>after</u> selecting a relay output in a relay output assignment menu.

Relay output assignment menu

This menu is not a submenu of the Measure Point menu, but rather an independent menu that can only be reached from the Measure Point menu.

It is used primarily to assign relay outputs that will be used if there is an alarm, for the individual alarms at the input selected in the Measure Point menu.

In addition, this menu also provides the same function as the “RelayOutput” menu.

The top three rows of the menu cannot be accessed here, and are intended only for orientation.

The behaviour of a relay output depends on its parameter settings and the settings of the appropriate measure points (see section 6.4.2 Behaviour of the Relay Outputs).

```
MeasurePoints RelayOutputs System Menu A
Measure Point No.: ___       Inhibit [ ]
[Information]   [Sensor data]   [Alarms]
Relay:___ closed circuit  Voting ___/___
Tag: ___________            new Alarm [ ]
Chan.  1st   2nd   3rd   4th   Fail Inh.
 ___    [ ]   [ ]   [■]   [ ]   [ ]   [ ]
    [OK]      [Cancel]      [Clear]
```

Figure 4-10: Relay output assignment menu

The functions of the individual menu elements are described below:

Relay

Field type: Selection

This field contains a list of all available relay outputs. After an output number is selected, the rest of the menu is filled, if settings have already been entered for that output. It also contains inputs which longer physically exist, but whose parameters are still stored in the system. Those inputs are only removed from selection when the user deletes them in the Measure Point menu.

After an output number is selected, the rest of the menu is filled, if settings have already been entered for that output. If an output number is selected that has not been configured before, the settings from the last displayed output remain and are used as the preliminary settings for the new output. This makes it easy to copy the settings from one output to another. If an output is displayed that has not yet been configured, default values are used as the preliminary settings for the input of certain fields.

This input field can be accessed without a key switch or password if an output is entered for which parameters have already been set. If a number is entered that has not been used before, authorisation by means of password or key switch is required.

When first opened, the field contains the relay output that was last selected in the Measure Point menu.

All parameter changes using the menu elements described below apply to the relay output selected in this field.

Chan. (Channel)

Field type: Selection

The field contains a list of all configured inputs. When opened, it contains the input that was last selected in the Measure Point menu. The following conditions, which must be met in order to set the relay output selected in the “Relay” field, apply to the input displayed here.

Al. 1-4 (1st-4th Alarm)

Field type: Check box

In this field, select the alarms that will cause the selected relay output to trigger, for the input selected in the “Channel” field. When this submenu is opened, the cursor is on the alarm that was displayed in the Measure Point menu before this submenu was selected.

Fail

Field type: Check box

If this condition is set, the selected relay output is activated when an error (fault) occurs for the input displayed in the “Channel” field.

Inhibit

Field type: Check box

If this condition is set, the selected relay output is activated when the input displayed in the “Channel” field is inhibited.

Voting (Alarm Logic)

Field type: Integer

The value entered in this field applies to the configuration conditions described above. Optional status combinations (alarm, fail, and inhibit) can be formed when the selected relay output is configured. Up to 256 configuration conditions per relay output are permitted. The number value selected in this field determines how many of the conditions configured in the control boxes must be met for the selected relay output to be activated. The number of conditions entered in the check boxes is displayed in the field beside the voting to be configured.

The following types of links can be formed in this manner:

Single link: (1-out-of-1):

Exactly one condition is set, and the value of 1 is entered as the voting.

“OR” link: (1-out-of-m)

Multiple conditions are set, and the value of 1 is entered as the voting, i.e., if any one or more of the set conditions are met, the relay output will be activated. Parameters for a global alarm or common alarms can be set in this manner.

“AND” link: (m-out-of-m)

The value entered for the voting corresponds to the number of set conditions, i.e. all of the set conditions must be met for the relay output to be activated.

Voting link: (n-out-of-m)

If ‘m’ conditions are set, and the value of ‘n’ is entered as the voting, then the selected relay output will only be activated if ‘n’ out of the ‘m’ conditions are met.

Normal (energised))

Field type: Selection

Set the operating mode for the selected relay output:

- Normally energised (Relay is energised)

When having been set, the relay driver output gives out a low signal (normally energised)

- Normally de-energised (Relay is de-energised)

When having been set, the relay driver output gives out a high signal (normally deenergised)

Tag

Field type: text

Enter a customer-specific designation for the selected relay output.

New Alarm (i. e. actual alarm)

Field type: Check box

If this field is set, the relay output selected can be set to “normal” status by pressing the <ACKNL> key in spite of the value having been outside the limits.

OK

Field type: Button

Pressing this button validates the settings entered for the selected relay output. After the button is pressed, the voting settings must not be higher than the number of conditions set in the check boxes. If this is the case, they become part of the system’s parameter set. If not, a warning appears.

Cancel

Field type: Button

Pressing this button cancels the settings entered for the selected relay output.

Clear

Field type: Button

Pressing this button deletes all of the parameters for the selected relay output. The output then returns to the way it was before its first configuration.

Relay outputs

This menu displays all of the parameters set for a relay output. Parameter values for relay outputs can be viewed and changed here.

The functions of this menu are similar to the “Relay Output” assignment menu described in the previous section. There, starting from a particular input, a connection to a relay output was made. In this menu, the setting conditions are configured starting from a particular relay output.

The behaviour of a relay output depends on its parameter settings and the settings of the appropriate measure points (see section 6.4.2 Behaviour of the Relay Outputs).

```
MeasurePoints RelayOutputs System Menu A
Relay:___  closed circuit  Voting ___/___
 [⬆]      Tag: __________    new Alarm [ ]
Chan.  1st   2nd   3rd   4th   Fail  Inh.
 ___   [■]   [ ]   [ ]   [ ]   [ ]   [ ]
 ___   [ ]   [ ]   [ ]   [ ]   [ ]   [ ]
 ___   [ ]   [ ]   [ ]   [ ]   [ ]   [ ]
 [⬇]    [OK]       [Cancel]       [Clear]
```

Figure 4-11: Relay output menu

The functions of the individual menu elements are described below:

Relay

Field type: Selection

This field contains a list of available relay outputs. As the first 8 relay outputs of the system are tied to the common messages, the first relay output which can be configured is output No. 9. It also contains outputs which are no longer physically exist, but whose parameters are still stored in the system. Those inputs are only removed from selection when the user deletes them in the menu.

After an output number is selected, the rest of the menu is filled, if settings have already been entered for that output. This input field can be accessed without a key switch or password if an output is entered for which parameters have already been set. If a number is entered that has not been used before, authorisation by means of password or key switch is required.

This makes it easy to copy the settings from one input to another. If an input is displayed that has not yet been configured, default values are use as the preliminary settings for the input of the certain fields.

This selection field can be accessed without a key switch or password if an input is entered for which input parameters have already been set. If a number is entered that has not been used before, authorisation by means of password or key switch is required.

All parameter changes using the menu items described below apply to the selected relay outputs in that field.

Normaly energised/Normaly de-energised

Field type: Selection

Set the operating mode for the selected relay output:

Normaly energised:

The relay output delivers in the set-condition (Alarm, Failure) a LOW-Signal, this is called a connected relay is not energised. (The Normaly energised principle)

Normaly de-energised:

The relay output delivers in the set-condition (Alarm, Failure) a HIGH-Signal, this is called a connected relay is energised. (The Normaly de-energised principle)

Tag

Field type: text

Enter a customer-specific designation for the selected relay output.

New Alarm (i. e. actual alarm)

Field type: Check boxes

If this field is set, the relay output selected can be set to “normal” status by pressing the <ACKNL> key in spite of the value having been outside the limits.

🡅, 🡇

Field type: Button

These buttons are used by the operator to select the required portion of the displayed configuration matrix. In the configuration matrix, it is possible to set the conditions for each input (1st to 4th alarms, Fail, Lock) that must be met for the selected relay output to be activated.

Chan. (Channel)

Field type: Selection field

The field contains a list of all configured inputs. When opened, it contains the input that was last selected in the Measure Point menu. The following conditions, which must be met in order to set the relay output selected in the “Relay” field, apply to the input displayed here.

Al. 1-4 (1st-4th Alarm)

Field type: Check box

In this field, select the alarms that will cause the selected relay output to be activated, for the input selected in the “Channel” field.

Fail

Field type: Check box

If this condition is set, the selected relay output is activated when an error (fault) occurs for the input displayed in the “Channel” field.

Inhibit

Field type: Check box

If this condition is set, the selected relay output is activated when the input displayed in the “Channel” field is inhibited.

Voting (Alarm Logic)

Field type: Integer

The value entered in this field applies to the configuration conditions described above. Optional status combinations (alarm, fail, and inhibit) can be formed when the selected relay output is configured. The number value selected in this field determines how many of the conditions configured in the control boxes must be met for the selected relay output to be activated. The number of conditions entered in the check boxes is displayed in the field beside the voting to be configured.

The following types of links can be formed in this manner:

Single link: (1-out-of-1):

Exactly one condition is set, and the value of 1 is entered as the voting.

Advise to multiply- links: At the creation of multiply-links the digital outputs with a high number of links must be selected to the lower numbered (9–256) switch outputs. After entering the links the system makes a link-calculation. The found value shall be recorded in the logbook by the system after take over. If the value of link-calculation exeed 63, a warning goes output. The system shall refuse a value over 70, the user has to reduce the link settings.

“OR” link: (1-out-of-m)

Multiple conditions are set, and the value of 1 is entered as the voting, i.e., if any one or more of the set conditions are met, the relay output will be activated. Parameters for a global alarm or common alarms can be set in this manner.

“AND” link: (m-out-of-m)

The value entered for the voting corresponds to the number of set conditions, i.e. all of the set conditions must be met for the relay output to be activated.

Voting link: (n-out-of-m)

If ‘m’ conditions are set, and the value of ‘n’ is entered as the voting, then the selected relay output will only be activated if ‘n’ out of the ‘m’ conditions are met.

OK

Field type: Button

Press this button to accept the settings entered for the selected relay output. After the button is pressed, the voting settings are checked to see if they are valid. If the settings are valid, they become part of the system's parameter set. If they are not valid, a warning appears.

Cancel

Field type: Button

Pressing this button cancels the settings entered for the selected relay output.

Clear

Field type: Button

Pressing this button deletes all of the parameters for the selected relay output. The output then returns to the way it was before its first configuration. Default values are used as the preliminary settings for the input of certain fields.

System

This menu displays all parameters that affect the entire system.

```
MeasurePoints RelayOutputs System Menu A

Language:        English
Date/Time:       05/04/2003    14:56:23
Password:        ________
Confirmation:    ________
Signal if Inhibited hold
            [Ok]    [Cancel]
```

Figure 4-12: System menu

The functions of the individual menu elements are described below:

Language

Field type: Selection

In this field, set the language for the user display.

Date/Time

Field type: Selection

The date and time are set by selecting the appropriate input fields with the cursor keys.

After this field is closed, the new Date and Time is displayed, but it does not become valid until the menu is closed with the [OK] button.

If the system has a radio controlled clock available, date and time can only read, not change.

Password/Confirmation:

Field type: text

The password for authorisation to change parameter data can be changed by entering up to 8 characters. The password must be at least four characters long and can include any character in the ANSI character set. Upper and lower case letters are recognised as different.

To remove password protection completely, delete the password by entering only spaces. Authorisation can then be obtained only with the key switch. If no key switch is available, deleting the password will permit authorisation to everyone. In this case, an additional safety message will appear with the warning that the performance test approval of the system will become invalid.

To guard against typing errors the new password must be entered identically, two times, before it becomes valid.

Signal if Inhibited

Field type: Selection

If a MAO-module is used to inhibit the sensor signals, there are three different ways of analogue signal behaviour for inhibited inputs.

- **pass:** The received measurement values are sent on.
- **hold:** The last measured value before inhibiting occurred is retained.
- **maintain:** The signal goes to the maintenance level (corresponds to 3,0 mA).

  The requests of EN 50271 concerning the signaling of exta conditions at the analog outputs is comply only if the function Maintain is setted.

The Setting in this field is essential for all latching measuring points in the whole system.

OK

Field type: Button

Press this button to accept the settings entered. After the button is pressed, the parameters are immediately checked to see if they valid. If the parameters are valid, they become part of the system's parameter set. If they are not valid, a warning appears.

Cancel

Field type: Button

Press this button to cancel the settings entered.

Maintain

Access to the "Maintain" menu is restricted. Data can be called up and displayed, but changes and deletions are only possible after entering a password or operating a key switch.

Calibration

To calibrate the individual gas detection inputs a manual or semi-automatic (not yet available) calibration procedure can be used. After a calibration process has been started using the MDO operation/display unit, a 'Zero' gas must be introduced by maintenance personnel. Then a 'Test' (span) gas must be introduced. The results of a calibration are then displayed and are considered valid thereafter (see section 7.1 Maintenance and Adjustment).

ICalibration parameters for the individual inputs can be set in the calibration menu. From that point on the calibration is controlled.

The menu is divided into two submenus:

- "Start calibration"
- "End calibration"

If an input is selected that is not already in calibration mode, the "Start calibration" menu appears. If an input is selected that is already in calibration mode, the "End calibration" menu appears.

The functions of the individual menu items are described below.

The “Meas. Point” and “Tag” fields are contained in both submenus.

Meas. Point

Field type: Selection

The field contains a list of all configured inputs. After an input number is selected, the rest of the menu is filled, depending upon whether or not the input is in calibration mode.

Global parameter changes and actions using the menu items described below apply to the input selected in this field.

Tag

Field type: Display

The field shows the designation of the selected input.

```
Calibration InterfaceTest Menu       A
Meas. Point:   1  Tag: MP1

Dimension: % LEL    Type
Zero Gas:  0.000    Air
Test Gas:  100.0    Ethane

         [Start]      [Cancel]
```

Figure 4-13: “Start calibration” submenu

Units

Field type: Display

This shows the unit of measurement for the selected input.

Zero Gas (concentration)

Field type: decimal number

Enter the zero gas concentration in this field. This should be the same as the measurement range zero, i.e. normally zero. The field defaults to the value of the last calibration, if the input has already been calibrated.

Zero Gas (type)

Field type: Display

The field shows the type of zero gas for the selected input.

Test Gas (concentration)

Field type: decimal number

Enter the test gas concentration in this field. The field defaults to the value of the last calibration, if the input has already been calibrated.

Test Gas (type)

Field type: Selection

The field contains a list of test gases that can be used to calibrate the inputs. It defaults to the reference gas (Measure Point menu) for the selected input.

Start

Field type: Button

Pressing this button starts the calibration process and automatically inhibits the output. After the button is pressed, the parameters are immediately checked to see if they are valid. If the parameters are valid and the selected input is not in alarm mode or inhibited, the calibration process begins and the “Calibration end” submenu appears.

Cancel

Field type: Button

Pressing this button cancels the parameter changes and closes the menu.

```
Calibration InterfaceTests Menu        A
Meas. Point: ___   Tag: _________
     CAL - ZERO                CAL - SPAN
     %UEG    mV                %UEG    mV
Old: _____  ____              _____  ____
New: _____  ____              _____  ____
Sig: _____  ____   Ux = ____  mV  ■■■■■
[End]     [Cancel]     [Back]     [Store]
```

Figure 4-14: “End calibration” submenu

Old

Field type: Display

These fields display the data from the last calibration, if the input has already been calibrated.

- Measurement value and internal signal UA for zero gas (CAL-ZERO)
- Measurement value and internal signal UA for test gas (CAL-SPAN)

The dimensions of the values are shown directly above the values.

New

Field type: Display

These fields display the data for the current calibration process.

In the case of semi-automatic calibration (not available at present), the system automatically fills the signal values (mV) captured for zero gas (CAL-ZERO) and span gas (CAL-SPAN) in the fields “value” and “internal signal UA”, as soon as the calibration phase has finished. In manual calibration, the current measurement value is captured and placed in the corresponding field when the “Store” button is pressed, depending on the calibration phase.

Sig.

Field type: Display

The current measured value and the current internal signal UA are displayed and updated every second.

Ux

Field type: Display

Display of the current difference signal Ux at passive sensors, if the measure point has already been calibrated. Otherwise no value is displayed (which means: no preliminary calibration done) or ***** (active sensor) is shown.

At preliminary calibration the difference signal Ux for zero gas is set to 0 mV. At all following calibrations the current difference signal is always based on the defined value.

Bar Display

Field type: Display (5-digit)

Indicator for a stable difference signal Ux. On manual calibration procedure all 5 digits must be filled black, only then the measured values can be accepted.

Store

Field type: Button

This button is relevant only for the manual calibration process. If it is pressed during zero gas measurement, the current measurement value is placed into the zero gas field. If it is pressed during test gas measurement, the current measurement value is placed in the test gas field.

End

Field type: Button

When readings for zero gas and test gas measurement are displayed in the corresponding fields, they can be validated by pressing the “End” button. If there are already inputs to the calibration history, the operator will then be asked whether this is a first calibration. If it is a first calibration, the existing inputs in the history will be deleted.

Cancel

Field type: Button

Pressing this button will cancel a calibration process at any time. The results up to that time will be voided.

Back

Field type: Button

Pressing this button will close the menu without affecting the calibration process.

Interface Tests

Test of the analogue outputs

This function is not yet available at present.

```
Calibration InterfaceTest Menu        A
  [Analog]    [Serial]   [Driver Output]

Output Number: ---
Output Value:  ---- mA


                   [End]
```

Test of the serial interfaces

From a list of interfaces situated at the SUPREMA, an interface can be selected at the DISPLAY + OPERATION UNIT. As soon as this interface has been selected, its usual function is inhibited. Therefore, testing of serial interfaces can not be carried out via PC/laptop.

Every time the [Test] button is operated, a test text consisting of all printable characters of the font is given to the interface. The text is introduced by the “Carriage-Return” character and terminated by “Line-Feed”.

By selecting another interface or by pressing the [End] button and thus leaving the menu, the inhibit of the interface is undone.

```
Calibration InterfaceTest Menu         A
 [Analog]    [Serial]    [Driver Output]

Interface: ---------



            [Test]           [End]
```

<u>Test of the digital driver outputs</u>

After a driver output has been selected by its appropriate sub system and output number, the normal output of this driver output is inhibited. The ↑ and ↓ cursor keys are used to switch between “ON” and “OFF” for changing the output value.

By pressing the [Test] button, the value set is displayed directly at the output selected. After finishing the test press the [End] button, or by testing another driver output, the normal state of the previous driver output is restored automatically.

```
Calibration InterfaceTest Menu         A
 [Analog]    [Serial]    [Driver Output]

Partial System: primary(A)
Output Number:  ---
Output Value:   ---

                  [End]
```

Diagnostics

<u>Logbook</u>

The logbook contains five histories:

- Calibration
- Events (system errors, signal problems, alarms)
- Configuration changes
- Supply Voltage
- Processor Temperature

All history entries are time-stamped. The size of the individual histories are variable. When a history is full, the oldest entry is overwritten. One exception is the first calibration entry will not be overwritten.

```
Logbook MeasureData Menu              A
[Calibration]
[Events]
[Changes]
[Supply Voltage]
[Prozessor Temperature]

              [Cancel]
```

Figure 4-15: Logbook selection menu

Selecting an item in the Logbook selection menu displays the corresponding history. History entries are shown as list views. After a list view has been opened by pressing the ↵ key, the cursor keys can be used to scroll vertically and horizontally through its content. Pressing the ESC key closes a list view. Pressing the [Back] button returns to the selection menu.

Calibration history

This history saves the calibration process data for each input. Up to four entries can be stored for each input, and older entries are overwritten, except for the first calibration.

```
Logbook MeasureData Menu              A
Measure Point No.:   9
Calibration History:
Date     Time  Type of gas          Conc
07.04.00 15:32 Ethane               7.00
*              Air                  0.00
14.11.00 09:45 Ethane               7.00
               [Back]
```

Figure 4-16: Calibration history

When an input is selected, the appropriate calibration history is displayed in the corresponding field, if the input has already been calibrated. The entry for a calibration process consists of two rows, listing first the test gas measurement and then the zero gas measurement. The first calibration entry is designated by a "*" at the beginning of the zero gas measurement row.

If a separate zero adjustment has been carried out, the values for "Concentration" and "Measurement value" are blanked in the Span Gas Measurement line by "———".

Each entry includes the following data:

- Date/Time of accepting and closing the calibration menu
- Gas types for the zero and test gases
- Gas concentrations for the zero and test gases
- Measured values for the zero and test gases
- Difference signal Ux for the zero and test gases (scroll to the right)

Events (system error, signal problem and alarm history)

This history stores the system errors, signal problems, and alarms for the individual inputs.

Each entry includes the following data:

- Date/Time that the event occurred

- Brief description of the event
- Additionally, system events are logged (e.g. BUS failures or similar) for service purposes. They serve as a source of information for the MSA service staff.

Configuration Changes History

This history stores changes of input parameter settings.

Each entry includes the following data:

- Date/Time of accepting and closing the calibration menu
- Measurement point number
- Name of the parameter changed
- New value of the parameter changed

Supply voltage history

This history stores over-limit and under-limit power supply events (internal power, external power, battery backup). An entry is made every time a new maximum or minimum power value is measured.

Each entry includes the following data:

- Date/Time of the power measurement
- Name of the power type
- Measured voltage value

Processor temperature history

This history stores over-limit and under-limit temperature events for the MDA-module processor.

When the temperature goes above or below the permitted range, the current temperature value is stored, and when it returns to within the permitted range, the peak value from the deviation is stored.

Each entry includes the following data:

- Date/Time of the over-limit or under-limit event
- Serial number of the MDA-module
- Temperature value
- Information on whether it remained out of the permitted range
  or returned to it

<u>Measure Data</u>

This menu shows all measure points and modules. Therefore, the module is divided into the “Measure Point” and “Module” submenus.

“Modules” submenu

From the “Module” submenu, the user can recall information on the system modules.

```
Logbook MeasureData Menu              A
    [Measure Point]          [Modules]
Module-ID:   2     Partial System: B
Module Type:      MCP-10
Serial-No.:       1234546789
Software-Version: 1.02.03b
no actual errors
              [Cancel]
```

Figure 4-17: “Modules” submenu

Module ID

Field type: Selection

This field contains the ID code Nos. of all system modules which are connected to the CAN bus. After an ID code No. has been selected, the remaining menu is filled with all data available for this particular module.

Module Type

Field type: Display

This field contains the type of module selected.

Serial No.

Field type: Display field

This field contains the serial number of the module selected.

Software version

Field type: Display

This field displays the software version of the module selected.

“Measure Point”

This submenu displays the current information on all inputs.

Measure Point No.:

Field type: Selection

After selection of a measure point No., in the appropriate display field, the current signals of the selected point are displayed.

Signal UA:

Field type: Display

The amplified sensor signal is displayed in this field. The signal UA corresponds to the signal that is applied to the test sockets of the MAI module, after selection of the corresponding input No., and consists of a fixed and a variable amplified quantity. Therefore the non-amplified sensor signal cannot be calculated directly.

Signal UQ:

Field type: Display

When passive sensors and MPI modules are used, the bridge current is displayed as a voltage value.

When active sensors and MCI modules are used, dashes are displayed in this field.

Signal UY:

Field type: Display

When passive sensors and MPI modules are used the amplified sensor signal UY (mV) is displayed. The signal consists of a fixed gain that depends on the MPI module type and an offset voltage.

When active sensors and MCI modules are used, dashes are displayed in this field.

4.3 PC Operation

4.3.1 General

Connecting a PC to serial interface A of the integral operation/display unit (see section 9.1 Connection of a PC/Laptop) provides a user friendly operator interface.

The PC operating program described below runs under the existing Windows platform. The user should already have general knowledge about working in the Windows environment.

4.3.2 Entering system parameters

Structure of the PC operating program

The operating program is divided into four windows:

- Measure
- Setup
- Maintainance
- Diagnosis

When the program is started, the “Measure” main window appears and displays the measurement data.

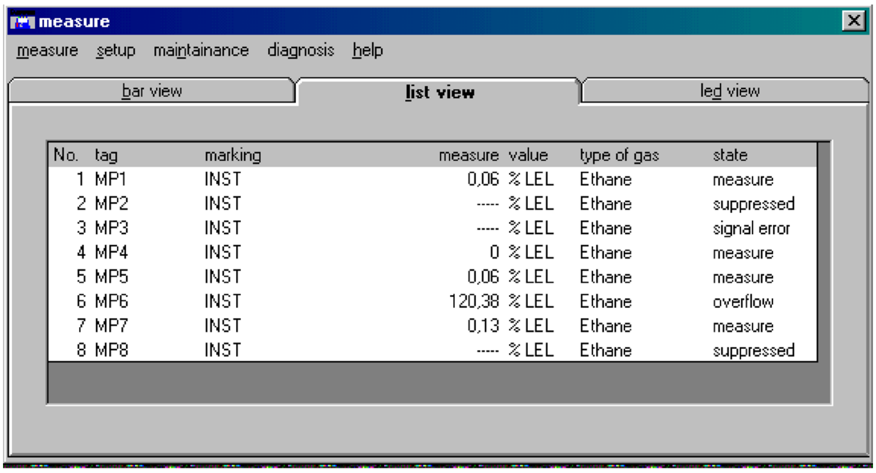


Figure 4-18: “Measure” main window

The other windows can be called up from the menu list in this window.

Access Authorisation

In the “Setup” and “Maintain” submenus, data can be displayed and entered and certain actions can be initiated by pressing buttons (e.g., starting a calibration procedure). However, the last two items require access authorisation by entering a password or introducing a key into a switch, if so equipped.

If the user wishes to press a restricted-access button and does not have authorisation, he must enter the password or activate the key switch. Password authorisation remains in effect until measurement mode is activated through operator input. Pressing the key switch will be requested for each data input.

The system is delivered with the default password “AUER”.

All of the operator functions are available through both control units, the integral operation/ display unit and the PC, if connected. However, certain actions such as changing parameters or calibration cannot be performed simultaneously through both control units. Therefore, to perform an action of that type, modification authorisation will be required and verified. It will remain exclusive for that control unit until measurement mode is activated either through operator input or automatically due to inactivity, after which it will again be possible to switch between the control units. If modification authorisation is at the PC and there has not been any communication between the PC and SUPREMA system for more than 5 minutes, modification authorisation will be released automatically.

In the “Measure” and “Diagnosis” submenus, data only is displayed, and so there is no access control.

Measure

This window shows the measurement data for the inputs available in the system.

Three display types are available for selection:

- list
- bar
- led

The displayed measure values are updated at intervals. In order to have short update cycles by a serial communication, the measurement data parameters displayed (tag, marking, unit, gas type etc.) cannot be updated in cycles. Instead, when the PC operating program is started, all of the sampling point parameters are transferred and stored in a buffer. The parameter settings of a sampling point are only updated when being displayed or stored in the “setup” submenu of the PC operating program. That means that, after the PC operating program has been started, parameter changes carried out at the the integral operation/display unit are not automatically displayed at the “measure” window of the PC operating program.

Measure mode

During normal operation the system is in measure mode, which displays all of the inputs available in the system. Contrary to the common alarm LED at the MDO front panel, the display of failures is not flashing. Measurement values that are over the full-scale range, or signal failures, are latched. Measurement values below the measurement range behave as if they were non-latching alarms.

Alarm mode

As soon as alarms are triggered, only the inputs in alarm status are displayed, arranged by input number. Contrary to the alarm LEDs at the MDO front panel, the display of alarms is not flashing.

Measurement values that are over the full-scale range are triggering up all alarms caused by values exceeding the limits. Alarm types are latching or non-latching.

Non-latching alarms:

As soon as a new alarm is triggered, it is displayed according to the three display types described below. When the signal is within the limits again, the alarm is no longer displayed, regardless of whether the alarm has been acknowledged or not. For non-latching alarms, the RESET key has no effect.

Latching alarms:

As soon as a new alarm is triggered, it is displayed according to the three display types described below. When the signal is within the limits again, the alarm continues being displayed, because it is latching. If the signal is within the limits again and the alarm has been acknowledged, the alarm display is stopped by pressing the RESET key. If the signal is still beyond the limit, or if the alarm has not yet been acknowledged, pressing the RESET key has no effect.

List display

This display type shows the current input data in a list format.

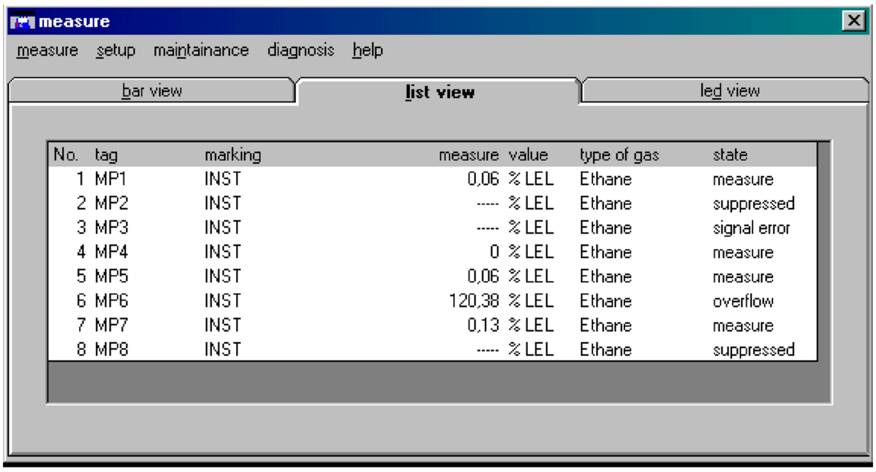


Figure 4-19: List display

The following input data is shown in this display type:

No	Number of the input in the system. This number is set by the System and cannot be changed by the user.
Tag	The customer-defined input number is displayed here.
Name of the sampling point	The customer-defined sampling point is shown.
Value	Numerical value and unit of measurement the current gas concentration. The measured values are displayed in intervals, as long as they are within the measuring range. If the measuring range is exceeded, the highest value reached is retained. In the case of signal failure or an alarm supression (during warm-up period of specific sensor types), dashes are displayed instead of the measured value.
Gas type	Name of the measured gas
Status	Current status of the input The status is updated at intervals and the following values can be displayed: - Measure - Calib. (calibrating) - inhibit - Overflow (Measured value above full scale) - Signal Err. (Measuring value below measurement range, measuring value missing) - Suppressed (alarm suppression during warm-up period of specific sensor types) - 1st to 4th alams - Free (sensor has not yet been installed)

Bar display

This display shows the measurement values as vertical bars, where each bar represents the relative measurement value of an input with respect to full scale. The value range that can be displayed is 0 ... 100%. The corresponding input number is displayed under each bar.

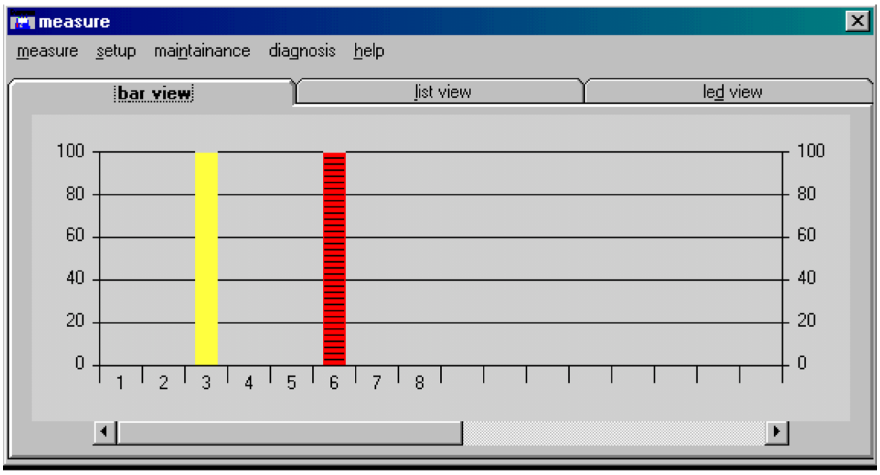


Figure 4-20: Bar display

In error-free operation with no alarms, the bars are shown in green. Any alarm will cause the corresponding bar to change to red. If an input has the status message “inhibited” or “fault” next to it, then its bar is shown in yellow.

When the bar for an input is clicked with the left mouse button, the current input data at the time of the click is displayed. There is no graphic updating of the input data while this display is open.

LED display

This display shows the status values of the inputs as LED's. Each LED column has the corresponding input number under it.

Off: not locked, no alarm, no failure, no measurement mode

Green: measurent mode

Yellow: inhibited, failure

Red: alarm

Below any LED-culomn the number of the Measure point belongs to is shown. If an input is not yet configured, no LEDs are displayed in that column.

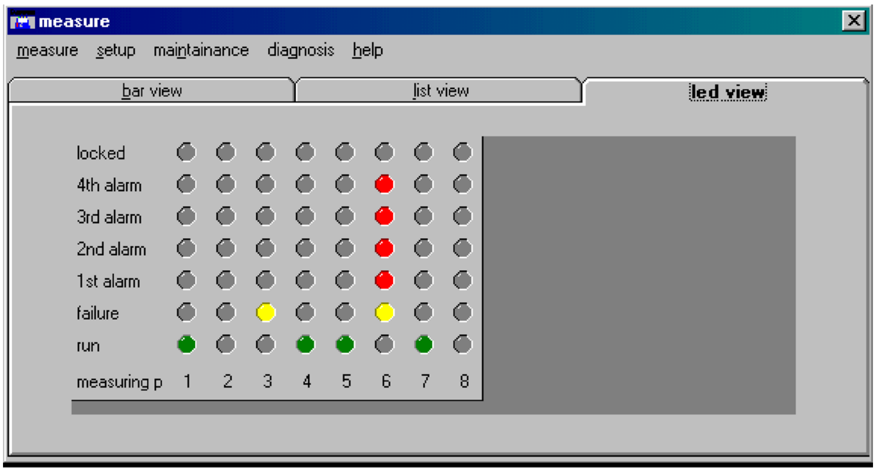


Figure 4-21: LED display

Setup

From the "Setup" menu in the "Measure" window, the operator can set parameters for inputs (measure points) and relay outputs, as well as system parameters. The menu item includes three sub-menu items:

- Measure point
- Relay output
- System settings

When one of these items is selected, the "Setup" window opens, containing all of the menus for setting parameters.

Measure point

This menu contains all of the parameters that describe an input. The parameter values for inputs can be viewed and changed here.

The measure points menu is divided into three submenus:

- Information
- Sensor data
- Alarms

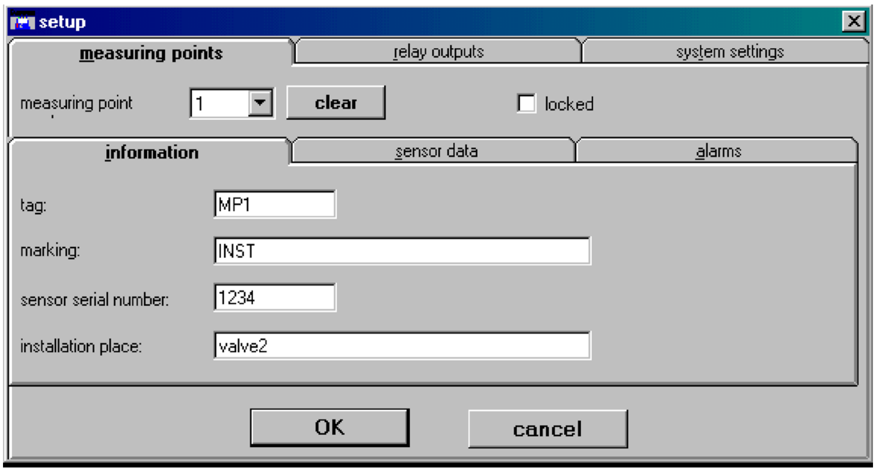


Figure 4-22: Measure point menu

The functions of the individual menu items are described below. The first items discussed are those that are identical in all three sub-menus.

<u>Measuring point</u>

Field type: Selection

The field contains a list of all configured inputs. It also contains inputs which no longer physically exist, but whose parameters are still stored in the system. Those inputs are only removed from selection when the user deletes them in the Measure Point menu.

After an input number is selected, the rest of the window is filled, if settings have already been entered for that input. If an input number is selected that has not been configured before, the settings from the last displayed input remain and are used as the preliminary settings for the new input. This makes it easy to copy the settings from one input to another. If an input is displayed that has not yet been configured, default values are used as the preliminary settings for the input of certain fields.

This selection field can be accessed without a key switch or password if an input is entered for which input parameters have already been set. If a number is entered that has not been used before, authorisation by means of password or key switch is required.

All parameter changes using the window items described below apply to the inputs selected in that field.

<u>Inhibit</u>

Field type: Check box

If this check box is enabled, the selected inputs cannot trigger alarms.

<u>Information, Sensor data, Alarms</u>

Field type: List

Selecting the appropriate item will display the corresponding submenu.

<u>OK</u>

Field type: Button

Press this button to accept the settings entered in all three submenus for the selected input. After the button is pressed, the parameters are immediately checked to see if they are valid. If the parameters are valid, they become part of the system’s parameter set. If not, a warning appears and the user can correct the settings.

Cancel

Field type: Button

Press this button to cancel the settings entered in all three submenus for the selected input.

Clear

Field type: Button

Press this button to delete all of the parameters for the selected input. The input will then return to the way it was before its first configuration. Certain Fields of the menu are defaulted. The delete function will not work if the input is being calibrated. If an input is involved in the setting conditions of a relay output, then these conditions do not change after the delete function is executed.

“Information” submenu

The “information” submenu contains general data on the selected input.

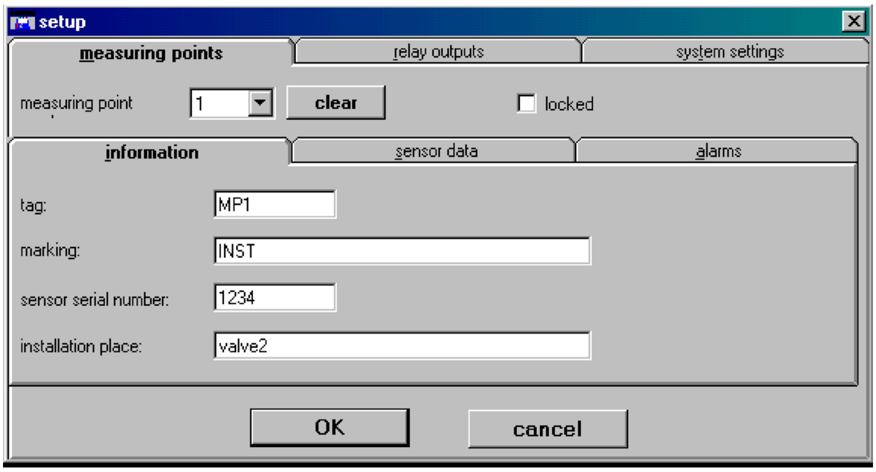


Figure 4-23: “Information” submenu

Tag

Field type: text

Enter a customer-specific designation for the selected input

Marking

Field type: text

Enter a customer-specific description for the selected input

Sensor serial number

Field type: text

Enter the serial number of the sensor for the selected input.

Installation place

Field type: text

Enter a customer-specific description of the installation location of the sensor for the selected input

“Sensor data” submenu

The “sensor data” submenu contains settings for the sensor at the selected input.

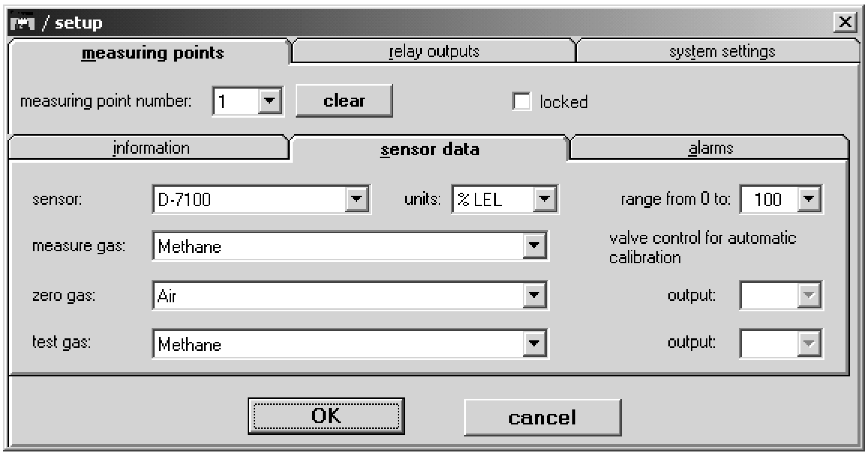


Figure 4-24: “Sensor data” submenu

<u>Sensor</u>

Field type: Selection

The field contains a list of recognized sensor types. Set the type of sensor used for the selected input.

<u>Dimension</u>

Field type: Selection

The field contains a list of units in which gases can be measured. Set the unit of measurement at the selected input.

<u>Range</u>

Field type: Selection

The field contains a list if measurement ranges appropriate for the sensors. Set the measurement range that applies to the sensor for the selected input.

<u>Measure gas</u>

Field type: Selection

The field contains a list of gases that can be measured with the recognised sensors. Set the measure gas that will be measured with the sensor at the selected input.

<u>Zero gas</u>

Field type: Selection

The field contains a list of ‘Zero gases’ that are used to calibrate sensors. Set the zero gas that will be used to calibrate the sensor at the selected input.

<u>Reference gas</u>

Field type: Selection

The field contains a list of ‘Reference gases’ used to calibrate sensors. Set the reference gas that will be used to calibrate the sensor at the selected input.

“Alarms” submenu

In the “Alarms” submenu, parameters can be set for up to four alarm levels for the selected input. A limit value can be set for each alarm to trigger either on a rising or falling input signal. In addition, relay outputs can be selected to operate if an alarm occurs.

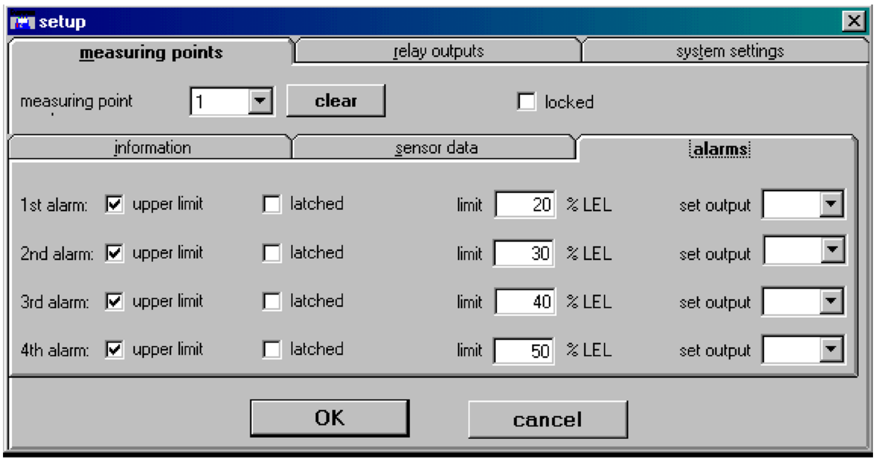


Figure 4-25: “Alarms” submenu

Limit

Field type: Decimal number

A limit value can be set here for each alarm at the selected input to trigger on either a rising or falling input signal.

Note: Please ensure that the correct decimal point is used (i.e. dot . or comma). If not, the value entered is not interpreted as intended by the operator.

In this field, it is also possible to deactivate an alarm. Doing so deletes the contents of the field.

Upper limit (Rising/falling)

Field type: Option

For each alarm at the selected input, set whether the alarm will trip when the signal is rising or falling. If this check box is enabled it is a rising alarm, if not checked, it is a falling alarm.

Latched

Field type: Check box

The alarm is latching if the check box is enabled, if not, it is non-latching.

This feature has an effect on the behaviour of the MDO front panel LEDs, what is shown in the “Measure” menu, and on the relay outputs assigned to an alarm.

Set output

Field type: Selection field

These fields contain a list of available relay outputs. Set relay outputs here that will be used in case of an alarm, for the individual alarms at the selected input. Link to this after selecting a relay output in a relay output assignment menu.

Relay output assignment menu

This menu is not a submenu of the input menu, but rather an independent menu that can only be reached through the input menu.

It is used primarily to assign relay outputs that will be used if there is an alarm, for the individual alarms at the input selected in the input menu.

In addition, this menu also provides the same function as the “relay outputs” menu, which can be accessed through the menu or through the list in the “Setup” window.

The behaviour of a relay output depends on its parameter settings and the settings of the appropriate measure points **(see section 6.4.2 Behaviour of the Relay Outputs).**

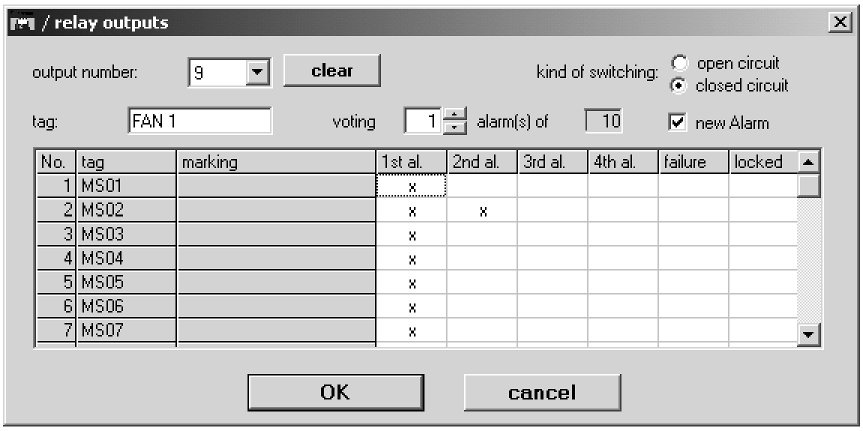


Figure 4-26: Relay output assignment menu

The functions for the individual menu items are described below:

<u>Output number</u>

Field type: Selection field

This field contains a list of the physical available relay outputs. Futher the relay outputs who are no more physical available whose parameter however are stored in the system yet are contained. The latter can be remove from the selection only then when the user cancel the field.

After an output number is selected, the rest of the menu is filled, if settings have already been entered for that output. If an output number is selected that has not been configured before, the settings from the last displayed output remain and are used as the preliminary settings for the new output. This makes it easy to copy the settings from one output to another. If an output is displayed that has not yet been configured, default values are used as the preliminary settings for the input of certain fields.

This input field can be accessed without a key switch or password if an output is entered for which parameters have already been set. If a number is entered that has not been used before, authorisation by means of password or key switch is required.

When first opened, the field contains the relay output that was last selected in the “Measure point” menu.

All parameter changes using the menu items described below apply to the relay output selected in this field.

<u>Normal (energised)</u>

Field type: Selection

Set the operating mode for the selected relay output:

ON Normal running is ON

When having been set, the relay driver output gives out a LOW signal (normally energised)

OFF Normal running is OFF

When having been set, the relay driver output gives out a HIGH signal (normally deenergised)

Normally energised: When an alarm condition is exceeded (relay output is set), a relay connected is de-energised.
Normally de-energised: When an alarm condition is exceeded (relay output is set), a relay connected is energised.

Tag

Field type: text

Enter a customer-specific designation for the selected relay output.

New Alarm (i. e. actual alarm)

Field type: Check boxes

If this field is set, the relay output selected can be set to “normal” status by pressing the <ACKNL> key in spite of the value having been outside the limits.

Configuration matrix

In the configuration matrices, shown as a table, it is possible to set the conditions for each input (1st to 4th alarms, failure, inhibited) that must be met for the selected relay output to be activated.

The following configuration conditions can be activated or deactivated by clicking with the left mouse button in the appropriate table cell.

- Alarm Levels 1-4:

Select the alarms that will activate the selected relay, for each input. When the menu is opened, the alarm that was selected in the input menu will be highlighted.

- Failure:

If this condition is set, the selected relay output is activated when a problem occurs for the corresponding input.

- Inhibit:

If this condition is set, the selected relay output is activated when the corresponding input is inhibited.

Voting (Alarm Logic)

Field type: Integer

The value entered in this field applies to the configuration conditions described above. Optional status combinations (alarm, fail, and inhibit) can be formed when the selected relay output is configured. The number value selected in this field determines how many of the conditions configured in the control boxes must be met for the selected relay output to be activated. The number of conditions entered in the check boxes is displayed in the field beside the voting to be configured.

The following types of links can be formed in this manner:

Single link: (1-out-of-1):

Exactly one condition is set, and the value of 1 is entered as the voting.

Advise to multiply-links: At the creation of multiply-links the digital outputs with a high number of links must be selected to the lower numbered (9–256) switch outputs. After entering the links the system makes a link-calculation. The found value shall be recorded in the logbook by the system after take over. If the value of link- calculation exeed 63, a warning goes output. The system shall refuse a value over 70, the user has to reduce the link settings.

“OR” link: (1-out-of-m)

Multiple conditions are set, and the value of 1 is entered as the voting, i.e., if any one or more of the set conditions are met, the relay output will be activated. Parameters for a global alarm or common alarms can be set in this manner.

“AND” link: (m-out-of-m)

The value entered for the voting corresponds to the number of set conditions, i.e. **all** of the set conditions must be met for the relay output to be activated.

Voting link: (n-out-of-m)

If ‘m’ conditions are set, and the value of ‘n’ is entered as the voting, then the selected relay output will only be activated if ‘n’ out of the ‘m’ conditions are met.

<u>OK</u>

Field type: Button

Press this button to accept the settings entered for the selected relay output. After the button is pressed, the voting settings are checked to see if they are valid. If the settings are valid, they become part of the system’s parameter set. If they are not valid, a warning appears and the settings can be correct.

<u>Cancel</u>

Field type: Button

Pressing this button cancels the settings entered for the selected relay output.

<u>Clear</u>

Field type: Button

Press this button to delete all of the parameters for the selected relay output. The output will then return to the way it was before its first configuration. Default values are used as the preliminary settings for the input of certain fields.

<u>Relay outputs</u>

This menu summarises all of the parameters for a relay output. The parameter values for the relay outputs can be viewed and changed.

The menu corresponds to the functions of the “relay outputs assignment menu” described in the preceding chapter, in which the relationship between a certain input to a relay output was designated. Unlike that system, the menu described here establishes the configuration conditions for a certain relay output.

The behaviour of a relay output depends on its parameter settings and the settings of the appropriate measure points **(see section 6.4.2 Behaviour of the Relay Outputs).**

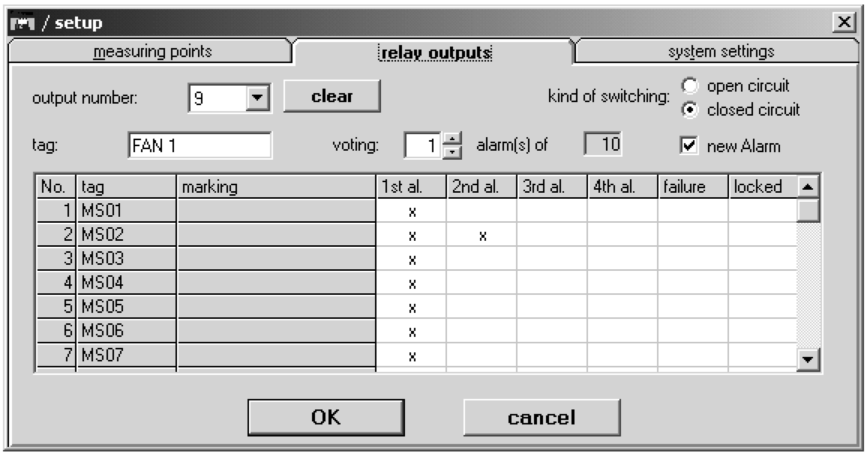


Figure 4-27: Relay output menu

The functions for the individual menu elements are described below:

<u>Output number</u>

Field type: Selection

This field contains a list of the physical available relay outputs. Futher the relay outputs who are no more physical available whose parameter however are stored in the system yet are contained. The latter can be remove from the selection only then when the user cancel the field.

After an output number is selected, the rest of the menu is filled, if settings have already been entered for that output.

If an output number is selected that has not been configured before, the settings from the last displayed output remain and are used as the preliminary settings for the new output. This makes it easy to copy the settings from one output to another.

This input field can be accessed without a key switch or password if an output is entered for which parameters have already been set. If a number is entered that has not been used before, authorisation by means of password or key switch is required.

If an output is displayed that has not yet been configured, default values are used as the preliminary settings for the input fields.

All parameter changes using the menu items described below apply to the selected relay in this field.

<u>Kind of switching</u>

Field type: Option

Set the operating mode for the selected relay output:

<u>Normaly energised:</u>

The relay output delivers in the set-condition (Alarm, Failure) a LOW-Signal, this is called a connected relay is not energised.

<u>Normaly de-energised:</u>

The relay output delivers in the set-condition (Alarm, Failure) a HIGH-Signal, this is called a connected relay is energised.

<u>Tag</u>

Field type:

Enter a customer-specific designation for the selected relay output.

<u>New Alarm (i. e. actual alarm)</u>

Field type: Check box

If this field is set, the relay output selected can be set to “normal” status by pressing the <ACKNL> key in spite of the value having been outside the limits.

<u>Configuration matrix</u>

In the configuration matrices, shown as a table, it is possible to set the conditions for each input (1st to 4th alarms, failure, inhibited) that must be met for the selected relay output to be activated.

The following configuration conditions can be activated or deactivated by clicking with the left mouse button in the appropriate table cell.

- 1st-4th Alarm:

Select the alarms that will activate the selected relay, for each input. When the menu is opened, the alarm that was selected in the input menu will be highlighted.

- Failure:

If this condition is set, the selected relay output is activated when a problem occurs for the corresponding input.

- Inhibit:

If this condition is set, the selected relay output is activated when the corresponding input is inhibited.

<u>Voting (Alarm Logic)</u>

Field type: Integer

The value entered in this field applies to the configuration conditions described above. Optional status combinations (alarm, failure, locked) can be formed when the selected relay output is configured. Up to 256 configuration conditions per relay output are permitted. The number value selected in this field determines how many of the conditions configured in the check boxes must be met for the selected relay output to be activated. The number of conditions entered in the check boxes is displayed in the field beside the voting to be configured.

The following types of links can be formed in this manner:

Single link: (1-out-of-1)

Exactly one condition is set, and the value of 1 is entered as the voting.

“OR” link: (1-out-of-m)

Multiple conditions are set, and the value of 1 is entered as the voting, i.e., if any one or more of the set conditions are met, the relay output will be activated. Parameters for a global alarm or common alarms can be set in this manner.

“AND” link: (m-out-of-m)

The value entered for the voting corresponds to the number of set conditions, i.e. all of the set conditions must be met for the relay output to be activated.

Voting link: (n-out-of-m)

If ‘m’ conditions are set, and the value of ‘n’ is entered as the voting, then the selected relay output will only be activated if ‘n’ out of the ‘m’ conditions are met.

OK

Field type: Button

By activity of this button the settings for the voted relay output can be make valid. After activity the button the system first check wether the at voting switching threshold not exeed the field type setted conditions. If this isn’t that way, the settings shal take over in the system parameter. If not, a report is issuning. The user can correct the settings.

Cancel

Field type: Button

Pressing this button cancels the settings entered for the selected relay output.

Clear

Field type: Button

Press this button to delete all of the parameters for the selected output. The output will then return to the way it was before its first configuration. Default values are used as the preliminary settings for the input fields.

System settings

This menu summarises all parameters that affect the entire system.

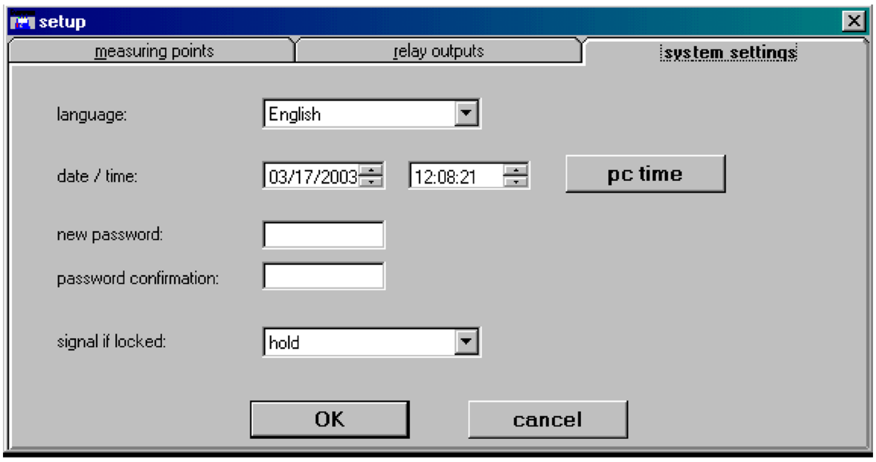


Figure 4-28: System settings menu

The functions of the individual menu elements are described below:

Language

Field type: Selection

In this field set the language for the user display. This setting has no influence on the WINDOWS system settings and the MDO display.

Date/Time

Field type: Selection

The date and time are set by selecting the appropriate input fields with cursor keys.

After this field is closed, the altered time is displayed, but does not become valid until the menu is closed with the [OK] button.

If the system has a radio controlled clock available, date and time can only read, not change.

PC Time

Field type: Button

Press this button to enter the date/time of the PC on which the operating program is carried out as preliminary settings for the date/time fields described above. But the values do not become valid until the menu is closed with the [OK] button.

If the system has a radio controlled clock, this button cannot be pressed.

Password/Confirmation:

Field type: text

The password for authorisation to change parameter data can be changed by entering up to 8 characters. The password must be at least four characters long and can include any character in the ANSI character set. Upper and lower case letters are recognised as different.

To remove password protection completely, the password can be deleted by entering only spaces. Authorisation can then be obtained only with the key switch. If no key switch is available, deleting the password will permit authorisation to everyone. In this case, an additional safety message will appear with the warning that the system will be open to unsecured modification access.

To guard against typing errors, the new password must be entered identically, two times, before it becomes valid.

Signal if inhibited

Field type: Selection

If a MAO-module is used to log up the sensor signals external, there are three different ways of analogue signal behaviour for inhibited inputs selectable.

- **pass**: The received measurement values are sent on.
- **hold**: The last measured value before inhibiting occurred is retained.
- **maintain**: The signal goes to the maintenance level (3 mA).

  The requests of EN 50271 concerning the signaling of exta conditions at the analog outputs is comply only if the function Maintain is setted.

The Setting in this field is essential for all latching measuring points in the whole system.

OK

Field type: Button

Press this button to accept the settings entered. After the button is pressed, the parameters are immediately checked to see if they valid. If the parameters are valid, they become part of the system’s parameter set. If they are not valid, a warning appears.

Cancel

Field type: Button

Press this button to cancel the settings entered.

Maintain

Calibration

To calibrate the individual gas detection inputs a manual or semi-automatic (not yet available) calibration procedure can be used. After a calibration process has been started using the MDO operation/display unit, a ‘Zero’ gas must be introduced by maintenance personnel. Then a ‘Test’ (span) gas must be introduced. The results of a calibration are then displayed and are considered valid thereafter.

Calibration parameters for the individual inputs can be set in the calibration menu. From that point on the calibration is controlled.

The menu is divided into two submenus:

- “Start calibration“
- “End calibration“

If an input is selected that is not already in calibration mode, the “Start calibration” menu appears. If an input is selected that is already in calibration mode, the “End calibration” menu appears.

The functions of the individual menu items are described below.

The “measuring point”, “Tag” and “Marking” fields are contained in both submenus.

Measuring point

Field type: Selection

The field contains a list of all configured inputs. After an input number is selected, the rest of the menu is filled, depending upon whether or not the input is in calibration mode.

Global parameter changes and actions using the menu items described below apply to the input selected in this field.

Tag

Field type: Display

The field shows the customer-specific designation of the selected input.

Marking

Field type: Display

The field shows the customer-specific description for the selected input.

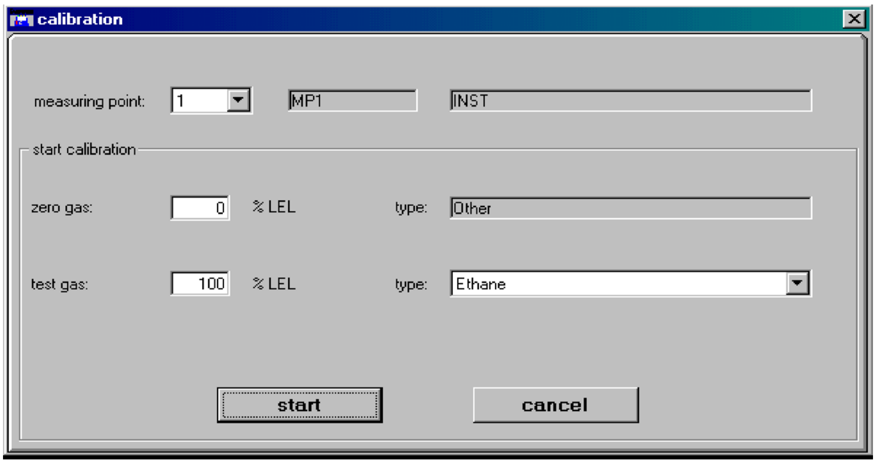


Figure 4-29: “Start calibration“ submenu

Zero gas (concentration)

Element type: Decimal number

Enter the zero gas concentration in this field. This should be the same as the measurement range zero, i.e. normally zero. The field defaults to the value of the last calibration, if the input has already been calibrated.

Test gas (concentration)

Field type: Decimal number

Enter the test gas concentration in this field. The field defaults to the value of the last calibration, if the input has already been calibrated.

Units

Field type: Display

The field beside the concentration shows the units of the selected input.

Zero gas (type)

Field type: Display

The field shows the type of the zero gas (e.g. air, nitrogen) of the input selected.

Test gas (type)

Field type: Selection

The field contains a list of test gases that can be used to calibrate inputs. It defaults to the reference gas for the selected input.

Start

Field type: Button

Pressing this button starts the calibration process and automatically inhibits the output from that channel. After the button is pressed, the parameters are immediately checked to see if they are valid. If the parameters are valid and the selected input is not in alarm mode or inhibited, the calibration process begins and the “Calibration end” submenu appears.

Cancel

Field type: Button

Pressing this button cancels the parameter changes and closes the menu.

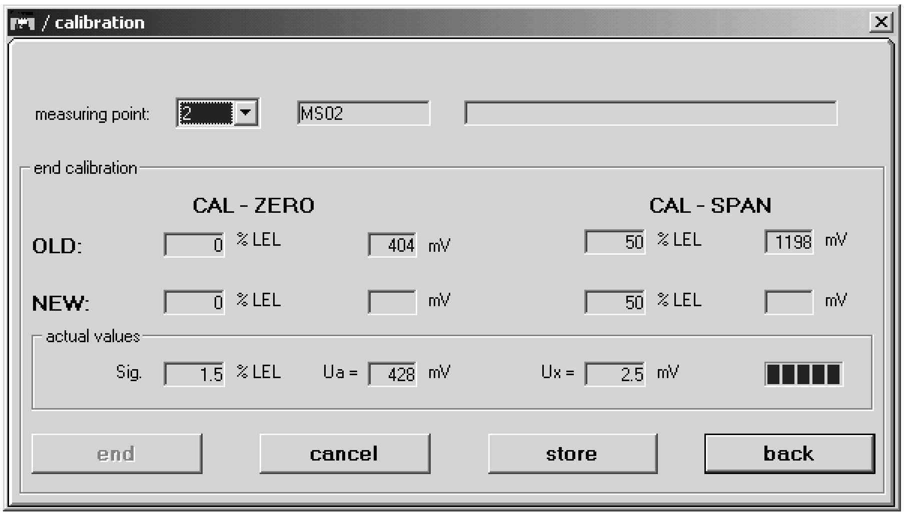


Figure 4-30: "End calibration" submenu

Old

Field type: Display

These fields display the data from the last calibration procedure, if the input has already been calibrated.

- Measurement value and internal signal UA for zero gas (CAL-ZERO)
- Measurement value and internal signal UA for test gas (CAL-SPAN)

New

Field type: Display

These fields display the data for the current calibration process.

In the case of semi-automatic calibration (not available at present), the system automatically fills the signal values (mV) captured for zero gas (CAL-ZERO) and span gas (CAL-SPAN) in the fields "value" and "internal signal UA", as soon as the calibration phase has finished. In manual calibration, the current measurement value is captured and placed in the corresponding field when the "Store" button is pressed, depending on the calibration phase.

Sig.

Field type: Display

The current measured value and the current internal signal UA are displayed and updated every second.

Ux

Field type: Display

Display of the current difference signal Ux at passive sensors, if the measure point has already been calibrated. Otherwise no value is displayed (which means: no preliminary calibration done) or ***** (active sensor) is shown.

At preliminary calibration the difference signal Ux for zero gas is set to 0 mV. At all following calibrations the current difference signal is always based on the defined value.

Bar Display

Field type: Display (5-digit)

Indicator for a stable difference signal Ux. On manual calibration procedure all 5 digits must be filled black, only then the measured values can be accepted.

Store

Field type: Button

This button is relevant only for the manual calibration process. If it is pressed during zero gas measurement, the current measurement value is placed into the zero gas field. If it is pressed during test gas measurement, the current measurement value is placed in the test gas field.

End

Field type: Button

Once readings for zero gas and test gas measurement are displayed in the corresponding fields, they can be validated by pressing the “end” button. If there are already inputs to the calibration history, the operator will then be asked whether this is a first calibration. If it is a first calibration, the existing inputs in the history will be deleted.

Cancel

Field type: Button

Pressing this button will cancel a calibration process at any time. The results up to that time will be voided.

Back

Field type: Button

Pressing this button will close the menu without affecting the calibration process.

Diagnosis

Logbook

The logbook contains five histories:

- Calibration
- Events (System errors, signal problems, alarms)
- Configuration changes
- Supply Voltage
- Processor Temperature

All history entries are time-stamped. The size of the individual histories are variable. When a history is full, the oldest entry is overwritten. One exception is the first calibration will not be overwritten.

Calibration history

This history saves the calibration process data for each input. Up to four entries can be stored for each input, and older entries are overwritten, except for the first calibration.

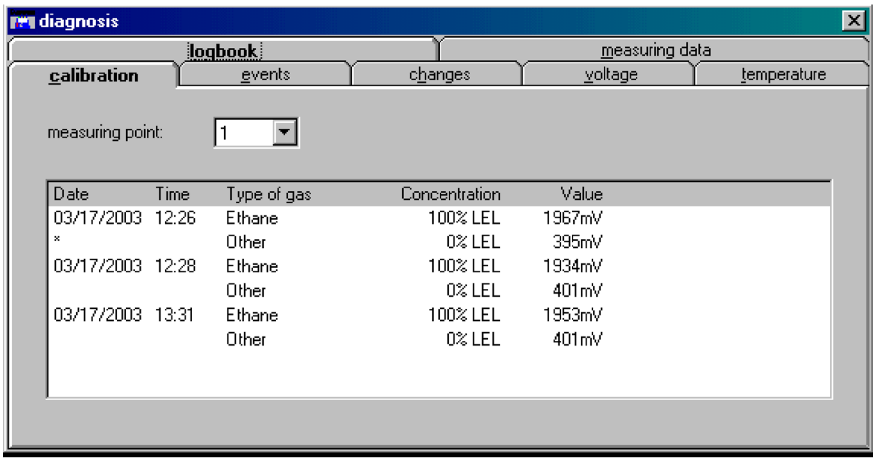


Figure 4-31: Calibration history

When an input is selected, the appropriate calibration history is displayed in the corresponding field, if the input has already been calibrated. The entry for a calibration process consists of two rows, listing first the test gas measurement and then the zero gas measurement. The first calibration entry is designated by a "*" at the beginning of the zero gas measurement row.

Each entry includes the following data:

- Date/Time of accepting and closing the calibration menu
- Gas types for the zero and test gases
- Gas concentrations for the zero and test gases
- Measured values for the zero and test gases
- Difference signal Ux for the zero and test gases (scroll to the right)

Events (System error, signal problem, and alarm history)

This history stores the system errors, signal problems, and alarms for the individual inputs.

Each entry includes the following data:

- Date/Time that the event occurred
- Brief description of the event
- Measuring point number (input)
- Additionally, system events are logged (e.g. BUS failures or similar) for service purposes. They serve as a source of information for the MSA service staff.

Configuration change history

This history stores changes to input parameters.

Each entry includes the following data:

- Date/Time of accepting and closing the inputs menu
- Measuring point number
- Designation of the changed parameter
- New value for the changed parameter

Supply voltage history

This history stores over-limit and under-limit supply voltage events (internal voltage, external voltage, battery backup). An entry is made every time a new maximum or minimum voltage value is measured.

Each entry includes the following data:

- Date/Time of the power measurement
- Name of the power type
- Measured voltage value

Processor temperature history

This history stores over-limit and under-limit temperature events for the MDA-module processor.

When the temperature goes above or below the limits of the permitted range, the current temperature value is stored, and when it returns to the permitted range, the peak value from the deviation is stored.

Each entry includes the following data:

- Date/Time of the over-limit or under-limit event
- Serial number of the MDA-module
- Temperature value

Information on whether it remained out of the permitted range or returned to it

<u>Measuring data</u>

This menu shows all sampling points and modules. Therefore, the menu is divided into the two “Measuring points” and “modules” submenus.

“Modules” submenu

From the “Modules” submenu, the user can recall information on the system modules.

<u>Module ID</u>

Field type: Selection

This field contains the ID code Nos. of all system modules which are connected to the CAN bus. After an ID code No. has been selected, the remaining menu is filled with all data available of this particular module.

<u>Module type</u>

Field type: Display

This field contains the type of the module selected.

<u>Serial number</u>

Field type: Display

This field contains the serial number of the module selected.

<u>Software version</u>

Field type: Display

This field displays the software version of the module selected.

“Measuring point” submenu

This submenu displays the current information on all inputs.

Measuring point (number)

Field type: Selection

After selection of a measuring point No., in the appropriate display field the current signals of the sampling point are displayed.

Signal UA

Field type: Display

The amplified sensor signal is displayed in this field. The signal UA corresponds to the signal that is applied to the test sockets of the MAI module, after selection of the corresponding input No., and consists of a fixed and a variable amplified quantity. Therefore the non-amplified sensor signal cannot be calculated directly.

Signal UQ

Field type: Display

When passive sensors and MPI modules are used, the bridge current is displayed as a voltage value.

When active sensors and MCI modules are used, dashes are displayed in this field.

Signal UY

Field type: Display

When passive sensors and MPI modules are used the amplified sensor signal UY (mV) is displayed. The signal consists of a fixed gain that depends on the MPI module type and an offset voltage.

When active sensors and MCI modules are used, dashes are displayed in this field.

5. Installation

5.1 General Information

5.1.1 Installation Instructions for Following the EMC Directives

The devices of MSA have been developed and tested in accordance with the EMC Directives 89/336/EEC, 91/263/EEC, 92/31/EEC, and 93/68/EEC and the corresponding standards EN 50270. The requirements of the EMC Directives can only be met by following the manufacturer's installation instructions.This applies only to tested devices and systems of the manufacturer.

General Instructions on the Installation of Tested Devices and Systems of MSA AUER GmbH to ensure that the EMC Directives are followed

- For the connection of the various devices to the power supply system a fault-free ground or fault-free equipotential bonding must be provided
- An appropriate supply voltage free of feedback to the external source in accordance with the EMC Directives must be used.
- If the devices are supplied from a direct voltage (dc) source, the supply cable must be screened.
- Screened cable is to be used to connect the sensors.
- Control cables must be screened (reset, acknowledge, measurement current output, printer, etc.).
- Screened cable must have at least 80 % coverage by the screening.
- Control and sensor cables must be laid physically apart from power supply cables.
- Screened cables must be laid in one piece. If it should prove necessary to extend a cable by way of a terminal box, the terminal box must be screened, and the connections in the box must be kept as short as possible.
- Unscreened cables and cables from which the insulation has been stripped must be as short as possible and must be laid without loops to the appropriate terminal posts.
- External devices that are operated by the gas warning units (horns, contactors, pumps, motors, etc.) must be radio-screened and follow the EMC Directives.
- If the EMC filters of the device are physically remote, the power supply cable between the filter and the device must be screened.
- If additional high-voltage surge protection measures are required an appropriate high-voltage protection filter, approved by MSA AUER GmbH, must be installed in the sensor cable.

5.1.2 Instructions on Meeting the EMC Requirements on the SUPREMA Control System

To meet the EMC product standard EN 50270 (Electromagnetic Compatibility. Electrical apparatus for the detection and measurement of combustible gases, toxic gases or oxygen), the following points must be observed:

General:

- The site chosen for the installation of the system must ensure that no excessive electromagnetic loads are present.
- The power supply connection must be equipped with a line filter of type FN 660 (Schaffner) or equivalent.
- For the external 24-volt supply, a line filter of type FN 2060 (Schaffner) or equivalent must be provided.
- Care must be taken to ensure that the line filters are in good contact (low resistance) with the mounting plate of the service cabinet.
- A clean grounding point must be provided for the equipotential bonding.
- Power supply cables are to be kept away from remote measurement/data lines (> 30 cm).
- All cables, unless otherwise specified, must be screened (> 80% coverage); they are to be connected to the rack.
- The rack is to be equipped with separate equipotential bonding.
- The connection of the cable screen should be as short as possible.
- Cables for data transmission (CAN, RS232, etc.) must be screened. There must not be any potential difference between the interface of the cable screen and ground. The cable screen must have good contact with the housings of the plug connectors.
- The cables for remote racks must be laid protected against mechanical damages (CAN, RS 232 etc.).

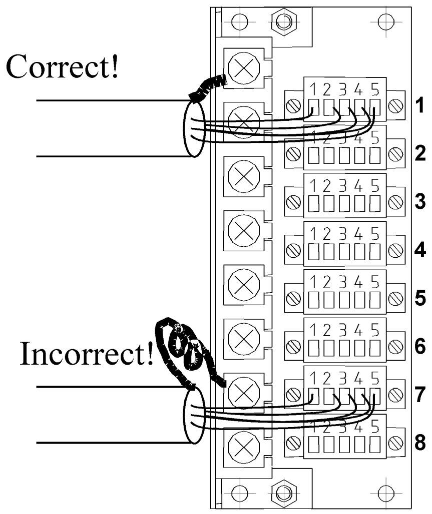


Figure 5-1: MAT module, connection of the screening

Connection of the Sensors:

1. By means of the MAT module, directly to the rack:

The remote measuring cables for passive/active sensors must be screened (> 80 % coverage), and the cable screen is to be connected to the terminals provided.

2. By means of the MAT-TS module in the service cabinet (40-way ribbon cable):

The maximum length for 40-way ribbon cables is 5 meters.

<u>MUT-module connected to MAT-TS-module</u>

Passive/active sensor cables and analogue output cables are usually screened. The cable screen is to be connected directly, over the shortest possible distance, to the screening terminal provided.

<u>MUT-module connected to MRC-TS-module</u>

The ribbon cable is to be screened. The cable screen is to be connected directly, over the shortest possible distance, to the screening terminal provided.

<u>MRC-TS-module connected to MRO-16 (8)-TS-module</u>

Screened cables are not required to connect the individual relay modules.

5.1.3 Standards and Guidelines

Strict adherence to the specifications and regulations applicable to installation, start-up, operation, and maintenance is required.

The system was developed in correspondence with the following standards and directives and has to be installed, operated and maintain according to this standards.

- EN 50073 Guide for selection, installation, use and maintenance of apparatus for the detection and measurement of combustible gases or oxygen.
- IEC 1508 Functional safety of electrical/electronic/programmable electronic safety-related systems. (In conjunction with DIN 19251, Requirements and Measures for Ensuring Safe Operation and DIN 19250, Basic Safety Considerations).
- EN 50270 Electromagnetic Compatibility. Electrical apparatus for the detection and measurement of combustible gases, toxic gases or oxygen.
- EN 50081-01 Electromagnetic Compatibility. Generic emission standard. Residential, commercial and light industry.
- EN 50054 Electrical apparatus for the detection and measurement of combustible gases – General requirements and test methods.
- EN 50057 Electrical apparatus for the detection and measurement of combustible gases – Performance requirements for Group II apparatus indicating up to 100% lower explosive limit.
- EN 50058 Electrical apparatus for the detection and measurement of combustible gases – Performance requirements for Group II apparatus indicating up to 100% (V/V) gas.
- EN 50104 Electrical apparatus for the detection and measurement of oxygen; Performance requirements for operating and test method.
- EN 50271 Electrical apparatus for the detection and measurement of combustible gases, toxic gases or oxygen – Requirements and tests for apparatus using software and/or digital technologies.
- UL 864 US: Standard: Control Units for Fire Protective Signalling Systems
- CAN/CSA-C22.2* Canadian Standard: Safety Regulations for Measuring Devices in the Laboratory and in the Field.

* With regard to fire and smoke detection, the SUPREMA has not been evaluated to any Canadian standard by a third party agency.

Warning: The area where the modules are installed must be outside of a hazardos area Zone 0, 1 or 2 and be free of ignitable, explosive or corrosive gases. Sensor installation at the SUPREMA must be carried out according to Guideline EN 60079-14.

5.2 Installation, Step by Step

- Unpack and inspect the device or its components.

Attention: Follow the instructions for components subject to damage from static electricity!

- Check the suitability of the installation site and the cabling requirements.
- Check the current and voltage supply and make sure it is suitable.
- Depending on the type of system shipped, install the switch cabinet, or the 19” mounting rack.
- Check the configuration of the modules and reconfigure if necessary.
- Install the modules in the 19” mounting rack (unless already installed at the factory).
- In the case of expanded systems with more than one 19” mounting rack, connect the CAN bus or check the connection if it has already been made.
- Install the sensors and connect the wiring to the SUPREMA.

Attention: Follow the installation instructions for hazardous areas!

- Connect the relay and current outputs to the external devices to be actuated.
- Connect the current and voltage supply.

After installation is complete, perform the start-up procedure as instructed in Section 6 “Startup”.

5.2.1 Unpacking

Perform the following steps on receipt of the shipment:

- Carefully unpack the device or its components, observing all of the instructions printed on or accompanying the packaging.
- Also inspect the contents of the delivery to determine if any transport damage has occurred and verify that everything listed in the shipping papers has in fact been received.

5.2.2 Installation Site

The SUPREMA control unit may be installed only outside of areas subject to the danger of explosion. The specified temperature and humidity conditions must also be satisfied, and contact with corrosive substances must be avoided.

Attention: The SUPREMA installation site must be outside of hazardous area Zones 0,1 and 2 and be free of combustible, explosive or corrosive gases.

5.2.3 Cabling

The terminal posts on the **Analogue Terminal Units** (MAT module and MAT-TS module) are designed for the connection of conductors with a cross section in the range of 0.2 ... 1.5 mm^2.

The terminal posts on the **Relay Output Units** (MRO-8, MRO-8-TS, and MRO-16-TS modules) are designed for the connection of conductors with a cross section in the range of 0.2 ... 2.5 mm^2.

The terminal posts on the **External Connection Module MGT-40-TS** are designed for the connection of conductors with a cross section in the range of 0.2-2.5 mm^2.

On the **Interconnection Board** (MIB module), the terminal posts for the connection of the supply voltages are designed for conductor cross sections of 0.2-4.0 mm^2, and the terminals for the system failure relays are designed for conductor cross sections of 0.2-2.5 mm^2.

On the **System Terminals Module** (MST module), the terminals for Alarm Reset, Horn Reset, Relay Inhibit, and Key Switch are designed for conductor cross sections in the range of 0.2-2.5 mm^2. The **System Terminals Module** (MST module) also has 2 SUB-D plug connector strips (9-way) for the connection of the CAN bus and 3 SUB-D socket terminal strips for RS232 connections.

The terminals for the supply voltage on the **Relay Connection Module** (MRC-TS module) are designed for conductor cross sections of 0.2 ... 2.5 mm^2.

The modules installed separately from the rack (MAT-TS, MRC-TS, and MGT-40-TS modules) and the Universal Terminal Module (MUT module) are connected by means of a 40-way screened ribbon cable. The Relay Connection Module (MRC-TS module) is connected to the Relay Output Modules (MRO-8-TS, MRO-16-TS) by a 20-way ribbon cable.

Module	Conductor Cross Section
MAT-/MAT-TS-Module	0,2 mm^2 - 1,5 mm^2
MRO-8-/MRO-8-TS-/MRO-16-TS-Module	0,2 mm^2 - 2,5 mm^2
MRC-TS-Module (Supply Voltage, Relay Lock)	0,2 mm^2 - 2,5 mm^2
MGT-40-TS-Module	0,2 mm^2 - 2,5 mm^2
MIB-Module (Supply Voltage)	0,2 mm^2 - 4,0 mm^2
MIB-Module (System Failure Relays)	0,2 mm^2 - 2,5 mm^2
MSP-Module (rack power supply, 150 W)	0,2 mm^2 - 4,0 mm^2
MST-Module (Alarm Reset, Horn Reset, Relay Inhibit, Key Switch)	0,2 mm^2 - 2,5 mm^2

Table 5-1: Allowed Conductor Cross Sections

Note: Conductors must be copper and can be either stranded or solid.

Type of Sensor	**Number of Wires**	**Cable Type**	**Max. cable loop resistance in ohms (xxx*) => for 4 ... 20 mA Zone max. working resistance**	**Maximum Length**	**Remarks**
D-7600 D-7602 D-715 D-7152 D-7711 D-7100 Series 47K	5 x 0.75 mm² 5 x 1.5 mm²	Y(C)Y Y(C)Y	36 ohms 36 ohms	750 m 1500 m	Screened cable is required.
D-7010	5 x 0.75 mm² 5 x 1.5 mm²	Y(C)Y Y(C)Y	28 ohms 28 ohms	500 m 1000 m	Screened cable is required.
D-7600 D-7602 D-715 D-7152 D-7711 D-7100 Series 47K	3 x 0.75 mm² 3 x 1.5 mm²	Y(C)Y Y(C)Y	36 ohms 36 ohms	750 m 1500 m	Screened cable is required.
D-7010	3 x 0.75 mm² 3 x 1.5 mm²	Y(C)Y Y(C)Y	28 ohms 28 ohms	500 m 1000 m	Screened cable is required.
D-8101 D-8113 D-8201 D-8213	4 x 1.5 mm²	Y(C)Y	36 ohms	1500 m	Screened cable is required.
DF-9500 DF-9200	2 x 1.5 mm²	NYSLYCYÖ (CY(Ex)i)	500 ohms (100 ohms)	20000 m (4000 m)	Screened cable is required. The values in parentheses apply only to the DF-9500 in association with zener barriers (operation in explosive area, cable color blue). Follow the instructions the use of zener barriers or galvanic isolators. Zener barriers and galvanic isolators must be installed outside the hazardous area.
DF-7010 DF-7100 DF-8603	3 x 1.5 mm²	Y(C)Y	20	1000 m	Screened cable is required.
DF-8201 DF-8250	3 x 1.5 mm²	Y(C)Y			Screened cable is required.
DF-8401 DF-8501* DF-8502*	3 x 1.5 mm²	Y(C)Y	20	1000 m	Screened cable is required.
DF-8510*	2 x 1.5 mm²	Y(C)Y	200 ohms	1000 m	Screened cable is required.
GD10	3 x 1.5 mm²	Y(C)Y	20	840 m	Screened cable is required.
SafEye	4 x 1.5 mm²	Y(C)Y	10	420 m	Screened cable is required.
Ultima X 2 wire	2 x 0.5 mm²	Y(C)Y		2000 m	Screened cable is required.
Ultima X 3 wire	3 x 0.5 mm² 3 x 1.0 mm² 3 x 1.5 mm²	Y(C)Y		300 m 750 m 1250 m	Screened cable is required.

Table 5-2: Cable Specifications

* With regard to fire and smoke detection, the SUPREMA has not been evaluated to any Canadian standard by a third party agency.

The maximum length of a cable is calculated as follows $l = \frac{R * \kappa * A}{2}$ **, where *R* is the maximum load in ohms,** κ **= 56** $\frac{m}{Ohm * mm^2}$ **(conductivity of copper); and *A* is the cross section of the conductor in mm².**

If no information is available on the maximum load, only the specified maximum length may be used.

The maximum allowable length of the CAN bus can be found in the following table:

Bit rate in kBit/s	10	20	50	125	250	500	1000
Maximum Bus Lenght in m	5000	2500	1000	500	250	100	25

Table 5-3: Maximum Allowable CAN Bus Length

Note: Cable must be laid in agreement with the previous EMC instructions and regulations.

5.3 Module Configuration

The modules should be configured in the order given here with no voltage applied. In the case of systems that have already been configured, the configuration of the individual modules must be checked.

5.3.1 Configuration of MIB Module

A DIL switch is provided on the back of the MIB module. This switch is used to set the CAN bus parameters.

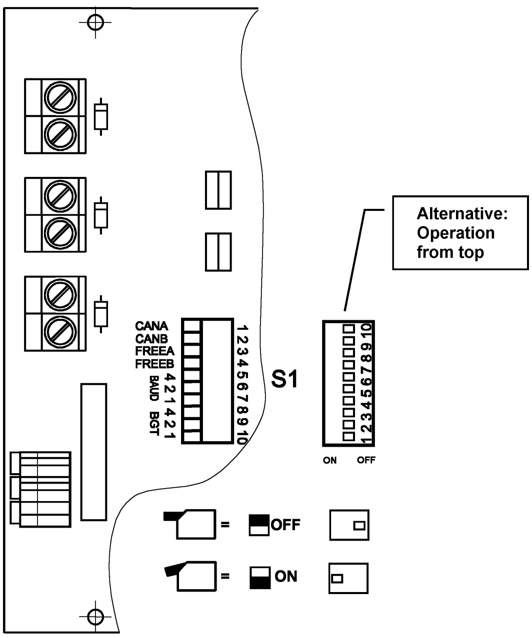
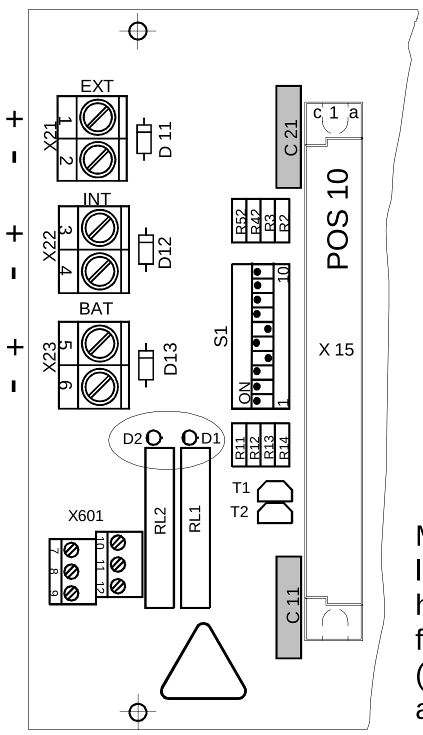


Figure 5-2: MIB-Module, DIL Switch (BGT = Rack No.)



MIB 20 as from layout version 2 has 2 system failure relays (X601) for SIL 3 applications.

CAN Bus Bit Rate Setting

The bit rates intended for the various expansion stages are listed in the following table.

	CAN		FREE		Baud			Rack		
	A	B	A	B	4	2	1	4	2	1
Switch No.	1	2	3	4	5	6	7	8	9	10
In the case of alternative assembly	10	9	8	7	6	5	4	3	2	1
Bit rate = 125 Kbit Standard setting for up to 64 MS*					ON	ON	ON			
Bit rate = 10 Kbit					ON	ON	OFF			
Bit rate = 20 Kbit					ON	OFF	ON			
Bit rate = 50 Kbit					ON	OFF	OFF			
Bit rate = 125 Kbit					OFF	ON	ON			
Bit rate = 250 Kbit Standard setting for up to 256 MS*					OFF	ON	OFF			
Bit rate = 500 Kbit					OFF	OFF	ON			
Bit rate = 1 Mbit					OFF	OFF	OFF			

Table 5-4: CAN BUS Bit Rate Settings/* MS = measuring point (input)

Explanation of the symbols:

= Any switch

Rack-CAN Node Number (BGT No.)

In the following, the CAN node numbers to be set when several racks [BGTs] are being used are listed. The standard setting for an individual rack is BGT 1.

	CAN		FREE		Baud			Rack		
	A	B	A	B	4	2	1	4	2	1
	1	2	3	4	5	6	7	8	9	10
In the case of alternative assembly	10	9	8	7	6	5	4	3	2	1
BGT 1 Standard setting for a single rack (BGT)								ON	ON	ON
BGT 2								ON	ON	OFF
BGT 3								ON	OFF	ON
BGT 4								ON	OFF	OFF
BGT 5								OFF	ON	ON
BGT 6								OFF	ON	OFF
BGT 7								OFF	OFF	ON
BGT 8								OFF	OFF	OFF

Table 5-5: Rack-CAN Node Number

Explanation of the symbols:

= Any switch

CAN-BUS Terminating Resistors

Both CAN bus systems (CAN-A + CAN-B) of the SUPREMA must have a terminating resistor at each end of the bus. One end of the bus is located on the MDO module. A terminating resistor is permanently connected here. For a 1-rack system, the other end of the bus is at the rear-panel wiring of the MIB. If the system consists of only one rack, switches 1 and 2 of the DIL switch must be set to the lower position.

If an additional rack is provided for the system, the racks are connected to each other at the rear via the MST cards with ready-made CAN bus cables.

For a “multi-rack” system, the DIL switch contacts 1 and 2 (CAN-A, CAN-B) of the last rack – by which the CAN BUS is ending - must be set to the lower position, all DIL switch contacts 1 and 2 (CAN-A, CAN-B) on the intermediate racks must be set to the upper position.

	CAN		FREE		Baud			Rack		
	A	B	A	B	4	2	1	4	2	1
Switch No.	1	2	3	4	5	6	7	8	9	10
In the case of alternative assembly	10	9	8	7	6	5	4	3	2	1
Terminating Resistor Closed	ON	ON								
Terminating Resistor Open	OFF	OFF								

Table 5-6: CAN Bus Terminating Resistors

Explanation of the symbols:

= Any switch

Turn-on Behaviour and Failure Behaviour of the MGO Module

		CAN		FREE		Baud			Rack		
		A	B	A	B	4	2	1	4	2	1
Turn-on behaviour	Behaviour at CAN-Bus failure	1	2	3	4	5	6	7	8	9	10
In the case of alternative assembly		10	9	8	7	6	5	4	3	2	1
All relays remain de-energised	All relays keep their last state (except for blinking).			ON	ON						
All relays remain de-energised	After 72 h, all relays are de-energised.			OFF	ON						
All relays are energised	All relays keep their last state (except for blinking).			ON	OFF						
All relays are energised	After 72 h, all relays are energised.			OFF	OFF						

Table 5-7: MGO Module, Configuration of turn-on behaviour and failure behaviour

Explanation of the symbols:

= Any switch

Turn-on Behaviour and Failure Behaviour of the MAO Module

During turn-on, at the analogue outputs a 0 mA signal is issued.

		CAN		FREE		Baud			Rack		
		A	B	A	B	4	2	1	4	2	1
Turn-on behaviour	Behaviour at CAN-Bus failure	1	2	3	4	5	6	7	8	9	10
In the case of alternative assembly		10	9	8	7	6	5	4	3	2	1
All analogue outputs are 0 mA.	All analogue outputs keep there last state.			ON	ON						
All analogue outputs are 2 mA.	All analogue outputs keep there last state.			OFF	ON						
All analogue outputs are 0 mA.	After ca. 2 min all analogue outputs are 0 mA.			ON	OFF						
All analogue outputs are 2 mA.	After ca. 2 min all analogue outputs are 2 mA.			OFF	OFF						

Table 5-8: MAO Module, Configuration of turn-on behaviour and failure behaviour

Explanation of the symbols:

= Any switch

5.3.2 Configuration of the MAI Module

Inserting the Adapter Modules (MCI/MPI/MFI/MSI)

For each input to which a sensor is to be connected, an input module (MCI/MPI) is inserted in the MAI module. Up to 8 inputs can be connected to each MAI module. Essentially both active and passive sensors can be connected. The module of the MCI type is provided for the connection of active sensors, and the module of the MPI type is used for the connection of passive sensors.

The MFI module has been provided for the connection of manual or automatic fire detectors. The MSI module has been provided for the connection of external switches.

Important: During installation, it is essential to verify for each input that the type of adapter module provided for the sensor is plugged into the correct slot on the MAI module **(see section 5.3.3 Configuration of the MCI Module – Active Sensors).**

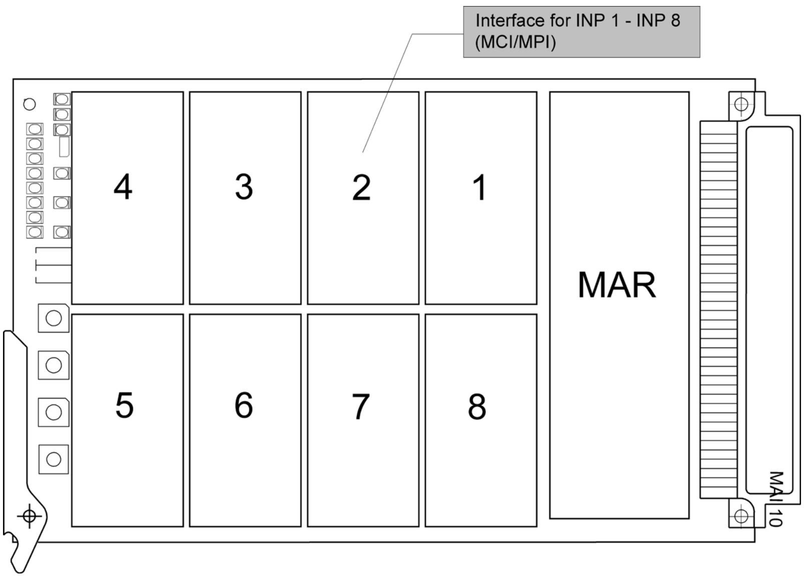


Figure 5-3: MAI module, position of adapter modules 1–8.

MAR = Analog Redundant: only with redundant systems

MCI = Current Input
MPI = Passive Input
} depending on type of sensor (active/passive)

MFI = Fire Input*

MSI = Switch Input

The co-ordination of inputs at the appropriate MAT module is described in the following figure:

* With regard to fire and smoke detection, the SUPREMA has not been evaluated to any Canadian standard by a third party agency.

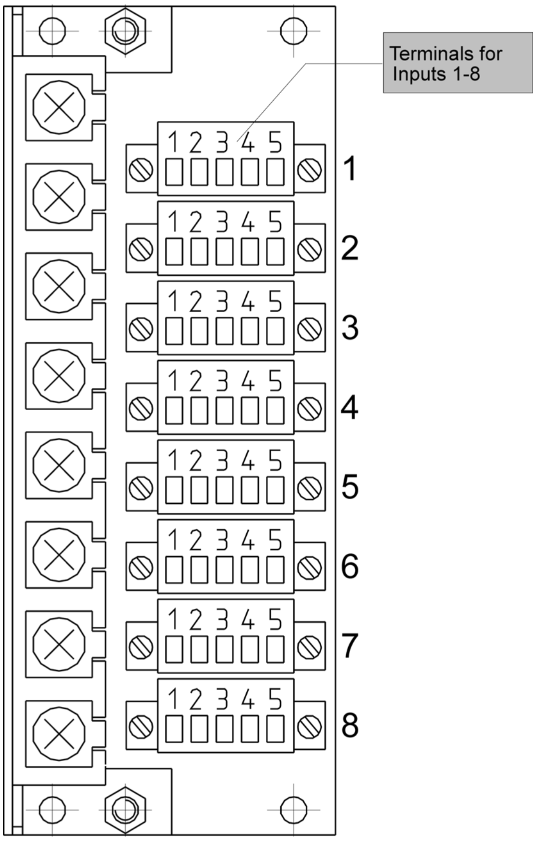


Figure 5-4: MAT module, position of the terminals for input 1–8

5.3.3 Configuration of MCI 10/MCI 20/MCI 20 BFE Module (active sensors)

The MCI 10 module can be configured for various types of active sensors by the use of solder bridges.

Note: Any type of sensor or device which has a 4 ... 20 mA output, a 0 ... 24 V output, or a volt-free contact output can be connected. To connect sensors not from MSA, however, you must discuss this with your MSA technical contact person to avoid problems.

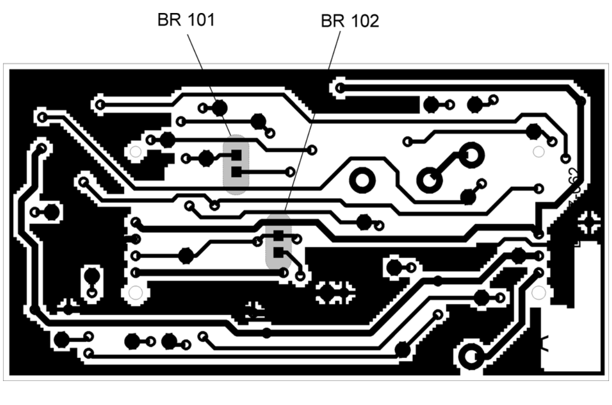


Figure 5-5: MCI 10 module, solder bridges

Solder bridges BR101 and BR102 are on the solder side of the MCI module and are usually covered by a barcode sticker. This must be removed if it is necessary to change the configuration. The solder bridges must be configured as shown in the following table:

Type of Sensor	BR101	BR102	Notes
4 … 20 mA (3-wire) 4 … 20 mA (2-wire) 0 … 24 V (2-wire) volt-free contact	open	open	Standard configuration
0 … 100 mV	closed	closed	

Table 5-9: MCI 10 module configuration

Configuration of MCI 20

No configuration

Configuration of MCI 20 BFE

No configuration

Warning: Passive sensors should never be connected to an MCI module, as this may cause the destruction of the sensors and/or the MAI/MCI modules.

Configuration of the MPI Module (Passive Sensors)

Variously equipped MPI modules are provided for the various types of passive sensors. The circuit board is the same, but the components mounted on it are different. The modules are characterised by the sensors they are designed to accept.

Note: Provisions have been made for the connection of MSA sensors only.

Module Type	Type of Sensor
MPI-WT100	D-7600/D-7602/D-7100/D-7711/D-715/D-7152/TYP 410/Sensor 47K
MPI-WT10	D-7010
MPI-HL8101	D-8101/D-8201
MPI-HL8113	D-8113/D-8213

Table 5-10: Types of MPI Modules

5.3.4 Configuration of the MAT Module

Two solder bridges are provided for each input on the bottom of the circuit board for 3 or 5 wire operation of the sensors:

Solder bridge OPEN = 5 wire operation

Solder bridge CLOSED = 3 wire operation

Note: The solder bridges for 3 wire operation must be closed only when passive sensors (MPI module) are connected. For 5 wire operation with active sensors (MCI module), the solder bridges must be open!

Assignment:	BR1, BR2	⇒	input 1
	BR3, BR4	⇒	input 2
	BR5, BR6	⇒	input 3
	BR7, BR8	⇒	input 4
	BR9, BR10	⇒	input 5
	BR11, BR12	⇒	input 6
	BR13, BR14	⇒	input 7
	BR15, BR16	⇒	input 8

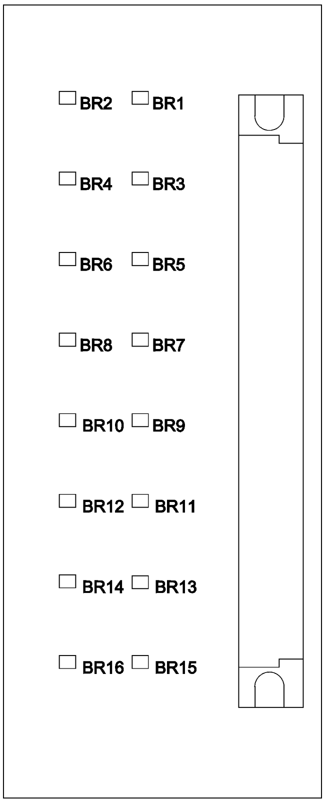


Figure 5-6: Configuration of MAT module

5.3.5 Configuration of MAT-TS Module

On top of the circuit board, next to the ribbon cable plug, 2 solder bridges for each input are provided for the 3 or 5 wire operation of the sensors:

Solder bridge OPEN	= 5 wire operation
Solder bridge CLOSED	= 3 wire operation

Note: The solder bridges for 3 wire operation should be closed only when passive sensors (MPI module) are connected. For 5 wire operation with active sensors (MCI module), the solder bridges must be open!

	Equivalent to X1/1-X1/2		Equivalent to X1/4-X1/5
Assignment:	BR1, BR2	⇒	input 1
	BR3, BR4	⇒	input 2
	BR5, BR6	⇒	input 3
	BR7, BR8	⇒	input 4
	BR9, BR10	⇒	input 5
	BR11, BR12	⇒	input 6
	BR13, BR14	⇒	input 7
	BR15, BR16	⇒	input 8

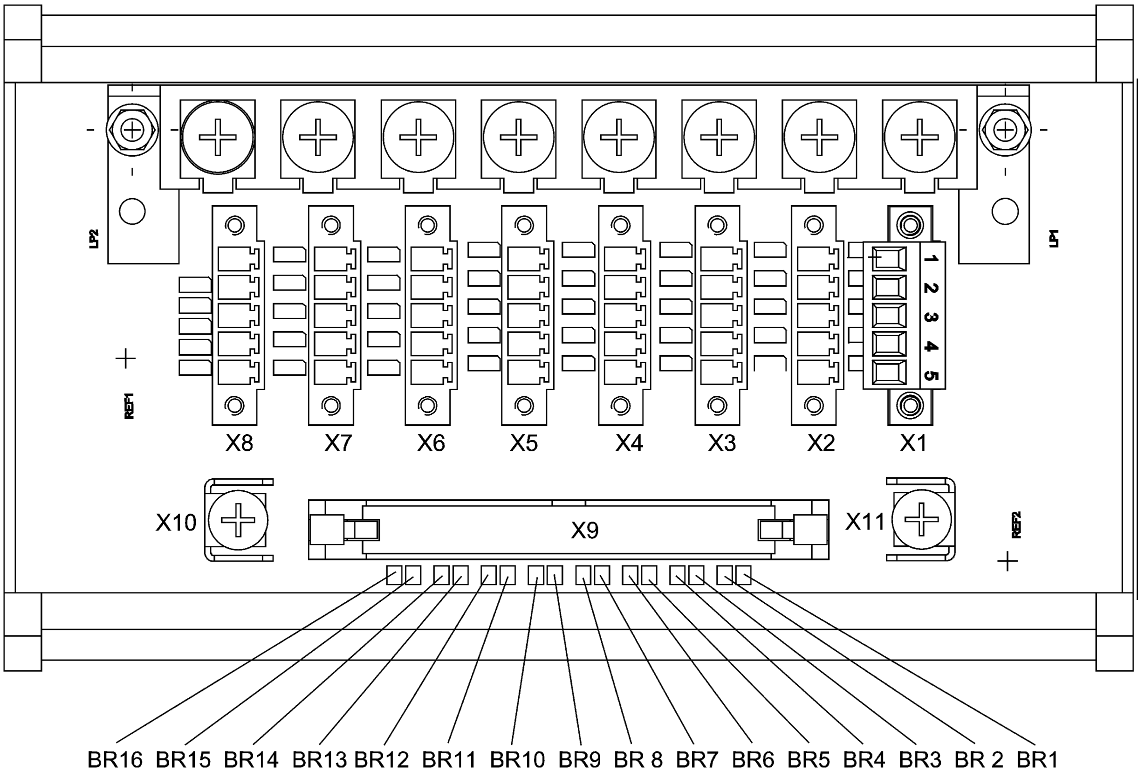


Figure 5-7: Configuration of the MAT-TS module

5.3.6 Configuration of the MRO-8-module

On the module, there is a solder bridge (BR1), which is used to define the function of the relay inhibit of the common alarms (see section 5.10.7 LOCR Connection) is established:

Solder bridge BR1 = OPEN = relays are energised when the relay inhibit is turned on

Solder bridge BR1 = CLOSED = relays are de-energised when the relay inhibit is turned on

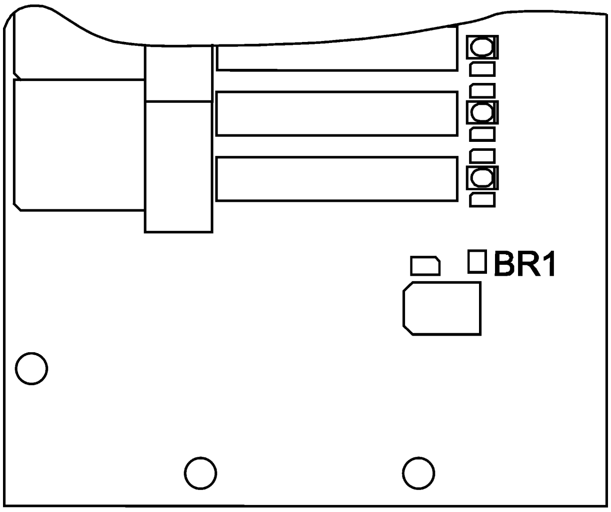


Figure 5-8: Configuration of the MRO-8 module

Attention: Because the common alarms are normally and this is fixed in the system and cannot be changed, solder bridge BR1 should never be closed under any circumstances (unless an alarm is to be triggered when the relays are inhibited).

5.3.7 Configuration of the MRC-TS Module

A solder bridge (BR1), which is used to determine the function of the relay inhibit (see section 5.7.2 Additional Relay Outputs) for the connected relay modules, is provided on the module:

Solder bridge BR1 = OPEN = relays are energised when the relay inhibit is turned on

Solder bridge BR1 = CLOSED = relays are de-energised when the relay inhibit is turned on

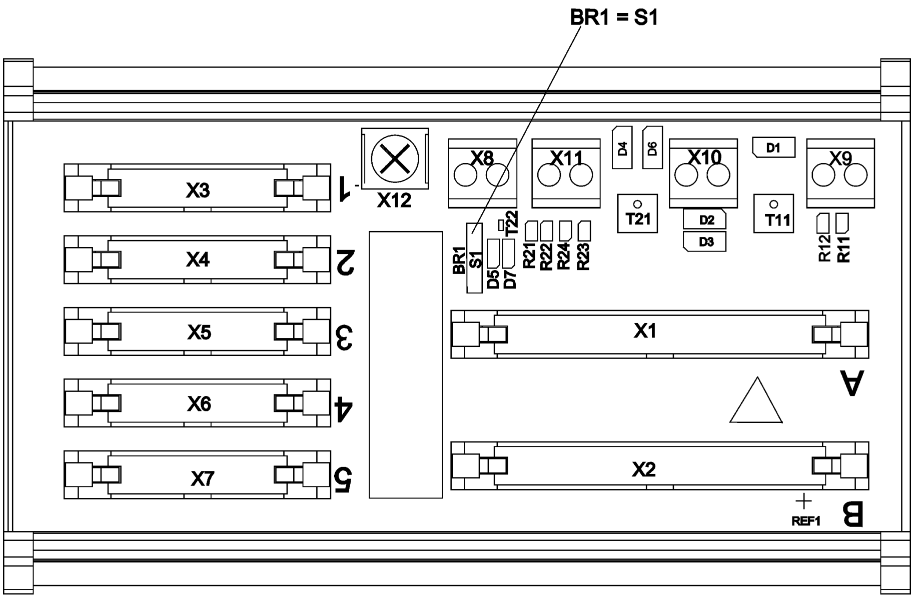


Figure 5-9: Configuration of the MRC-TS module

Attention: Because the common alarms are normally energised and this is fixed in the system and cannot be changed, solder bridge BR1 on the first MRC-TS module in the system (the first 40 relay outputs) should never be closed (unless an alarm is to be triggered when the relays are inhibited).
In addition, the first 32 available relay outputs (relay output 9-40; 1st MGO module in the system) should also be configured according as normally energised, like the common alarms, when the option of inhibiting the relays via the LOCK connection is used.

5.3.8 Configuration of the MRO-8-TS Module

The function of the relay inhibit is determined by solder bridge BR1 on the MRC-TS module.

5.3.9 Configuration of the MRO-16-TS Module

The function of the relay inhibit is determined by solder bridge BR1 on the MRC-TS module.

5.3.10 Configuration of the MUT Module

No configuration

5.3.11 Configuration of the MAR Module

No configuration

5.3.12 Configuration of the MST Module

No configuration

5.3.13 Configuration of the MAO Module

Watchdog Reset

Solder bridge BR5 = OPEN =	standard function of the WATCHDOG (WDI signal only, no processor RESET)
Solder bridge BR5 = CLOSED =	WATCHDOG generates a processor RESET in the event of a function error

CAN-A/CAN-B Operation

Solder bridges (BR1-BR4) can be used to select whether the MAO card is controlled via the CAN-A or CAN-B bus.

CAN-A	BR1 + BR3 = CLOSED & BR2 + BR4 = OPEN (Standard Setting)
CAN-B	BR1 + BR3 = OPEN & BR2 + BR4 = CLOSED

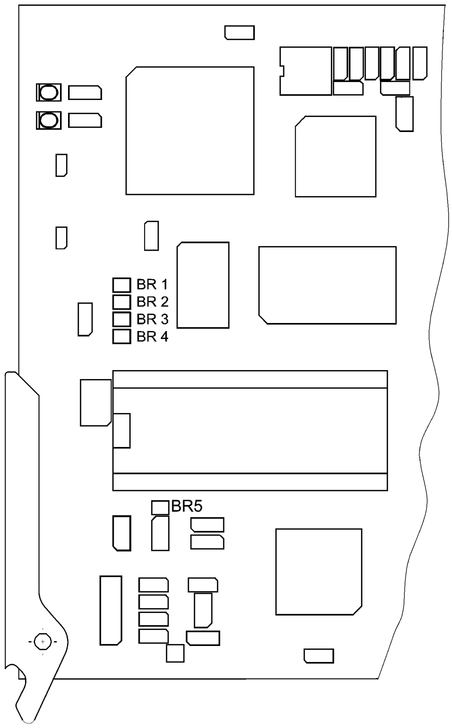


Figure 5-10: Configuration of the MAO module

As of layout version 6, the operating modes for CAN-A or CAN-B buses and the turn-on behaviour must be configured with the S3 and S4 DIL switches.

FREE-A-/B settings

Switch S3				Function	
1	**2**	**3**	**4**		
OFF	OFF	ON	ON	Function FREE-A/B by switches on the MIB module	
X	X	OFF	OFF	Function by switch FREE-A/B on the MAO PCB	
				Turn-on behaviour	**Behaviour at CAN failure**
OFF	OFF	OFF	OFF	All analogue outputs at 2 mA.	All analogue outputs at 2 mA.
X	ON	OFF	OFF		Last state is kept
ON	X	OFF	OFF	All analogue outputs at 0 mA.	

X: Any switch

CAN-A-/B setting

Switch S4				Function
1	**2**	**3**	**4**	
ON	ON	OFF	OFF	Control of the MAO PCB by CAN-A bus (also for redundant applications)

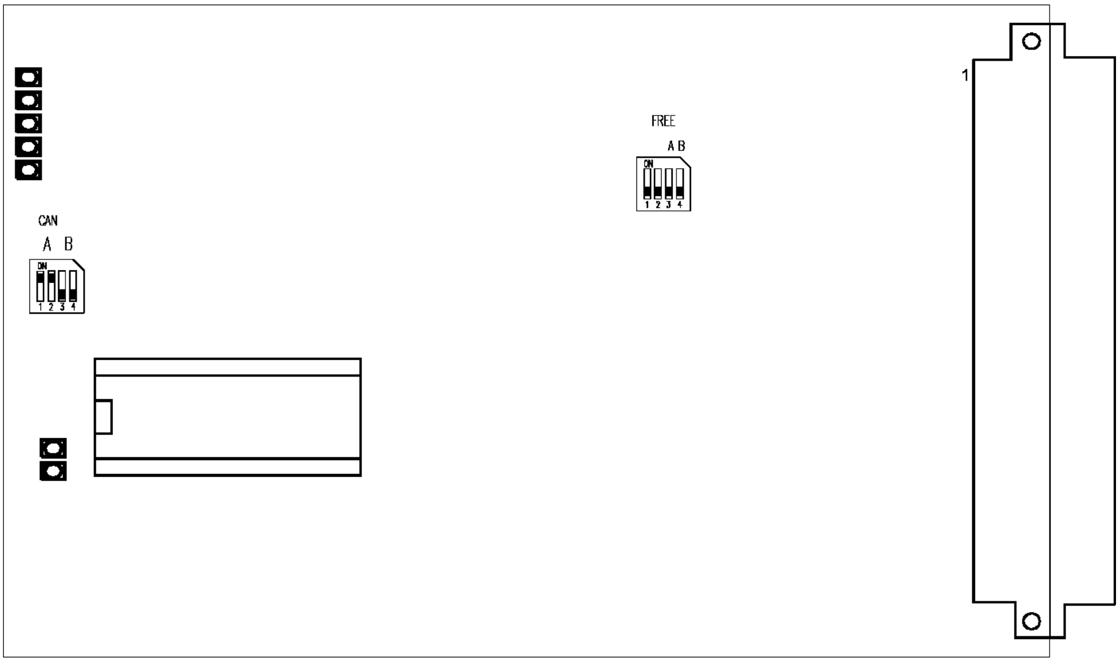


Figure 5-11: Configuration MAO module, Layout version 6

Note: The MAO module is always controlled by the CAN-A bus and is always outputting the measuring values of the MDO module.

5.3.14 Configuration of the MGO Module

Plug-in bridges (BR1-BR4) can be used to select whether the MGO card is controlled via the CAN-A or via the CAN-B bus.

Configuration of turn-on and failure behaviour of the MGO module is effected via the DIL switch on the MIB module (FREE A + FREE B).

CAN-A	BR11 + BR13 = CLOSED & BR12 + BR14 = OPEN (Standard Setting)
CAN-B	BR11 + BR13 = OPEN & BR12 + BR14 = CLOSED

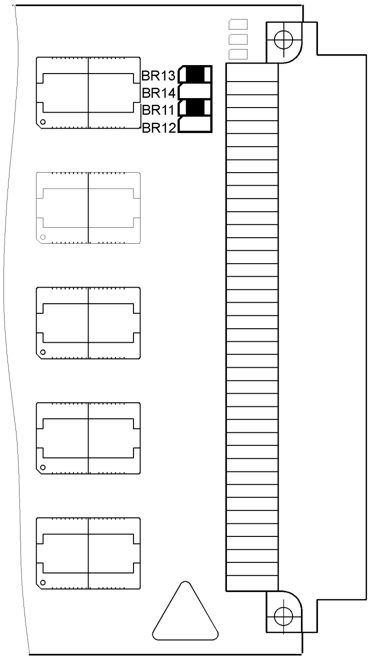


Figure 5-12: Configuration of the MGO Module

Switch S1 (as from layout version 15)

Switch S1				Function
1	2	3	4	
OFF	OFF	OFF	OFF	Factory setting (standard and SIL 3 operation)
OFF	OFF	OFF	ON	Only for MGO software version 1.02.01 and older

Switch S2

Switch S2				Function
1	2	3	4	
ON	ON	OFF	OFF	Factory setting/Do not change

As of layout version 12, for SIL applications, the operating modes for control via CAN-A or CAN-B buses, the turn-on behaviour must be configured with the S3 and S4 DIL switches.

FREE-A/-B settings

Switch S3				Function	
1	2	3	4		
OFF	OFF	ON	ON	Function by switch FREE-A/B by switch on the MIB module	
X	X	OFF	OFF	Function by switch FREE-A/B 1+2 on the MAO PCB	
				Relay behaviour	
				Behaviour at CAN failure	**Turn-on behaviour**
OFF	OFF	OFF	OFF	Activated after 72 h	Activated
OFF*	ON*	OFF*	OFF*	De-activated after 72 h*	De-activated*
ON	OFF	OFF	OFF	Last state is kept	Activated
ON	ON	OFF	OFF	Last state is kept	De-activated

* For SIL 3 operation, the de-activation function is set to 72 h.

CAN-A/-B setting

Switch S4				Function
1	2	3	4	
ON	ON	OFF	OFF	Control of the MGO PCB by CAN-A bus
OFF	OFF	ON	ON	Control of the MGO PCB by CAN-A bus

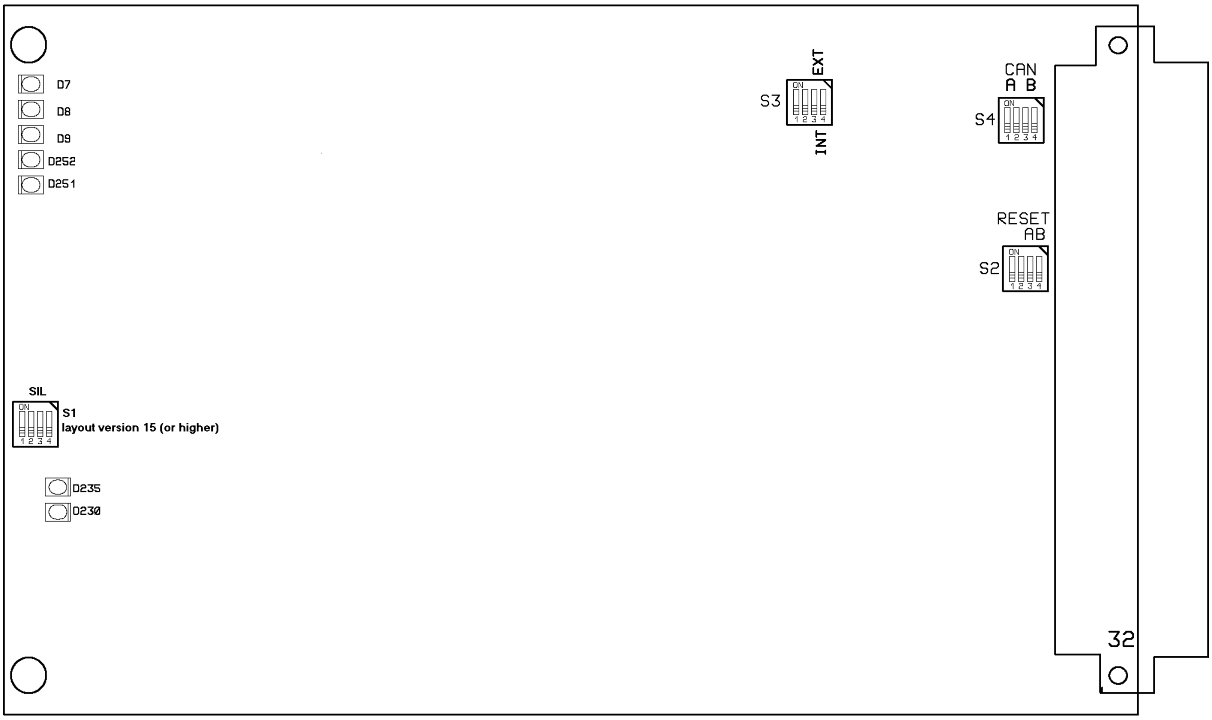


Figure 5-13: MGO module, as from layout version 15

5.3.15 Configuration of the MCP Module

The MCP module is shipped factory-configured. No provisions are made for changing the configuration.

Within the scope of the installation and start-up of the system or of the replacement of the MCP module, however, the bridge placement illustrated in Figure 5-12, MCP module, standard configuration, must be checked and corrected if necessary.

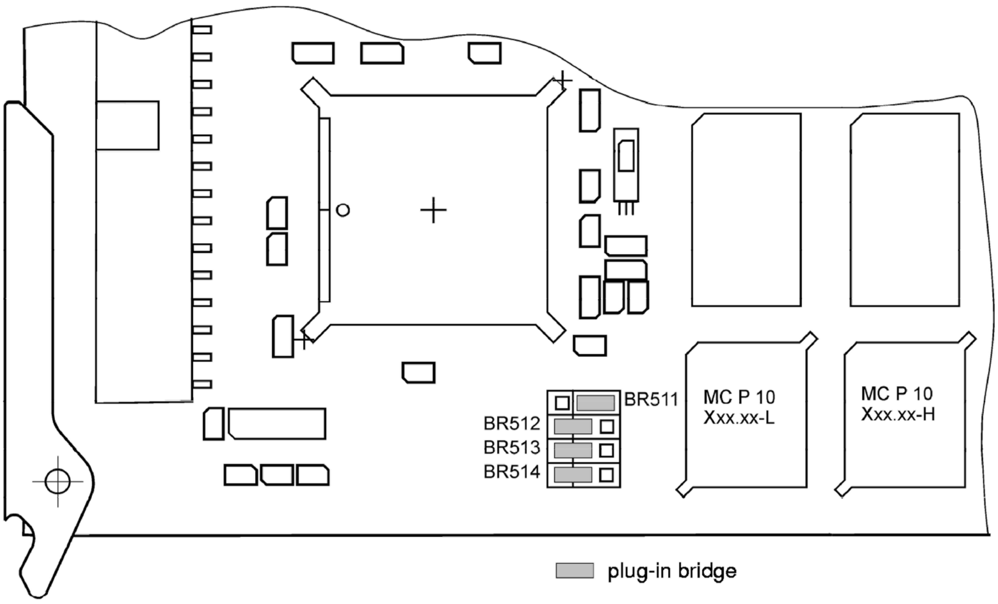


Figure 5-14: MCP module, standard configuration

5.3.16 Configuration of the MDO Module

The MDO module is shipped factory-configured. No changes to the configuration are planned.

Within the scope of the installation and start-up or the replacement of the MCP module, however, the bridge placement shown in Figure 5-16, MDO module, standard configuration, must be checked and corrected if necessary.

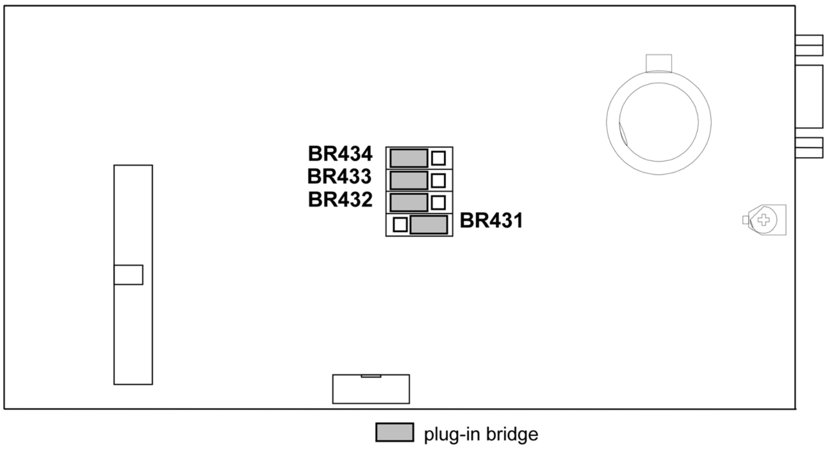


Figure 5-15: MDO module, standard configuration

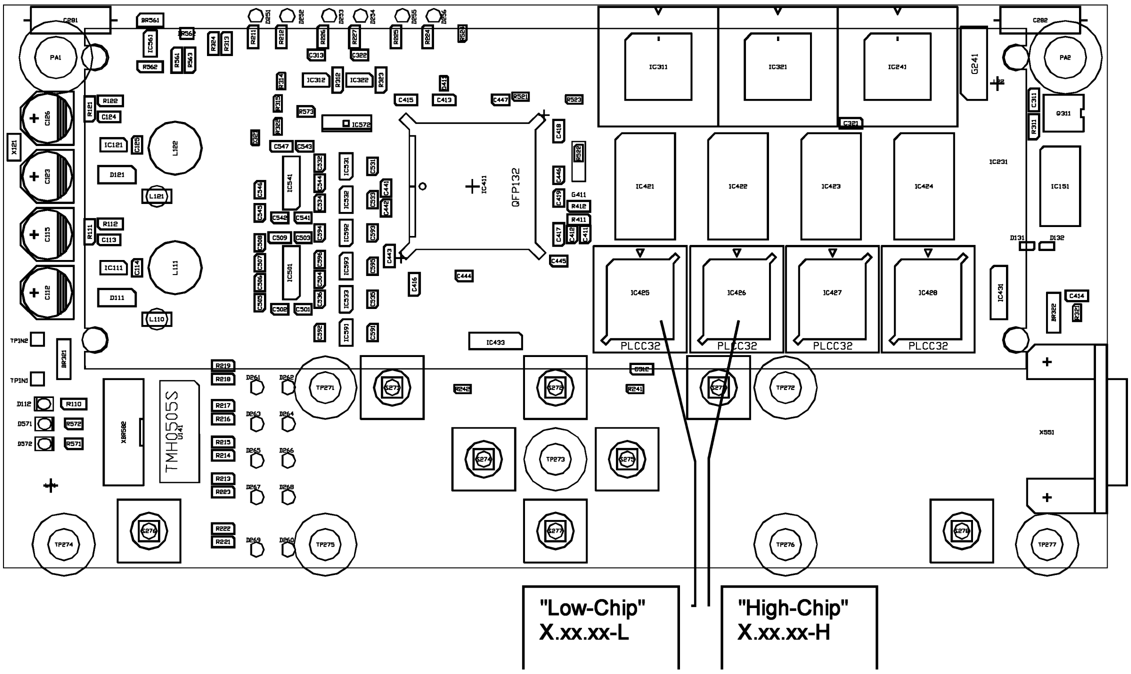


Figure 5-16: MDO Module Memory Chip Assignment H/L

5.3.17 Configuration of the MDA Module

Switch S2

Switch S2				Function
1	2	3	4	
ON	ON	OFF	OFF	Factory setting/Do not change

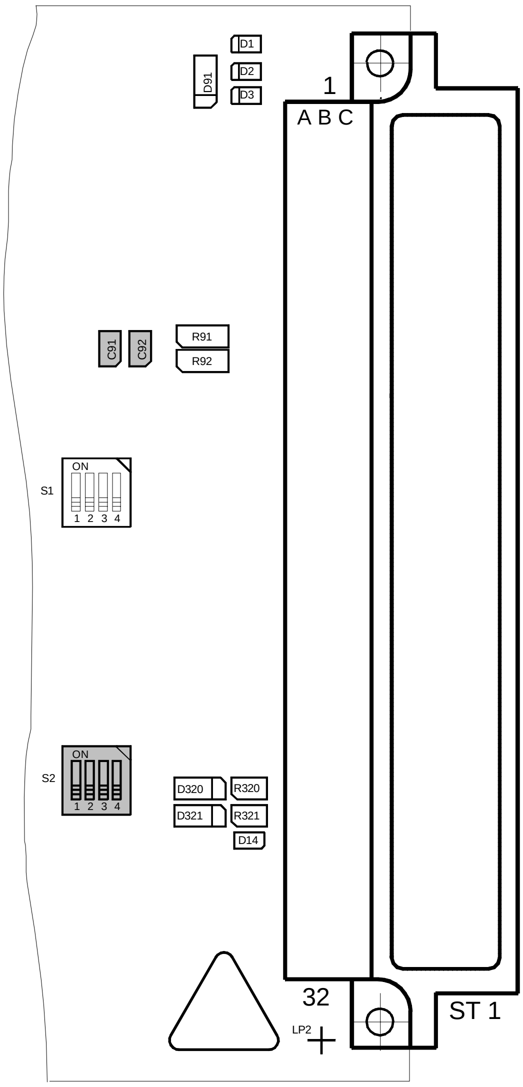
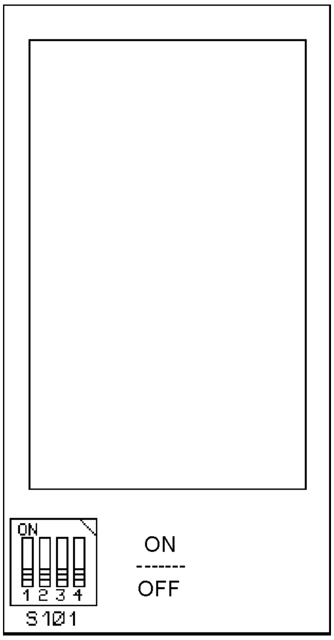


Figure 5-17: Configuration ot the MDA module

5.3.18 Configuration of the MFI Module*

S101 Code Switch



Functions S101

<u>1 = ON, 2 = ON, 3 = OFF</u>
The fire detectors are powered from the SUPREMA power supply (no dc decoupling between signal line and SUPREMA power supply)

<u>1 = OFF, 2 = OFF, 3 = ON</u>
The fire detectors are powered from a separate power supply. Signal line and SUPREMA power supply are electrically isolated.

<u>4 = ON</u>
The module is configured for applications with a zener barrier.

<u>4 = OFF</u>
The module is configured for applications without a zener barrier.

Figure 5-18: View of the MFI Module

<u>Configuration in the SUPREMA menu</u>

Settings/Measure points/Sensor data

Sensor	MFI
Measuring range	0 … 100
Units	any

Settings/Measure points/Alarms

1st alarm/level	30.00
Above alarm level	Alarm
Below alarm level	No alarm
Latching	Alarm latching
2nd to 4th alarm	de-activated
2nd to 4th level	de-activated

* With regard to fire and smoke detection, the SUPREMA has not been evaluated to any Canadian standard by a third party agency.

5.3.19 Configuration of the MSI Module

S101 Code Switch

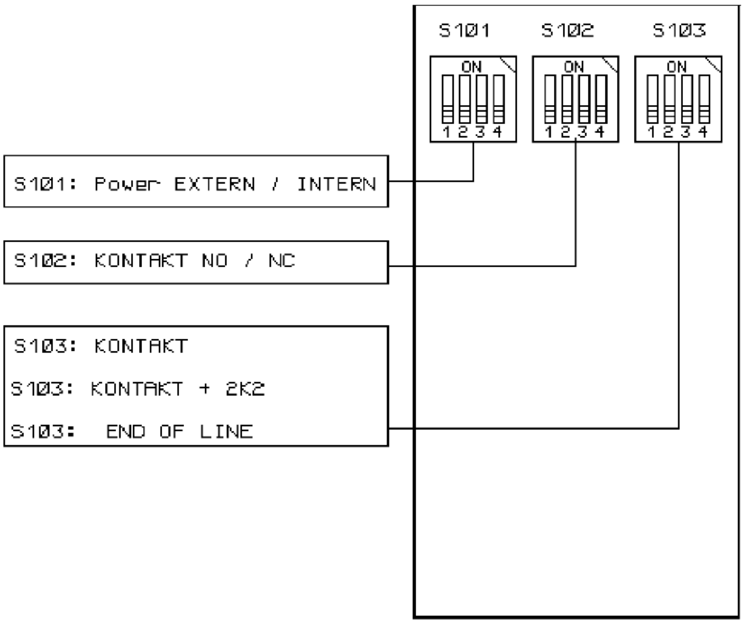


Figure 5-19: View of the MSI Module

<u>Configuration in the SUPREMA menu</u>

Settings/Measure points/Sensor data

Sensor	MSI
Measuring range	0 … 100
Units	any

Settings/Measure points/Alarms

1st alarm/level	30.00
Above alarm level	Alarm contact shut
Below alarm level	Alarm contact open
Latching	Alarm latching
2nd to 4th alarm	de-activated
2nd to 4th level	de-activated

S 101				Features
1	2	3	4	
X	X	-	-	The Module is connected to an external power supply (18 ... 32 VDC) via terminal 2(+) and terminal 5(-). A Supply Voltage <16 V causes an Failure message. The out terminals are electrically isolated from the other SUPREMA-terminals. The maximum allowed Voltage between the output terminals and the other SUPREMA-terminals is 50 VDC or 24 VAC. Every MSI 10 module requires ist own supply voltage.
-	-	X	X	The module is energised from the SUPREMA Power Supply. The output terminals are not electrically isolated from the other SUPREMA-terminals.
S 102				
X	X	-	-	The switch type (N.O.) - Normally OPEN is supported. A closed contact causes an alarm. Several contacts connected in parallel can be monitored with one module.
-	-	X	X	The switch type (N.C.) - Normally CLOSED is supported. An open contact causes an alarm. Several contacts connected in series can be monitored with one module. There is no provision for connecting several contacts in parallel.
S 103				
*	*	-	-	Contact without a series resistor. There is no provision for an END OF LINE resistor. **Contact type N.O.:** The number of contacts connected in parallel is unlimited. A short circuit of the connecting wires will cause a Failure alarm. An open circuit of the connecting wires is not reported. **Contact type N.C.:** The number of contacts connected in series is unlimited. A short circuit of the connecting wires is not reported. An open circuit of the connecting wires will cause a Failure alarm.
*	*	-	X	Contact without a series resistor. END OF LINE resistor = 2.2 KΩ ±5%. **Contact type N.O.:** The number of contacts connected in parallel is unlimited. A short circuit of the connecting wires will cause a Failure alarm. An open circuit of the connecting wires will cause a Failure alarm. **Contact type N.C.:** The number of contacts connected in series is unlimited. A short circuit of the connecting wires will cause a Failure alarm. An open circuit of the connecting wires will cause a Failure alarm.
*	*	X	X	Every Contact with a series resistor = 2.2 KΩ ±5%. END OF LINE resistor = 2.2 KΩ ±5%. **Contact type N.O.:** The number of contacts connected in parallel is limited to 20. A short circuit of the connecting wires will cause a Failure message. An open circuit of the connecting wires interrupt cause a Failure message. **Contact type N.C.:** Only one contact can be monitored. A short circuit of the connecting wires will cause a Failure message. An open circuit of the connecting wires will cause a Failure message.

X = Switch ON - = Switch OFF * = Switch position dont’t care

5.3.20 MRD 10 Dummy Relay

Module application/function

Up to 5 relay modules can be connected (MRO10–8/MRO10–16) to the MRC module. If not all 5 relay modules are connected, an MRD module must be plugged into each of the unused relay module connectors. The unused relays are simulated by this module.

With an MRD module connected the driver outputs of the MGO module are provided with a fixed load. Monitoring the driver outputs therefore allows a failure state to be recognised.

All 40 outputs of the MGO10 modules are monitored. Output failures (open/short circuit) are identified and are reported as a system failure.

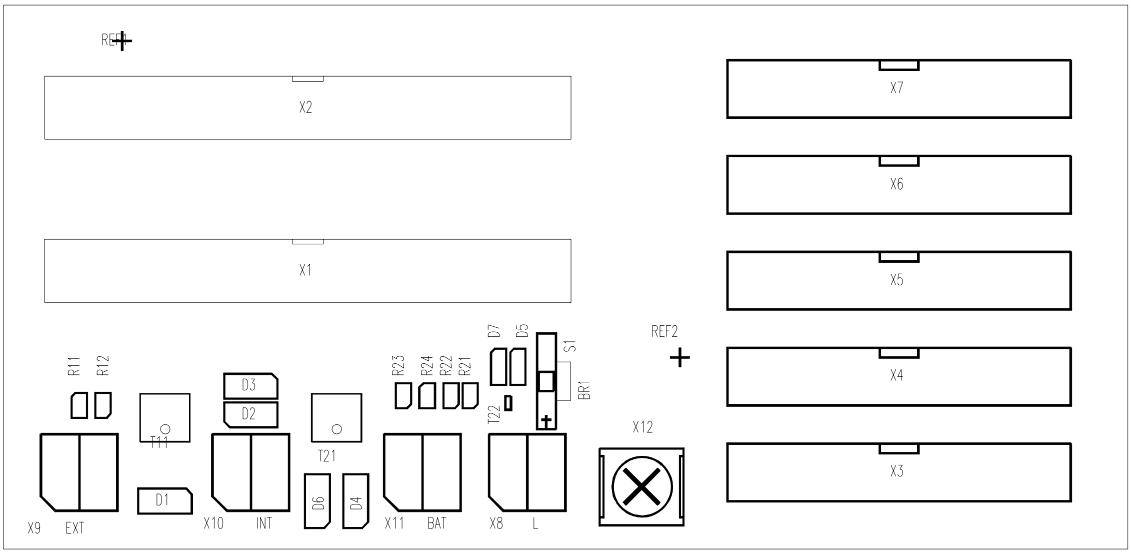


Figure 5-20: View of the MRC module

MRC10

X3 -X7 = 20-pin connection for relay modules MRO10–8/MRO10–16

Unused relay module connections have to be fitted with MRD modules.

Module use/connection

On each MRD module one resistor is connected in series with a light-emitting diode to provide the load for the MGO module. The light-emitting diodes show the switching state of the MGO driver output.

LED ON = driver output conducting = relay activated

LED OFF = driver output not conducting = relay deactivated

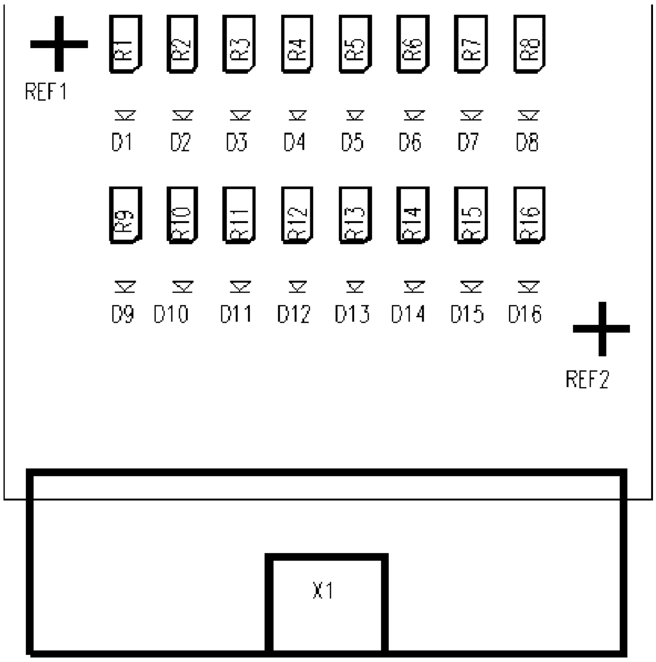


Figure 5-21: View of MRD Module

LED 1 – 8 = Driver outputs channel A

LED 9 – 16 = Driver outputs channel B

5.4 System Configuration (Hardware)

5.4.1 Slot Assignments

After all the modules have been configured (or after their configuration has been checked), all the required modules should be inserted into the racks or pushed from behind onto the contacts and fastened in place mechanically by means of the retainers provided.

Assignment:	Front:		Rear:
	Slot 1	⇒	MST-Module
	Slot 2–4	⇒	free
	Slot 5–15	⇒	Pos 1–10

For each slot on the front there is a corresponding module connector plug on the rear. To install modules that are to be inserted from the front (MCP module, MDA module, MAI module, MGO module, and MAO module) detach the front plate and flip it down. The following rules should be observed:

Front:

Slots 1–3:

The first 3 slots are reserved exclusively for the MCP module. In systems without redundancy, slot 1 is the standard slot for the MCP module (see section 10 Redundant Systems).

Slots 4–5 :

Slots 4 and 5 are reserved exclusively for the MDA module. In systems without redundancy, slot 4 must be used for the MDA module (see section 10 Redundant Systems).

Slots 6–13:

Slots 6–13 can be filled with MAI, MAO, or MGO modules, as desired.

Slots 14–15:

Slots 14 and 15 may be filled only with MAO or MGO modules.

Rear:

Connection site 1:

The first connection site is reserved exclusively for the MST module. The racks are shipped with the MST module installed as standard equipment, so that only Positions 1–10 are available for configuration.

Positions 1–10:

Positions 1-10 can be filled with either MAT-, MUT-modules, as desired.

Positions 9:

The MRO-8-module can only be installed at Position 9.

Note: The MRO-8 module must be installed in POS 9 only! It is impossible to be use more than one MRO-8 module in one rack.

Rear

MST					MXT	MXT	MXT	MXT	MXT	MXT	MXT	MXT	MXT	MXT
					Pos. 1	Pos. 2	Pos. 3	Pos. 4	Pos. 5	Pos. 6	Pos. 7	Pos. 8	Pos. 9	Pos. 10
Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7	Slot 8	Slot 9	Slot 10	Slot 11	Slot 12	Slot 13	Slot 14	Slot 15
MCP 1	MCP 2	MCP 3	MDA 1	MDA 2	MAI MGO MAO	MAI MGO MAO	MAI MGO MAO	MAI MGO MAO	MAI MGO MAO	MAI MGO MAO	MAI MGO MAO	MAI MGO MAO	MGO MAO	MGO MAO

Front

Figure 5-22: Slots and Positions on the rack

Slots in the Rack:

Slots 1–3:	**slots for MCP modules only**
Slots 4–5:	**slots for MDA modules only**
Slots 6–13:	**slots for INPUT/OUTPUT modules**
Slots 14–15:	**slots for OUTPUT modules only**
INPUT:	**MAI module (with MPI/MCI modules)**
OUTPUT:	**MGO-module**
	MAO-module

Connection sites on the rear of the rack:

MST: **connection site for the MST module only**
MXT(Positions 1–10)**:** **connection site for:**
- **MAT module** (8 x 5 terminals)
- **MUT module** (40-way ribbon cable)
- **MRO-8 module (Position 9!)**

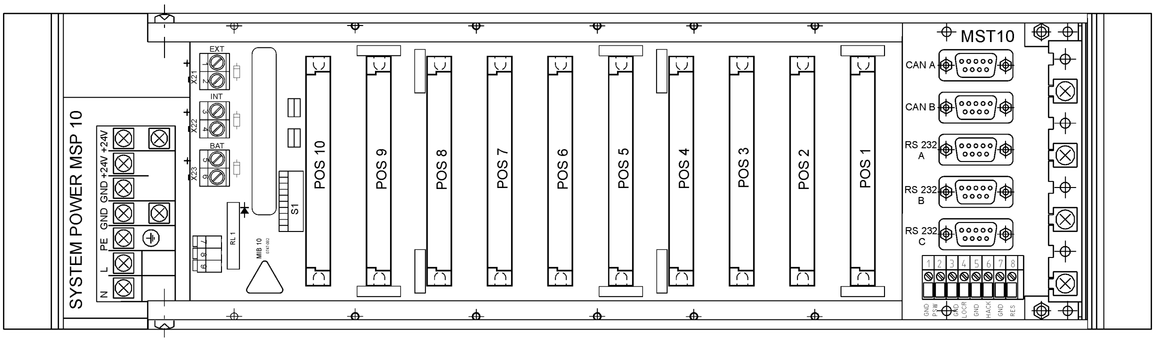


Figure 5-23: Rear of the Rack

5.4.2 System Requirements

The following requirements must be fulfilled in order to build a functional system:

- Exactly one MCP module and one MDO module are required for a system (up to 8 racks) (non-redundant design). The MCP module must be properly connected by ribbon cable to the MDO module mounted in the front panel.
- Exactly one MDA module is required for a rack (non-redundant design) if MAI modules are also present in the rack.
- The numbering of the measurement channels of the MAI modules is determined by the selected slot. Channels 1–8 are assigned to slot 6 (POS 1), channels 9–16 to slot 7 (POS 2), etc.

Attention: In the standard design with a MAT module installed in the rack, the first MAI module must be inserted into slot 7 (POS 2), the 2nd MAI module into slot 9 (POS 4), etc. Thus the measurement channel numbers obtained are: 1st MAI module (POS 2): 9-16. 2nd MAI module (POS 4): 25-32, etc.

- The system automatically assigns the measurement channels numbers 18 and the associated measurement values to the first inserted MAO module card (and the measurement channel numbers 9–16 to the second MAO module card, etc.).

Attention: Because, in the standard design with a MAT module inserted in the rack, this module is in slot 7 (POS 2/measurement channel numbers 9-16), two MAO module cards must be inserted in order that the measurement values of measurement channels 9-16 can be transmitted as 4 ... 20 mA output signals.

- **It is extremely important to ensure that the modules plugged into the rear are compatible with the modules inserted in the front (e.g., the combination of an MAI module with an MRO-8 module is non-functional).** (see table 5-11: Assignment of the Connection Modules)
- The modules plugged into the rear must be located at the same slots as the modules with the associated functions plugged into the front.

Note: A MAT module covers 2 slots; a MRO-8 module covers 3 slots.

The following combinations of modules installed in the front and in the rear are possible or required:

Front	Rear
MCP module	MST module
MDA module	----------
MAI module	MAT module (direct connection of sensors) MUT module (connection to the MAT-TS module or the MGT-40-TS module for remote connection of sensors)
MGO module	MRO-8 module (direct connection of relay outputs) only POS 9/Slot 14 MUT module (connection to the MRO-8-TS module or the MRO-16-TS module via the MRC-TS module for remote connection of relay outputs) MUT module (connection to the MGT-40-TS module for providing driver outputs for the connection of magnetic valves, etc.)
MAO module	MAT module (direct connection of the 4 … 20 mA outputs) MUT module (connection to the MAT-TS module or the MGT-40-T module for remote connection of the 4 … 20 mA outputs)

Table 5-11: Assignment of the Connection Modules

Note: Further information on the functions of the individual modules can be found in section 3.6 Description of the Modules.

5.4.3 Maximum Loads

Note: It is extremely important to ensure that the maximum loads are not exceeded in order to guarantee a reliable operation.

The following load limits must not be exceeded when a SUPREMA system is being configured:

The operating voltage may be from 19.2 VDC to 32 VDC. The values specified below are for an operating voltage 24 VDC.

Maximum output current of an input	400 mA
Maximum output power for an input (Sensor and cable)	5 W
Maximum output power for a MAI module	40 W
Maximum output power for 8 MAI modules	320 W
Maximum input power for 8 MAI modules	400 W
Maximum input power for a MIB module (for a rack)	480 W
Maximum current load for a MIB module	20 A
Maximum current load MIB module/GND terminal (MAI module and MGO module currents)	32 A
Maximum output current for a MSP module (Rack - power pack)	6.5 A
Maximum output power for a MSP module (Rack - power pack)	150 W

Table 5-12: System Configuration/Maximum Loads

Nominal current of a driver output	0.3 A
Maximum current of a driver output	1.0 A
Maximum current for 8 driver outputs (a MGO module has each 5 driver Ics with each 8 driver outputs)	4.0 A(8 x 0.5 A)
Maximum current total of all current loads of a MGO module (one MGO module is disposing of 40 driver outputs)	12 A (40 x 0.3 A)

Table 5-13: MGO Module/Maximum Loads

When setting the number of modules allowable per rack, the following factors of influence have to be observed:

- The power of the sensors to be connected including the losses resulting from the cable lengths (MAI module/ MIB module).
- The currents of the modules connected to the relay driver outputs (MGO module/ MIB module: GND terminal).
- The power requirement of the system modules (see table 5-36: Power Requirements of the System Modules).
- The power available from the supply voltage.

For further details, see the tables in section 5.11 Connection of the System Power Supply and section 11 Technical Data and the operation and maintenance manuals of the sensors to be connected.

Note: A cooling fan must be installed and operated to prevent overheating in the installation framework if more than 65 measuring points are fitted with MPI modules.

5.4.4 Configuration Examples

Standard System with 8 Inputs/8 Common Alarm Relays

Rear

						MAT							MRO	
					Pos. 1	Pos. 2	Pos. 3	Pos. 4	Pos. 5	Pos. 6	Pos. 7	Pos. 8	Pos. 9	Pos. 10
Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7	Slot 8	Slot 9	Slot 10	Slot 11	Slot 12	Slot 13	Slot 14	Slot 15
MCP			MDA			MAI							MGO	

Front

Figure 5-24: Configuration example 1

Standard System with 32 Inputs/8 Common Alarm Re

Rear

						MAT		MAT		MAT		MAT	MRO	
					Pos. 1	Pos. 2	Pos. 3	Pos. 4	Pos. 5	Pos. 6	Pos. 7	Pos. 8	Pos. 9	Pos. 10
Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7	Slot 8	Slot 9	Slot 10	Slot 11	Slot 12	Slot 13	Slot 14	Slot 15
MCP			MDA			MAI		MAI		MAI		MAI	MGO	

Front

Figure 5-25: Configuration example 2

Standard System with 64 Inputs/8 Common Alarm Relays

Rear

					MUT	MUT	MUT	MUT	MUT	MUT	MUT	MUT	MRO-8	
					Pos. 1	Pos. 2	Pos. 3	Pos. 4	Pos. 5	Pos. 6	Pos. 7	Pos. 8	Pos. 9	Pos. 10
Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7	Slot 8	Slot 9	Slot 10	Slot 11	Slot 12	Slot 13	Slot 14	Slot 15
MCP			MDA		MAI	MAI	MAI	MAI	MAI	MAI	MAI	MAI	MGO	

Front

Figure 5-26: Configuration example 3

Standard System with 32 Measurement Sites, Redundant Design

Rear

MST						MAT		MAT		MAT		MAT	MUT	MUT
					Pos. 1	Pos. 2	Pos. 3	Pos. 4	Pos. 5	Pos. 6	Pos. 7	Pos. 8	Pos. 9	Pos. 10
Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7	Slot 8	Slot 9	Slot 10	Slot 11	Slot 12	Slot 13	Slot 14	Slot 15
MCP	MCP		MDA	MDA		MAI + MAR		MAI + MAR		MAI + MAR		MAI + MAR	MGO	MGO

Front

Figure 5-27: Configuration example 4

5.5 Systems Consisting of Several Racks

5.5.1 Systems with Central Recording of Measuring Values

In systems with several racks, which are not isolated from each other, the following points should be kept in mind:

- Each rack must have a guaranteed voltage supply. The GND-connectors of all racks must be interconnected.
- When the central unit respectively the satellites consist of several racks, note that in each rack-group the GND-connectors must be interconnected.
- The racks must be connected to each other by a CAN bus.
- The racks are connected by way of the MST module cards on the rear with ready-made CAN bus cables.
- For a “multi-rack” system, contacts 1 and 2 (CAN-A, CAN-B) of the DIL switch on the MIB module in the last rack – i.e., the one where the CAN bus ends – should be closed. All DIL switch contacts 1 and 2 (CAN-A, CAN-B) on the tracks in between must be open (see section 5.3.1 Configuration of the MIB Module).

- The setting of the CAN bus bit rate must be the same for all racks and should correspond to the standard settings defined for the total number of inputs in question (see section 5.3.1 Configuration of the MIB Module).
- Each rack must have it own CAN node number. The standard setting for the first rack is 111 (see section 5.3.1 Configuration of the MIB Module).
- In the case of non-redundant systems, the standard practice is to use the CAN-A bus connection; when a redundant system is built, the CAN-B is also connected (see section 10 Redundant Systems).
- A cooling fan must be installed and operated for the warmth removal in the installation framework if more than 65 measuring points are fitted with MPI modules.

Connection Notes

The MAI Module has been modified to facilitate applying the CAN Bus connections.

Unlike the previous MST module (G status A), the revised version (G status B) has an input and output for each CAN Bus. For this reason, when connecting several racks via CAN bus, the CAN Bus T-piece is no longer required. (Art.-No.: 10030080).

In the following, the connection of several racks (BGT) via CAN bus is described for both MST module variations.

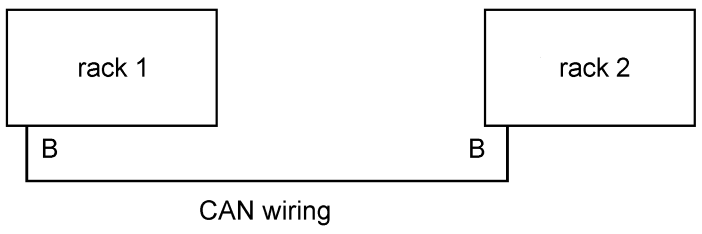
Note: For reason of clarity, only one CAN bus is described, the other CAN buses are connected the same way.

Signification: **St = Plug**
B = Socket
(stands for plug connectors at the respective line)

For connections and terminal assignment see section 5.10 System Ports (MST module).

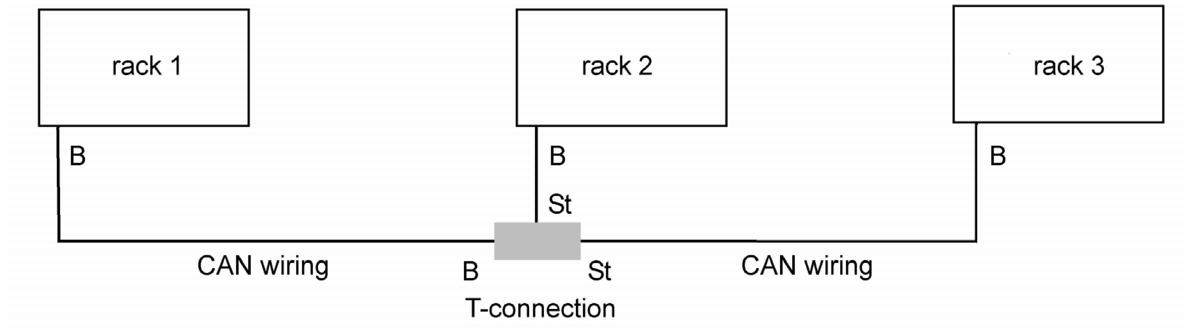
<u>MST Module G Status A:</u>

<u>Connection of 2 racks:</u>



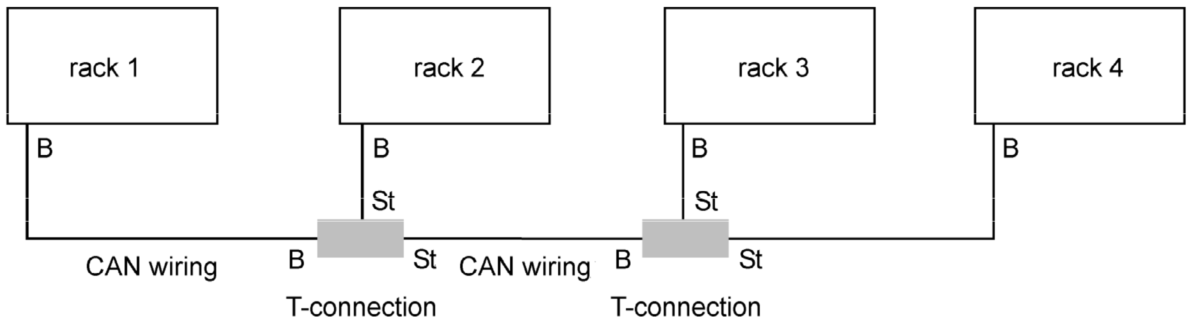
The CAN terminating resistor at Rack 1 is not set, at Rack 2 it is set.

Connection of 3 Racks:



The CAN terminating resistor at Rack 1 and Rack 2 is not set, at Rack 3 it is set.

Connection of 4 Racks:

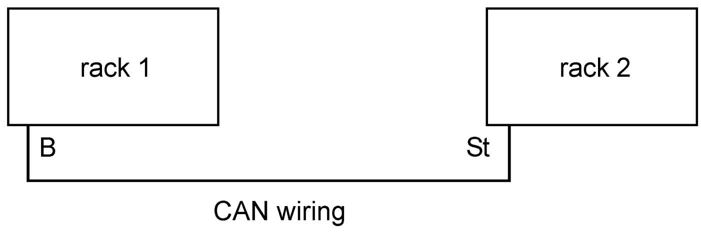


The CAN terminating resistor at Rack 1, Rack 2 and Rack 3 is not set, at Rack 4 it is set.

For every further rack, a T-piece, ribbon cable and a CAN line socket/plug is needed.

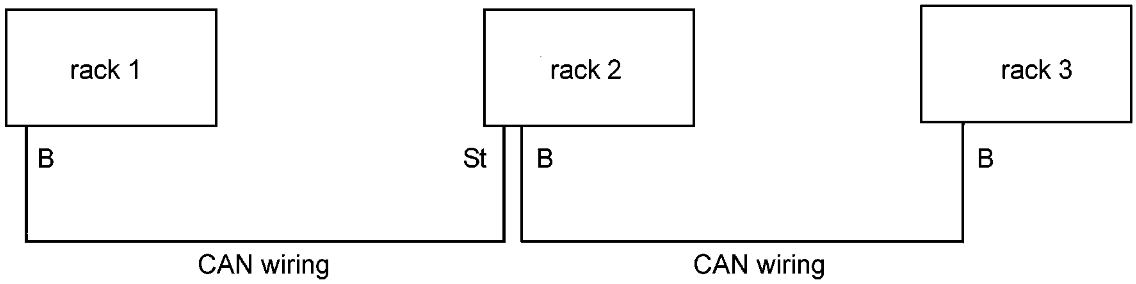
MST Module G Status B (revised Version):

Connection of 2 Racks:



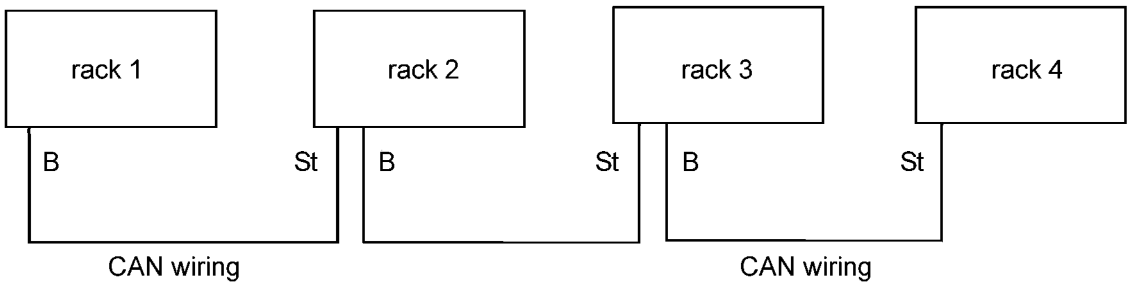
The CAN terminating resistor at Rack 1 is not set, at Rack 2 it is set.

Connection of 3 Racks:



The CAN terminating resistor at Rack 1 and Rack 2 is not set, at Rack 3 it is set.

Connection of 4 Racks:



The CAN terminating resistor at Rack 1, Rack 2 and Rack 3 is not set, at Rack 4 it is set.
For every further rack, a CAN line socket/plug is needed.

Listing CAN Bus Connection Elements:

Description	**Order-No.**
SUPREMA CAN cable plug/plug, 5 m	10030081
SUPREMA CAN cable socket/socket, 5 m	10030082
SUPREMA CAN cable plug/socket, 5 m	10030083
SUPREMA CAN cable plug/socket, 0.5 m	10030084
SUPREMA CAN cable socket/socket, 0.5 m	10030085
SUPREMA CAN cable plug/plug, 0.5 m	10030086
SUPREMA CAN T-piece	10030080
SUPREMA CAN ribbon cable D-SUB	10030087
SUPREMA CAN terminating resistor socket	10030078
SUPREMA CAN terminating resistor plug	10030079

Table 5-14: CAN Bus Connection Elements

5.5.2 Systems with Decentralised Recording of Measuring Values (Satellites)

To reduce the installation cost for systems with large distances between the sensors and alarms the SUPREMA evaluation unit, for recording of measuring values as well as control of alarm means can be carried out near the sensors.

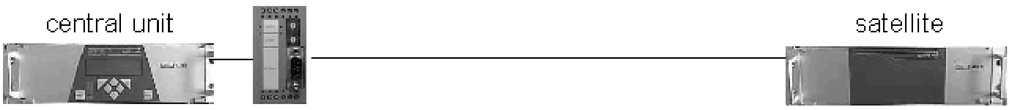
This can be achieved by having a SUPREMA rack (rack with MDO module) installed in a control station, and a satellite SUPREMA rack (rack-E without MDO-10), equipped only with with measuring points and/or outputs, installed in the field. Both racks communicate with one another via the CAN Bus.

This means that instead of up to 64 sensor cables, only one CAN bus cable has to be connected.

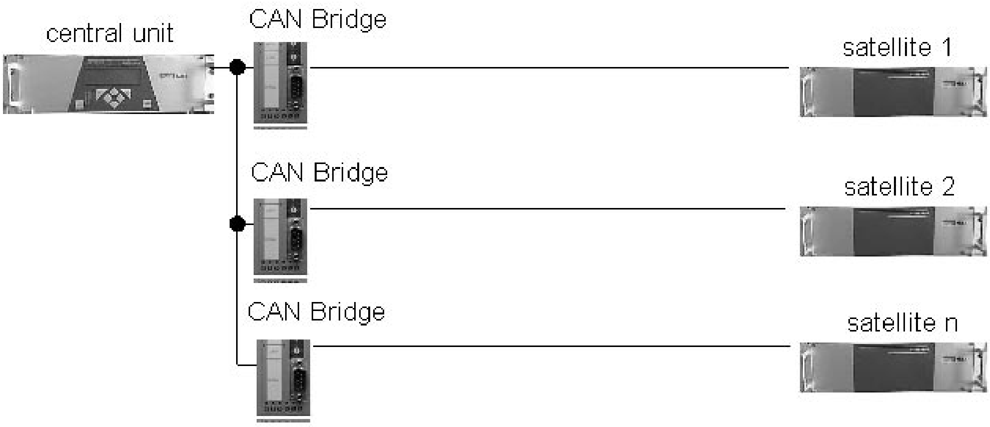
Note: At distances >20 m, a CAN bridge has to be interposed. [(see section 5.5.2.1 SUPREMA CAN Bridge CBM)]

Examples of Satellite Applications:

With one satellite:



With two or n Satellites:



Connection Note:

Figure 5-28: Connection CAN-Bridge CBM

The terminating resistor of rack 1 must be deactivated, and a 120 Ohm resistor connected between terminal 2 and 4, NET 0, of the CAN connection.

A 120 ohms resistor for Net 1 must be connected under the terminal (2 to 4) NET1 of the CAN connection.

5.5.2.1 SUPREMA CAN-Bridge CBM

If a satellite is operated with a cable length > 20 metres, a SUPREMA CAN BRIDGE CBM must be provided. It is necessary for galvanic isolation, the matching of bit rates and the filtering of CAN Identifiers (data reduction).

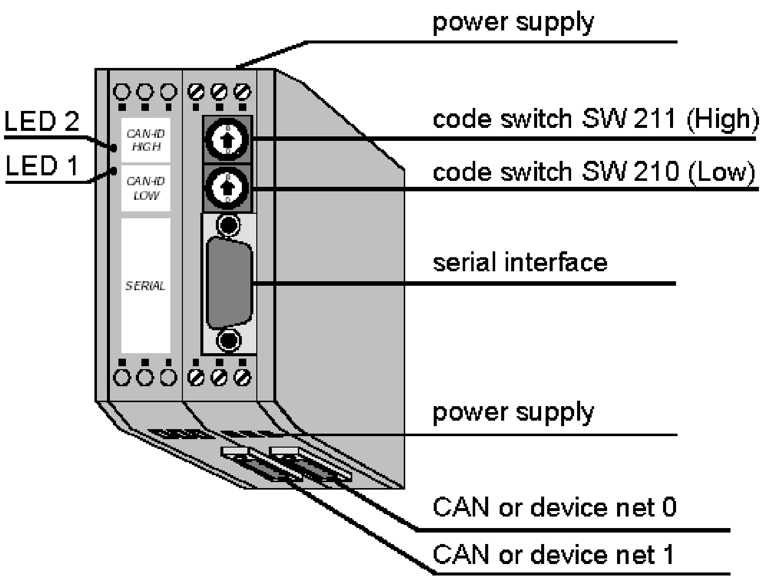


Figure 5-29: SUPREMA CAN-Bridge CBM

The SUPREMA CAN BRIDGE is supplied with 24V DC (X101). The CAN Bus of the Basic Rack is connected to NET 0 (X400), and the satellite rack is connected to NET1 (X400) (Exact connection assignments are to be seen from the CAN Bridge hardware).

For parameter setting, a serial interface (DSUB plug connector X100) is provided. The CAN Bridge parameters can be set using a terminal program (e.g. Hyper Terminal for Windows).Details of this process are described below.

The code switches SW211 and SW210 of the CAN Bridge are only for internal service purposes and must always be in position 0. When both LED‘s (1 and 2) are on the status is ‘good‘. If there is a failure at one of the two CAN buses, the corresponding LED will flash, LED 1 for NET 1, and LED 2 for NET 0.

For the correct function of the SUPREMA CAN bridge, some points must be considered:

a) Baud rate setting at the Central Rack (depends on the number of measuring points)

b) Baud rate setting at the satellite rack (depends on the distance of the satellite)

c) Rack number (Dip switch at the MIB module)

d) Components of the Satellite racks (Plug positions of the MDA, MGO, MAO, MAI modules)

Note: 32 filters max. may be set, i.e., in a satellite, 9 MGO/MAO modules max. can be integrated. The number of MDA/MAI modules per rack is not limited.

As to a):

Measuring points	**5 Bit rate setting in kB/s** Simplex/Duplex	**Bridge command**
1 - 64	125	B0:6
65 - 128	250	B0:4
129 - 256	250	B0:4

Table 5-15: Baud rate at the Central Rack

As to b):

Measuring points	**Distance in m**	**Bit rate setting in kB/s**	**Bridge command**
1 - 64	0 - 800	50	B1:9
65 - 128	0 - 400	125	B1:6
129 - 256	0 - 200	250	B1:4

Table 5-16: Baud rate at the Satellite Rack

As to (c) and (d):
The CAN identifier for the CAN Bridge filter function must be calculated, see the following section. After calculation, the results must be transformed to hexadecimal numbers.

Calculation formula for the CAN Identifiers:

$$COBID_{(Module)} = COBID + NID \qquad NID = (16 * BGTID + SLNR)$$

NID = Node ID

BGTID = Rack number (-1)

SLNR = Slot number

COBID = CAN ID assignment (see table 5-18)

$COBID_{(Module)}$ = CAN Identifier for COBID of the Module

Node ID (NID)	Slot No. (SLNR)	Module
16 * Rack ID +	1	MCP 10 A
16 * Rack ID +	2	MCP 10 B
16 * Rack ID +	3	MCP 10 C
16 * Rack ID +	4	MDA 10 A, …
16 * Rack ID +	5	MDA 10 B, …
16 * Rack ID +	6 … 15	MGO 10, MGI 10, MAO 10, …
16 * Rack ID +	16	MDO 10

Table 5-17: Calculation of the Node ID

Message	COB-ID (Module) (dec)	COB-ID (Module) (hex)	Purpose	COB-ID (hex) Range
NMT-Start/Stop	0	0	Start and Stop of nodes	0
SYNC	128	80	Synchronisation	80
EMERGENCY	128+NID	80+NID	Failure message (128+Node-ID)	81-FF
TIME STAMP	256	100	Time Stamp	100
PDO1(rx)	384+NID	100+NID	Digital Input (256+Node-ID)	181-1FF
PDO1(tx)	512+NID	200+NID	Digital Output (512+Node-ID)	201-27F
PDO2(rx)	640+NID	280+NID	Analogue Input (640+Node-ID)	281-2FF
PDO2(tx)	768+NID	300+NID	Analogue Output (768+Node-ID)	301-37F
SDO(rx)	1408+NID	580+NID	Reading from object directory (1408+Node-ID)	581-5FF
SDO(tx)	1538+NID	600+NID	Writing in object directory (1536+Node-ID)	601-67F
Nodeguard	1792+NID	700+NID	Network control (1792+Guard-ID)	701-77F

Table 5-18: CAN-ID Assignment

Note: One filter must be set for NET0 to NET1 and one mask must be set for NET1 to NET2.

Standard Identifiers are needed, which must be present in any filter, these are: for NET 0: 0, 80, 100.

(All numbers are shown in hexadecimal)

Calculation example of the MDA 10 module in slot 4 of rack 2:

ID calculation for:

Writing Object directory	16*1+4+1536=1556=**614**(hex)	Net1<-Net0
Nodegard	16*1+4+1792=1812=**714**(hex)	Net1<-Net0

Calculation example of the MGO 10 module in slot 14 of rack 1:

ID calculation for:

Digital Output	16*0+14+512=526=**20E**(hex)	Net1<-Net0
Writing Object directory	16*0+14+1536=1550=**60E**(hex)	Net1<-Net0
Nodegard	16*0+14+1792=1806=**70E**(hex)	Net1<-Net0

Calculation example of the MAO 10 module in slot 13 of rack 3:

ID calculation for:Configuration Example:

Analog Output	16*2+13+768=813=**32D**(hex)	Net1<-Net0
Writing Object directory	16*2+13+1536=1581=**62D**(hex)	Net1<-Net0
Nodegard	16*2+13+1792=1837=**72D**(hex)	Net1<-Net0

Configuration example:

Components of the individual racks:
Central rack

Module	Slot	Remark	Number
MDO			1
MCP	1		1
MDA	4		1
MAI	6/8	MS 1-24	3
MGO	14		1

- Rack-CAN-Node Number : 1 (set on MIB-Module)
- Bit rate: 125 kB
- CAN termination at the MIB module, if CAN line to CAN bridge is < 30 cm, otherwise provide a 120 Ohms terminating resistor at the CAN bridge, and switch off the termination at the MIB module (see section 5.3.1 Configuration of MIB-Module).

Satellite:

Module	Slot	Remark	Number
MDA	4		1
MAI	6/8	MS 65-96	3
MGO	14		1

- Set on rack 2
- Bitrate: 50 kB
- Switch on the CAN-terminating resistor at MIB 20

Parameter Setting for CAN Bus A

Net 0 is the Central Rack

To reduce the data overflow at the CAN bus, the CAN bridge is provided with a filter which only lets the data required pass through to NET 1.

Filter for NET 0 after NET 1:

B0:6	{Bit rate = 125kB}
I0:0 I1:0	{START/STOP}
I0:80 I1:80	{Sync Byte}
I0:100 I1:100	{Time stamp}
I0:614 I1:614	{SDO tx MDA (SAT1)}
I0:714 I1:714	{Nodegard for MDA (SAT1)}
I0:21E I1:21E	{Data for MGO (SAT1)}
I0:61E I1:61E	{SDO tx MGO (SAT1)}
I0:71E I1:71E	{Nodegard for MGO (SAT1)}

Net 1 are the satellites

Filter for NET1 to NET0:

B1:9	{Bit rate = 50kb}
M1:0:0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	{Mask for NET1 to NET0}

With help of a text editor, a *.txt file is generated, which only contains the data required:

```
B0:6
I0:0 I1:0
I0:80 I1:80
I0:100 I1:100
I0:614 I1:614
I0:714 I1:714
I0:21E I1:21E
I0:61E I1:61E
I0:71E I1:71E
B1:9
M1:0:0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
```

Command Set of the CAN Bridge CBM:

R	Read the CAN bridge parameter setting
E	Copy the parameters to memory
C	Delete all parameters from the CAN bridge

B*n*:*m*	Baud rate setting:	*n* = 0 for Net0 *n* = 1 for Net1 m = See Tables 1 and 2

I0:*ID* I1:*ID*	Filter from NET0 to NET1, ID stands for the necessary identifier.
I1:*ID* I0:*ID*	Filter from NET1 to NET0, ID stands for the necessary identifier.
M1:0:0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	Mask from NET1 to NET0, all identifier will let pass.

Details can be found in the CAN Bridge CBM manual.

Programming of the CAN Bridge CBM:

Programming is carried out with the help of a terminal program which can send *.txt files.

Connection Line:
For the data transfer, a Null modem line is needed.

Modulation of the Terminal Program:

Baud rate:	9600 kb/s
Data bits:	8
Stop bits:	1
Parity:	n

Example of the Hyperterminal for Windows:

The Null modem line must be connected to the CAN bridge CBM (X100), and the Computer COM Port. The terminal program must be started with the a.m. settings.

After switching on the CAN bridge, the start screen on the terminal display looks like that shown below, or similar.

```
........................=============================
                        > > >  R T O S  -  U H  < < <
                        =============================
 Nuc=7.8-A       Daemon=2.3      EdFm=2.L       Vi/Vo=1.6       assign=0.9
 Math=1.H        Hyp=15.4-J      R/W_P90=1.6    Dat1.4          Dev = 3.5
 IDF=1.1         Prom=3.0        Editor 10.B    Help=1.F        Sh/sr=4.7-C
 sh/ext=1.2x     Shell=4.4-D     XC 4.2-L       Loader=6.5-F    copy=1.H
 ScAcc=1.3       User=0.8        I/O_Pack=25    DBV/rw=1.1      Nil=1.2
 Extp=4.3A       Setup=3.3e      SysRes=15c     EX=2.2-M        Check=1.5
 CBM-DP_Ini=2.5  Imp/CBM_S=5.8C  T_IrLk=1.0     Flash_Prom=0.P
 SRamDsk=1.8g
 Fm=UHFM3.J      LineEd-F=1.3G
 RESET.
 C200I:Using I/O-Base 0x800000 for card 0ADRS_00200000 Flash_Prom
 1*AMD29
 F080

 CPU-Type_68331  25.2_MHz        Date_-------- Time_00:00:00
 C200I: Using Interrupt 30 for card 0
 C200I: Using Interrupt 30 for card 0
 C200I: ''CAN_SJA100'' with 2 Nets identified
 C200I: Hardware-Version=1.0.00
 C200I: Firmware-Version=0.0.00
```

Command R and >Enter<, will get the current parameters:

```
V1.3
>r
B0:6
B1:6
```

This is the contents for a reset CAN bridge; both baud rates are set to 125k. Before programming all parameters in the CAN-Bridge must be delete.

When the *.txt file generated above is transferred with help of the terminal program, the following screen contents will be seen:

```
>B0:6
>I0:0 I1:0
>I0:80 I1:80
>I0:100 I1:100
>I0:614 I1:614
>I0:714 I1:714
>I0:21E I1:21E
>I0:61E I1:61E
>I0:71E I1:71E
>B1:9
>M1:0:0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
```

Press E and >Enter<, to write the parameters into the memory, and then check them by pressing R and >Enter<.

```
e
>r
B0:6
I0:0 I1:0
I0:80 I1:80
I0:100 I1:100
I0:614 I1:614
I0:714 I1:714
I0:21e I1:21e
I0:61e I1:61e
I0:71e I1:71e
B1:9
M1:0:0xxxxxxxxxxxxxxxxxxxxxxxxxxxxx
```

The parameters have now been successfully set.

Note: The parameter setting of a CAN bridge for the CAN Bus B is carried out the same way as the parameter setting for the CAN Bus A.

Technical Data:

Supply voltage	Nominal voltage 24 VDC ±10 % Current consumption (at 20 °C): typ. 85 mA
Plug connector	**X 100** (DSUB9, plug) - serial interface
	X 101 (6-pin screw connector UEGM) - 24 V supply voltage
	X 400-SIO331 (Combicon design, 5-pin MSTB2.5/5-5.08) - CAN or DeviceNet Net 0
	X 400-SIO-CAN2 (Combicon design, 5-pin MSTB2.5/5-5.08) - CAN or DeviceNet Net 1
Temperatur range	5 … 50 °C environmental temperature
Humidity	90 % max., noncondensing
Dimensions of the cabinet (W x H x D)	Width: 40 mm, Height: 85 mm, Depth: 83 mm (including mounting rail and protuding connector DSUB9, without CANDeviceNet plug)
Weight	approx. 200 g

Table 5-19: Technical Data CAN-Bridge CBM

5.6 Connection of the Sensors

5.6.1 General Instructions

Warning: Always turn off the voltage to the system before connecting the sensors.

- Incorrect connection of the sensors can cause damage both to the SUPREMA and to the sensor itself.
- It must be ensured that the adapter modules corresponding to the sensors are plugged into the appropriate MAI module (verify that the sequence is correct (see section 5.3.2 Configuration of the MAI Module).
- After the sensors have been connected, they are to be separated electrically again by pulling the connector plug on the MAT or MAT-TS module. They are to be plugged in again individually only as part of the startup procedure (see section 6 Startup). If the MGT-40-TS module is being used, this is to be disconnected by pulling the ribbon cable connector to the MUT module.
- To ensure that the system will function correctly, the EMC Directives and the measures derived from them must be observed (see section 5.1.1 Installation Instructions for Following the EMC Directives, and section 5.1.2 Instructions on Meeting the EMC Requirements on the SUPREMA Control System).

The cables are to be connected to the SUPREMA and to the sensors in observance of the allowable cable cross sections and the maximum cable lengths. A detailed description of the connections can be found in the connection diagram for the type of sensor in question and in the sensor data sheet (see Appendix). The operating and maintenance instructions of the sensor to be connected should also be noted.

5.6.2 Notes for the Operation With Catalytic Combustion Sensors

Sensor poisons

For the safe operation of the catalytic combustion sensors it must be made sure that in the environmental air no substances and gases which damage or poison the sensor appear. These sensor poisons are a. o. Silicone, Silane compounds, Hydrogen Sulfide, Sulfur compounds. In the case of doubt a MSA-Auer employee must be contacted to judge on the spot the possible appearance of sensor poisons and suggest alternative measurement procedures.

Oxygen Concentration

Catalytic combustions sensors operation ist only possible at an O_2 concentration of above 10 Vol.%. At O_2 concentrations above 22 Vol.%, the EX approval for remote measuring heads becomes invalid.

Measuring Free

Before the installation of the sensors it must be made sure that the environmental atmosphere is free of combustible gases (e.g. by check with hand-held test instruments). The unambiguity otherwise cannot be ensured to the measuring value indication at the SUPREMA.

3-conductor operation of passive sensors

At use of passive sensors in 3-conductor operation, the requirements of line control according to EN 50054 are comply only up to a maximum line- resistance of 1.7 Ohm pro lead respectively 3.4 Ohm loop resistance. If the line-resistance exceeds 1.7 Ohm pro lead respectively 3.4 Ohm loop resistance the 5-conductor operation is recommended.

5.6.3 Note for Operation with Active Sensors (0/4 ... 20 mA)

At use of MCI 10-Modules Order No 10021029 and 10041567: The requirements of line control according to EN50054 are not met with 3-conuctor operation in case of short-circuit of the signal output of the remote measuring head against GND.

This note is invalid if using the MCI 20-Modules Order No 10043997 and 10044020. This Modules are without any qualification operative.

5.6.4 Overview of the Terminal Assignment

In the following, an overview is presented of the assignment of the terminals. If the sensors are to be connected directly to the rack, the MAT module is to be used. For remote connection (installation on a mounting rail), the MAT-TS module (maximum conductor cross section, 1.5 mm^2; sensors can be electrically isolated individually) or the MGT-40-TS module (maximum conductor cross section, 2.5 mm^2; 8 sensors per module, can be isolated electrically only as a group) can be used. The remote modules are connected to the MUT module on the rack by the associated ribbon cable.

MAT Module/MAT-TS Module/Sensor Connections

The function of the terminal connections of the MAT/MAT-TS module depends on the module card plugged into the rack.

Module Type	Sensor Type	Terminal 1	Terminal 2	Terminal 3	Terminal 4	Terminal 5
MAI Module with MPI Module WT	Catalytic/Passive 5-wire	K' (white)	K (brown) + IBr	0 (green) + UX	D (yellow) - IBr	D' (grey)
MAI Module with MPI Module WT	Catalytic/Passive 3-wire (MSA AUER)	Bridge K	K (brown) + IBr Bridge K	0 (green) + UX	D (yellow) - IBr Bridge D	Bridge D
MAI Module with MCI Module	active/ 2-wire	4 ... 20 mA signal (GND)	+24 V			
MAI Module with MCI Module	active/ 3-wire	4 ... 20 mA signal	+24 V		GND	
MAI Module with MPI Module HL	Semiconductor/ active 4-wire	+M (white)	+H (green)	-M (brown)	-H (yellow)	

Table 5-20: MAT-/MAT-TS Module, Terminal Assignment, Sensor Connections

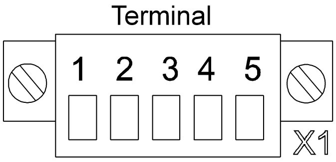


Figure 5-30: MAT Module/MAT-TS Module, Connector Plug

For the 3-wire operation of the passive WT sensors, bridges are to be provided:

Terminals 1–2: BR K–K'

Terminals 4–5: BR D–D'

If wire jumpers cannot be installed at the terminals, they can be provided on the rear of the MAT module in the form of solder bridges. (next to the ribbon plug of the MAT-TS module). (see section 5.3.4 Configuration of the MAT Module and section 5.3.5 Configuration of the MAT-TS Module)

MGT-40-TS Module/Sensor Connections

		MAI Module with MPI Module (WT)	MAI Module with MPI Module (WT)	MAI Module with MCI Module	MAI Module with MCI Module	MAI Module with MPI Module (HL)
Measurem. Point No.	MGT-40-TS Module Terminal No.	Catalytic/passive 5-wire	Catalytic/passive 3-wire	active/ 2-wire	active/ 3-wire	Semiconduc-tor/4-wire
1	2	K‘ (white)		signal	signal	+M (white)
	1	K (brown)	K (brown)	+24 V	+24 V	+H (green)
	4	0 (green)	0 (green)			-M (brown)
	3	D (yellow)	D (yellow)		GND	-H (yellow)
	6	D‘ (grey)				
2	5	K‘ (white)		signal	signal	+M (white)
	8	K (brown)	K (brown)	+24 V	+24 V	+H (green)
	7	0 (green)	0 (green)			-M (brown)
	10	D (yellow)	D (yellow)		GND	-H (yellow)
	9	D‘ (grey)				
3	12	K‘ (white)		signal	signal	+M (white)
	11	K (brown)	K (brown)	+24 V	+24 V	+H (green)
	14	0 (green)	0 (green)			-M (brown)
	13	D (yellow)	D (yellow)		GND	-H (yellow)
	16	D‘ (grey)				
4	15	K‘ (white)		signal	signal	+M (white)
	18	K (brown)	K (brown)	+24 V	+24 V	+H (green)
	17	0 (green)	0 (green)			-M (brown)
	20	D (yellow)	D (yellow)		GND	-H (yellow)
	19	D‘ (grey)				
5	22	K‘ (white)		signal	signal	+M (white)
	21	K (brown)	K (brown)	+24 V	+24 V	+H (green)
	24	0 (green)	0 (green)			-M (brown)
	23	D (yellow)	D (yellow)		GND	-H (yellow)
	26	D‘ (grey)				
6	25	K‘ (white)		signal	signal	+M (white)
	28	K (brown)	K (brown)	+24 V	+24 V	+H (green)
	27	0 (green)	0 (green)			-M (brown)
	30	D (yellow)	D (yellow)		GND	-H (yellow)
	29	D‘ (grey)				
7	32	K‘ (white)		signal	signal	+M (white)
	31	K (brown)	K (brown)	+24 V	+24 V	+H (green)
	34	0 (green)	0 (green)			-M (brown)
	33	D (yellow)	D (yellow)		GND	-H (yellow)
	36	D‘ (grey)				
8	35	K‘ (white)		signal	signal	+M (white)
	38	K (brown)	K (brown)	+24 V	+24 V	+H (green)
	37	0 (green)	0 (green)			-M (brown)
	40	D (yellow)	D (yellow)		GND	-H (yellow)
	39	D‘ (grey)				

Table 5-21: MGT-40-TS Module, Terminal Assignments for Connection of the Sensors

MGT-40-TS Module/Allocation MAT – MGT connections

	MAI Module	
Measurement Point No.	MAT Terminal No.	MGT-40-TS-Module Terminal No.
1	1	2
	2	1
	3	4
	4	3
	5	6
2	1	5
	2	8
	3	7
	4	10
	5	9
3	1	12
	2	11
	3	14
	4	13
	5	16
4	1	15
	2	18
	3	17
	4	20
	5	19
5	1	22
	2	21
	3	24
	4	23
	5	26
6	1	25
	2	28
	3	27
	4	30
	5	29
7	1	32
	2	31
	3	34
	4	33
	5	36
8	1	35
	2	38
	3	37
	4	40
	5	39

Table 5-22: MGT-40-TS Module/Allocation MAT – MGT connections

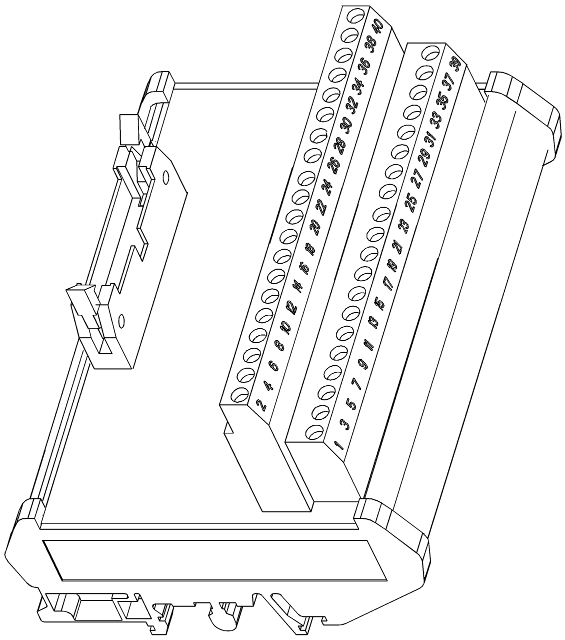


Figure 5-31: MGT-40-TS Module

5.7 Connection of the Relay Outputs

The function of the individual relay modules is described in detail in section 3.6.4 Description of the Modules/Relay Outputs. Depending on the application, the following relay modules can be used:

- MRO-8 module — 8 common alarm relays on the rack
- MRC-TS module — connection of 5 relay modules (MRO-8-TS modules), installed on mounting rail
- MRO-8-TS module — 8 relays, installed on mounting rail
- MRO-16-TS module — 16 relays, redundant design (see section 10 Redundant Systems), installed on mounting rail.

The relay modules are controlled by the MGO module, which has 40 switching outputs available per module. The first 8 switching outputs of the first MGO module in the system are permanently assigned to the common alarms, whereas the other outputs can be configured freely (see section Configuration of the Relay Driver Outputs).

In addition, a system failure relay is available on the MIB module, which is controlled in the event of a system failure (SYSTEM FAIL, LED is lightened).

The following table provides information on the contact load capacity of MRO modules:

Maximum Switching Voltage	400 VAC 300 VDC
Maximum Switching Power, ac:	1500 VA
Nominal Current	3 ADC
Maximum Switching Power, dc: (from the load limit curve)	24 VDC/3 A 50 VDC/0.3 A 100 VDC/0.1 A

Table 5-23: MRO-Module, Contact Load Capacity

Note: To ensure a save relay contact operation the relay output must be fused to get a overload protection. To calculate the fuse rating, multiply the maximal allowed nominal current by factor 0,6.

5.7.1 MRO-8 Module Relay Output Unit Common Alarms

This module is used only when relays are required for common alarms and installation is to be done directly on the rack. The module offers 8 common alarm relays and can be plugged directly into the rear of the rack. Each relay has a changeover contact, which is connected to terminals. The common alarm relays can be inhibited by connecting a switch to the LOCR contact of the MST module (see section 5.10.7 LOCR Terminal). As standard practice, the common alarm relays are normally energised (i.e. a relay is energised – no alarm. The relay is de-energised when an alarm is triggered at one or more inputs.).

Note: The MRO-8 module must be installed in POS 9 only! It is impossible to be use more than one MRO-8 module in one rack.

MRO-8 Module Relay Assignment

Relay No.	Assignment
1	1st Alarm
2	2nd Alarm
3	3rd Alarm
4	4th Alarm
5	Signal Failure (Sensor)
6	Horn
7	Inhibit
8	Power Supply Failure

Table 5-24: MRO-8-Module, Relay Assignment

MRO-8 Module, Relay Assignment

Relay No.	Terminal No.	Contact
1	1	NO
	2	C
	3	NC
2	13	NO
	14	C
	15	NC
3	4	NO
	5	C
	6	NC
4	16	NO
	17	C
	18	NC
5	7	NO
	8	C
	9	NC
6	19	NO
	20	C
	21	NC
7	10	NO
	11	C
	12	NC
8	22	NO
	23	C
	24	NC

Table 5-25: MRO-8 Module, Terminal Assignment

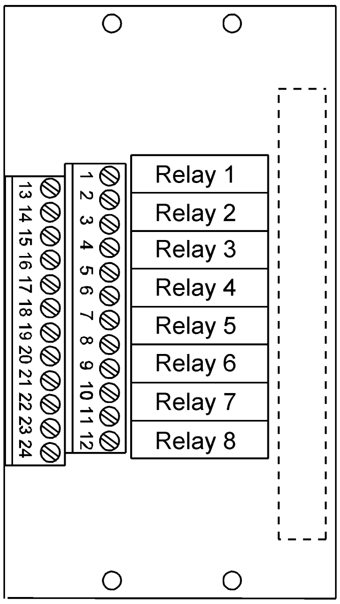


Figure 5-32: MRO-8 Module, Terminal Assignment

5.7.2 Additional Relay Outputs

If more relay outputs are required, MRO-8-TS modules are used together with the MRC-TS module (mounting rail installation). Remember that the first 8 switching outputs of the first MGO module card in the system are permanently assigned to the common alarms. Thus the first MRO-8-TS module which is connected by way of the MRC-TS module to the first MGO module card in the system is always assigned to the 8 common alarms. The connection of the MRO-16-TS module provided for redundant systems is described in section 10 Redundant Systems.

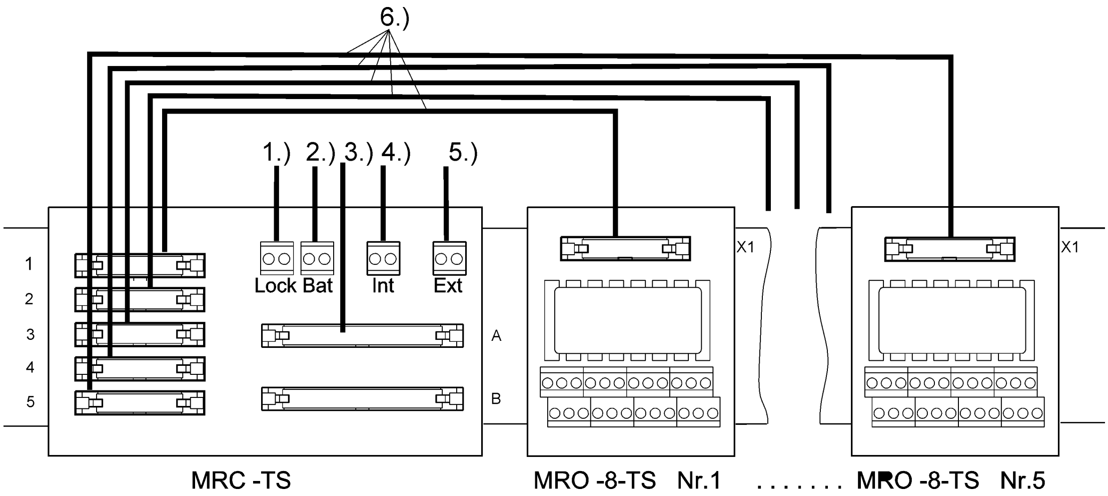


Figure 5-33: Connection diagram of the MRC-TS and MRO-8-TS modules

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Attention: The GND of the Bat, Int, and Ext connections of the MRC-TS module must be connected to the GND of the SUPREMA supply voltage.

The MRC-TS module is connected via connector A by means of a 40-way screened ribbon cable [3.)] to the MUT module plugged into the rear of the rack. The MUT module establishes the connection with the MGO module plugged into the rack (see section 5.4.1 Slot Assignment). MRO-8-TS modules Nos. 1-5 are connected to the MRC-TS connector 1-5 by means of a 20-way ribbon cable. In addition, the supply voltage for the relays must be connected to the terminals Bat [2.)], Int [3.)], and/or Ext [5.)]. As an option, a switch can be connected to the Inhibit (Lock) terminal [1,)] for the purpose of inhibiting the relays. (see section 5.3.7 Configuration of the MRC-TS Module).

MRC-TS Module, Relay Connection Module

This module is used when relay modules for mounting rail installation remote from the rack are used. Up to 5 TS-relay modules (MRO-8-TS) are connected by way of an MRC-TS module. It is to this module that the relay power supply and the ribbon cable required for the control of the relays by the MGO module card are connected. The MGO module is connected to the MRC-TS-Module with a 40-way ribbon cable and a rack mounted MUT module.

The power supply to the relays must be provided by appropriate connections on the MRC-TS module. Also note the following points:

- The power supply concept of the MRC-TS module must agree with that of the rack (assignment of the External/Internal/Battery terminals must agree).
- When different voltage supplies are used for the MRC-TS module and the associated rack, the GND terminals must be connected together, otherwise the relays will not switch.

5.7.2.1 Relay Inhibit

- By connecting a switch to the LOCK contact of the MRC-TS module, all the relays of the connected MRO-8-TS modules can be inhibited simultaneously.
- Individual relays cannot be inhibited in this way. The only way to inhibit an individual relay is to inhibit the associated input (see section 6.3.6 Configure the Sensors).
- By means of the bridge (BR1), the type of inhibiting (normally energised or normally de-energised) can be specified (see section 5.3.7 Configuration of the MRC-TS Module)

normally energised	**=**	**relay energised**	**=**	**alarm**
normally de-energised	**=**	**relay de-energised**	**=**	**alarm**

Attention: The type of inhibiting must agree with the type selected on the operating menu for the relay outputs and must be the same for all relays connected to the MRC-TS module **(see section 6.4.1 Configure the Relay Driver Outputs).** **Because the common alarms operate according to normally energised principle and cannot be changed, the first 32 freely configurable relay outputs must also be configured according to the normally energised principle (normal: ON) if relay inhibiting is provided.**

Note: If the normally energised principle is selected for inhibiting, then, to ensure the voltage supply to the relays, after the SUPREMA voltage supply is turned off, an independent external voltage supply must be connected to the appropriate terminals of the MRC-TS module (EXT/BAT, 24 VDC).

Note: If service is finished the inhibit status of the relays must be cancelled.

M**RO-8-TS Module, Relay Output Unit**

The MRO-8-TS module is used in conjunction with the MRC-TS module when additional types of messages are required in addition to the common alarms. The module has 8 relays, each with its own changeover contact (250 VAC/3 A). They are controlled by an MGO module card, operating by way of the MRC-TS module. For this purpose, the MRO-8-TS module is connected by a 20-way ribbon cable to the MRC-TS module. The inhibiting of the relays is accomplished via the LOCK function of the associated MRC-TS module. (The LOCR terminal on the MST module affects only the common alarms when an MRO-8 module is plugged into the rack).

MRO-8-TS Module, Relay Assignment

The first 8 outputs of the system are assigned to the common alarm messages. The outputs of additional modules can be assigned to any message desired.

Relay No.	Assignment
1	1st Alarm
2	2nd Alarm
3	3rd Alarm
4	4th Alarm
5	Signal Failure (Sensor)
6	Horn
7	Inhibit
8	Power Supply Failure

Table 5-26: MRO-8-TS Module, Common Alarm Relay Assignment

MRO-8-TS module

The terminals are assigned as follows:

Relay No.	Terminal No.	Contact
1	1	NO
	2	C
	3	NC
2	13	NO
	14	C
	15	NC
3	4	NO
	5	C
	6	NC
4	16	NO
	17	C
	18	NC
5	7	NO
	8	C
	9	NC
6	19	NO
	20	C
	21	NC
7	10	NO
	11	C
	12	NC
8	22	NO
	23	C
	24	NC

Table 5-27: MRO-8-TS-Module, Terminal Assignment

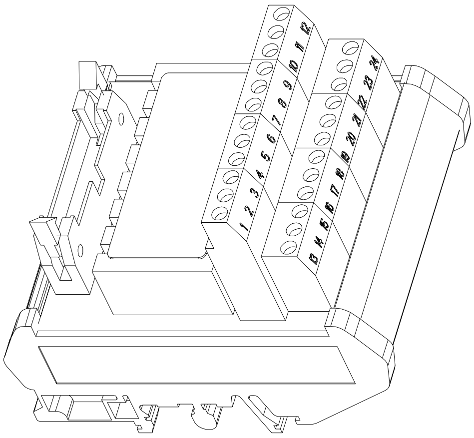


Figure 5-34: MRO-8-TS-Module

5.7.3 System Failure Relay

There are two system failure relays on the MIB module, designed as changeover contacts. They are operated according to the normally energised principle. Both relays are de-energised when a failure occurs. The terminal contacts are directly next to the relays on the MIB module.

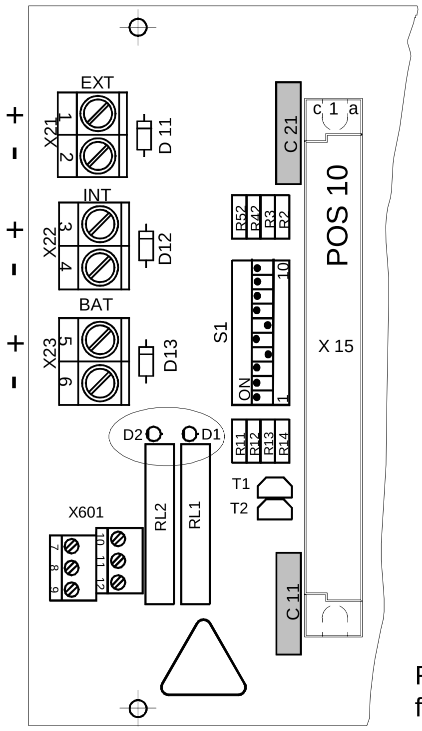


Figure 5-35: MIB Module, connection terminals for the system failure relay

Terminal Assignment:

X 601 Terminal No.	Contact
7	Break contact relay 1
8	Centre contact relay 1
9	Make contact relay 1
10	Break contact relay 2
11	Centre contact relay 2
12	Make contact relay 2

Table 5-28: MIB Module, System Fail Relay, and Terminal Assignment

Note: Both system failure relays have to be interconnected such that the failure report is triggered already when one relay is de-activated. This applies for remote racks, too.

5.8 Connection of the Switching Outputs

Up to 512 switching outputs can be controlled by the system via the MGO module (40 open collector drivers per module). These switching outputs can be used to drive relays, magnetic valves, and LEDs (24 VDC/300 mA). It must be remembered that the first 8 switching outputs of the first MGO module in the system are permanently assigned to the common alarms, whereas the other outputs can be configured as desired (see section 6.4.1 Configure the Relay Driver Outputs). The switching outputs can be accepted by an MGT-40-TS module installed on a mounting rail. The MGT-40-TS module must be connected to the MUT module assigned to the MGO module card by a 40-way ribbon cable.

The connection of switching outputs via the MAT module or the MAT-TS module is not provided for and not allowed!

Note: The outputs from this module (maximum +24 VDC/300 mA) are referenced to the SUPREMA ground. Therefore, the ground of the module supply voltage must be connected to the ground of the SUPREMA (ground of the power supply terminal at the MIB module).

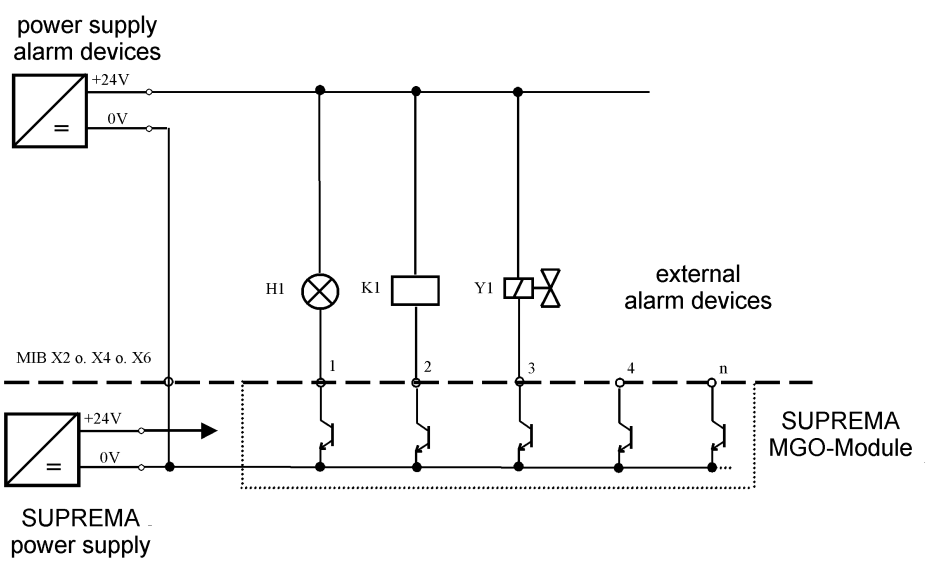


Figure 5-36: Principle circuit diagram, connection of the switching outputs

Note: The load limits, described at chapter 5.4.3 „Maximum Loads“ must be meet!

MGO Driver Output (Switching Output)	Terminal No. (MGT-40-TS)
1	2
2	4
3	6
4	8
5	1
6	3
7	5
8	7
9	10
10	12
11	14
12	16
13	9
14	11
15	13
16	15
17	18
18	20
19	22
20	24
21	17
22	19
23	21
24	23
25	26
26	28
27	30
28	32
29	25
30	27
31	29
32	31
33	34
34	36
35	38
36	40
37	33
38	35
39	37
40	39

Table 5-29: MGT-40-TS Module, Terminal Assignments of the Switching Outputs

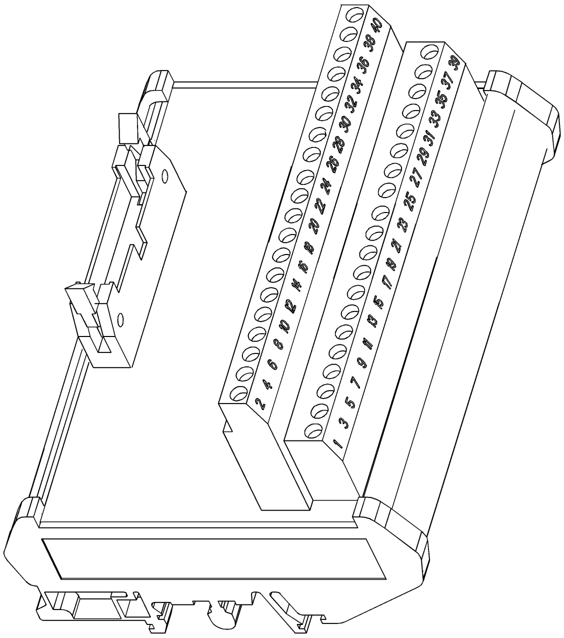


Figure 5-37: MGT-40-TS Module

The cables are to be screened (see section 5.1.1 Installation Instructions for Following the EMC Directives).

5.8.1 MHD-TS Module (High Driver)

The MHD module is an external supplement of the MGO module inverting the MGO output signal.

Unlike the MGO module (= Low Driver), the MHD assembly switches loads which are jointly connected to GND (= High Driver).

The MHD module is connected to the rack by 40-pin ribbon cable, and thus makes 40 outputs available (24V/0.3 A).

40-pin ribbon cable connection at MUT 10 (of MGO 10).

- 24 V supply and load connections (20 A maximum)
- Mounting on C or standard rail
- Outputs short-circuit-proof

Redundant supply must be realized externally.

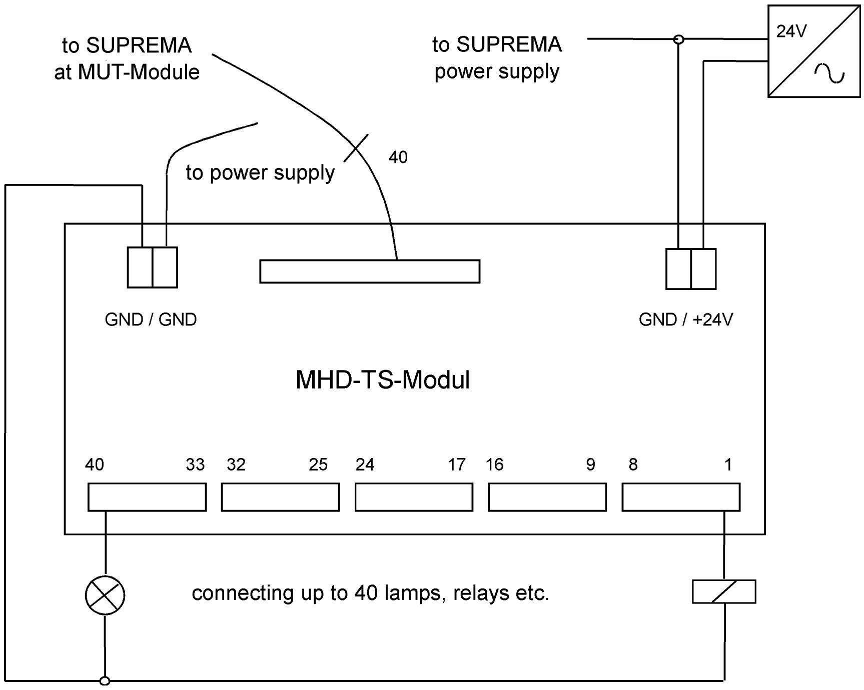


Figure 5-38: MHD-TS Module Connection (Switching outputs inverted)

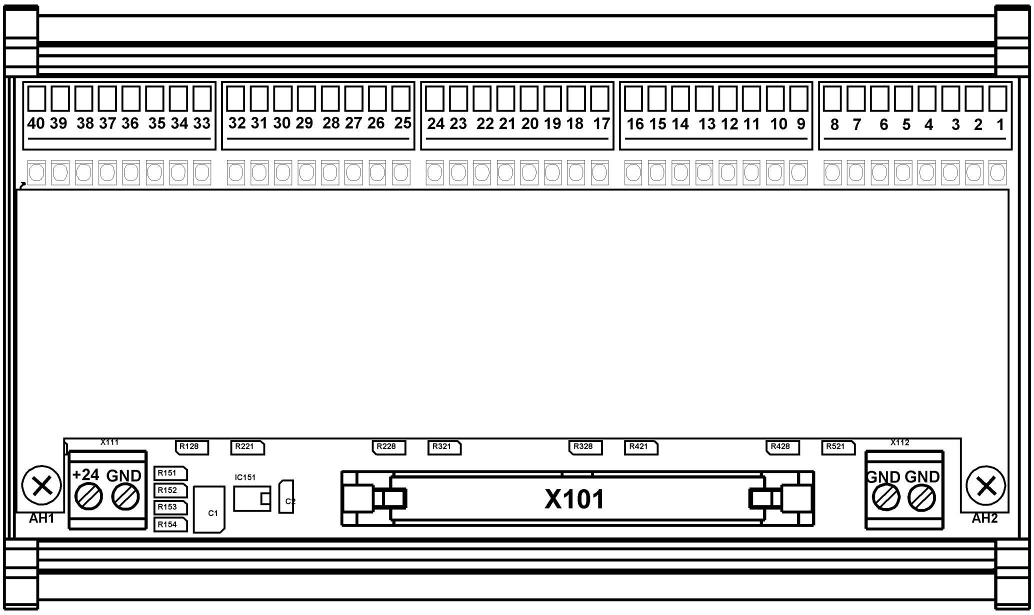


Figure 5-39: MHD-TS Module

5.9 Connection of the Analogue Outputs

Analogue outputs can be used to generate external records of the sensor signals using the MAO module that supplies an electrically isolated 0 ... 20 mA output current. Each MAO module offers 8 analogue outputs that follow the level of the sensor signal. The analogue outputs are assigned directly to the signal inputs (1:1); that is, measurement channel 1 is transmitted via analogue output 1. The system automatically assigns measurement channel nos. 1–8 and the associated measurement values to the first plugged-in MAO module (measurement channel nos. 9–16 being assigned to the second MAO module card, etc.).

Attention: In the standard design with the MAT module plugged into the rack, the first MAI module is in the 7th slot (position 2/measurement channel nos. 9–16). Therefore two MAO module cards must be plugged in so that the measurement values of measurement channels 9–16 can be transmitted as analogue signals.

The analogue signals can be accepted directly on the rack at the terminals of a MAT module plugged into the rear of the rack.

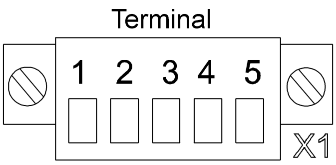


Figure 5-40: MAT module/MAT-TS module, connector plug

Terminal No. 1	Terminal No. 2	Terminal No. 3	Terminal No 4	Terminal No 5
			+ Ia	- Ia

Table 5-30: MAT-/MAT-TS Module Terminal Assignment, Analogue Outputs

For remote connection with mounting rail installation, the MAT-TS module (conductor cross section, 0.2 ... 1.5 mm^2) or the MGT-40-TS module (conductor cross section, 0.2 ... 2.5 mm^2) is provided, which are connected to the MAO module card by a 40-way ribbon cable and the MUT module.

Analogausgangs-kanal	Klemmen-Nr. (MGT-40-TS)	Funktion
1	6	+ Ia
	3	- Ia
2	9	+ Ia
	10	- Ia
3	16	+ Ia
	13	- Ia
4	19	+ Ia
	20	- Ia
5	26	+ Ia
	23	- Ia
6	29	+ Ia
	30	- Ia
7	36	+ Ia
	33	- Ia
8	39	+ Ia
	40	- Ia

Table 5-31: MGT-40-TS-Module Terminal Assignment, Analogue Outputs

The cables must be screened (see section 5.1.1 Installation Instructions for Following the EMC Directives).

An external device with voltage input (e.g. recorder, PC with a DAQ card) can be connected to the analogue outputs by connecting a resistor across the input terminals of the recorder. When a 100-Ohm resistor is used, a voltage range of 0 ... 2 V is obtained for a 0 ... 20 mA signal.

Attention: Maximum load 500 ohms. The accuracy of the measured voltage depends on the tolerance of the resistor used.

5.10 System Ports (MST Module)

The system expansions and system connections described in the following can be realised by using the MST module, plugged into the rear of the rack.

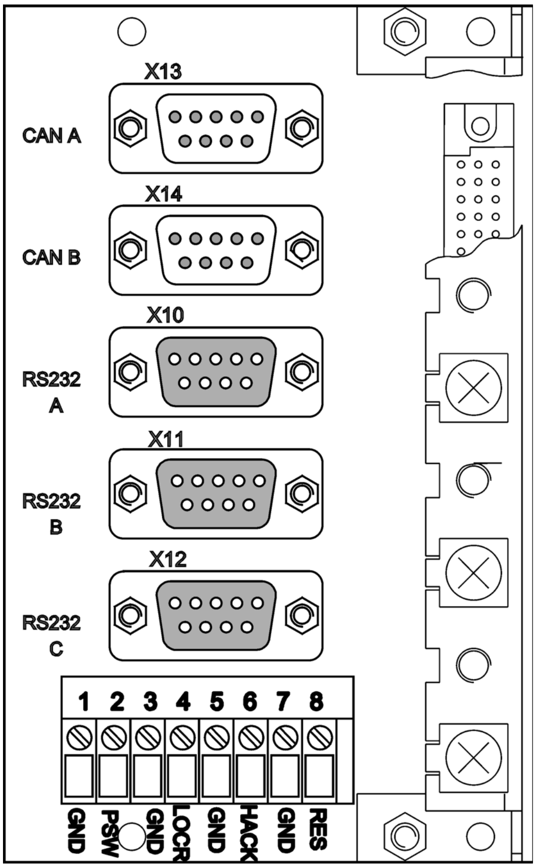


Figure 5-41: MST Module ports, Connections

For simplification of the CAN bus connection at systems with several racks, the MST module has been revised. For every CAN bus an additional connection was added so that the T pieces are saved when connecting racks (see section 5.5 Consisting of Several Racks).

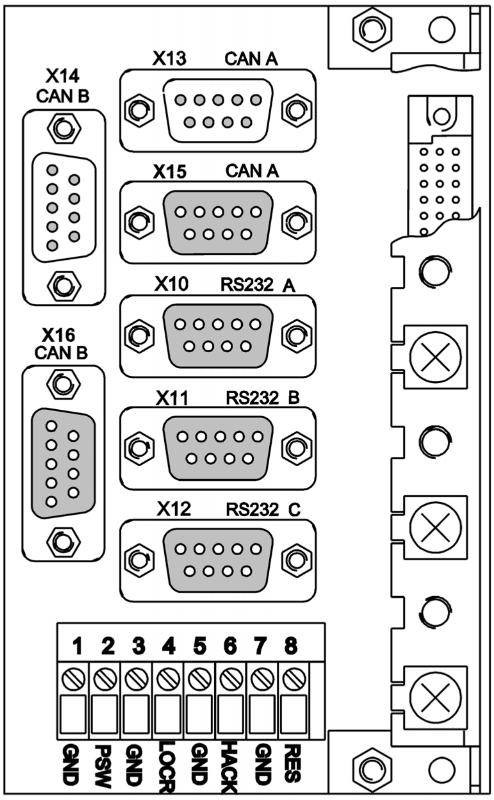


Figure 5-42: MST Module Connections as from PCB version 8

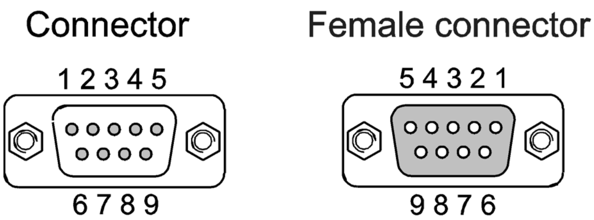


Figure 5-43: SUB-D pin assignment

5.10.1 CAN Bus Ports (CAN-A/CAN-B)

The two system buses in the system, i.e., CAN-A and CAN-B, are provided to allow expansion of the system (systems with several racks). The measurement value input (MDA+MAI module) or the switching outputs (MGO module) can be set up separately from the main rack to reduce the cabling. In systems without redundancy, the individual racks are connected to each other by ready-made CAN bus cables via the CAN-A bus port (see Section Fehler! Verweisquelle konnte nicht gefunden werden. (see section 5.4 System Configuration – Hardware).

Plug Assignment:

Plug	Name	Terminal No.	Assignment
X13, X15	CAN A	2	CAN A Port
		3	GND
		6	GND
		7	CAN +
X14, X16	CAN B	2	CAN B Port
		3	GND
		6	GND
		7	CAN +

Table 5-32: MST Module, Pin Assignment, CAN Bus Ports

Only screened (>80 % coverage) CAN-cables are to be used. These must have separate cable screen, which is connected to the plug housing. A wire is to be provided in the cable for the CAN GND.

5.10.2 PC/Laptop Port (System Operation, RS 232A)

A PC or a laptop can be plugged into this port. By using the SUPREMA operating program, the system can be operated with a Windows interface. This is recommended, especially for the initial setup of a new system with an average to large number of inputs (see section 9.1 Connection of a PC/Laptop). It also makes it easier to perform calibrations and routine maintenance. The PC/laptop should meet the following minimum requirements:

System Requirements for PC:
- Minimum Pentium I, 200 MHz, 32 MB of RAM
- Windows 95/98/NT 4.0
- Connecting cable: RS 232 extension, SUB-D connector 9-way, plug and socket (do not use a null-modem cable!)
- RS 232 configuration: 19200 kBits/sec., 8 data bits, 1 stop bit, Parity none

---

The terminal assignment of the RS 232A connection is given in the following table (see figure 5-43: SUB-D pin assignment). Connect the screening to the pin housing.

Socket No.	Assignment
1	
2	T x D
3	R x D
4	
5	GND
6	
7	
8	
9	

Table 5-33: RS 232A Terminal Assignment

5.10.3 Printer Port (Printer, RS 232B)

Using this port, the alarm messages can be sent to a printer so that records can be kept.

- Connecting cable: RS 232 extension (do not use a null-modem cable!)
- RS 232 configuration: 19200 kBits/sec., 8 data bits, 1 stop bit, Parity none

---

The pin assignment of the RS232B port is given in the following table (see also figure 5-43: SUB-D pin assignment). Connect the screening to the pin housing.

Socket No.	Assignment
1	
2	T x D
3	R x D
4	
5	GND
6	
7	
8	
9	

Table 5-34: RS 232B, Pin Assignment

When a signal event occurs (alarm, failure), the following information is transmitted in a single line through this port to a printer:

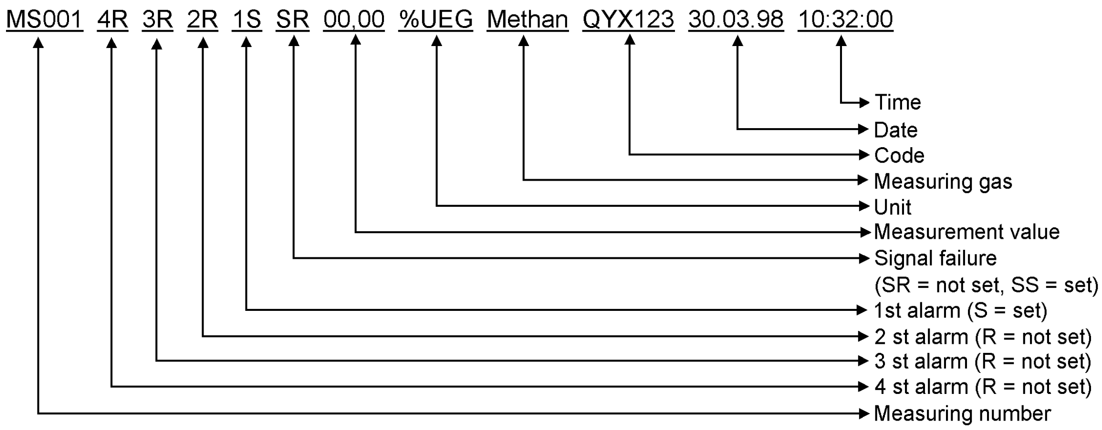


Figure 5-44: Protocol Printer, Data Structure

The results are printed each time the measurement value exceeds or falls below the alarm threshold, in the event of a system failure, in the event of a successful manual reset or a signal failure. The current status of the input is printed out in accordance with the data structure shown in Figure 5-36.

5.10.4 Diagnostics / Service (RS 232C)

This port is intended only for internal system testing. (Output of failure messages when the system configuration is transferred.)

5.10.5 Reset Terminal (Reset Latching Alarms)

Latching alarms can be released via terminals 7 and 8 by closing a contact (key, etc.) (same function as the RESET key on the front panel).

MST Terminal 8 : RES

MST Terminal 7 : GND

5.10.6 Acknowledge Terminal (Reset Horn Relay)

The horn relay can be reset via terminals 5 and 6 by closing a contact (key, etc.) (same function as the ACKNL key on the front panel).

MST Terminal 6 : HACK

MST Terminal 5 : GND

5.10.7 LOCR Terminal

The relay inhibit for the MRO-8 module (common alarms) on the rear of the rack can be activated via terminals 3 and 4 by closing a contact (key, etc.). All 8 modules are inhibited as a block. This terminal has no effect on the MRO-8-TS modules. These modules are inhibited via the LOCK terminal on the MRC-TS module (see section 5.7.2.1 Relay Inhibit).

MST Terminal 4 : LOCR

MST Terminal 3 : GND

Note: If the voltage supply for the MIB module is interrupted, the inhibiting function of the MRO-8 modules is no longer active.

5.10.8 Password Terminal

The password input can be replaced via terminals 1 and 2 by closing a contact (key switch). If the current password has been forgotten, this terminal can be used to enter a new password (see section 7.5 Changing the password).

MST Terminal 2 : PSW

MST Terminal 1 : GND

5.11 Connection for the System Power Supply

Before beginning installation, make sure that section 3.7 System Power Supply , has been read and understood. Care must also be taken to ensure that the complete system, including the sensors and relay modules, does not exceed the maximum load of the selected supply voltage. If an external power supply or a battery is used, the supply voltages must operated via an appropriate EMC filter. The requirements of the EMC and Low Voltage Directive must be complied with.

5.11.1 Calculation of the Required Power Supply

The power consumption for supplying the sensors is based on the number and types of connected sensors and on the resistance of the cables used.

Type of Sensor	Sensor Power	Power per Ohm of Cable Resistance
D-7600	1,5 W	0.1 W*
D-7602	1,5 W	0.1 W*
D-7711	1,5 W	0.1 W*
D-715	1.5 W	0.1 W*
D-7152	1.5 W	0.1 W*
D-7100	1.5 W	0.1 W*
Series 47 K	1.5 W	0.1 W*
D-7010	2.5 W	0.1 W*
D-8101/D-8113	1.5 W	0.1 W
DF-7100	2.5 W	0.05 W, max.
DF-7010	4 W	0.05 W, max.
DF-8603	4 W	0.1 W
DF-8201	1.5 W	0.05 W, max.
DF-8250	1.5 W	0.05 W, max.
DF-8501/DF-8502***	5 W	0.1 W
DF-9500	1 W	not applicable
DF-9200	1 W	not applicable
IR 3600	230 VAC external	
SafeEye	8 W **	0.1 W
GD10	3.5 W	0.05 W, max.
Ultima X	4 W	0.1 W
Ultima X IR	7 W	0.1 W

Table 5-35: Power Requirement of the Sensors and Cables

* Value applies to a bridge current of Ibr = 300 mA

** Only detector and source greater than 6 W. Both (detector and source) should be supplied by external voltage source.

*** With regard to fire and smoke detection, the SUPREMA has not been evaluated to any Canadian standard by a third party agency.

After adding the power consumption for the sensors, the following power values can be given for the individual module cards:

Type of Module	Power (VA)/Module
MCP module	5
MDO module	5
MDA module	1
MGO module	1
MAI module	1
MAO module	5
MRO-8	1.5
MRO-8-TS	1.5
MRO-16-TS	3

Table 5-36: Power Requirements of the System Modules

Attention: The supply voltage may be turned on only after all required installation steps have been completed and the installation has been verified during the startup procedure (see section Startup).

5.11.2 Connection of the DC-Voltage Supply (MIB Module)

The system is supplied with 24 VDC (19.2 ... 32 VDC). There are 3 pairs of connection terminals on the MIB module, so that the supply can originate from 3 different sources (redundancy). The supplies are functionally equivalent, but the order in which the power is drawn is prioritised: 1st = EXT, 2nd = INT, 3rd = BAT. The changeover from one power source to another is accomplished on the system modules.

Warning: The input voltage range (19.2 … 32 VDC) must not be exceeded! Higher voltage values can lead to the destruction of the unit!

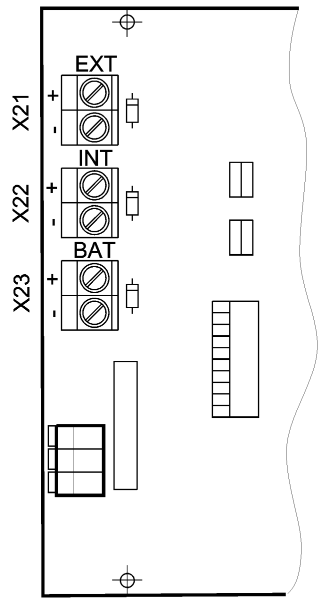


Figure 5-45: MIB module, supply voltage terminals

When an external power supply or a battery is used, the supply voltages must be operated via an appropriate EMC filter. The requirements of the EMC and Low Voltage Directive must be complied with. The external power supply must be a SELV, limited energy source.

EXT Connection (External Power Supply Unit, 24 VDC)

- Connection for external power to supply all assemblies of a rack.
- Required when a redundant power supply is to be provided or when the internal rack power supply unit is unable to supply all the sensors.
- Maximum supply current of 20 A for one rack.

INT Connection (Rack Power Supply Unit, 24 VDC, 150 Watts)

- Connection for an internal rack power supply or an external power supply.
- Power supplied to all the rack units and sensors.
- If the rack power supply cannot supply sufficient current, the sensors, module cards or relays must be supplied by external units.

- The internal rack power supply can be omitted if, because of a high power requirement or a redundant design, the power is supplied by an external power supply via the INT connection terminals.
- Maximum supply current of 20 A.

BAT Connection (Continuous Battery Power Supply)

- Continuous battery power supply for all units in a rack (20 ... 28 VDC).
- If the internal and/or the external power supply unit fails, the system is supplied from here
- Maximum supply current, 20 A.

5.11.3 Connection of the Internal Rack Power Supply Unit (MSP Module)

The system can be supplied by the power supply built into the rack. The power supply has a wide-range input (85 ... 265 VAC, 47 ... 63 Hz or 120 ...330 VDC).

Power Supply Unit - Terminal Designation		Function	
+24 V	+S	Output: +24 VDC	Blade Connection
+24 V		Output: +24 VDC	
GND		Output: GND	
GND	-S	Output: GND	Blade Connection
PE		Ground Wire Connection	(EARTH)
L		Line (HOT) BLACK WIRE	
N		Neutral WHITE WIRE	

Table 5-37: MSP Module, Terminal Assignment

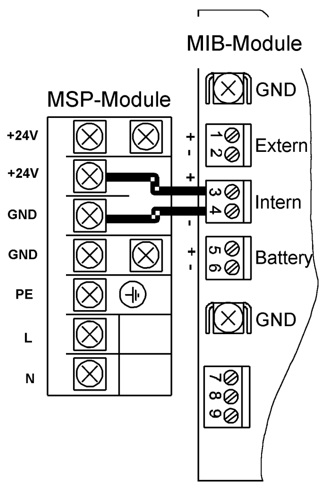


Figure 5-46: Connection diagram of the MSP module

Warning: Connection of the line power must be made with the power switched off and all relevant safety regulations should be complied with.

As shown in Figure 5-46, the +24 V output terminal of the MSP module must be connected to the +ve terminal of the INT connection, and the GND output terminal of the MSP module must be connected to the -ve terminal of the INT connection of the MIB module. The line power is supplied via the terminals “L” and “N” of the MSP module.

Note: External overcurrent shall be included in the building installation, shall be in close proximity to the equipment and within easy reach of the operator and shall be marked as the disconnecting device for the equipment.

Attention: Do not supply line power to the MIB module. This will damage the SUPREMA system.

The line earth ground wire is connected to the PE terminal of the MSP module. If multiple earth ground conductors are connected to PE, then the line earth ground conductor must be installed first and all others installed afterwars.

Note: Before turning on the line voltage during the start-up procedure, reinstall the Plexiglas cover over the connection terminals of the MSP module in order to prevent any danger that might arise from accidental contact with the line voltage.

5.12 Labelling Concept

Labelling fields are provided on the various modules for the numbering of the plug-in cards, the connector plugs, and connected inputs and outputs. The customer is free to mark them in any way deemed fit except the MPI and MCI modules that are an exception due to the lack of space. In the following, the labelling fields and a possible plan for marking them is presented. This plan is merely a suggestion and the customer is free to label the fields in correspondence with his own concept of the system.

5.12.1 Plug-In modules

The labelling field for the plug-in cards (MCP, MDA, MAI, MGO and MAO modules) is located on the front, on the release lever for the card. It is therefore immediately visible as soon as the front panel of the rack has been swung down. The type of module is printed on the lower half. The upper half is available for the customer to mark. A possible labelling system is illustrated in the following.

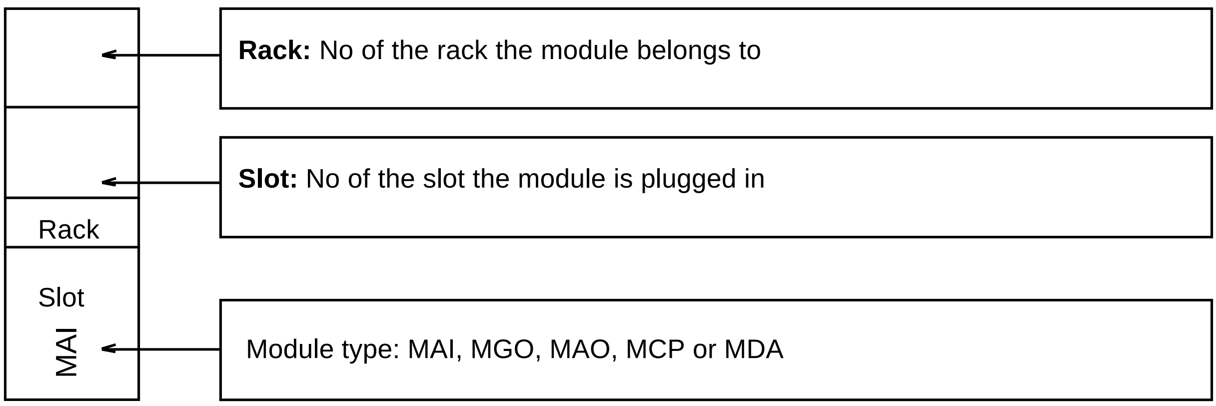


Figure 5-47: Labelling field, plug-in cards

5.12.2 Slots in the Rack

In the rack, a labelling field is provided in front of the slots. The slot nos. and the types of modules allowed for each slot are printed on it. In the first rack, the input numbers assigned to the slot are also printed on this field (in the case that the slot has been filled with an MAI module). In addition, the customer also has the possibility of marking the type of module actually used in each slot, and, when MGO or MAO modules are used, of entering the output channel no. corresponding to the position of the module in the system. When several racks are installed and MAI modules are being used, it is necessary to enter the input nos., starting with the second rack, corresponding to the position in the system.

The following rules apply to the numbering of the input and output channels:

MAI Modules/Measurement Sites:

The input nos. are assigned permanently to the slots in the rack; 8 inputs can be connected per MAI module. For example, if the first MAI module has been plugged into the 7th slot in the first rack, the first 8 inputs acquire the nos. 9-16.

MGO Modules/Relay Driver Outputs:

The relay driver output nos. are assigned to the MGO module; each MGO module makes 40 relay driver outputs available. That is, regardless of the slot no. and the rack no., the relay driver outputs of the first MGO module acquire the nos. 1–40, those of the second MGO module, the nos. 41–80, etc.

MAO Modules/Analogue Outputs:

The analogue output nos. are permanently assigned to the input nos.; 8 analogue outputs are available per MAO module. The first MAO card plugged into the system provides the analogue outputs for input nos. 1–8, the second provides the analogue outputs for input nos. 9–16, etc., regardless of whether a MAI module is present or not. If, for example, the first MAI module has been plugged into the 7th slot of the first rack (input nos. 9–16), then the analogue signals of the first 8 sensors are sent to the second MAO module plugged into the system (analogue outputs 9–16).

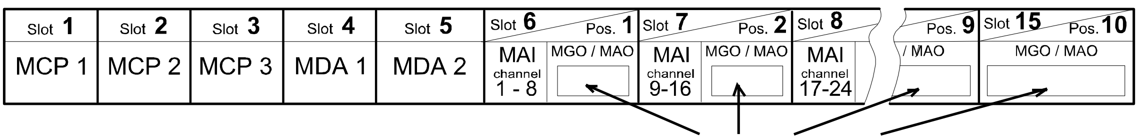


Figure 5-48: Labelling of the slots in the 1st **rack**

5.12.3 Connection and Terminal Modules on the Rack

A free labelling field is provided for the modules plugged into the rear of the rack (MRO-8, MAT, and MUT modules). The following rules apply to the assignment of the rear plug positions to the slot numbering on the front:

Assignment:	**Front:**		**Rear:**
	Slot 1	⇒	**MST module**
	Slot 2-4	⇒	**free**
	Slot 5-15	⇒	**Positions 1–10**

Figure 5-49 shows a possible labelling system.

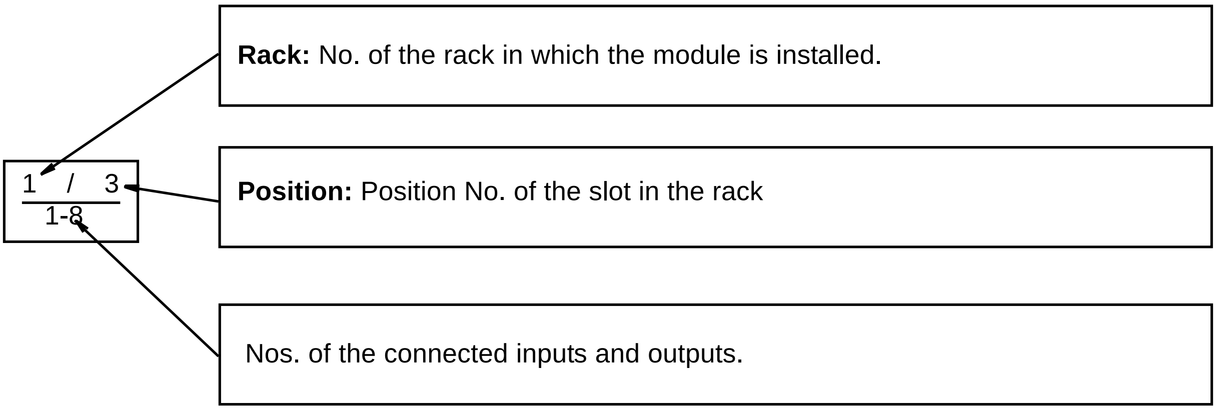


Figure 5-49: Labelling of the connection and terminal modules in the rack

5.12.4 Connection and Terminal Modules in Rail-Mounted Installation

A free labelling field is provided for modules installed on mounting rails (MRO-8-TS, MAT-TS, MRC-TS, and MGT-40-TS modules). Figure 5-50 shows a possible labelling system.

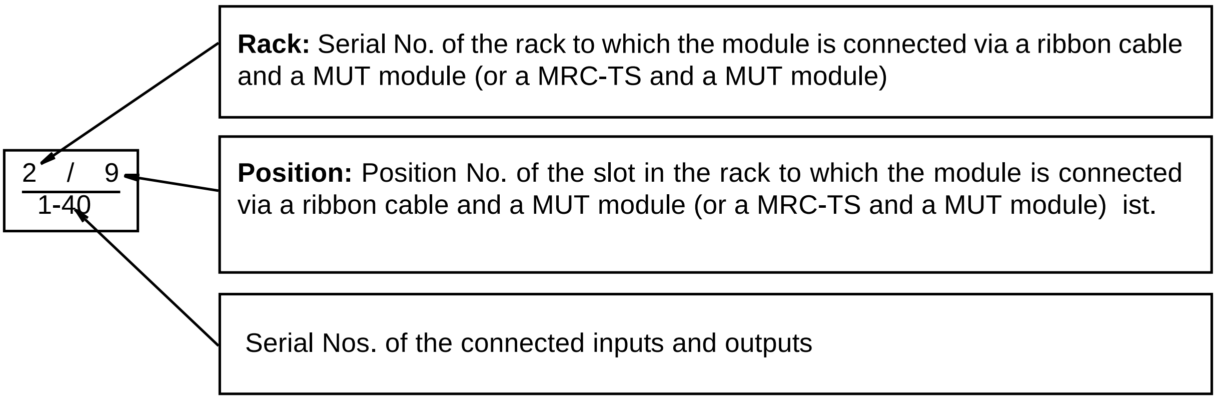


Figure 5-50: Labelling of the rail-mounted connection and terminal modules

5.12.5 MAT(-TS) Connector Plug

A free labelling field is provided on the bottom of the connector plug of the MAT and MAT-TS modules. Figure 5-51 shows a possible labelling system.

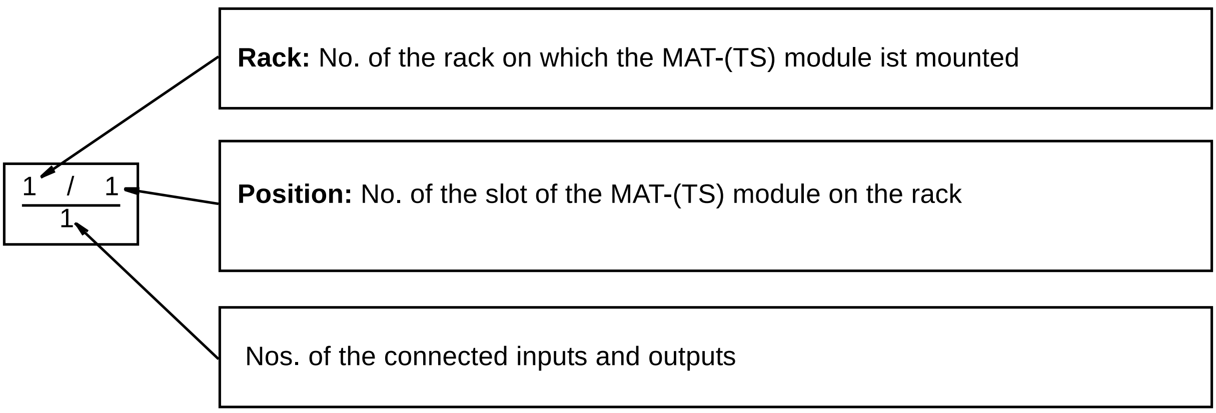


Figure 5-51: Labelling of the MAT-(TS) connector plug

6. Startup

Attention: High voltages can be present in the MSP module and at the relay terminals of the relay modules. Suitable safety measures must be taken when starting up the system.
Startup procedures may be performed only by authorized and qualified personnel.
Before startup, it must be ensured that all installation steps have been executed properly and that the cable connections and configurations of the individual modules as well as of the entire system are correct.

Startup is to be performed by executing the following steps:

- Make sure that the voltage supply is turned off.
- Check to make sure that the sensor, relay, switching output, and analog output connections of the system are disconnected.
- Ensure that all the required modules have been properly mounted in the system and are connected to each other.
- In systems with several racks, make sure the CAN bus connection is correct (cabling, baud rate, CAN node no., terminating resistor).
- Turn on the supply voltage.
- System Configuration (Configuration Tool)
- Connect and configure the sensors.
- Connect and configure the relay or switching outputs.
- Give the sensors a preliminary calibration.
- Subject the overall system to a function test with gas.

6.1 Turn On the Supply Voltage

Turn on the supply voltage to the system under consideration of all relevant safety measures. After the power is turned on, the message “AUER SUPREMA MDO Module” appears on the display of the front panel (MDO module) along with the current software and hardware revision nos. At the same time, all LEDs light up. After the module has run through a self-test, it starts the system with the message “system start in progress”. After the system starts successfully, the number of inputs corresponding to the plugged-in MAI modules is displayed in the “Measure/List” menu.

Note: If this process is not completed in 15 minutes, the installation should be checked again. If necessary, an MSA service technician should be called in to correct the problem.

6.2 System Configuration

At the first start-up of Suprema systems, by means of the configuration tool described in the the following the current hardware configuration must be stored in the system.

At options, the system modules connected in addition must be registered by means of the configuration tool in the system.

6.2.1 Configuration Tool

Generally

For the configuration tool, the following is needed:

- The transfer program “SUPREMA_Configuration.exe”
- The database “config.mdb”
- Microsoft Database Program Access 97

The data base “config.mdb” can be copied to another name. But the extension must also be “.mdb”. The data base structure must not be changed.

The transfer program serves as a data transfer between the SUPREMA system and the configuration database.

Configuration

The configuration is manipulated with the help of the Microsoft Database Program Access 97.

The database (e.g. config.mdb) contains the following listings which specify the SUPREMA System:

- digital output map
- measuring point map
- module configuration
- module types
- power supplies

View of the database:

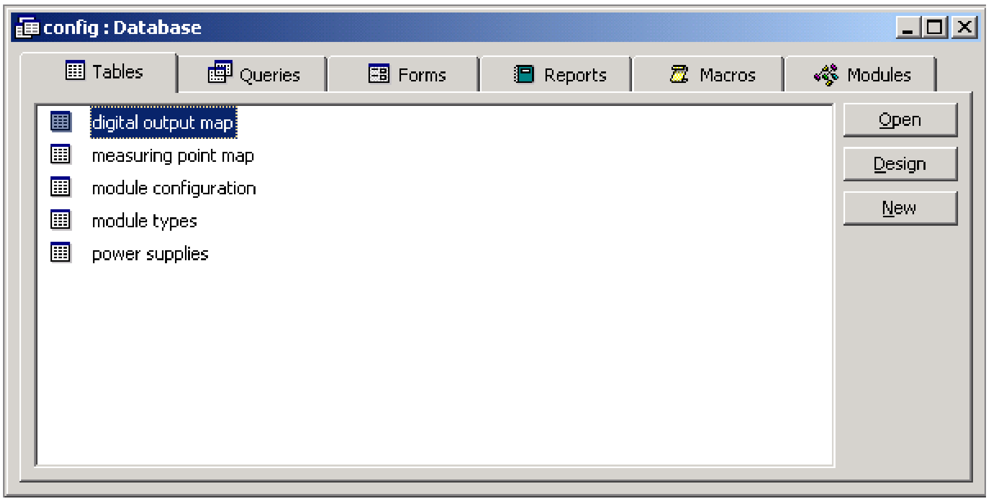


Figure 6-1: Access 97 Database “config.mdb”

Digital Outputs

In this listing, the possible LOGICAL outputs (0–511) are assigned to the – by MGO cards inserted – PHYSICAL outputs (1–512). Basically, the assignment in this map can be arbitrary. We recommend the standard assignment (see figure 6-2 Digital output map listing) to avoid problems on system configuration/test.

Channel Number

In this column, the numbers of possible physical outputs (0519) are listed. Up to 13 MGO cards each with 40 outputs (13 x 40 = 520) can be connected to the system (Rack 1 to Rack 8). The outputs 1–512 (Numbering 0–511 in the listing) can be used for configuration.

Digital Output Number

The “logical” numbers are entered which are selected as “Digital Output” on the parameter setting. The output numbers may be assigned freely. . We recommend the standard assignment (see figure 6-2 Digital output map listing) to avoid problems on configuration. The number of digital outputs depends on the components of the MGO-10 modules and must always correspond (40 outputs/MGO max.).

Example:

SUPREMA System with a MGO-10 module has to be configured with 24 outputs.

View of the“digital output map” listing:

channel number	digital output number
0	1
1	2
2	3
3	4
4	5
5	6
6	7
7	8
8	9
9	10
10	11
11	12
12	13
13	14
14	15
15	16
16	17
17	18
18	19
19	20
20	21
21	22
22	23
23	24
24	0
25	0
26	0
27	0

Figure 6-2: “Digital output map” listing

All digital outputs which are not needed are set to “0” (Zero) in the field “Digital Output Number”.

Measuring Points

By means of the listing, the measuring points are configured. A maximum of 256 measuring points max. can be configured, which can be distributed over 8 racks.

Channel Number

In this column, the numbers of the possible physical measuring points (0–255) are listed. Up to 32 MAI cards each with 8 inputs (32 x 8 = 256) can be connected (rack 1 to rack 8). Rack 1 has the numbers of the physical measuring points 0 to 63.

Measuring Point Number

Here, the “logical” measuring point numbers are entered which are selected as “measuring point” in the parameter setting. The measuring point numbers may be assigned freely. To avoid configuration problems, standard numbering is recommended (see figure 6-3 Measuring point map listing). For rack 1, the measuring point numbers 1–64 are provided as standard.

Example:

Only measuring points 9–16 and 25–26 shall be operated. In this case, the following listing is generated: View of the “measuring point map” listing:

channel number	measuring point number
0	0
1	0
2	0
3	0
4	0
5	0
6	0
7	0
8	9
9	10
10	11
11	12
12	13
13	14
14	15
15	16
16	0
17	0
18	0
19	0
20	0
21	0
22	0
23	0
24	25
25	26
26	27
27	28
28	29

Figure 6-3: „Measuring point map” listing

All measuring points which are not needed are set to “0” (Zero) in the field “Digital Output Number”.

<u>Modules</u>

By means of this listing, the modules are assigned to the rack slot positions.

MAI modules need not be configured.

In the column “node id”, the slot number is entered, where the module specified under “module type“ has been plugged.

In the columns “CAN-A/CAN-B”, the function is selected accordingly.

The MDO is aaigned to slot number 16 for the 1st rack and is defined as CAN-A.

For further racks, the “node id” is increased by 16, according to the rack number.

e.g. for Rack 2, the first MCP has the node ID 17 for Rack 3, the first MCP has the node ID 33, etc.

Listing of node id (NID) of the Racks

	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot6	Slot 7	Slot 8	Slot 9	Slot10	Slot11	Slot12	Slot13	Slot14	Slot15	
	1.MCP	2.MCP	3.MCP	1.MDA	2.MDA	X	X	X	X	X	X	X	X	X	X	MDO
1st Rack	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
2nd Rack	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
3rd Rack	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
4st Rack	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
5st Rack	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
6st Rack	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
7st Rack	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112
8st Rack	113	114	115	116	117	118	119	120	121	122	123	*	*	126	127	128

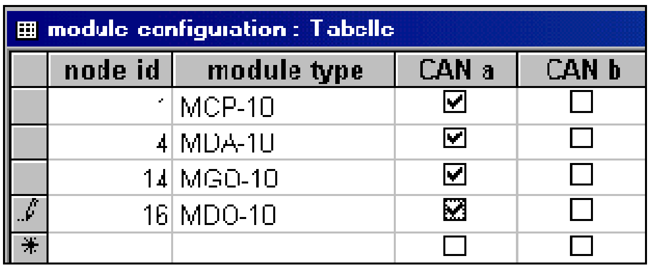
Table 6-1: Listing of Node ID

X = MGO or MAO

*MOD-Bus Gateway (PKV 30) has address 124 or 125, according to the setting at the gateway.

Attention: No moduls may than being put in these places in the 8th rack.

View of the “module configuration” listing:



module configuration : Tabelle

node id	module type	CAN a	CAN b
1	MCP-10	☑	☐
4	MDA-10	☑	☐
14	MGO-10	☑	☐
16	MDO-10	☑	☐
		☐	☐

Figure 6-4: “Module configuration” listing

Note: For Simplex systems (non-redundant) always select CAN a.

Module Types

This listing is only for information about which modules can be integrated into the system.

View of the “module types” listing:

module type
MAO-10
MCP-10
MDA-10
MDO-10
MGO-10
PKV-30

Figure 6-5: “Module types” listing

Voltage supplies

The voltage supplies used are entered by ticking the relevant box.

View of the “power supplies” listing:

rack number	internal	external	battery
1	☐	☑	☐
	☐	☐	☐

Figure 6-6: “Power supplies” listing

Transfer program SUPREMA_Configuration.exe

The transfer program serves as data transfer between the SUPREMA system and a configuration database.

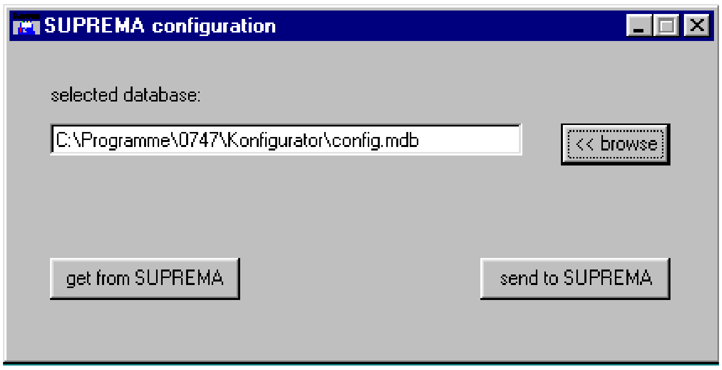


Figure 6-7: Transfer program “SUPREMA_Configuration.exe”

Selection of a configuration database

First, the user has to choose a configuration database. This is made either by direct input of path and file name in the text field provided, or by means of the “browse“ button. The actions described below refer to this database.

Getting configuration data from a SUPREMA System

By clicking the button “get from SUPREMA”, the configuration data of the SUPREMA system connected is transferred to the PC and stored in the selected database. All data which was stored before is overwritten by this action.

When this process has been complted without failures, the message “transmission successful“ appears.

If there is a message “transmission failed”, the data stored is probably incomplete or faulty. Possible failure causes are:

- The transfer line between PC and SUPREMA is defective.
- The configuration database selected is faulty.

After an automatic configuration, the input of the supply voltage is missing and has to be completed manually in the resulting listing. After transfer of this configuration database to the SUPREMA, this failure will not occur any more.

Sending configuration data to a SUPREMA System

By clicking on the button “send to SUPREMA”, the configuration data stored in the database selected is transferred to the SUPREMA system connected.

The transfer process has been successful if the “transmission successful“ message appears and the SYSTEM FAIL LED at the SUPREMA has not been set.

After the transfer procedure, a new startup of the system will be necessary, otherwise, the configuration data transferred will not work.

The configuration data transferred is checked for validity by the SUPREMA system. This validity check has been restricted to a few basic items. It cannot check whether a configuration is completely correct.

If the “failed in putting together the configuration data” message is shown, there is a failure in the configuration database. In this case, no data have been transferred to the SUPREMA system.

Possible failure causes are:

- A listing contains too little or no record at all.
- A listing contains an incomplete record.
- The database name is longer than 20 characters (not including the file extension).

If the “transmission failed” message is shown, a failure of the data transfer to the SUPREMA system has been occurred. The configuration of the SUPREMA system is probably incomplete and faulty.

Possible failure causes are:

- The transfer line between PC and SUPREMA system is defective.
- The SUPREMA system did not recognise the configuration data as valid.

Via the RS 232 diagnosis/service connection, failure information can be read during transfer by a terminal program.

6.3 Start the Sensors

Before putting the sensors into service for the first time, several steps must be performed, which depend on the type of sensor. Not only the instructions given here but also the operating and maintenance instructions that came with the sensor to be connected must be followed.

Note: If errors occur during startup which cannot be corrected with the help of the troubleshooting guide in section 7 Maintenance and Sercice contact an MSA service technician.

6.3.1 Presetting of Passive Sensors

To simplify the presetting of passive sensors, the MAI module has been revised.

Thi revision is valid as of PCB version:

1	2	3	4
O4	O4	O4	O4

Instrument status: “B”

The operational steps to be carried out and the signal voltages present at the test sockets are depending from the instrument status of the module. Die durchzuführenden Bedienschritte und die an den Meßbuchsen anliegende Signalspannungen hängen vom G-Zustand des Moduls ab. Therefore in the following sections the presetting for the different instrument status is described one by one.

6.3.2 Auxiliary Equipment Required

To preadjust the sensors on the MAI module, remove the screws holding the front panel in place and swing the panel down. The following tools will be required:

- a TORX T8 screwdriver (for removing the screws on the front panel),
- a voltmeter with a voltage measuring range of 0 ... 3 VDC,
- 2 connecting cables (for connecting the voltmeter to the MAI measuring socket, Ø 2 mm).
- a zero gas and a test gas appropriate to the sensor and to the substance to be detected, and
- a calibration adapter and hose connections suitable for the sensor (see the sensor operating and maintenance (O & M) instructions).

After the system voltage supply has been turned on and the system has started successfully, the following settings should be made on the appropriate MAI module for the startup of the passive sensors:

6.3.3 MAI Module - Instrument Status “A” and “B”

6.3.3.1 Adjust the Sensor Current

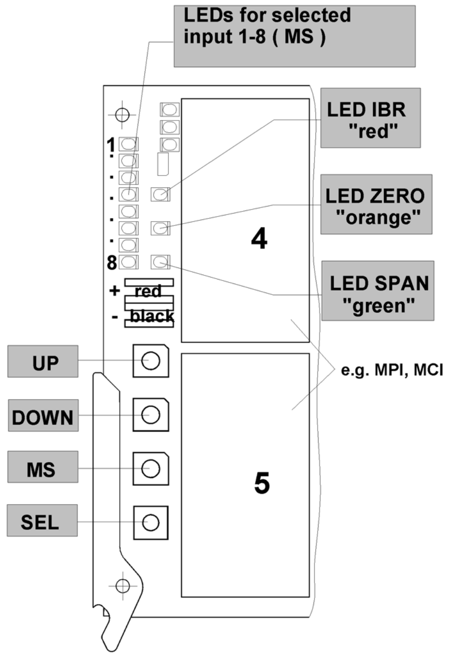


Figure 6-8: Display and operating elements of the MAI module - Instrument Status “A” and “B”

Attention: Do not connect the sensor yet!

To prevent accidental damage to the sensor or even its destruction by excessive bridge current, an equivalent sensor circuit is used to adjust the sensor current. The MSA equivalent sensor module appropriate for the type of sensor can be used for this purpose. If this is not available, a MAT connector plug, wire resistors, and wire bridges can be used to build an equivalent sensor as shown in figure 1-9.

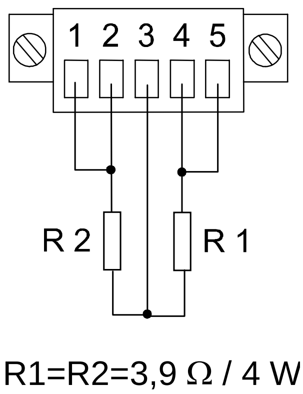


Figure 6-9: Equivalent sensor circuit for the MPI-WT100/MPI-WT10 module

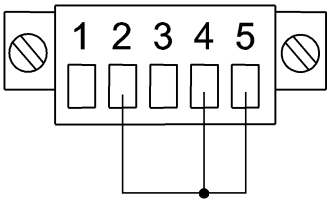


Figure 6-10: Equivalent sensor circuit for the MPI-HL8101/MPI-HL8113 module

- **Connect** the **equivalent sensor circuit** to the inputs to be adjusted.
- **Connect** the **digital multimeter to** the **test sockets** on the MAI module (red/black) and select the 3 VDC measuring range.
- Enable operator buttons (UP, DOWN, MS) by pressing the SEL-Button.
- **Select** the **input** by pressing the **MS button**; each press of the button advances the selection by one input. The selected site is indicated by the front row of LEDs (LED at the top = input 1, LED at the bottom = input 8). The LED of the selected input lights up green.
- Using the **SEL button**, **select** the **function IBR** (bridge current) (LED IBR lights up red).
- By pressing the **UP** or the **DOWN button**, **adjust the bridge current** specified for the sensor **(± 1 %)** (see the sensor data sheet or the sensor O&M instructions). Note: The voltage in mV present at the test sockets corresponds to the adjusted current in mA (e.g., 270 mV = 270 mA)

Repeat these steps for each of the passive sensors to be connected.

Disable operator keys by pressing the SEL-Button until the INPUT LED go out.

Then remove the short-circuit bridge (terminal 2/terminal 4), and connect the sensor cable. After the sensors are connected, it is recommended that the bridge current for each individual sensor be checked again and corrected if necessary.

6.3.3.2 Preadjust the Zero Point/Sensitivity

After the sensors have been allowed to stabilise for a sufficient period of time – which depends on the types of sensors and measuring components (see the associated sensor O&M instructions) – a preliminary adjustment must be performed on the MAI module with gas.

Note: To perform the preliminary adjustment, at least 2 people are required. To avoid communication problems between person 1 operating the SUPREMA and Person 2 supplying the sensors with gas, we recommend the use of a set of appropriate two-way radios.

In addition, the required zero and test gases as well as test adapters and hose connections (see sensor O & M instructions) for supplying the gases are a necessary precondition for the successful completion of the preliminary adjustment with gas.

The flow rate and the duration of the test gas supply can be found in the associated sensor operating and maintenance instructions.

For the preliminary adjustment, person 1 (at the SUPREMA) and person 2 (at the sensor in question) must perform the following steps:

Person 1:

- **Connect** the **digital multimeter** to the **test sockets** on the MAI module (red/black) and select the 3 V DC measuring range.
- **Press** the **MS button to select** the **input**. Each press of the button advances the input by one in sequence. The selected input is indicated by the forward row of LEDs (LED at the top = input 1, LED at the bottom = input 8). The LED of the selected input lights up green.
- Enable operator buttons (UP, DOWN, MS) by pressing the SEL-Button.

Person 2:

- **Supply** the **zero gas** to the sensor corresponding to the selected input (for about 5 minutes or in accordance with the sensor O&M instructions) at least until person 1 has completed the preliminary adjustment of the zero point.

Person 1:

- Using the **SEL button**, **select** the **function ZERO** (the ZERO LED lights up orange).
- **Set** the **default value** specified for the sensor (rough pre-alignment of the zero point) by actuating the UP button (yellow, at the top) or the DOWN button (yellow, second from the top).

Default Values:	
MPI-WT100, MPI-HL 8113, and MPI HL-8101:	**2.0 V**
MPI-WT-10:	**1.48 V**

- Using the **SEL button**, **select** the **SPAN function**. The **voltage value** at the **test sockets** (digital multimeter) should now be **0.4 ± 0.05 V. If** this is **not** the case, **select** the **ZERO function again**, and use the **UP** or **DOWN button** to **change the default voltage value until** the **voltage value at the test sockets after switching to the SPAN function is within the tolerance range of 0.4 ± 0.05 V.** To check the **SPAN value**, you must use the SEL button to switch to the SPAN function. When the adjustments are being made to the ZERO function, the value displayed on the MDO display unit or, if a PC is connected, the measurement value shown for the input in the operating software, can be used as a guideline (a displayed value of approximately 0% of the measuring range ➔ the SPAN value is within the tolerance).

Note: If the zero point cannot be adjusted (SPAN value not within the tolerance range), then it is possible that the sensitivity (signal amplification) has been set too high. In this case, use the SEL button to select the SPAN function and then press the DOWN button several times (about 20 times) to reduce the sensitivity. Then repeat the adjustment steps described above.

Person 2:

- **Shut off** the **zero gas supply when** person 1 notifies you that the preliminary **adjustment** of the zero point **has been successfully completed**. Then **turn on** the **test gas** (concentration, usually 50% of the measuring range; in no case should this concentration be less than 20% of the extreme value of the measuring range; see the operating and maintenance instructions of the sensor).

Person 1:

- **Select** the **SPAN function** by pressing the SEL button. **Allow** a certain **recovery time** (voltage signal stops fluctuating or fluctuates only slightly).
- **Set** the **value** corresponding to that **of the test gas concentration** by pressing the **UP** or **DOWN button**. The voltage value is calculated by means of the following formula:

U = C / 100 * 1.6 V + 0.4 V
U is the voltage at the test jack in V, C the span gas concentration in % of measuring range.

Attention: This formula does not apply to D-8108, D-8113, DF-8201, DF-8250, DF 8401 or DF-8603 sensors or to any of the connectable sensors with a highly nonlinear output signal.

Person 2:

- **Shut off the test gas when** person 1 informs you that the preliminary sensitivity **adjustment has been completed**

Repeat these steps for each of the passive sensors to be connected.

Disable operator keys by pressing the SEL-Button until the INPUT LED go out.

6.3.4 MAI Module – from Instrument Status “C”

6.3.4.1 Setting the Sensor Current

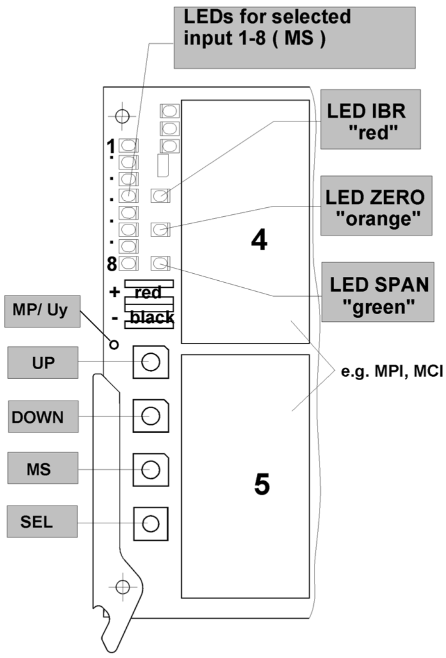


Figure 6-11: Display and Operation Elements of the MAI Module – Instrument Status “C”

The signal Uy can be measured against GND (black test jack) at the test point MP/Uy at passive sensors. Uy is the sensor signal measured with a constant factor. It serves for the judgment of the sensor sensitivity.

Attention: Do not yet connect sensor!

The sensor setting is made by means of an equivalent sensor circuit in order to avoid inadvertent damage or destruction of the sensor by a too high bridge current. The MSA sensor simulation module corresponding to the sensor type can be used for this purpose. If it is not available, an equivalent sensor circuit can be realized by means of a MAT connection plug, wire resistors and wire bridges according to figure 6-9: Equivalent sensor circuit for the MPI-WT100/MPI-WT10 module or figure 6-10: Equivalent sensor circuit for the MPI-HL8101/MPI-HL8113 module.

- **Connect equivalent sensor circuit** to the measuring points to be adjusted
- **Connect digital multimeter** to the **test jacks** of the MAI module (red/black), and select the 3 V DC measuring range
- Activate the operation keys (UP, DOWN, MS) by pressing the SEL key
- **Select measuring point** by **pressing** the **MS key**; per keystroke a measuring point further is switched, the selected measuring place is shown by the front LED row (topmost LED = measuring point 1, undermost LED = measuring point 8); the LED of the selected measuring point is shining green.
- **Select the IBR** function (bridge current) by pressing the **SEL key** (LED IBR is shining/ red)
- **Adjust** the **bridge current** provided for the sensor **(± 1%)** by pressing the **buttons UP** or **DOWN** (see data sheet of measuring head resp. operation manual sensor) Note: the voltage in mV being on at the test jacks corresponds to the adjusted current in mA (e.g. 270 mV = 270 mA).

Repeat these steps for all passive sensors to be connected.

Deactivate the operation keys (UP, DOWN, MS) by pressing the SEL key repeatedly (until the LED of the selected measuring point and the function LED are extinguished).

After this remove short-circuit bridge (terminal 2/terminal 4) and connect sensor cable. After connection of the sensors we recommend to check again and to correct if necessary the bridge current for every particular sensor.

6.3.4.2 Presetting of Zero/Sensitivity

After a sufficient warmup time of the sensors which is sensor and measuring component dependent (see respective sensor operation and maintenance manual), a gas technical presetting must be carried out at the MAI module for passive sensors.

Note: For the presetting performance, at least 2 persons are necessary. If the SUPREMA is not situated within hearing range of the installed sensors, then the use of a set of adequate radio equipment is in addition recommended to avoid incorrect calibrations.

Furthermore the required zero and span gases as well as test adapter and tube connections for gas application (see respective sensor operation and maintenance manual) are conditions for the successful performance of the gas technical presetting.

Flow and duration of span gas application can be seen from the sensor operation and maintenance manual.

For the presetting the following steps must be carried out of person 1 (at the SUPREMA) and person 2 (at the respective sensor):

Person 1:

- **Connect digital multimeter** to the **test jacks** of the MAI module (red/black), and select the 3 V DC measuring range.
- Ua is shown in mV when selecting SEL and SPAN functions.
- **Activate the operation keys** (UP, DOWN, MS) by **pressing** the **SEL key**

  Select measuring point by **pressing** the **MS key**; per keystroke a measuring point further is switched, the selected measuring point is shown by the front LED row (topmost LED = measuring point 1, undermost LED = measuring point 8); the LED of the selected measuring point is shining green.

Person 2:

- **Application of zero gas** at the sensor assigned to the measuring point selected (approx. 5 min. resp. accoridng to sensor operation and maintenance manual at least until person 2 has finished the zero presetting.

Person 1:

- First select SPAN by pressing SEL key. (LED SPAN is shining green)
- *Set SPAN to Maximum* . (Press UP key approx. 10 sec)
- **Select Zero** by pressing the **SEL key** (LED ZERO is shining/orange)
- Adjust the **default value** (rough pre-adjustment of the zero) provided for the sensor by pressing the **button UP** or **DOWN**.

Default values for all passive sensors:
MPI WT10, MPI WT100, MPI HL8113 and MPI HL8101:
Zero Ua = 350 ... 450 mV

Person 2:

- **Finish zero gas application when** person 1 reports **the successful presetting** of the **zero.** Then **apply span gas** (concentration normally 50% of measuring range, in no case this concentration should be smaller than 20% of the measurement range final value (see respective sensor operation and maintenance manual).

Person 1:

- **Select SPAN** function by pressing the **SEL button**, wait until warm-up time is finished (voltage signal does not change any more, or only slightly)
- **Adjust the value** correponding to the span gas concentration by pressing the **buttons UP** or **DOWN**. (see data sheet of measuring head resp. operation manual sensor). The voltage value is calculated according to the formula:

Ua = C / 100 * 1.6 V + 0.4 V
Ua is the voltage at the test jack in V, C the span gas concentration in % of measuring range.

Attention: This formula does not apply to the sensor types D-8101, D-8113, DF-8201, DF-8250, DF-8401 und DF-8603, as well as all connected sensors with strongly unlinear output signal.

Person 2:

- **Finish span gas application** when person 1 **reports** the **successful presetting** of the **sensitivity.**

These steps have to be repeated for all passive sensors connected.

Deactivate the operation keys (UP, DOWN, MS) by pressing the SEL key repeatedly (until the LED of the selected measuring point and the function LED are extinguished).

6.3.5 Preadjust the Active Sensors (MAI Module)

No preliminary adjustments on the MAI module are made for active sensors (with 0 ... 20 mA or 4 ... 20 mA current output). The buttons for setting the bridge voltage, the zero point, and the sensitivity are inactive.

After the supply voltage has been turned on and the system has started successfully, the active sensors can be connected to the SUPREMA without any further preliminary adjustments. In the case of systems with passive and active sensors, it is recommended that the passive sensors be adjusted before the active sensors are connected.

6.3.6 Configure the Sensors

Note: The basic operation, the menu design, and the menu structure are described in detail in section 4 Operation of the System for both the integrated operating unit, i.e., the MDO module, and also for the PC operating software. Knowledge of this section is assumed in the following explanations. In the following, the configuration procedure is described in a general manner. The input fields of the PC operating software are almost completely identical to those of the display on the MDO front panel module. Differences with respect to operation are explained in sections 4.2 Setup (Via the MDO Front Panel Module) and 4.3 Setup (Via PC or Laptop). The "SUPREMA Operating Program" can then be used to operate the system under a Windows user interface. This is especially recommended for the initial setup of a new system with a medium to large number of inputs, because it is faster and easier to enter the input parameters on a PC keyboard than to enter them by means of the limited number of operating buttons on the MDO front panel module.

Attention: All entries of inputs, relay output parameters, or system parameters require that a valid password be entered or that the key switch be actuated.

Note: It is generally recommended that only one operating method be used at once (MDO front panel or PC operating software), because the option which is activated first inhibits the use of the other input unit. It must also be remembered that, when the PC/laptop is changed from one SUPREMA control system to another, the PC operating software must also be restarted.

System requirements for the PC operating software:
minimum of a Pentium I/200 MHz /32 MB of RAM
Windows 95/95/NT4.0
connecting cables: RS 232 extension, SUB-D connectors, 9-channel, plugs on socket terminal strip (no null-modem cable)
RS 232 configuration: 19200 baud, 8 data bits, 1 stop bit, parity none,
protocol: Xon/Xoff
SUPREMA connection: RS 232 connection to the MST module

6.3.6.1 Set the System Parameters

Note: The names of the menu and option fields refer to the display on the MDO front panel module. The corresponding names in the PC operating program are in parentheses if they are not the same.

The system parameters should be set first in the “Setup/System” (“Setup/System Settings”) menu. The following options are available:

- *Language:* Either German or English can be selected as the system language.

Note: When the settings are made by using the PC operating software, only the language of the operating software is changed.

- *Date/Time:* The current date and time can be set.
- *New Password (Most Recent Password)*: A customer-specific password can be entered.
- *Confirmation (Password Confirmation):* Re-enter the new password to confirm.

Note: When a new password is entered, a pop-up menu appears, which asks that the old password be entered. The default password is: “AUER”. Note that it is entered in all-caps.

- *Signal if locked:* Here it is possible to choose what signal is present at the analog output (MAO module) when a input is inhibited (i.e., alarm evaluation is deactivated). The following selection parameters are available:
- “*hold*”: the signal present at the moment of inhibiting is frozen in;
- “*pass*”: the output signal continues to follow the input signal;
- “*maintain*”: a constant output current (3 mA) is generated.

Note: When a PC/laptop is connected, settings cannot be made simultaneously in the "Setup/System" menu (or in the "Setup/System Settings" menu of the PC operating software). The first operating unit to be activated inhibits the other one.

6.3.6.2 Set the Input Parameters

The input parameters are set in the "*Setup/Measure Points*" menu.

Three submenus are available: "*Information*", "*Sensor Data*", and "*Alarms*".

Enter user-dependent and system-dependent information in the "*Information*" menu. Enter the sensor-dependent parameters in the "*Sensor Data*" menu, and specify the alarm thresholds and the alarm behavior (latching/crossing) in the "*Alarms*" menu.

Option field: "*Measure Point No*.": Use this to select the input to be configured.

Note: The Measure point no. (input no.) is assigned within the system to the MAI modules used.

Option field: "*Locked*": The input is inhibited (no alarm given).

Note: This is to be recommended especially during maintenance work on the sensors while the alarm devices are still connected (see section 7 Maintenance and Service). Specify the status of the analog output assigned to the input in the "*Signal if Locked*" option field of "*Setup/System*" menu ("Setup/*System Settings*").

6.3.6.2.1 Information Menu

Text fields "*Tag*", "*Marking*", and "*Installation Place*":

- Enter customer-specific and system-specific parameters of the input here.

In the text field: "*Serial No. Head*" ("*Serial Number Head*"):

- Enter the sensor serial no. of the sensor connected to this input.

6.3.6.2.2 Sensor Data Menu

Here is where information specific to the sensor and to measurement gas is entered.

Option field: "*Sensor Type*" ("*Sensor*"): Select the MSA sensor type connected to the input.

Note: A sensor database is assigned to each type of sensor. This database contains information such as noise level, minimum signal, etc. In conjunction with the selected measurement gas and measuring range, a corresponding linearization is also automatically activated when needed as a function of the type of sensor.

Option field "*Dimension*": Select the measurement unit (%LEL, vol.%, ppm, etc.)

Option field "*Range*" ("*Range from 0 to*:"): Select the measuring range.

Note: Care must be taken to ensure that the selected values are correct and valid.

Option field “*Measure Gas*”: Select the measurement gas (gas or vapor to be monitored).

Option field “*Zero Gas*”: Select the zero gas (gas used to adjust the zero point of the sensor)

Option field “*Reference Gas*”: Select the reference gas (gas used to calibrate the sensitivity of the sensor when the measurement gas is difficult to handle).

Note: If the measurement gas (the gas or vapor to be monitored) is used to check and calibrate the sensor attached to the input, the same gas as that appearing in the field “*Measure Gas*” is to be selected in the option field “*Reference Gas*”. (In the “*Maintain/Calibration*” menu, the gas selected in the “*Reference Gas*” field appears as the test gas.)

For the zero gas and the reference gas, it is possible to assign relay driver outputs for remote calibrations. These outputs can then be used to actuate valves for supplying zero or reference gas. The option fields “*Valve No.*” (“*Valve control for Automatic Calibration*”) are used for this.

Warning: It is absolutely necessary to make sure that no alarms are assigned to the outputs assigned here.

6.3.6.2.3 Alarms Menu

Up to four alarms per input can be configured. Per alarm, a limit value can be set, which is monitored to determine whether it is crossed in one direction or the other. Each alarm can be set to be either latching or non-latching.

Check box “*Upper*” (“*Upper limit*”): The assigned alarms are set to be either of the “over” or “under” type. If this box is checked, the alarm is of the “over” type.

Check box “*latched*”: The assigned alarms are set to be latching or non-latching. If this box is checked, the alarm is latching.

Note: This property has an effect on the behavior of the front-panel LEDs, on what is shown in the “Measure” menu, and on the relay outputs assigned to the alarm.

Input field “*Limit Values*” (“*Limit*”): An alarm is triggered when the measurement value exceeds or falls below the limit value set here.

Warning: When the limit values are entered via the PC operating software, be sure to use decimal separators in the PC operating system to prevent incorrect interpretation of the entered value.

Note: Alarms which are not required can be deactivated in this field. To do this, actuate the left cursor key until only zeros appear in the field. Then actuate the lower cursor key: The content of the field is deleted (display: “——”). The alarm is now deactivated (PC operating software: Delete Field Contents (Del key, then confirm by pressing Enter).

Option field: "*Relay*" ("*Set Output*"): Assignment of the relay driver outputs to the alarms of the selected input. After a relay driver output has been selected, the program branches to a "*Menu for Assigning Relay Outputs*".

For the sake of clarity during the startup procedure, the relay driver outputs should be configured and assigned in the "*Setup/Relay Outputs*" menu.

Important: After the entries have been made, the settings are not accepted until the O.K. field in the "Information" menu has been activated. (When the system is being operated via the MDO front panel module, the O.K. field is not visible in the "Sensor Data" and "Alarms" menus.

6.4 Configure the Relay Driver Outputs (Switching Outputs)

Note: All the explanations in this section are based on the configuration of switching outputs, because the parameterization is independent of whether the alarm devices are actuated directly via the switching output or via a connected relay module. When relay driver outputs are described in the following, the information also applies equally to the switching outputs.

Before connecting and configuring the relay driver outputs, be sure that no alarm devices are connected to the relay contacts. Otherwise, it would be possible for unnecessary alarms to be triggered. Also make sure that the relay driver outputs have been connected properly. section 5.7 Connection of the Relay Outputs .

Before the relay modules or other approved alarm devices or units are connected to the relay driver outputs, turn off the voltage to the system. Then check to make sure that the required MGO modules are present in the system in the slots provided for them. Then make the cable or plug connections to the relays or relay modules to be actuated. The alarm devices (or other devices to be actuated) should not be connected to the relay contacts until after the relay driver outputs have been configured. Otherwise, false alarms could be triggered.

Then turn the voltage back on. After the system has been turned on, the message "AUER SUPREMA MDO Module" and the current software and hardware revision nos. appear on the display of the front panel (MDO module). The module then performs a self-test and starts the system with the message "system start in progress". After the system has been started successfully, the number of inputs corresponding to the plugged-in MAI modules appears in the "*Measure/List*" menu.

Note: If this procedure is not over in 15 minutes, check the installation again and, if necessary, call in an MSA service technician to correct the problem.

6.4.1 Configure the Relay Driver Outputs

Up to 40 relay driver outputs can be actuated per each plugged-in MGO module. Be sure that the first 8 relay driver outputs in the system are permanently assigned to the common alarms. The other relay driver outputs (starting with relay driver output 9) can be configured as desired. (see section 5.7 Connection of the Relay Outputs).

The relay driver outputs are configured in the “Setup/Relay Outputs” menu. The individual options are described below.

Note: The name of the menu or of the input or option field used by the PC operating software is given in parentheses.

Option field “*Relays*” (“*Output number*”): Choose the number of the relay driver output to be configured.

Option field (beside “*Relays*” field) (“*kind of switching*”):

Normally energised	When having been set (alarm, failure), the relay driver output gives out a LOW signal, i.e. the connected relay is de-energised (normally energised principle)
Normally de-energised	(Relay is de-energised) When having been set (alarm, failure), the relay driver output gives out a HIGH signal i.e. the connected relay is energised (normally de-energised principle)

Note: When the relays are inhibited by using the LOCK connection on the MRC-TS module, the switching direction selected in the “Normal” option field must agree with the switching direction set via the bridge BR1 on the MRC-TS module. Remember that the relays can be inhibited via the LOCK connection only as a block of 40, whereas the “*open circuit/closed circuit*” field makes it possible to select a value for each individual relay. **(see section 5.3.7 Configuration of the MRC-TS-Module)**

Check box “*new Alarm*” (i. e. actual alarm): When this field is set, the relay output selected can be set to “*normal*” status by pressing the <ACKNL> key, in spite of the value having been outside the limits.

Configuration Matrix:

Here is where you assign the measure point no. and the setting conditions to be fulfilled to the selected relay output.

The input numbers are shown in the column “*Channel*” (“*No.*”). (PC operating program: In addition, the corresponding input parameters which were entered in the “*Setup/Measure Points*” menu are shown the “*Tag*” and “*Marking*” columns.)

Use the control fields [🡅] and [🡇] to scroll through the list of inputs (select the cursor key and then press Return). (PC operating software: Use the scroll bar.)

Attention: When connecting the sensors to the rack, space constraints allow only every other MAI module slot to be used. This means that the input numbers are 9–16, 25–32, etc. The input numbers 1–8, 17–24, etc., which are not actually present still appear, however, in the setting matrix. In no case may any settings be made here.

For each input, it is possible to select any one of the following conditions: “1st alarm”, “2nd alarm”, “3rd alarm”, “4th alarm”, “failure”, or “locked”. In the “*Voting*” option field, you can link the individual setting conditions logically together.

Check box "*1st-4th Alarm*": If the alarm condition (limit value) for the assigned input is fulfilled, then the selected setting condition is fulfilled. Checking the check box selects the condition.

Check box "*Failure*": This setting condition is fulfilled when a failure has occurred at the assigned input. Checking the check box selects the condition.

Check box "*Locked*": This setting condition is fulfilled when the assigned input is inhibited. This condition is selected by checking the check box.

Option field "*Voting*": Here links can be made between the various setting conditions selected in the setting matrix. The number of setting conditions selected for the chosen relay driver output is shown after the "/" (in the field "*Alarm(s) of*").

In the option field "*Voting*", you enter the number of conditions which must be fulfilled for the setting of the relay driver output.

The following types of links can be set up in this way:

- **Single link**: Exactly one condition has been set, and the value 1 has been selected as the switching threshold.
- **OR link**: Several conditions have been set, and the value 1 has been selected as the switching threshold. That is, the selected relay output is set when any one or more than one of the selected conditions are fulfilled. It is possible in this way to configure a **Common Alarm**.
- **AND link**: The value set for the switching threshold is the same as the number of selected conditions; that is, all of the selected conditions must be fulfilled before the selected relay output is set.
- **"n" out of "m" link**: If m conditions have been set and the value n has been selected as the switching threshold, the selected relay output is set when n out of the m conditions are fulfilled.

Attention: After finishing the configuration , check the settings you have made for correctness and plausibility to ensure that the alarms will be triggered reliably.

It is recommended that the relay output driver configuration be checked after the preliminary calibration and before the connection of alarm devices by supplying test gas to the sensors. In this way, the functionality of the entire system is tested all the way from the sensor to alarm actuation.

Attention: No input may be inhibited during the test.

The alarm configuration can also be checked at the sensors without test gas application by using the sensor simulation modules.

6.4.2 Behaviour of the Relay Outputs

The behaviour of a relay output depends on the parameter setting of "*new Alarm*" or the alarm settings "*latching*" or "*non-latching*" section 4 Operation of the System.

Non-latching alarm:

The signal is within the alarm limits:

- The output is at “*normal*” status.

The signal is outside the alarm limits:

- The output is permanently at alarm status.

Acknowledgement by pressing the ACKNL key:

- The output is at alarm status, unless the parameter setting is “*new Alarm*” (i. e. actual alarm).
- The output changes to “*normal status*”, if the parameter setting is “*new Alarm*”. If after 24 hours the signal is still outside the alarm limits, the output changes again to alarm status and can be acknowledged again.

The signal is no longer outside the limits:

- The output changes to “*normal*” status, regardless of whether the alarm has been acknowledged or not.

For non-latching alarms, the RESET key has no effect.

<u>Latching alarm:</u>

The signal is within the alarm limits:

- The output is at “*normal*” status.

The signal is outside the limit:

- The output is permanently at alarm status.

Acknowledgement by pressing the ACKNL key:

- The output is at alarm status, unless the parameter setting is “*new Alarm*” (i. e. actual alarm).
- The output changes to “*normal status*”, if the parameter setting is “*new Alarm*” (i. e. actual alarm).

The signal is no longer outside the alarm limits, and the ACKNL key has not yet been pressed:

- The output is permanently at alarm status.

The signal is no longer outside the alarm limits, and the ACKNL key has been pressed:

- The output is at alarm status, unless the parameter setting is “*new Alarm*” (i. e. actual alarm).
- The output changes to “*normal status*”, if the parameter setting is “*new Alarm*”. If after 24 hours the signal is still outside the alarm limits, the output changes again to alarm status and can be acknowledged again.

The signal is no longer outside the alarm limits, the ACKNL key has been pressed, and the RESET key is being pressed:

- The output changes to *“normal”* status

If the signal is still outside the alarm limit, or if the ACKNL key has not yet been pressed, pressing the RESET key has no effect.

6.5 Preliminary Calibration

Note: Under certain conditions, some of the maintenance and service functions described here can be nonfunctional when older versions of the hardware and software of the SUPREMA system are being used. For detailed information on this, please contact the MSA Customer Service office in your area.

6.5.1 Passive Sensors

After the sensors have been allowed sufficient recovery time, which depends on the sensors and on the measuring components (see the appropriate sensor data sheets), the preliminary calibration for passive sensors must be performed on the SUPREMA system.

Note: At least 2 people are required to perform the preliminary calibrations. To avoid communication problems between Person 1 operating the SUPREMA and Person 2 supplying the sensors with gas, we recommend the usage of a set of appropriate two-way radios.

In addition, the required zero and test gases as well as test adapters and hose connections (see the sensor operating and maintenance instructions) for supplying the gas are a necessary precondition for the successful completion of the preliminary calibrations.

The duration and flow rate of the zero gas and test gas can be found in the he associated sensor operating and maintenance instructions.

Attention: The preliminary calibration may not be performed until after the preliminary adjustment of the MAI module in accordance with Section Preadjustment of Passive Sensors, has been properly completed for all connected passive sensors.

6.5.2 Presetting of Passive Sensors

For the preliminary calibration, the following steps must be completed by person 1 (at the SUPREMA) and by person 2 (at the sensor in question):

Person 1:

- Select the “Maintain/Calibration” menu.
- Select the input to be calibrated in the “Measuring Point” option field.
- Enter the gas concentration in the “Zero Gas” field.

Note: The concentration of the test gas in the zero gas is to be entered in this field (usually 0%), not the concentration of the zero gas!

Attention: The value must be identical to the lower limit of the measuring range; that is, it must be equal to zero.

- Enter the test gas concentration in the “Test Gas” field.
- If the test gas is not the same as the reference gas entered in the “Setup/measure points” menu, select the test gas being used in the “Test Gas Type” field.
- Start calibration with the “Start” control field (select the control field, press “Enter”).

Note: We recommend the use of test gas with a concentration of approximately 50% of the measuring range of the input. In no case should the test gas concentration be less than 25% of the extreme value of the measuring range. If possible, the test gas (the gas which used to calibrate the sensor) and the measurement gas (the gas to be monitored) should be identical. If this is not the case and a reference gas is used, the response factor of the gas concentration used must be known (see O & M instructions for the sensor, reference curve).

Attention: Exceptions to this rule are sensor types D-8101, D-8113, D-8113, D-8201, DF-8201, DF-8250, DF-8401 and DF-8603. Because of the nonlinear output signal of these sensors, they should always be calibrated to the rating [extreme value of the measuring range] provided that this is below the LEL [lower explosion limit].

Person 2:

- Supply the zero gas through the test adapter to the sensor assigned to the selected input (duration and flow rate according to the sensor O & M instructions).

Person 1:

- After actuating the *“Start”* field, you will be asked for the password. Enter the password or actuate the key switch.
- The *“End Calibration”* submenu will appear.
- The values of the preceding calibration are shown in the line *“OLD”*. The values of the current calibration are shown in the line *“NEW”* after the control field has been actuated “[Store]”. In a preliminary calibration, the line *“OLD”* is zero.
- In the *“Sig:”* field, the current measurement value UA of the input to be calibrated is shown. After the zero gas has been supplied for a sufficient period of time – all 5 digits of the bar display are filled black – actuate the control field “[Store]” to confirm the value. The value is now shown in the field “CAL-ZERO/mV”.

Person 2:

- After you have been informed by person 1 that the zero point calibration has been completed successfully, cut off the zero gas supply and start with the test gas supply.

Person 1:

- The current measurement value UA of the measure point to be calibrated shown in the *“Sig:”* field changes. After the test gas has been supplied for a sufficient period of time – all 5 digits of the bar display are filled black – confirm the value by actuating the control field “[Store]”. The value is now shown in the *“CAL-SPAN/mV”* field.
- Conclude the calibration of the selected input by actuating the control field “[End]”.

Note: Signals UA above 600 mV are not valid for the zero point calibration. Signals UA below 600 mV are not valid for the span calibration.

- In the start calibration menu, select the next input, and repeat the procedure described above.

Person 2:

- After you have been informed by person 1 that the sensitivity calibration has been successfully completed, shut off the test gas supply and start the zero gas supply at the next sensor to be calibrated.

Note: If the preadjustment was correct, the ACTUAL VALUES for the zero point will be approximately in the range of 350 mV to 450 mV.
The signal voltage shown is calculated according to the formula:
Signal = Cpr / 100 * 1600 mV + 400 mV
(for sensors with a linear output signal), where Cpr is the concentration of the test gas as a % of the measuring range. The tolerance is approximately equal to the signal value in mV ± 100 mV.

Attention: If the signal voltage exceeds a value of 2000 mV during the test gas supply, a signal failure will be triggered in the system (the Signal Fail LED will flash). The calibration is invalid. In no case may the calibration value be accepted. Instead, terminate the calibration by actuating the control field '[*Cancel*]". Then check the choice of test gas concentration and make sure that it is being supplied correctly. It may be necessary to check and correct the preadjustment of the input on the MAI module.

6.5.3 Active Sensors

A preliminary calibration on the SUPREMA system is not required for active sensors (sensors with a 4 ... 20 mA output). The preliminary calibration is to be performed directly at the sensor in accordance with the operating and maintenance instructions of the sensor. As default values, the SUPREMA system interprets an input current of 4 mA as 0% of the measuring range and an input current of 20 mA as 100% of the measuring range.

Attention: In the case of sensors which do not send a maintenance level during calibration, it is recommended that the input be inhibited in the "*Setup/Measure Points*" menu during the preliminary calibration.

Note: As part of the startup procedure, it is recommended that the correctness of the displayed values be checked either by supplying gas to the sensors or by supplying a constant current to the MAT module from a source of constant current. The method for correcting the 4 ... 20 mA input is described in section 7.1.2 Active Sensors .

6.6 Completing Startup

To check the correctness of all the completed adjustments, it is recommended that all the inputs be tested with test gas. Verify that the correct alarm is triggered and that the correct relay driver output is actuated. Keep a record of this test.

Startup is complete after a successful final check of the SUPREMA system and of the completed installation and calibration procedures. Now the external alarm and warning systems can be connected.

Warning: To guarantee the unambiguity of catalytic combustion sensor operation it must be made sure (e.g. by check with hand-held test instruments) each time before turning on the sensors and the system that the environmental atmosphere to be monitored by the sensors is free of combustible gases.

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7. Maintenance and Service

Note Under certain conditions, some of the maintenance and service functions described here can be nonfunctional in older versions of the hardware and software of the SUPREMA system. For details, contact the MSA Customer Service office in your area.

Warning: In the case of operation with catalytic combustion sensors: To guarantee the unambiguity of catalytic combustion sensor operation it must be made sure (e.g. by check with hand-held test instruments) each time before turning on the sensors and the system that the environmental atmosphere to be monitored by the sensors is free of combustible gases.

7.1 Maintenance and Adjustment

The system must be checked at regular intervals (not greater than 6 months) to ensure that it is functioning properly in accordance with the EN 50073 and the applicable international, national, industry-specific or company regulations, and the sensitivity and the zero point of the connected sensors must be adjusted as necessary in accordance with the operating instructions for the types of sensors connected to the system.

Sensors which are no longer able to generate the minimum signals must be replaced.

7.1.1 Passive Sensors

Before calibration, make sure that the sensors have recovered.

Note: At least 2 people are required to perform the calibration. To avoid communication problems between Person 1 operating the SUPREMA and Person 2 supplying the sensors with gas, we recommend the usage of a set of appropriate two-way radios.

Again, the required zero and test gases, test adapters, and hose connections (see operating and maintenance instructions for the sensor) for supplying the gas are the necessary precondition for a successful calibration.

The duration and flow rate of the zero and test gas supplys can be found in the operating and maintenance instructions as well as the sensor data sheet for the sensor in question.

For the calibration, person 1 (at the SUPREMA) and person 2 (at the sensor in question) must perform the following steps:

Person 1:

- Select the “Maintain/Calibration” menu.
- Select the input to be calibrated in the “Measure Point” field.
- Enter the gas concentration in the “Zero Gas” field.

Note: Enter the concentration of the test gas in the zero gas in this field (usually 0%), not the zero gas concentration.

Attention: The value must be identical to the lower limit of the measuring range, which means it must be equal to zero.

- Enter the test gas concentration in the “Test Gas” field.
- If the test gas is different from the reference gas entered in the “Setup/Measure points” menu, select the test gas used in the “Test Gas Type” field.
- Start calibration with the “Start” control field (select the control field, press “Enter”).

Note: We recommend the use of test gas with a concentration of approximately 50 % of the measuring range of the measure point. In no case should the test gas concentration be less than 25 % of the extreme value of the measuring range. If possible, the test gas (the gas which used to calibrate the sensor) and the measurement gas (the gas to be monitored) should be identical. If this is not the case and a reference gas is used, the response factor of the gas concentration used must be known (see O & M instructions for the sensor, reference curve).

Attention: Exceptions to this rule are sensor types D-8101, D-8113, DF-8201, DF-8250, DF-8401 and DF-8603. Because of the nonlinear output signal of these sensors, they should always be calibrated to the rating [extreme value of the measuring range] (provided that this is below the LEL [lower explosion limit].

Person 2:

- Supply zero gas through the test adapter to the sensor assigned to the selected measure point (duration and flow rate according to the sensor O & M instructions).

Person 1:

- After actuating the “Start” field, you will be asked for the password at the first measure point. Enter password or actuate the key switch.
- The “End Calibration” submenu will appear.
- The readouts “SENS.%” and “UX mV” are currently still not available.
- The values of the preceding calibration are shown in the line “OLD”. The values of the current calibration are shown in the line “NEW” after the control field has been actuated “[Store]“. In a preliminary calibration, the line “OLD” is blank.
- In the “Signal=” field, the current measurement value of the measure point to be calibrated is shown. After the zero gas has been supplied for a sufficient period of time – all 5 digits of the bar display are filled black – actuate the control field “[Store]” to confirm the value. The value is now shown in the field “CAL-ZERO/mV”.

Person 2:

After you have been informed by person 1 that the zero point calibration has been completed successfully, cut off the zero gas supply and start with the test gas supply.

Person 1:

- The current measurement value of the measure point to be calibrated is shown in the “Sig:” field. After the test gas has been supplied for a sufficient period of time – all 5 digits of the bar display are filled black – confirm the value by actuating the control field “[Store]”. The value is shown now in the “CAL-SPAN/mV” field.
- Conclude the calibration of the selected input by actuating the control field “[End]”.

Note: Signals UA above 600 mV are not valid for the zero point calibration. Signals UA below 600 mV are not valid for the span calibration.

- A dialog menu will appear: “Preliminary calibration? NO=<ESC>, YES=<ENTER>”. Terminate the calibration by actuating the “ESC” key. Pressing the “ENTER” key deletes the measurement values of earlier calibrations stored in the calibration menu and in the “Diagnosis/Logbook” (should be used only after replacement of a sensor).
- In the start calibration menu, select the next input and repeat the procedure described here.

Person 2:

- After being informed by person 1 that the sensitivity calibration has been completed successfully, shut off the test gas supply and start zero gas supply at next input to be calibrated.

Note: If the preadjustment was correct, the ACTUAL VALUES for the zero point will be approximately in the range of 350 mV to 450 mV.
The signal voltage shown is calculated according to the formula:
Signal = C / 100 * 1600 mV + 400 mV
(for sensors with a linear output signal),
where C is the concentration of the test gas as a % of the measuring range.
The tolerance is approximately equal to the signal value in mV ± 100 mV.

Attention: If the signal voltage exceeds a value of 2000 mV during the test gas supply the calibration is invalid. In no case may the calibration value be accepted. Instead, terminate the calibration by actuating the control field “[*Cancel*]”. Then check the choice of test gas concentration and make sure that it is being supplied correctly. It may be necessary to check and correct the preadjustment of the measure point on the MAI module.

7.1.2 Active Sensors

For active sensor (sensors with an output of 4 ... 20 mA), the calibration is to be performed directly on the sensor in accordance with the relevant operating and maintenance instructions. As default values, the SUPREMA system interprets an input current of 4 mA as 0% of the measuring range and an input current of 20 mA as 100 % of the measuring range.

Attention: In the case of sensors which do not transmit a maintenance level during calibration, we recommend that the measure point be locked during the preliminary calibration in the “*Setup/Measure point*” menu.

In the following section, the procedure for checking and correcting the display for active sensors is described.

Checking and Adjusting the Display

If, in spite of correctly calibrated active sensors, the expected values (0% of the measuring range for a signal current of 4 mA and 100 % of the measuring range for a signal current of 20 mA) do not appear on the SUPREMA, the calibration on the SUPREMA must be checked and corrected if necessary.

For this purpose, either the signal current of the connected sensor or a variable power source can be used. If the signal current of the sensor is used, make sure that the sensor is supplying the correct values.

Tip: A simple way to correct a possibly incorrectly set measure point consists in changing the selected type of sensor in the "*Setup/Measure Points/Sensor Data*" menu. To do this, navigate to the "*Setup/Measure Points/Sensor Data*" menu, select any other type of sensor, and confirm the selection ([OK] field in the "*Setup/Measure Points/Information*" menu). Then re-select the type of sensor actually connected and confirm. The measure point will thus be set back again to the standard setting of 4 mA = 0 % of the measuring range and 20 mA = 100 % of the measuring range. Attention: The measure point should be locked during this adjustment (to prevent an alarm from being triggered).

Note: During this calibration the measuring point must be inhibit (alarm rejection).

Note: No adjustments on the MAI module are either necessary or possible for active sensors.

<u>Calibration with a Variable Power Source</u>

One person is required for this procedure. The following steps are to be performed:

- Lock the measure point in question in the "*Setup/Measure points*" menu to prevent an alarm from being triggered.
- Then detach the cable connections of the sensor to the MAT module.
- Connect the variable power source to the MAT module as follows:

MAT module terminal 1: + pole of the power source (signal)
MAT module terminal 4: – pole of the power source (GND)

- Set the output current of the power source to 4 mA.
- Unlock the measure point in question in the "*Setup/Measure Points*" menu to allow a calibration.
- Select the "*Maintain/Calibration*" menu.
- Select the measure point to be calibrated in the "*Measure Point*" field.
- Enter 0 % of the measuring range in the field "*Zero Gas*" as the zero gasconcentration.

- Enter 100 % of the measuring range in the field "*Test Gas*" as the test gas concentration.
- Begin the calibration with the "*Start*" control field (select the control field, press Enter).
- After actuating the "*Start*" field, you will be asked for the password at the first measure point. Enter the password or actuate the key switch.
- The "End Calibration" submenu will appear.
- The current measurement value UA of the measure point to be calibrated will appear in the "*Sig:*" field. For an input current of 4 mA, a value of 400 mV ± 10 mV should be displayed here. In the field "Ux=" no value or ***** is displayed.
- If the value UA is within the tolerance range (400 mV ± 10 mV), confirm by actuating the control field "[*Store*]". The value will be appear in the field "*CAL-ZERO / mV*".
- Set the output current of the power source to 20 mA.
- The current measurement value UA of the measure point to be calibrated will appear in the "*Sig:*" field. For an input current of 4 mA, a value of 2,000 mV ± 10 mV should appear here.
- If the value UA is within the tolerance range (2.000 mV ± 10 mV), confirm by actuating the control field "[*Store*]". The value will appear in the field "*CAL- ZERO/ mV*".
- End the calibration of the selected measure point by actuating the control field "[*End*]".
- A dialog box appears: "*Preliminary calibrations? NO=<ESC> YES=<ENTER>*". Terminate the calibration by actuating the "ESC" key. Pressing the "Enter" key deletes the measurement values of earlier calibrations stored in the calibration menu and in the "*Diagnosis/Logbook*" menu (should be used only after replacement of a sensor).
- Set the power source back to 4 mA and lock the measure point again.
- Cut the connection between the MAT module terminal and the power source and reconnect the sensor.
- After allowing the sensor to recover sufficiently, unlock the measure point.
- In the beginning calibration menu, select the next measure point and repeat the procedure described above.

<u>Calibration by Means of the Sensor</u>

Make sure before the calibration that the sensors have recovered. This procedure can also be used to compensate for small deviations in the output current of the sensors from the system setup of the SUPREMA (4 mA = 0 % of the measuring range, 20 mA = 100 % of the measuring range). The deviations in the current should not exceed ± 0.5 mA, however, or otherwise the error evaluation (leaving the measuring range in one direction or the other) will be impaired.

Note: At least 2 people are required to perform the calibration. To avoid communication problems between Person 1 operating the SUPREMA and Person 2 supplying the sensors with gas, we recommend the usage of a set of appropriate two-way radios.

Again, the required zero and test gases, test adapters, and hose connections (see operating and maintenance instructions of the sensor) for supplying the gases are a necessary precondition for a successful calibration.

The duration and flow rate of the zero and test gas supplys can be found in the operating and maintenance instructions for the sensor in question.

For the calibration, person 1 (at the SUPREMA) and person 2 (at the sensor in question) must perform the following steps:

Person 1:

- Select the “Maintain/Calibration” menu.
- Select the input to be calibrated in the “Measure Point” field.
- Enter 0 % of the measuring range in the field “Zero Gas” as the zero gasconcentration.
- Enter the test gas concentration in the field “Test Gas”.
- If the test gas is not the same as the reference gas entered in the “Setup/Measure Points” menu, select the test gas being used in the field “Test Gas Type”.

Note: Sensors with a linear output signal:
The test gas concentration should be in the upper third of the measuring range.
The displayed signal voltage is calculated according to the formula:
Signal = C / 100 * 1600 mV + 400 mV.
Sensors with a nonlinear output signal must be calibrated to the rating. (Take note of the LEL.) Signal voltage for full scale: 2,000 mV ± 10 mV.

- Start calibration with the “Start” control field (select the control field, press “Enter”).

Person 2:

- Supply the zero gas via the test adapter to the sensor assigned to the selected input (duration and flow rate as specified in the O&M instructions for the sensor).

Person 1:

- After actuating the “Start” field, you will be asked for the password at the first measure point. Enter the password or actuate the key switch.
- The “End Calibration” submenu will appear.
- The current measurement value UA of the measure point to be calibrated will appear in the “*Sig:*” field. After the zero gashas been supplied for a sufficient period of time (the value remains stable), confirm the value by actuating the control field “[Store]”. The value will appear in the field “CAL-ZERO/mV”.

Person 2:

- After being informed by person 1 that the zero point calibration has been completed successfully, shut off the zero gas supply and start test gas supply.

Person 1:

- The current measurement value UA of the measure point to be calibrated will appear in the “*Sig:*” field. After the test gas has been supplied for a sufficient period of time (the value remains table), confirm the value by actuating the control field “[*Store*]”. The value will appear in the he field “*CAL-MSAN / mV*”.
- Conclude the calibration of the selected measure point by actuating the control field “[*End*]“.
- A dialog box appears: “*Preliminary calibration? NO=<ESC> YES=<ENTER>*”. End the calibration by pressing the “ESC” key. Pressing the ENTER key deletes the measurement values of earlier calibrations stored in the calibration menu and in the “*Diagnosis/Logbook*” menu (should be used only after replacement of a sensor).

- Select the next measure point in the beginning calibration menu and repeat the procedure described above.

Person 2:

- After being informed by person 1 that the sensitivity calibration has been completed successfully, shut off the test gas supply and begin with the zero gassupply at the next measure point to be calibrated.

7.1.3 Separate Zero Adjustment

A separate zero adjustment is possible from software versions MCP 2.02.15 and MDO 2.02.15b. If the primary calibration has already been completed, then it is possible to only adjust the zero in the course of maintenance work. The appropriate span value is then processed by the SUPREMA based on the data from the last calibration completed. The steps for zero adjustment are to be carried out as described in the previous section. After storage of the zero value („[Store]" control field) the zero adjustment can be carried out by actuating the („End]" control field). The following confirmation dialog must be answered by entering <YES>.

Note: If the value is below the zero adjustment range, the separate zero setting is cancelled and a warning displayed. Exceeding the calculated span value is also invalid and results in cancelling of the separate zero setting. It is then recommended to carry out a complete calibration (according to Sect. 7) and if necessary replace the sensor.

Note: After the separate zero setting, no SPAN value is shown in the calibration menu and in the logbook for these settings.

7.2 Sensor Simulation Modules

For function test of the SUPREMA sensor inputs, simulation modules can be used independently from the sensor type.

7.2.1 Description of Function of Sensor Simulation Module 4-20mA, WT, HL

Design

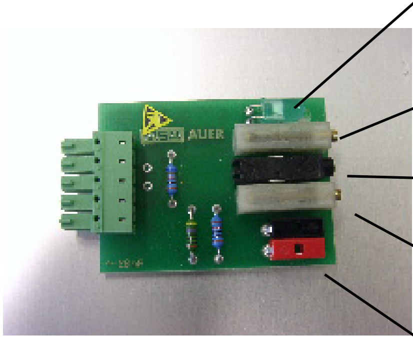


Figure 7-1: Sensor simulation module

Setting and Operation

After plugging the sensor simulator into a MAT a desired measuring value is adjusted for operation with zero signal by means of rotation at the zero signal potentiometer. By plugging the switch another measuring value is simulated which is regulated by the span signal potentiometer. It can be measured at both of the test jacks or directly at the MAI by means of a voltmeter.

Examples

<u>for MCI – Check 4 ... 20 mA</u>

Sensor type:	DF-9500
Measuring gas:	Carbon monoxide
Zero gas:	Air
Reference gas:	Carbon monoxide
U_a at open switch (Normal operation):	400 mV
U_a at closed switch (Alarm) :	1.9 V

The sensor simulation module may be used only to the check and presetting and not to the calibration.

for MPI – Check Catalytic Combustion Sensors

Sensor type:	D-7100
Measuring gas:	Methane
Nullgas:	Air
Reference gas:	Methane
U_x at open switch (Normal operation):	0 mV
U_x at closed switch (Alarm):	100 mV

for MPI – Check Semiconductor Sensors

Sensor type:	D-8101
Measuring gas:	Acetone
Zero gas:	Air
Reference gas:	Acetone
U_x at open switch:	1.6 V
U_x at closed switch:	1.1 V

7.3 Replacement of Sensors

Sensors which are no longer able to reach the minimum signals, the zero point of which can no longer be adjusted, or which no longer function properly for some other reason must be replaced.

For this purpose, inhibit the corresponding measure point in the "*Setup/Measure Points*" menu. Then perform the following steps:

- Remove the connector plug of the sensor from the MAT-/MAT-TS module or the sensor cable from the MGT-40-TS module.
- Pull out the old sensor, put the new (properly functioning) sensor in its place, and install it (see section 5.6 Connection of the Sensors).
- Reconnect the connector plug of the sensor to the MAT-/MAT-TS module or the sensor cable to the MGT-40-TS module.
- Perform a preliminary calibration as described in section 6.3 Start the Sensors , under consideration of the required sensor recovery time.
- Check the configuration of the sensors in the "*Setup/Measure Points*" menu.
- Unlock the measure point.

7.4 Replacement of Modules

When a module is found to be defective, it must be replaced.

Attention: An MSA service technician must be called in to help with the diagnosis and to help decide whether the module must be replaced or not.

Attention: Generally, all plug-in cards must only be replaced when the voltage to the SUPREMA system has been shut off. Pulling out and plugging the plug-in cards as well must only be effected after having disconnected the supply voltage connections.

In the following, the procedure for replacing individual modules is described.

7.4.1 Plug-In Cards

Replacement of the MCP and MDO Modules

The MCP module and the MDO module are responsible for signal processing, signal management, and the storage of configuration data, among other things, in the system. The voltage to the system must therefore be shut off before these modules can be replaced.

The modules must be replaced by the following sequence of steps:

- Safeguard the system configuration (setup/measure points, relay outputs, system).
- Cut off the power to the system (e.g., by disconnecting the supply voltage connections at the MIB module see figure 5-45 MIB-Module, Supply Voltage Terminals.

Note: When rail-mounted relay modules are being used, the triggering of an alarm associated with the shut-off of the voltage can be prevented by locking the relays on the MRC-TS module, provided that the MRC-TS module is supplied with a voltage separate from that of the system (see section 5.7.2 Relay Inhibit).

- Replace the MCP, MDO or MCP and MDO modules (be careful of the ribbon cable connection between the MCP and the MDO modules).
- Turn the voltage supply back on.
- Reconfigure the system.
- Unlock the relays again if necessary.

Replacement of the MDA Module

It is necessary to turn off the system to replace the MDA module. To prevent alarms and failure messages, the measure points assigned to the MDA module or the relays assigned to the measure points (see section 5.7.2 Relay Inhibit) Inhibit) must be inhibited.

Replacement of MAI, MCI, and MPI Modules

It is necessary to turn off the system to replace the MAI module. To avoid alarms and failure messages, the measure points assigned to the MAI module or the relays assigned to the measure points (see section 5.7.2 Relay Inhibit) must be inhibited.

If the MPI or MCI module is also to be replaced along with the MAI module, care must be taken to ensure that the correct assignment to the connected sensors is preserved (see section 5.3.2 Inserting the Adapter Modules).

When MPI modules are being replaced, the following points must be kept in mind:

- The preadjustment of the MAI module (see section 6.3.1 Presetting of Passive Sensors) must be performed again.
- The type of MPI must correspond to the type of connected sensor. (see table 5-10: Types of MPI Modules).

Attention: When replacing MPI modules, always electrically separate the connected sensor to prevent damage as a result of uncompensated sensor current.

When replacing MCI modules, it is not necessary to repeat the adjustment steps, but it is necessary to make sure that the modules are configured correctly. (see section 5.3.3).

Replacement of the MGO Module

It is necessary to turn off the system to replace the MGO module. To prevent alarms and malfunction messages, the relays must be inhibited directly on the MRC-TS module (see section 5.7.2 Relay Inhibit).

Replacement of the MAO Module

It is necessary to turn off the system to replace the MAO module. The failure message can be prevented from being sent any farther by inhibiting the relays on the MST module (MOR-8 module) or on the MRC-TS module (MRO-8-TS module) (see section 5.10.7 LOCR Terminal or section 5.7.2 Relay Inhibit).

7.4.2 Connection Modules

Replacement of MAT/MAT-TS, MUT, and MGT-40-TS Modules

These modules can be replaced without interrupting the system, although the function in question (sensor input, relay driver or analog output) is not available during the replacement.

When the modules which implement sensor connections are replaced, the assigned measure points must be locked to prevent alarms or failure messages (see section 6.3.6.2 Set the Input Parameters).

When it is necessary to replace a MUT module to which an MRC-TS module is connected, the connected relays can be locked by using the LOCK connection on the MRC-TS module, provided that the MRC-TS module has a voltage supply separate from the system (see section 5.7.2 Relay Inhibit)

Replacement of MRO-8/MRO-8-TS Modules

It is not necessary to turn off the system to replace MRO-8/MRO-8-TS modules. Alarm devices which are connected to the modules must be deactivated, however (especially when the relays are operating Normally energised).

7.5 Changing the Password

f the current password is to be changed, a new password can be entered in the following way:

- Use the cursor key in the “Setup/System” menu to select the field “Password”.
- Press the Enter key; you will be asked to enter the current password or to actuate the key switch.

Note: If you have forgotten the current password, a new password can be entered by actuating the key switch. If there is no key switch to close, connect terminal contacts 1 (GND) and 2 (PSW) on the MST module**(see section 5.10.8 Password Connection)** **with a wire jumper, provided that these terminals can be accessed safely.**

- After entering the password or actuating the key switch (close it briefly and then open it again), leave the entry window by selecting the OK field and then press the ENTER key.
- You can now enter the new password in the “Password” and “Confirmation” fields of the “Setup/System” menu.
- After selecting the OK field, the new password will be accepted when the ENTER key is pressed.

The password must have a minimum of four characters and may not have more than eight. Any symbol from the ASCI character set can be used. A distinction is made between upper-case and lower-case letters.

If no password at all is wanted, the password can be deleted here by entering zeros. Authorization can then be granted only by the use of the key switch. If there is no key switch, authorization is open to anyone after deletion of the password. In this case, an additional security dialog is initiated with the warning that the approval of the system is revoked in the event of unauthorized changes. If no password at all is wanted, the password can be deleted here by entering blanks. Authorization can then be granted only by the use of the key switch. If there is no key switch, authorization is open to anyone after deletion of the password. In this case, an additional security dialog is initiated with the warning that the approval of the system is revoked in the event of unauthorized changes.

7.6 Plug-In Cards – Status LED

In the case of the modules designed as plug-in cards, status LEDs are located in the upper left corner. The position and function of these LEDs are described in the following.

7.6.1 MCP, MDA, MGO, MAO Modules

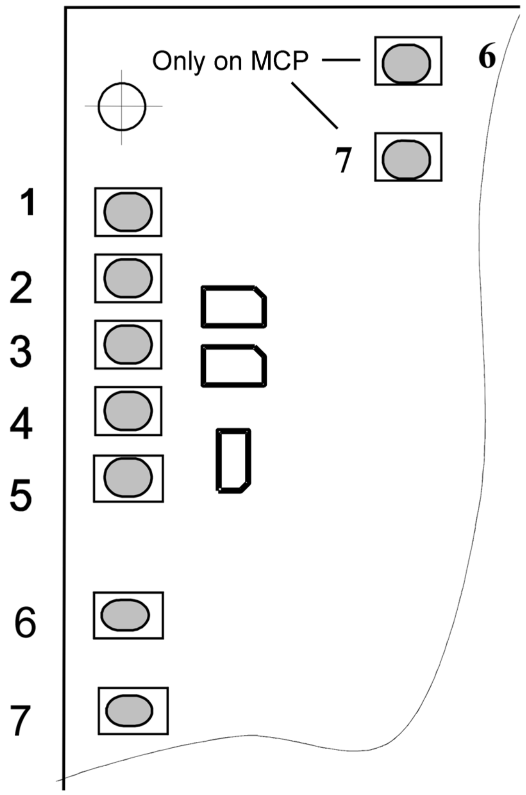


Figure 7-2: MCP, MDA, MGO, MAO modules, Status LEDs

LED-No.	Color	Function
1	green	ON: The external voltage supply is connected to the module.
2	green	ON: The internal voltage supply is connected to the module.
3	green	ON: The battery voltage supply is connected to the module.
4	red	ON: A failure has occured in the module
5	green	ON: The module's CAN bus communications are proceeding correctly.
6	yellow	ON: system reset
7	yellow	ON: voltage failure

Table 7-1: MCP, MDA, MGO, MAO Modules, Function Status LED

In the normal case, only one of the first three LEDs is on. If no LED is on, there is a problem with the voltage supply to the module.

If the failure LED (LED No. 4) is on, you should contact an MSA service technician. If this cannot be done right away, the module can be replaced if a spare unit is available (see section 7.4 Replacement of Modules). The failure which occurred is stored in the SUPREMA logbook and can be found in the "*Diagnosis/Logbook/Events*" menu.

7.6.2 MAI-Module

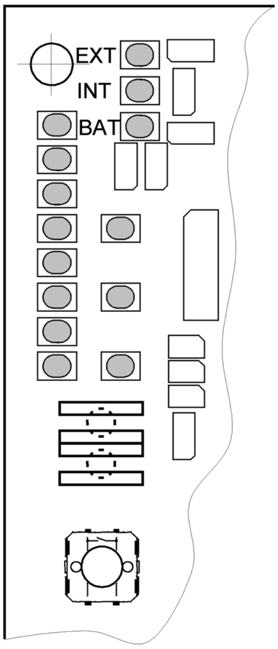


Figure 7-3: MAI module, Status LEDs

LED	Color	Function	
EXT	green	ON:	The external voltage supply is connected to the module.
INT	green	ON:	The internal voltage supply is connected to the module.
BAT	green	ON:	The battery voltage supply is connected to the module.

Table 7-2: MAI Module, Function Status LEDs

In the normal case, only one of the first 3 LEDs is lit. If no LED is lit, there is a problem with the voltage to the module.

7.7 Diagnostic Functions

The structure and operation of the "*Diagnosis*" menu are described in detail in section 4 Operation of the System. In the following, some of the more important functions are described in greater detail.

The "*Diagnosis*" menu is divided into the submenus "*Logbook*" and "*Measuring Data*".

In the "*Logbook*" menu, a series of failures and incidents is stored and can thus be used to conduct an incident verification procedure at a later time.

The current status of the system, however, can be reviewed in the "*Measuring Data*" menu.

7.7.1 Logbook Functions

The logbook is divided into five history menus:

- Calibration

- Events
- Configuration Changes
- Supplemental Voltage
- Processor Temperature

The History entries are shown as list view in chronological order.

Note: You can scroll vertically and horizontally through the lists by selecting the header (with the cursor key), by pressing Enter again, and finally by using the cursor keys (or by using the scroll bar in the PC operating program).

Calibration History

The date/time of the last four calibrations are stored here for each measure point. If there are more than 4 entries, the oldest one is overwritten. Exception: the preliminary calibration is always kept.

In addition, the test and zero gases used (type of gas, concentration, and unit) are also stored as well as the associated signal voltage values (preamplified signal UA and difference voltage Ux). On the basis of the gas concentration, it is possible to use these values to determine the percentage by which the sensor signal has decreased.

Note: The signal voltage values (preamplified signal UA and difference voltage Ux) and the unit are visible on the MDO module display only after scrolling with the right cursor key.

Events History

Crossings of the alarm threshold and signal failures are stored in this history. The date/time of the incident, the measure point involved, and a short description are given.

When an **alarm limit** is crossed, the alarm number (1st, 2nd, 3rd, 4th alarm) is also recorded.

The message “**signal failure**” is transmitted when:

- the signal is outside the measuring range;
- an interruption or short-circuit has occurred in the sensor cable;
- an MAI module is being replaced without the associated measure points having been inhibited first; or
- an MPI or MCI module not corresponding to the type of sensor connected is being used (see section 5.3.2 Configuration of the MAI Module)

A protocol of **system incidents** is also kept for service purposes. These protocols are also used as an information source for the MSA service personnel.

Configuration Changes History

Changes of measure point parameters are stored here.

An entry includes the following data:

- date/time the configuration was accepted as valid from the Measure Point menu;
- measure point no.;

- name of the changed parameter and
- new value of the changed parameter

Supply Voltage History

The times when the supply voltage exceeded or fell below the limit value (internal supply, external supply, battery backup) are stored in this history. An entry is made each time a new maximum or minimum value for a power source is measured.

The limit values for the supply voltage are:
Minimum value: 19.2 VDC
Maximum value: 32.0 VDC

The entry contains:

- date and time of the voltage measurement
- name of the supply source
- measured voltage value

Processor Temperature History

The times when the temperature of the processor on the MDA module card exceeded or fell below the limit value are stored in this history.

When a temperature value leaves the allowed range and exceeds or falls below a limit value, the actual temperature value is stored; when the temperature returns to the allowed range, the peak value which occurred during the deviation is stored.

An entry contains:

Ein Eintrag umfasst folgende Daten:

- the date and time when the temperature exceeded or fell below the limit;
- the serial no. of MDA module card;
- the temperature value and
- information on whether the incident involved a departure from the allowed range or a return to the allowed range.

7.7.2 Measurement Data

This menu is divided into the submenus “Measure Points” and “Modules”, which display the current data of the measure points and modules present in the system.

7.8 System Failure Messages

F. No	Failure Message Text	Appears in case of	Disappears in case of	Error LED	Fail LED	Info 1 (BYTE)	Info 2 (DWORD)	Mo-dule	Remarks/Remedial action
1	Dynamic memory overfloy at	Stack overlow or stack underflow detected	Restart	X	X	Task IDD	Memory address	all	Generally software problems (e.g. wrong stack dimensions) Perhaps sequence error to No. 2,3 or 6
2	Error in work memory at	RAM failure detected (Self-test)	Whole RAM tested: failure-free (after approx. 24 h)	X	X	Bit pattern fault bits	Memory address	all	Hardware defect: exchange module
3	Error in program memory at	ROM failure detected (Self-test)	Whole ROM tested: failure-free (after approx. 24 h)	X	X	1 = test 0 at sys-tem start, elso 0	Checksum is = loWord should be = HiWord	all	Hardware defect: exchange module
4	Internal timeout at	Internal time control detects failure	All tasks have been reported in time	X	X*	Nominal value of Taskflags (8 lowest Bit)	Taskflags is = loWord should be = HiWord	all	Perhaps sequence error of CAN bus failure. Check Bus (*System fail only if failure is standing in line more than 1 sec.)
5	Data lost on Bus at	CAN controller detects overflow	CAN Controller in normal mode	X	X	Always 0	Always 0	MDA MGO MAO	Green LED goes out if CAN overflow is detected. Perhaps Bus not terminated correctly or modules with wrong bitrate at the bus. May also be hardware defect.
6	Fatal internal error at	Exception Interrupt (e.g. write access to ROM, invalid memory address...)	Restart	X	X	Exepton no.	Memory address	all	Hardware defect: exchange module Perhaps sequence error to No. 1, 2 or 3
7	Buffer overflow at	Overflow of the internal processing queues.	Restart	X	X	Queue no.	Status	MDA MCP MDO	Perhaps in combination with No. 4 at system overload or sequence error to CAN bus failures
8	Communi-cation error on bus at	Error at SDO transfer (transfer of configuration and parameter data)	SDO transfer successfully ended	X	X	CAN-I/O error code	CANopen index/sub index	MCP MDO	Perhaps CAN-bus failure: check Bus. Check MCP, MDO, MDA for incompa-tible software status. May occur when pulling cards out
9	System error of configuration memory at	Error on accessing flash memory which contains parameter and confi-guration data files	Restart	X	X	Flash error code	Sector/block or cell no.	MCP MDO	Hardware defect. Exchange module. Perhaps in combi-nation with No. 10 or 15.

Table 7-3: System Failure Message

F. No.	Failure Message Text	Appears in case of	Disappears in case of	Error LED	Fail LED	Info 1 (BYTE)	Info 2 (DWORD)	Module	Remarks/Remedial action
10	Error in configuration memory at	Flash error detected (Self-test of the con-figuration an para-meter memory)	Whole flash tested error-free (after approx. 24 h)	X	X	Sector	Block = low Chksum = hi	MCP MDO	Hardware defect. Exchange module Perhaps sequence error of No. 9
11	Data lost at serial communi-cation at	Error at serial communication	Restart	X	X	No. of the interface	Indication char = l0, status = hi	MDO	Data lost at PC interface or printer interface: Check cables, perhaps hardware defect: ex-change MDO module
12	Node guarding error detected by	Module does not respond to node-guarding, or does not send any heartbeat	All nodes respond again	X	X	ID Module failure; for MGO "0"	No of MAI, CAN bus or 0; for MGO: time	MCP MDO MGO	CAN-Bus failure, module defect or missing: Check bus and modules. MGO is sending this message if no output data have been received for a certain time
13	Programm error at	Application programm error	Restart	X	X	Application fault no.	Various	MCP MDO	Normally software problems (not plausible internal software status)
14	Data error at	Application data error	Restart	X	X	Data set subindex	Data set index + Module-ID	MCP MDO	On parameter data matching records of different contents with indentical revision code have been detected: Set parameters by manual selection. Often se-quence error of No. 9 or 10.
15	System configuration error at	The system configu-ration detected does not correspond to the configuration stored or is not consistent	Restart	X	X	ID con-cerned Module	Type of profle + additional info	all	Modules on wrong plug positon? Several racks of the same ID (switch) in the system?
16	Data acquisition error at	SPI communication error between MDA and MAI or at digital outputs (MGO)	SPI commu-nication resp. outputs all right again	X	X	MDA: Mux OK=1 else 0 MGO: error type	MDA:error type; MDA: Input No. MAI/channel MGO: diagno-sis code	MDA MGO	MAI or MDA defect. Can also be caused by defect rack. Always appears if a MDA but not a MAI, is being plugged in a rack. MGO: Outputs short-circuited or open.

ERROR LED: see 7.6.1 LED 4; FAIL LED: see 4.2.2

ID Rack Assignment in decimal and hexadecimal figures

Rack 1	Slot	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	ID dec.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	ID hex.	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	10
Rack 2	Slot	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	ID dec.	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
	ID hex.	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F	20
Rack 3	Slot	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	ID dec.	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
	ID hex.	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F	30
Rack 4	Slot	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	ID dec.	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
	ID hex.	31	32	33	34	35	36	37	38	39	3A	3B	3C	3D	3E	3F	40
Rack 5	Slot	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	ID dec.	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
	ID hex.	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F	50
Rack 6	Slot	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	ID dec.	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
	ID hex.	51	52	53	54	55	56	57	58	59	5A	5B	5C	5D	5E	5F	60
Rack 7	Slot	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	ID dec.	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112
	ID hex.	61	62	63	64	65	66	67	68	69	6A	6B	6C	6D	6E	6F	70
Rack 8	Slot	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
	ID dec.	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	
	ID hex.	71	72	73	74	75	76	77	78	79	7A	7B	7C	7D	7E	7F	

Table 7-4: ID Rack Assignment in decimal and hexadecimal figures

These ID are reserved for gateways (MOD-Bus, Profibus etc.)

Slot No. 16 of a rack is reserved for the MDO 10 only. Only one MDO 10 can be contacted in one system.

7.9 Display of Digital Messages

Message	**Priority**	**Display (List)**	**LEDs/Relays**
Alarm 1	9	Measure point status 1st Alarm	Signal AL 1 at
Alarm 2	8	Measure point status 2nd Alarm	Signal AL 2 at
Alarm 3	7	Measure point status 3rd Alarm	Signal AL 3 at
Alarm 4	6	Measure point status 4th Alarm	Signal AL 4 at
System error	1		System Fail at
Signal error	3	Meas. point status Signal failure	Signal Fail at
Module error	1		Module failure at
CAN-Bus failure	1		CAN failure at
Free	1	Measure point status free	
Measuring	10	Measure point status measuring	
Inhibit	2	Measure point status inhibited	Inhibit at
Calibration	6	Measure point status calibration	Inhibit at
Sensor warm-up	4	Measure point status suppressed	Inhibit at
Measuring range overflow	5	Measure point status overflow	Signal Fail at
New value	1		Signal blinking

Table 7-5: Display of the digital messages

The highest priority messages (“1” means highest priority) are displayed first. Messages with a lower priority are displayed in addition if these use other indicating ranges for message display.

7.10 LED Test

An LED test is provided (as from PCB version 11) for the MDO which enables a visual functional test of the front panel LEDs. This test can be carried out independently from the active operating state of the SUPREMA and does not affect the mode of operation of the SUPREMA. To carry out the LED test, please press the switch shown in the illustration. The front panel LEDs should now be illuminated (System – power, fail, inhibit and Signal – 1st to 4th alarm, fail). If there is an LED that is not illuminated when the switch is pressed, it is possible that the MDO module needs to be replaced.

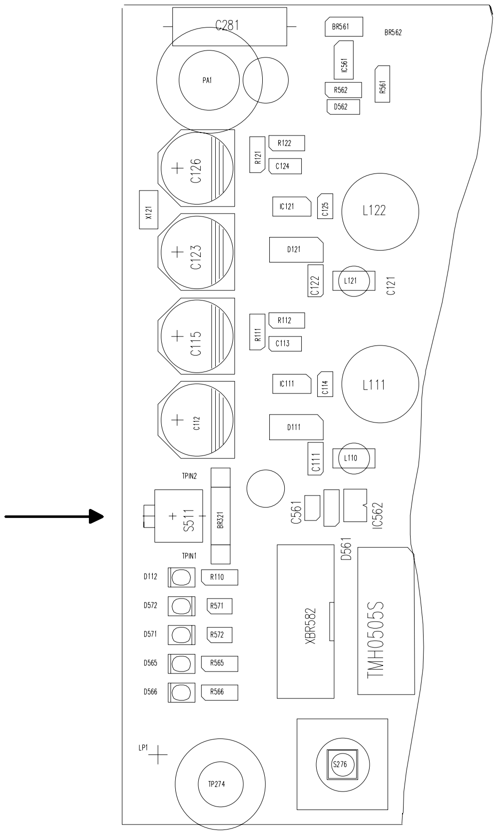


Figure 7-4: MDO, Switch for LED Test

8. System Expansions

Up to 256 inputs can be connected to a SUPREMA system. Up to 512 alarms can be given. A complete system for up to 64 inputs can be installed in one 19” rack. Depending on the size of the current system already in place, various additional modules will be required to expand the system. It must also be remembered that connecting additional modules, inputs, and relays increases the power demand of the system and may make it necessary to choose a new system power supply.

Attention: Any module card installed in addition must be registered with the help of the configuration tool in the system. (see section 6.2 System Configuration).

8.1 Connection of Additional Sensors

Up to 256 sensors can be connected to a SUPREMA system.

One MAI module makes it possible to connect up to 8 sensors. An appropriate MCI or MPI module is required for each sensor. Per rack, a maximum of either 8 MAI modules (when the rail-mount system is used for connecting the sensors: MAT-TS or MGT40-TS module) or 4 MAI modules (when the rack-mount system is used for connecting the sensors: MAT module) are used; that is, a maximum of 64 or 32 sensors can be connected per rack.

The connection of additional sensors is based on the assumption that the sensors themselves and their connecting cables have first been installed properly. The sensors are then to be connected according to the instructions described in section 5.6 Connection of the Sensors..

One of the following procedures must be followed, depending on the extent to which the system has already been expanded:

1. Not all of the 8 possible inputs on an existing MAI module have been assigned. The number of free inputs is = the number of new inputs to be connected.

In this case, only additional MPI or MCI modules (corresponding to the number and type of new sensors to be connected) are required. To plug in the additional MPI or MCI modules, the MAI module must first be removed from the rack. It is not necessary to shut down the system. To avoid alarm or error messages, the inputs belonging to the MAI module (see section 6.3.6.2 Set the Input Parameters) or the relays belonging to the inputs (see section 5.7.2.1 Relay Inhibit) must be inhibited.

When plugging the MPI or MCI modules into the MAI module, be sure that the modules are correctly assigned to the inputs, that the correct type of module for the sensor in question has been selected, and that the module has been configured properly. A detailed description of these topics can be found in section 5.3.2 Configure the MAI Module.

After verifying that the expansions are being made correctly, plug the MAI module back into the rack. The additional inputs must now be preadjusted (passive sensors only), configured, and calibrated. These steps are described in detail in sections 6.3.1 Preadjust the Passive Sensors, 6.3.6 Configure the Sensors and 6.5 Preliminary Calibration.

2. All of the existing MAI modules are assigned, or the number of free inputs is < the number of new sensors to be connected. A sufficient number of free slots for additional MAI modules are available in the existing racks. In this case, additional MAI modules (one MAI module required for every 8 sensors) with the associated MPI/MCI modules are required, depending on the number of new sensors to be connected. Additional MAT/MAT-TS/MUT/MGT40-TS modules

will also be needed. The new MAI modules can be plugged in while the system is running. To avoid alarm and error messages, the connected relays (see section 5.7.2 Relay Inhibit) must be locked. The new inputs are recognized by the system; as in case no. 1, however, they must be preadjusted (passive sensors only), configured, and calibrated. These steps are described in detail in sections 6.3.1 Preadjust the Passive Sensors and, 6.3.6 Configure the Sensors and 6.5 Preliminary Calibration.

3. All of the existing MAI modules are assigned, or the number of free inputs is < the number of new inputs to be connected. No free slots for additional MAI modules are present in the existing racks.

In this case, additional MAI modules (one MAI module required for every 8 sensors) with the associated MPI/MDI modules are required, depending on the number of new sensors to be connected. Additional MAT/MAT-TS/MUT/MGT40-TS modules will also be needed. In addition, one or more new racks and the necessary CAN bus connecting cables are required.

Always turn off the voltage when connecting a new rack. After the supply voltage has been turned off, mount and install the additional racks. The connection of the racks and the required configuration changes (MIB module) are described in sections 5.5 Systems with Several Racks and 5.3.1 Configure the MIB Module. Be sure to choose the correct CAN bus Bit rate and CAN node no.

Note: Whenever you connect additional sensors, always make sure that the voltage supply to the system is still adequate (see section 5.11.1 Calculation of the Required Power Supply). If necessary, install a voltage supply which meets the new requirements.

8.2 Connection of Additional Relay Driver Outputs

8.2.1 Additional Relay Connections

One SUPREMA system can provide a maximum of 512 relay driver outputs.

One MGO module makes 40 relay driver outputs available. A maximum of 10 MGO modules can be plugged into one rack. This number, however, is based on the use of at least one additional rack containing the appropriate MAI modules, which make it possible to connect the sensors.

One of the following procedures must be followed, depending on the extent to which the system has already been expanded:

1. A sufficient number of free relay driver outputs are still present on an existing MGO module.

a) Until now, only the common alarms of the MRO module plugged into the rack have been used.

In this case, the MRO-8 module must be replaced by MRO-8-TS modules, which are connected with ribbon cable via MRC-TS and MUT modules to the MGO module plugged into the rack (see Figure 5-33: Connection Diagram od the MRC-TS and MRO-8-TS Modules). 5 MRO-8-TS modules, each with 8 relays, can be connected per MRC-TS module. The connection procedure is described in detail in section 5.7.2 Additional Relay Outputs.

b) MRO-8-TS modules are already installed.

In this case, the connection can be made to existing MRO-8-TS modules; otherwise, additional MRO-8-TS modules must be installed.

Note: In both cases, the relay outputs must be configured as instructed in section 6.4.1 Configure the Relay Driver Outputs.

2. An additional MGO module is required.

a) Free slots are still available in the existing racks.

In this case, it is necessary to install not only the additional MGO module but also additional MRO-8-TS modules, which are connected via MRC-TS and MUT modules with ribbon cable to the MGO module plugged into the rack (see Figure 5-33: Connection Diagram od the MRC-TS and MRO-8-TS Modules). 5 MRO-8-TS modules, each with 8 relays, can be connected per MRC-TS module. The connection procedure is described in detail in section 5.7.2 Additional Relay Outputs.

b) There are no free slots for MGO modules available in the existing racks.

Always turn off the voltage when connecting a new rack. After turning off the voltage supply, mount and install the additional rack. The connection of the racks and the necessary configuration changes (MIB module) are described in sections 5.5 Systems with Several Racks and 5.3.1 Configuration of the MIB Module. Take special care to choose the correct CAN bus baud rate and CAN node no.

Additional relay modules are to be connected as described under Point 2a).

Note: In both cases, the relay outputs must be configured as instructed in section 6.4.1 Configure the Relay Driver Outputs.

Note: Whenever you connect additional sensors, always make sure that the voltage supply to the system is still adequate (see section 5.11.1 Calculation of the Required Power Supply). If necessary, install a voltage supply which meets the new requirements.

8.2.2 Additional Switching Outputs

As a rule, the same guidelines (especially those for the MGO module) apply here as to the connection of additional relays (see section 5.7.2 Additional Relay Connections). Instead of the MRO and MRC-TS modules, however, MGT40-TS modules are required, which are connected via ribbon cable and an MUT module to the MGO module plugged into the rack (see section 5.8 Connection of Switching Outputs).

8.3 Connection of Additional Analog Outputs

A maximum of 256 analog outputs are provided by the SUPREMA, corresponding to the maximum number of sensors which can be connected.

One MAO module makes 8 analog outputs available. Up to 10 MAO modules can be plugged in per rack. This is based, however, on the use of at least one additional rack containing the corresponding MAI modules, which make it possible to connect the sensors.

One of the following procedures must be used, depending on the extent to which the system has already been expanded:

1. Not all of the 8 possible analog outputs on an existing MAO module have been assigned. The number of free analog outputs is = the number of new analog outputs to be connected.

No additional modules are required. The additional analog outputs can be connected to the existing MAT or MAT-TS module.

2. All of the existing MAO modules are assigned, or the number of free analog outputs is < the number of new analog outputs to be connected. A sufficient number of free slots for additional MAO modules are present in the existing racks.

In this case, additional MAO modules are required in correspondence with the number of new analog outputs to be connected.

Attention: In the standard design with a MAT module plugged into the rack, 2 MAO modules are required because of the fixed assignment of the inputs for each group of 8 analog outputs. The modules must be plugged in next to each other (in adjacent slots). The analog outputs are connected to the second module.

Additional MAT/MAT-TS/MUT modules are also required.

3. All of the existing MAO modules are full, or the number of free inputs is < the number of new inputs to be connected. No free slots for additional MAO modules are available in the existing racks.

In this case, additional MAO modules are required, in correspondence with number of new analog outputs to be connected.

Attention: In the standard design with a MAT module plugged into the rack, 2 MAO modules are required because of the fixed assignment of the inputs for each group of 8 analog outputs. The modules must be plugged in next to each other (in adjacent slots). The analog outputs are connected to the second module.

Additional MAT/MAT-TS/MUT modules are also required.

One or more new racks and the necessary CAN bus connecting cables will also be needed.

Always turn off the voltage when connecting a new rack. After turning off the voltage supply, mount and install the additional rack. The connection of the racks and the necessary configuration changes (MIB module) are described in sections 5.5 Systems with Several Racks and 5.3.1 Configure the MIB Module. Take special care to choose the correct CAN bus baud rate and CAN node no.

Note: Whenever you connect additional sensors, always make sure that the voltage supply to the system is still adequate (see section 5.11.1 Calculation of the Required Power Supply). If necessary, install a voltage supply which meets the new requirements.

---

9. Connection of Peripherals

To simplify the operation (especially the configuration) of the SUPREMA, a PC or laptop with operating software can be connected via the RS 232-A port. A PC or laptop with MSA-Auer visualization software can also be connected to the SUPREMA via the RS 232-A port.

A protocol printer can be connected via the RS 232-B interface.

9.1 Connection of a PC/Laptop

For this connection, you can use either the RS 232-A port on the MST module or the RS 232 port on the MDO module.

Attention: No more than one PC/laptop may be connected to the SUPREMA system at one time, even if more than one RS232 port is available.

Connecting cable: RS 232 extension, 9-pin SUB-D connector, plug/jack (**do not use a null modem cable!**).

To connect a PC/laptop to the MDO module, the front panel screwing has to be loosened, and the front panel must be dropped.

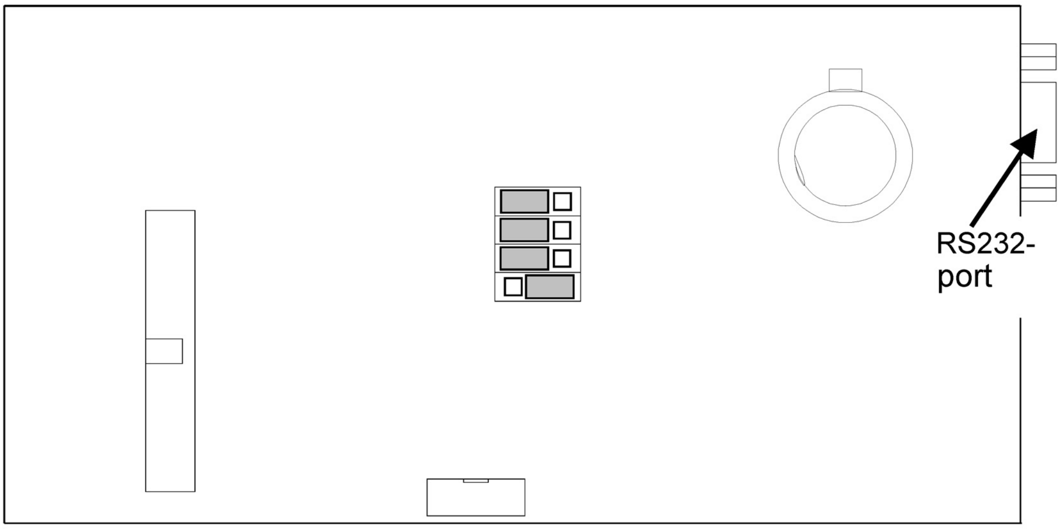


Figure 9-1: MDO module, RS 232 port

The terminal assignment of the RS 232 port on the MDO module is the same as that used for the RS 232-A port on the MST module (see section 5.10 System Ports (MST Module).

The MST module is mounted on the **rear** of the rack, to the right on the outside.

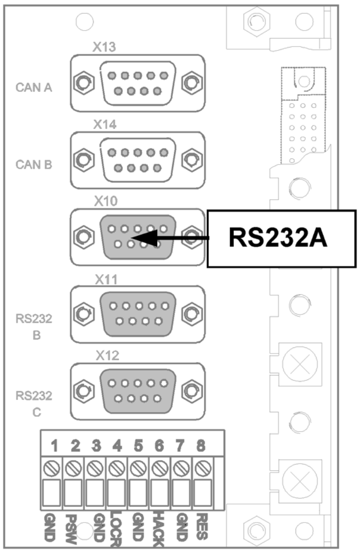


Figure 9-2: MST module, RS 232-A port

The PC/laptop is connected via the serial interface (RS 232). The necessary settings for the interface are described in the following sections.

9.1.1 Operating Software

PC operating software is available as an option to improve the convenience of the operation and configuration of the SUPREMA system. The software is available on CD-ROM. It is installed on the PC/laptop by running the setup program (Setup.exe) from the CD.

The PC should satisfy the following minimum requirements:

- Pentium I/200 Mhz/32 MB of RAM

The operating software runs under the following operating systems:

- Windows 95/98/ NT4.0

The serial interface of the PC/laptop must be configured in accordance with the following specifications:

- RS 232 configuration (COM1): 19200 baud, 8 data bits, 1 stop bit, parity none

---

Note: The operating software can be connected over COM 1–4!

Section 4.3 Operating by PC describes in detail how to use the software.

9.1.2 Display Software

On request, display software customized to customer specifications can be provided.

The program is made available on CD-ROM.

How to use the software is described in detail at the enclosed operation instructions.

9.2 Protocol Printer

For the continuous recording of events, a protocol printer can be connected to the RS 232-B port on the MST module. The MST module is mounted on the **rear** of the rack, to the right on the outside.

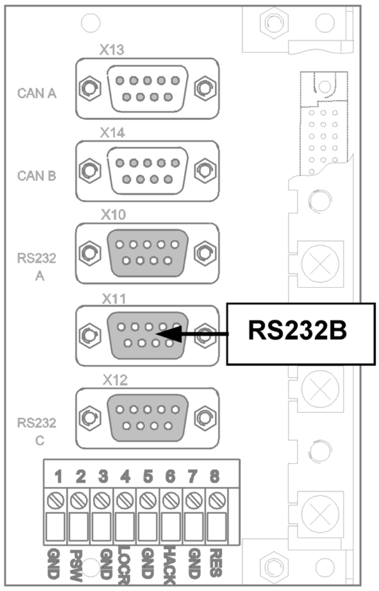


Figure 9-3: MST module, RS 232-B port

The terminal assignment of the RS232-B connection is described in section 5.10.3 Printer Port.

Connecting cable: RS 232 extension (no null modem cable)
RS 232 configuration: 19200 baud, 8 data bits, 1 stop bit, no parity

---

When a signal event occurs (alarm, error), the following single line of information is sent via this port to the connected printer:

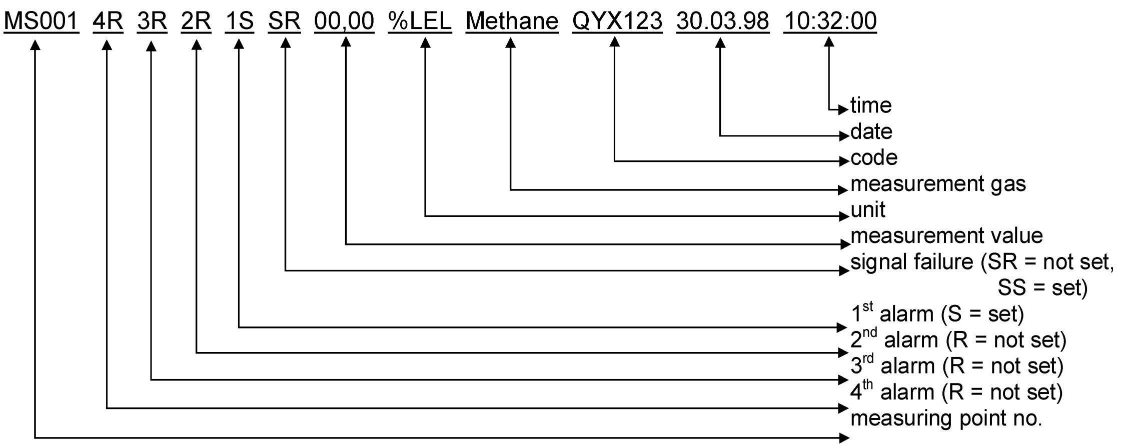


Figure 9-4: Protocol printer, Data Structure

This output is generated each time a change occurs in the status of a sampling point, that, is, whenever the upper or lower alarm threshold is crossed (unless the alarm is self-locking), whenever a signal error is received, and whenever a self-locking alarm or a signal error is successfully reset manually (status no longer exists). The current status of the sampling point with the data structure shown in Figure 9-4: Protocol printer, Data Structure is printed out along with the date and time of the most recent change of status.

9.3 Bus Connection

To connect the SUPREMA system to existing industrial control systems, it is necessary to communicate with other data buses for processing of measuring values, alarms/failures.

The signal convertion necessary is realised by SUPREMA gateways.

Note: 2 gateways Per CAN channel can be connected.

Attention: The gateways are not included in the approval!

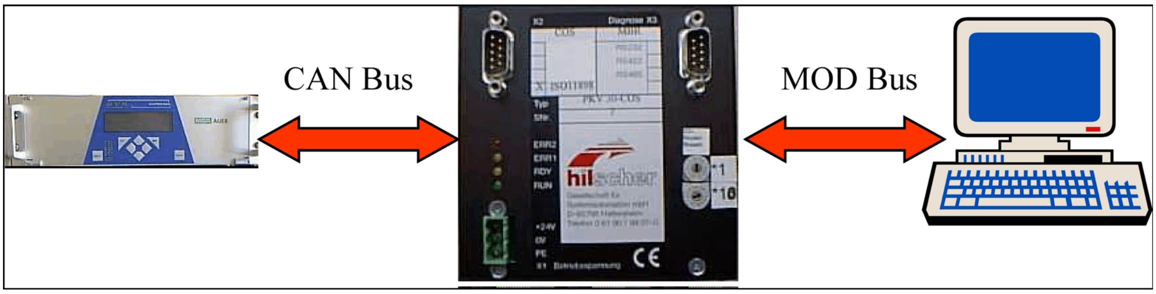
For the time being, the following bus systems are supported:

- MOD-Bus RTU Standard
- Profibus DP

Further data bus systems on request.

9.3.1 SUPREMA Gateway CAN/MOD-Bus RTU (PKV30)

(Not contained in EC type test approval DMT 03 ATEX G 003 X)



The gateway is installed on a mounting rail in the cabinet and requires a 24 V dc supply voltage (X1). The SUPREMA transfers the data via the CAN bus which is connected to X2 at the gateway. For data supply to the MOD bus, there are 3 physically different serial interfaces (X3) and 3 different data formats to be selected.

The gateway generally operates as a slave for the CAN bus and MOD bus. The SUPREMA and the control system must therefore initiate the gateway to send data.

Enclosed with the gateway are the following 5 manuals for installation, parameters and operation:

- Device manual PKV 30-COS Protocol converter for CANopen Slave
- Bridge manual Transfer CANopen Slave to MSA AUER at the PKV30-COS
- Protocol manual Modbus coupling RTU Format (also called J-Bus)

- Operation manual ComPro Project and Service program DOS Program
- Protocol manual CANopen Slave

Physical MOD-Bus Interface:

- RS 232C* (Point to Point Interface, 19200 Baud max.)
- RS 485 (2 [3] wire Bus Interface, 19200 Baud max.)
- RS 422 (4 [5] wire Bus Interface, 19200 Baud max.)

All interfaces are connected by a 9-pin D-SUB plug connector. The plug pin assignment and the interface parameters can be seen in the gateway device manual PKV 30-COS Protocol converter for CANopen Slave.

Data format MOD Bus RTU Standard:

There are 3 different modes which can be used.

- **Mode 1** contains the measuring value in INT16 , dimension and measuring range of the individual measuring points
- **Mode 2*** only contains the measuring values in INT16 of the individual measuring points.
- **Mode 3** contains the measuring value as a decimal number, measuring point No., measuring point status, dimension and measuring range.

* Basic setting (See Bridge manual Transfer CANopen Slave to MSA AUER at the PKV30-COS)

Parameter setting is made by the comPro program enclosed on a floppy disc. (See operation manual “Project planning and diagnostic program” DOS program.)

Truth Table

For the status register from address 10001 on, the following truth table (10001–10008) is valid for measure point MS 1:

					Event				
Memory address	Data value	1st alarm	2nd alarm	3rd alarm	4th alarm	Calibration	Signal failure	Inhibited	Measure range exceeded
10001	1st alarm	1	1	1	1	0	0	0	1
10002	2nd alarm	0	1	1	1	0	0	0	1
10003	3rd alarm	0	0	1	1	0	0	0	1
10004	4th alarm	0	0	0	1	0	0	0	1
10005	Calibration	0	0	0	0	1	0	0	0
10006	Signal failure	0	0	0	0	1	1	1	0
10007	Inhibited	0	0	0	0	0	0	1	0
10008	Measure range exceeded	0	0	0	0	0	0	0	1

For measure points MS 2– 56 see above as for measure point MS 1.

Setting the CANopen node address:

For the gateways, the CANopen node numbers

124 ⬄ Code switch 1 = C; 16 = 7 (1*C+16*7=124)

125 ⬄ Code switch 1 = D; 16 = 7 (1*D+16*7=125)

are provided.

Connection to the SUPREMA:

Figure 9-5: Connection Suprema Gateway CAN/MOD-BUS RTU

The CAN terminating resistor of rack 1 has not been set, therefore at the T-piece of the PKV 30 a terminating resistor is connected.

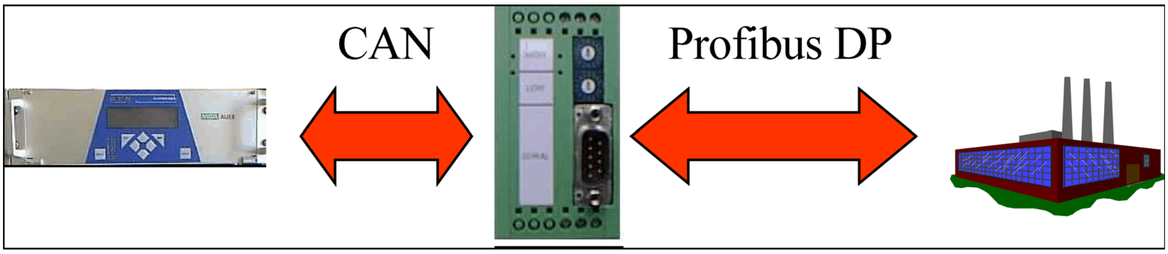
Technical Data:

Supply voltage	18 ... 30 V at 24 V, the supply current is: 200 mA max.
Plug connector	X 1: COMBICON for supply voltage X 2: 9-pin D-SUB for CANopen Interface X 3: 9-pin D-SUB for RS 232, 485 and 422 Interface
LED displays	Ready and communication, failure of the serial interface SCL 1, Status CANopen.
Temperature range	0 ... 50 °C
Type of protection	IP 50
Dimensions (L x W x H)	105 x 105 x 80 mm
Weight	500 g
Mounting	Mounting rail DIN EN 50022

Table 9-1: Technical Data Suprema Gateway CAN/MOD-Bus RTU

9.3.2 SUPREMA-Gateway CAN/Profibus DP

(Not contained in EC type test approval DMT 03 ATEX G 003 X)



The SUPREMA Gateway Profibus DP can very easily be integrated to the available, SPS-controlled system. The gateway is equipped for rail mounting and supplied with a 24 V dc voltage. For the connection of the CAN interface, a Combicon plug connector is available. The 9-pin plug connector X100 is provided for connection of the Profibus interface.

The following 2 manuals for installation, parametrization and operation are enclosed with the gateway:

- CAN-CBM-DP PROFIBUS-DP/CAN-Gateway Hardware Manual
- CAN-CBM-DP PROFIBUS-DP/CAN-Gateway with SUPREMA CANopen Firmware Software Manual

Connection to the SUPREMA:

Figure 9-6: Connection Suprema Gateway CAN/Profibus DP

The CAN terminating resistor of BGT 1 has not been set. At the CAN Bus terminal(from 2 to 4), a 120 Ohm resistor is connected together with the CAN cable.

Technical Data:

Supply voltage	Nominal voltage: 24 V/DC ± 10% current consumption (at 20 °C): 125 mA max. (+20 mA on TTY operation of the serial interface)
Plug connector	X100-SIO331 (DSUB9, plug) - serial interface X100-CBMPB (DSUB9, socket) - profibus-DP-interface X101 (6-pin screw connector UEGM) - 24 V supply voltage X400 (Combicon design, 5-pin MSTB2.5/5-5.08) - CAN or DeviceNet
Temperature range	0 ... 50 °C environmental temperature
Humidity	max. 90%, noncondensing
Dimensions of the cabinet (W x H x D)	Width: 40 mm, Hight: 85 mm, Depth: 83 mm (including mounting rail and protuding connector DSUB9, without CAN/DeviceNet plug)
Weight	Approx. 200 g

Table 9-2: Technical Data Suprema Gateway CAN/Profibus DP

10. Redundant Systems

10.1 Application/Function Safety

For the safety functions of gas warning measuring instruments, the European standards EN 50 054–058, EN 61 779 part 1-5, EN 50 104 and EN 50 271 have been prepared for the monitoring of explosive gas and vapours as well as oxygen.

Additionally, if systems are operated together with microcomputers, the standard EN 61 508 must be considered with regard to functional safety in a measuring and control application.

This standard divides the application types into Safety Integrity Levels SIL 1–4. The system must be designed to meet the safety level required.

For the EN 61 508 SIL 3 Safety Level, the SUPREMA must be operated with redundancy. Moreover, the system as well as the MRC-TS module must not be operated with a redundancy whose failure rate is more than $6.73 * 10^{-6}$ 1/h.

For operation according to SIL 4, additional conditions must be met which are not planned for the SUPREMA for the time being.

By retrofitting modules, a non-redundant rack system can be converted to a redundant system. There are sufficient spare slots in the rack for the additional MGO modules but not for additional relay modules, (MTO, MRC).

The following module types are needed for retrofitting:

MCP Module	Central Processing
MDA Module	Data Acqusition
MAR Module	Analog Redundant
MGO Module	General Output
MRO-8 Module	Relay Output (8 Relay)
MRO-16 Module	Relay Output (2 x 8 Relay, redundant)

By adding the MCP Module, operation of a second CAN bus for data acquisition and alarming as well as the necessary double modules for data acquisisiton and alarming, the non-redundant system can be converted to a redundant system.

10.2 Function of Redundant Systems

The circuit diagram of the redundant system shows its design and function: The signal from the sensors connected to the MAT modules is amplified by the sensor modules (MCI, MPI) to give a voltage of approx. 400 ... 2000 mV. By 2 separate A/D converters (on MAI + MAR), the measuring signal is digitised and transferred to the two processing channels A and B by passing it through the MDA modules (A + B) to the separate CAN Bus systems (channels). The signal processing and evaluation of one channel is carried out independently from the other. The Table 1-1 “Modules of the Rack” shows the different components of the rack for a non-redundant and a redundant system.

Module Functions

MDA Module	= Measuring Signal Input
MCP Module	= Measuring Signal Evaluation
MGO Module	= Alarm Output
MAI Module	= Analog Input (ADW 1)
MAR Module	= Analog Redundant (ADW 2)

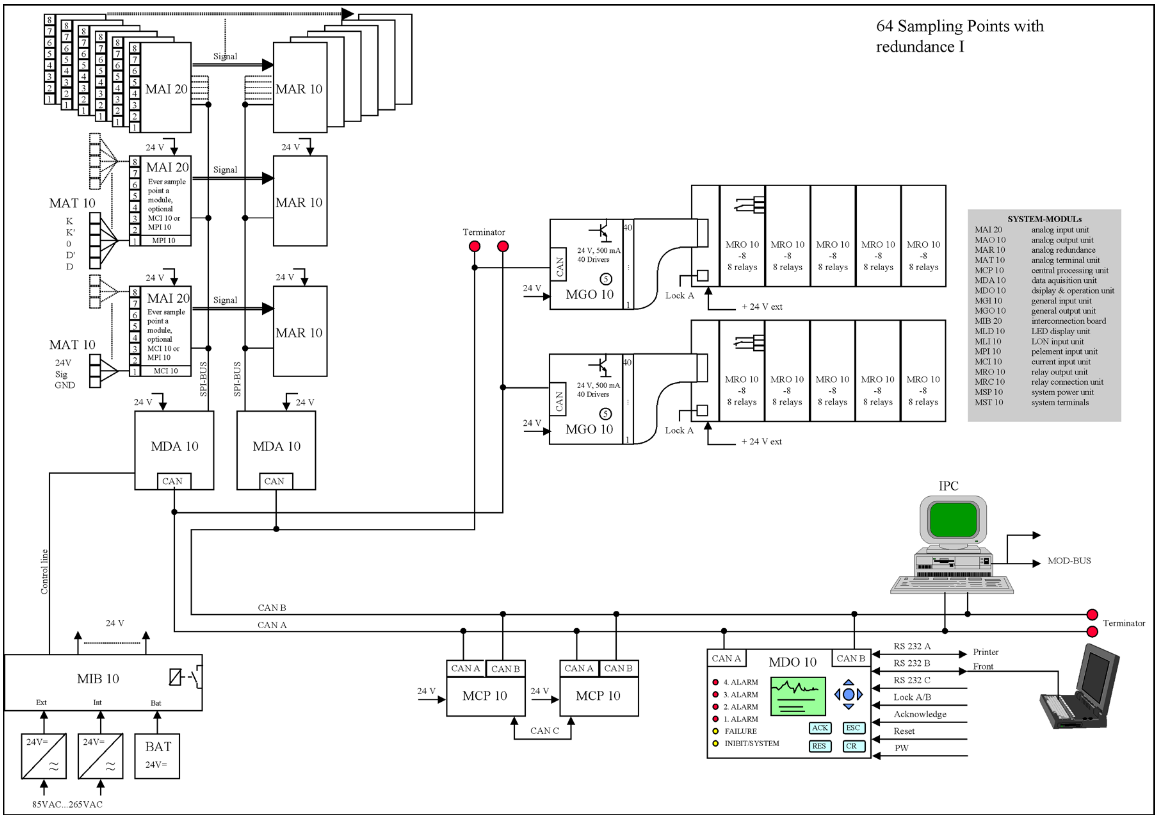


Figure 10-1: Circuit Diagram Rack System (redundant)

10.3 Design of the Redundant System

10.3.1 Components of the Rack

In the non-redundant version, the system is consists of only one channel (channel A). By retrofitting modules for channel B, the system can be designed to be redundant in one rack for up to 64 measuring points.

Attention: Retrofitting necessary modules for redundant design must only be carried out voltage-free, i.e. the whole SUPREMA system must be switched off. The following new startup must be carried out with consideration of the necessary configuration and parameter setting steps.

Note: When retrofitting, the Regulations for Handling Electrostatic Sensitive Components must be followed!

Slot	Name	Non redundant (Channel A)	Redundant (Channel B)
1	MCP1	MCP + MDO	MCP + MDO
2	MCP 2		MCP
3	MCP 3		
4	MDA 1	MDA	MDA
5	MDA 2		MDA
6	SLOT 6/POS 1	MAI	MAI + MAR
7	SLOT 7/POS 2	MAI	MAI + MAR
8	SLOT 8/POS 3	MAI	MAI + MAR
9	SLOT 9/POS 4	MAI	MAI + MAR
10	SLOT 10/POS 5	MAI	MAI + MAR
11	SLOT 11/POS 6	MAI	MAI + MAR
12	SLOT 12/POS 7	MAI	MAI + MAR
13	SLOT 13/POS 8	MAI	MAI + MAR
14	SLOT 14/POS 9	MGO	MGO
15	SLOT 15/POS 10		MGO

Table 10-1: Modules of the Rack

By adding further racks (8 max. per system) and the appropriate modules, the system can be extended up to 256 measuring points with up to 512 outputs.

- The MAR modules are plugged into the MAI modules.
- The MGO modules: configuration is by plug-in jumpers for CAN A or CAN B
- The same number of MGO modules at CAN A and CAN B
- Connection of 2 gateways at CAN A and CAN B (MOD Bus, Profi bus)

10.3.2 Installation of the MAR Module

This module is used for redundant evaluation of the input signals together with a second, redundant MDA module.

It is plugged on the MAI module. The analog ouput signals of the MPI module or MCI module are digitised in parallel to the MAI module by a 12 bit ADC, and are transferred to the second MDA module via its own SPI Bus.

Here, the function is identical to the MAI module.

For connecting the MAR module, the MAI module has to be unplugged from the rack which must be voltage-free. For every MAI module, a MAR module is necessary.

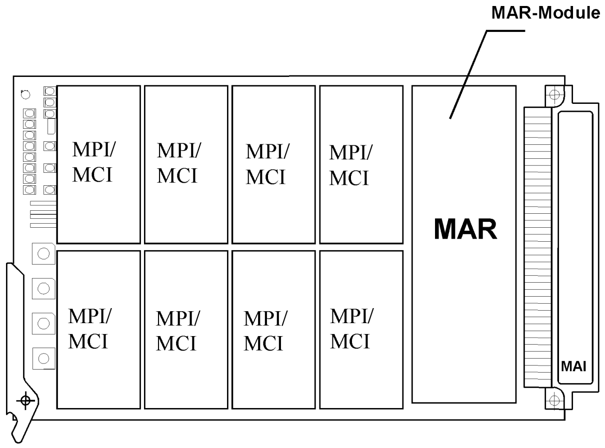


Figure 10-2: MAI Module with MAR Module

10.3.3 Installation of MCP and MDA Module

The second MCP module must be plugged into rack position Slot 2, and the second MDA module into rack position Slot 5.

Before plugging the modules, the SUPREMA system must be voltage-free.

These modules are normally operated as CAN B, a hardware configuration is not necessary.

10.3.4 Output Drivers/Relay Ouputs

The MGO modules provide switching outputs (24V DC / 300 mA, short-circuit safe and overload safe) for control of information and alarms (LEDs, relays, solenoid valves etc.). In redundant systems, both channels must have the same number of MGO modules connected.

If relays are needed instead of the driver outputs, because a separation of potentials is required or other voltages have to be switched, the relay modules **MRO-8-TS** or **MRO-16-TS** may be used. Both modules are suitable for “G” or Top Hat type DIN rail mounting and provide 8 relay ouputs per module in a compact design. The MRO-8-TS module has 1 changeover contact per relay. Connection to the relay contacts is via screw terminals.

The use of MRO-16-TS modules permits the redundant lay out of the following wiring and control of actuating and notice elements.

At use of MRO-8-TS modules only the non-redundant control of actuating and notice elements is possible.

Attention: The lay-out of the circuit connected to the MRO-8-TS resp. MRO-16-TS modules depends on the requirements of the respective application. It is completely up to the user´s responsibility to observe the valid standards and guidelines.

Note: The MRO-16-TS Modules do not have changeover contacts. The working contacts of the redundant relays are connected in series. (1 or 2 contacts open = alarm). Two terminal blocks with screw terminals are used to connect to the relay contacts.

10.3.5 Installation MGO Module

Before plugging in modules, the SUPREMA system must be voltage-free.

The module must be configured via jumper plugs for the CAN B bus.

CAN-A	**BR11 + BR13 = CLOSED**	**&**	**BR12 + BR14 = OPEN**
CAN-B	**BR11 + BR13 = OPEN**	**&**	**BR12 + BR14 = CLOSED**

10.3.6 Connection MRO10-8-TS Module

On redundant systems, the outputs of 2 MGO modules must always be connected (channel A + B).

The 40 driver outputs of the MGO modules are connected to the MRC-TS modules of Plug A using a 40-way ribbon cable via MUT modules at the rear of the rack. Plug B is only used if MRO-16-TS Modules are connected. Using a 20-way ribbon cable each of the plugs 1–5 are connected to the 8 driver outputs of the MGO module to up to 5 MRO-8-TS modules.

Connection MRO-8-TS Module Redundant

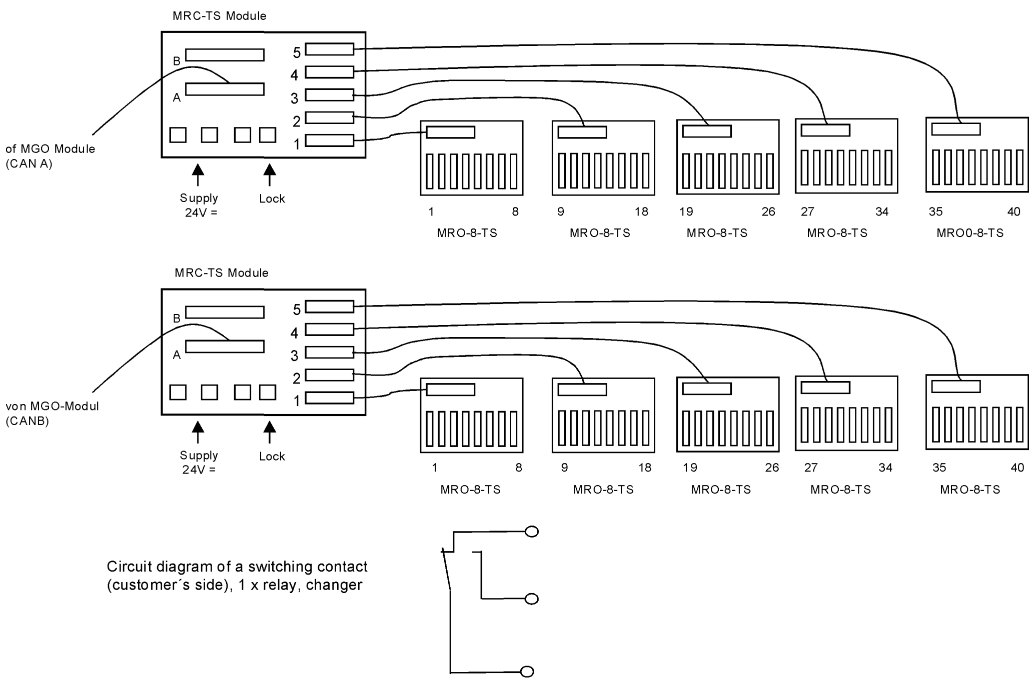


Figure 10-3: Connection MRO-8-TS Redundant Module

The terminal connections and the relay assignment of the MRO-8-TS module are described in detail in section 5.7.2 Additional Relay Outputs.

10.3.7 Connection MRO-16-TS Module

If the system is redundant, the outputs of 2 MGO modules must always be evaluated (channel A + B). The connection of up to 5 MRO-16-TS modules (40 outputs) is achieved via 1 MRC-TS module. Using 20-way ribbon cables, each of the plugs, 1–5, are connected via the 8 driver outputs (channel A + B) of the MGO modules to up to 5 MRO-16-TS modules.

The 40 driver outputs of the MGO module of channel A are connected to the MRC-TS modules at Plug A using a 40-way ribbon cable via the appropriate MUT module at the rear of the rack.

The 40 driver outputs of the MGO module of channel B are connected to the MRC-TS modules at Plug B using a 40-way ribbon cable via the appropriate MUT module at the rear of the rack.

Connection MRO-16-TS Module Redundant

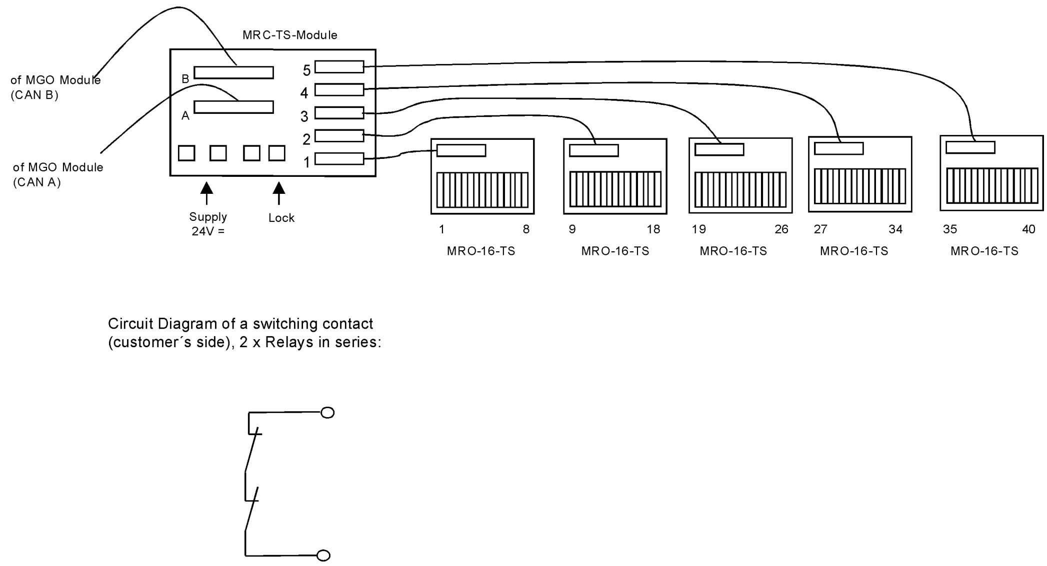


Figure 10-4: Connection MRO-16-TS Module

Connection Terminals	Relays	Function at Position 1, (first relay block)
1-2	1, 9	1st Alarm
3-4	2, 1	2nd Alarm
5-6	3, 11	3rd Alarm
7-8	4, 12	4th Alarm
9-10	5, 13	Failure measuring value
11-12	6, 14	Horn
13-14	7, 15	Inhibit
15-16	8, 16	Failure Power

Table 10-2: Terminal Connections MRO-16-TS Module

Relays specified are connected in series to effect hardware redundancy. The relays 1–8 are selected by CAN A (MCP A), the relays 9–18 by CAN B (MCP B).

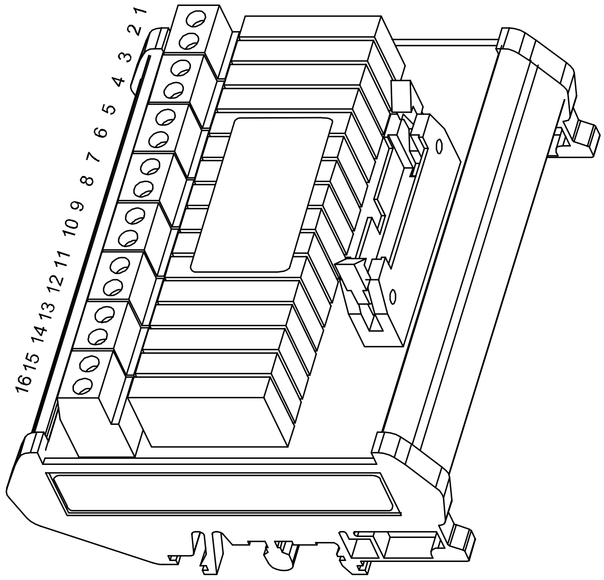


Figure 10-5: MRO-16-TS Module

10.3.8 MAO Module

The MAO module is not made with redundancy, therefore retrofitting of MAO modules is not necessary.

As standard, it is supplied configured via solder jumpers for the CAN A.

10.4 Startup

The data stored in every MCP and MDO module contains information on system configuration, i.e. the modules used, supply voltages, measuring points and alarm outputs.

Also included is the measuring point parameters (sensor type, calibration etc.) and switching output parameters (switching direction etc.) stored in additional maps in every MCP and MDO module.

After connecting the modules, the configuration stored in the SUPREMA memory has to be updated according to the system status.

If the configuration listing does not correspond to the system status, “SYSTEM FAILURE“ will be issued after startup.

10.4.1 Setting the System Configuration

Parameter Setting after Retrofitting

If a non-redundant system has been made redundant by retrofitting more modules, the configuration and parameter setting is automatically transferred to the retrofitted MCP module. The assumption is that only one MCP/MDO module has been retrofitted. There will be no message concerning system configuration (see figure 10-7 System Configuration Message).

This message will only appear if all three MCP/MDO modules has different configurations. In this case, the system configuration message will appear, and the module has to be selected from which the valid configuration is to be copied. After a new startup, this selected configuration will be copied over to the other modules.

If the configuration is to be taken from the retrofitted module, the RESET button must be pressed for approx. 1 sec. during warm-up. The system configuration message appears after the warm-up period, so that the configuration can be taken from this module.

- Switch off system, connect all additional modules
- Switch on system (new startup)

During the warm-up period, the following message appears on the front panel display (MDO Module):

AUER-SUPREMA-MDO-XX
Rev. xxxxxxx HW xxx

Figure 10-6: Startup Message

Note: As of version 1.02.07, automatic reading-in of the configuration is no longer possible. The configuration must always be generated and transferred manually.

During this message, the RESET button has to be pressed for approx. 1 sec. After segment test of the display, the following message appears:

System configuration
There are several possible system configu-
rations available, please select the
configuration to be used
Module ID Configuration name

[OK]

Figure 10-7: System Configuration Message

By pressing the cursor keys, the operator can select the MCP card which contains the valid system configuration. By pressing the OK button, the configuration selected will be copied to the other MCP modules and to the MDO.

Attention: When selecting “recognised parameters deleted” the measuring point parameters are completely deleted, and a new configuration is generated automatically by reading the system configuration. I.e. all measuring point parameters must be entered once more.

After this, the system has to be started up once more by switching off and on. During the warm-up period of the system, the current hardware configuration is compared with the configuration listing stored. If there are differences, a system failure message will appear.

In the case of retrofitting, a new configuration of the system is not necessary.

10.4.2 Configuration in the Case of New Installation

Generating and Transferring a Configuration File

Connect PC/LAPTOP

- Start the Configurator
- Generate the configuration listing according to the hardware equipment
- Copy the file CONFIG.MDB >> NAME.MDB
- Edit the NAME.MDB data base
- Transfer the configuration listing (NAME.MDB) to the system.

  After the program message “Transmission successful”, the configuration listing has been stored, and the configuration is finished. After this, the system has to be started up once more by switching off and on.

Note: Generating a configuration file is described in detail in section 10.4.3 Configuration Tool.

Automatic Generation of the Configuration File

- Make a new startup (System OFF/ON)

During warm-up period, the following message appears on the display of the front panel (MDO Module):

AUER-SUPREMA-MDO-XX
Rev. xxxxxxx HW xxx

During this message, the RESET button has to be pressed for approx. 1 sec. After segment test of the display, the following message appears:

System configuration
There are several possible system configu-
rations available, please select the
configuration to be used
Module ID Configuration name

[OK]

When selecting “recognised parameters deleted”, the measuring point parameters are completely deleted, and a new configuration is generated automatically by reading the system configuration.

Note: By the automatic reading, existing parameters are deleted.

10.4.3 Configuration Tool

Generally

For the configuration tool, the following is needed:

- The transfer program “SUPREMA_Configuration.exe”
- The database “config.mdb”
- Microsoft Database Program Access 97

The data base “config.mdb” can be copied to another name. But the extension must also be “.mdb“. The data base structure must not be changed.

The transfer program serves as a data transfer between the SUPREMA system and the configuration database.

Configuration

The configuration is manipulated with the help of the Microsoft Database Program Access 97.

The database (e.g. config.mdb) contains the following listings which specify the SUPREMA System:

- digital output map
- measuring point map
- module configuration
- module types
- power supplies

View of the database:

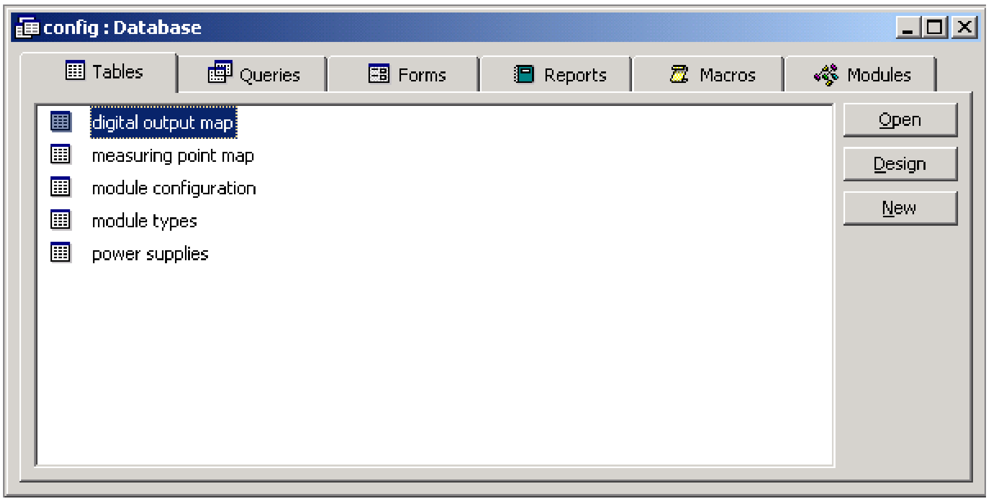


Figure 10-8: Access 97 Database “config.mdb”

Digital Outputs

In this listing, the possible LOGICAL outputs (0–511) are assigned to the – by MGO cards inserted – PHYSICAL outputs (1–512). Basically, the assignment in this map can be arbitrary. We recommend the standard assignment (see figure 10-9 Digital Output Map Listing) to avoid problems on system configuration/test.

Channel Number

In this column, the numbers of possible physical outputs (0–519) are listed. Up to 13 MGO cards each with 40 outputs (13 x 40 = 520) can be connected to the system (Rack 1 to Rack 8). The outputs 1–512 (Numbering 0–511 in the listing) can be used for configuration.

Digital Output Number

The “logical” numbers are entered which are selected as “Digital Output” on the parameter setting. The output numbers may be assigned freely. . We recommend the standard assignment (see figure 10-10 Measuring Point Map Listing) to avoid problems on configuration.

The number of digital outputs depends on the components of the MGO-10 modules and must always correspond (40 outputs/MGO max.).

Example:

SUPREMA System with a MGO-10 module has to be configured with 24 outputs.

View of the “digital output map” listing:

channel number	digital output number
0	1
1	2
2	3
3	4
4	5
5	6
6	7
7	8
8	9
9	10
10	11
11	12
12	13
13	14
14	15
15	16
16	17
17	18
18	19
19	20
20	21
21	22
22	23
23	24
24	0
25	0
26	0
27	0

Figure 10-9: “Digital output map” listing

All digital outputs which are not needed are set to “0” (Zero) in the field “Digital Output Number”.

Measuring Points

By means of the listing, the measuring points are configured. A maximum of 256 measuring points max. can be configured, which can be distributed over 8 racks.

Channel Number

In this column, the numbers of the possible physical measuring points (0–255) are listed. Up to 32 MAI cards each with 8 inputs (32 x 8 = 256) can be connected (rack 1 to rack 8). Rack 1 has the numbers of the physical measuring points 0 to 63.

Measuring Point Number

Here, the “logical” measuring point numbers are entered which are selected as “measuring point” in the parameter setting. The measuring point numbers may be assigned freely. To avoid configuration problems, standard numbering is recommended (see figure 6-3). For rack 1, the measuring point numbers 1–64 are provided as standard.

Example:

Only measuring points 9–16 and 25–26 shall be operated. In this case, the following listing is generated:

View of the “measuring point map” listing:

channel number	measuring point number
0	0
1	0
2	0
3	0
4	0
5	0
6	0
7	0
8	9
9	10
10	11
11	12
12	13
13	14
14	15
15	16
16	0
17	0
18	0
19	0
20	0
21	0
22	0
23	0
24	25
25	26
26	27
27	28
28	29

Figure 10-10: “Measuring point map” listing

All measuring points which are not needed are set to “0” (Zero) in the field “Digital Output Number”.

<u>Modules</u>

By means of this listing, the modules are assigned to the rack slot positions.

MAI modules need not be configured.

In the column “node id”, the slot number is entered, where the module specified under “module type” has been plugged.

In the columns “CAN-A/CAN-B”, the function is selected accordingly.

The MDO is aaigned to slot number 16 for the 1st rack and is defined as CAN-B.

For further racks, the “node id” is increased by 16, according to the rack number. e.g. for Rack 2, the first MCP has the node ID 17 for Rack 3, the first MCP has the node ID 33, etc.

Listing of Node ID of the Racks:

	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot6	Slot 7	Slot 8	Slot 9	Slot10	Slot11	Slot12	Slot13	Slot14	Slot15	
	1.MCP	2.MCP	3.MCP	1.MDA	2.MDA	X	X	X	X	X	X	X	X	X	X	MDO
1st Rack	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
2nd Rack	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
3rd Rack	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
4th Rack	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
5th Rack	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
6th Rack	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
7th Rack	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112
8th Rack	113	114	115	116	117	118	119	120	121	122	123	*	*	126	127	128

Table 10-3: Listing of Node ID

X = MGO or MAO
*MOD-BUS Gateway (PKV 30) or Profibus DP Gateway have addresses 124 or 125, according to the setting at the gateway.

Attention: At these addresses, no modules must then be connected in the 8th rack.

View of the “module configuration” listing:

	node id	module type	CAN a	CAN b
	1	MCP-10	☑	☐
	2	MCP-10	☐	☑
	4	MDA-10	☑	☐
	5	MDA-10	☐	☑
	14	MGO-10	☑	☐
	15	MGO-10	☐	☑
	16	MDO-10	☐	☑
▶			☐	☐

Figure 10-11: “Module configuration” listing

For the modules, only CAN A or CAN B may be marked.

<u>Module Types</u>

This listing is only for information about which modules can be integrated into the system.

View of the “module types” listing:

module type
MAO-10
MCP-10
MDA-10
MDO-10
MGO-10
PKV-30

Figure 10-12: “Module types” listing

<u>Voltage supplies</u>

The voltage supplies used are entered by ticking the relevant box.

View of the “power supplies” listing

rack number	internal	external	battery
1	☐	☑	☐
	☐	☐	☐

Figure 10-13: “Power supplies” listing

Transfer program SUPREMA_Configuration.exe

The transfer program serves as data transfer between the SUPREMA system and a configuration database.

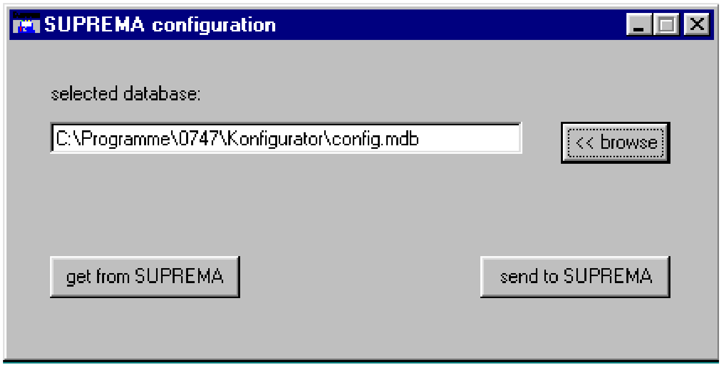


Figure 10-14: Transfer program “SUPREMA_Configuration.exe”

<u>Selection of a configuration database</u>

First, the user has to choose a configuration database. This is made either by direct input of path and file name in the text field provided, or by means of the “browse” button. The actions described below refer to this database.

<u>Getting configuration data from a SUPREMA System</u>

By clicking the button “get from SUPREMA”, the configuration data of the SUPREMA system connected is transferred to the PC and stored in the selected database. All data which was stored before is overwritten by this action.

When this process has been complted without failures, the message “transmission successful” appears.

If there is a message “transmission failed”, the data stored is probably incomplete or faulty. Possible failure causes are:

- The transfer line between PC and SUPREMA is defective.
- The configuration database selected is faulty.

After an automatic configuration, the input of the supply voltage is missing and has to be completed manually in the resulting listing. After transfer of this configuration database to the SUPREMA, this failure will not occur any more.

Sending configuration data to a SUPREMA System

By clicking on the button “send to SUPREMA”, the configuration data stored in the database selected is transferred to the SUPREMA system connected.

The transfer process has been successful if the “transmission successful” message appears and the SYSTEM FAIL LED at the SUPREMA has not been set.

After the transfer procedure, a new startup of the system will be necessary, otherwise, the configuration data transferred will not work.

The configuration data transferred is checked for validity by the SUPREMA system. This validity check has been restricted to a few basic items. It cannot check whether a configuration is completely correct.

If the “failed in putting together the configuration data” message is shown, there is a failure in the configuration database. In this case, no data have been transferred to the SUPREMA system.

Possible failure causes are:

- A listing contains too little or no record at all.
- A listing contains an incomplete record.
- The database name is longer than 20 characters (not including the file extension).

If the “transmission failed” message is shown, a failure of the data transfer to the SUPREMA system has been occurred. The configuration of the SUPREMA system is probably incomplete and faulty.

Possible failure causes are:

- The transfer line between PC and SUPREMA system is defective.
- The SUPREMA system did not recognise the configuration data as valid.

Via the RS 232 diagnosis/service connection, failure information can be read during transfer by a terminal program.

10.4.4 Function Check

After configuration and parameter setting of the system, a functional check must be carried out:

Start of System

By switching OFF/ON the system, a new startup is effected. During startup, several internal system checks are carried out. A system which is working failure-free will show the following settings after startup:

Front Panel Display

1.LED SYSTEM POWER	ON
2. LED SYSTEM FAIL	OFF
3. LED SYSTEM INHIBIT	OFF
4. LED SIGNAL 1 AL	OFF
5. LED SIGNAL 2 AL	OFF
6. LED SIGNAL 3 AL	OFF
7. LED SIGNAL 4 AL	OFF
8. LED SIGNAL FAIL	OFF
9. LCD Display	Display Listing

Displays of the Module Cards

All CAN-BUS Module cards have the following LED displays:

LED	Function	Required
LED 1 GN	EXT = ON	OFF
LED 2 GN	INT = ON	ON*
LED 3 GN	BAT = ON	OFF
LED 4 RT	CAN-BUS Failure	OFF
LED 5 GN	CAN-BUS in Operation	ON

*= Rack operation via INT terminals

Displays of the MAI Modules

LED	Function	Required
LED 1-8	MS 1-8 = ON	OFF
LED EXT	EXT = ON	OFF
LED INT	INT = ON	ON*
LED BAT	BAT = ON	OFF
LED IBR	IBR ON SOCKETS	OFF
LED ZER	UY ON SOCKETS	OFF
LED SIG	UA ON SOCKETS	OFF
LED of connector strip	Signal Request	FLASHING

*= Rack operation via INT terminals

Check of the Signal Processing/Alarming

After a successful startup and setting of the system parameters, a functional check must be carried out:

- By application of test gas, alarms should to be initiated.
- Test of the switching output functions according to the relay configuration.

11. Technical Data

11.1 System Data

Racks per system:		1–8
Number of inputs	- per system:	1–256
	- per rack;	up to 64
Switching outputs/relay outputs:		0–512, 240 VAC, 3 A, resistive
Analog outputs 0 - 20 mA:		0–256
Operation and Display:		240 x 64 pixel graphics display cursor keyboard function keys
Interfaces:		3 x RS232: - PC operation - printer - free 2 x CAN-Bus
System operating voltage:		19.2 V ... 32 VDC
System power supply (3x rendundancy):		3 x 24 VDC
Rack power supply,150 W:		85 ... 265 VAC, 47 ... 63 Hz; 120 ... 330 VDC
- output voltage, rack power supply:		24 VDC
- output current, rack power supply:		6.5 A

System power supply limits to be observed:

- maximum allowable operating current feed (+24 V):	20 A
- maximum rack load current of all MAI cards (+24 V):	10 A
- maximum rack load current of all MGO cards (GND):	12 A

Connectable sensors:	- active	4 ... 20 mA, 2-wire
	- active	4 ... 20 mA, 3-wire
	- active	4 ... 20 mA, 4-wire
	- passive	3-wire
	- passive	5-wire
	- passive	4-wire (semiconductor sensors)
Housing:	19” rack, 3HE	

Storage temperature for all parts of the system: -25 °C ... +55 °C
Operating temperature 40 °C max.
Pollution degree 2
Installation category II
Altitude 2000 meters max.

11.2 Module Data

11.2.1 MCP 10 Central Processing Unit

Order No.: 10022752
Function

- Monitoring and control of all system functions, signal evaluation for up to 256 sampling points
- actuation of up to 512 relay driver outputs
- parameter storage

Technical Data

Operating voltage feed (3 x 24 VDC):	14 ... 32 VDC
Operating current:	75 mA
Temperature range:	5 °C ... 40 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Plug connector: (pre-mating contacts for power supply)	96-channel VG terminal strip
Dimensions:	100 x 160 mm
Weight:	120 g

11.2.2 MDA 10 Data Acquisition Unit

Order No.: 10022688
Function

- reads in the measurement values from the MAI10 module, processes the measurement signals, calculates mean values
- monitors 2 x power supply voltages, 1 x battery voltage

Technical Data

Operating voltage feed (3 x 24 VDC):	14 ... 32 VDC
Operating current:	95 mA
Temperature range:	5 °C ... 40 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Plug connector: (pre-mating contacts for power supply)	96-channel VG terminal strip
Dimensions:	100 x 160 mm
Weight:	108 g

11.2.3 MDO 10 Display + Operation Unit

Order No.: 10022686
Function

- 240 x 64 pixel backlit graphics display
- system operation via cursor field

- individual function keys for horn acknowledgement and alarm reset
- plain-text messages for alarms and errors at the sampling points
- graphic display of alarm and error states (LED field)
- bar graphs of measurement values
- display of system status (common LEDs for alarms, errors)
- system clock (RTC), optional connection to a wireless clock
- 2 x RS 232 (RS 485 optional), electrically isolated (laptop/printer interface)

Technical Data

Operating voltage feed (3 x 24 VDC):	14 ... 32 VDC
Operating current:	
without backlighting:	100 mA
with backlighting:	200 mA
Temperature range:	5 °C ... 40 °C
Humidity:	0 ...90 % relative humidity noncondensing
Plug connector:	40-channel ribbon cable
Dimensions:	107.5 x 211 mm
Weight:	365 g

11.2.4 MGO 10 General Output Unit

Order No.: 10022750
Function

40 driver outputs for relays + LEDs (24 VDC/0.3 A)

Technical Data

Operating voltage feed (3 x 24 VDC):	14 ...32 V
Operating current logic:	50 mA
Total load current, switching outputs:	12 A
Nominal switching voltage:	24 VDC
Nominal switching current:	0.3 A
Maximum driver IC limit data (8 outputs per driver)	
- output current: (all outputs ON, per output)	500 mA
- output current: (1 output ON)	1 A
- total current of all outputs of one driver IC:	4 A
Temperature range:	5 °C ... 40 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Plug connector: (pre-mating contacts for power supply)	96-channel VG terminal strip
Dimensions:	100 x 160 mm
Weight:	115 g

11.2.5 MHD10-TS Modular High Driver

Order No.: 10038420

The MHD10 uses 10 IC drivers for driving 40 capacitive or inductive outputs (output 1–4, 5–8, 9–12, etc.). The drivers are over-temperature- and over-voltage-safe. The maximum power loss per driver is limited, the more outputs are active the less must be the current per output.

Technical Data

Relay driver supply INT, EXT, BAT :	19 ... 32 VDC
maximum input current(24V terminals):	12 A
No-signal current consumption (all outputs off):	95 mA at 24 V
Output current:	300 mA/output typical
Maximum current 1 output:	1 A
Maximum current 1 driver:	2 A (4 x 500 mA)
Maximum current all drivers:	12 A (40 x 300 mA)
Temperature range:	5 °C ... 40 °C
Humidity:	30 ... 90 % relative humidity noncondensing
Dimensions:	150 x 90 x 60 mm
Weight:	approx. 165 g

11.2.6 MAI 20 Analog Input Unit

Order No.: 10021051
Function

- module for holding the sensor modules (MCI, MPI, MFI, MSI)
- 12-bit ADC, 11 channels, measures signal voltage + output voltage (24 V)
- terminals on the MAT10 card (24 V, GND, signal)
- 3 status LEDs
- sensor monitoring (measurement signal (PLH/PLT), sensor current, remote measurement cable)
- data transmission to the MDA module via SPI bus

Technical Data

Operating voltage feed (3 x 24 VDC):	18.5 ... 32 VDC
Internal power draw:	typically 50 mA
Allowable total power draw: (with 8 sensor modules)	3 A, maximum
Temperature range:	5 °C ... 40 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Plug connector: (pre-mating contacts for power supply)	96-channel VG terminal strip
Dimensions:	100 x 160 mm
Weight:	95 g

11.2.7 MPI 10 WT100 Passiv Input Unit

Order No.: 10021028
Function

- power source for passive sensors (24 VDC)
- supply module for WT sensors
- sensor current, 100-400 mA
- prepares the Ux bridge signal

Technical Data

Operating voltage feed:	19.2 ... 32 V
Operating current:	460 mA, maximum
Maximum load: (at operating voltage of 19.2 V and sensor current of 400 mA)	36 ohms
Setting range, constant current:	180 ... 400 mA
Setting range, zero point:	± 130 mV (Ux)
Setting range, sensitivity:	4 ... 190 mV (Ux)
Temperature range:	5 °C ... 40 °C
Humidity:	0 ... 90% relative humidity noncondensing
Dimensions:	46 x 24 mm
Weight:	12 g

11.2.8 MPI 10 WT10 Passiv Input Unit

Order No.: 10024279
Function

- power source for passive sensors (24 VDC)
- supply module for WT sensors
- sensor current, 100 ... 400 mA (depending on components installed)
- prepares the Ux bridge signal

Technical Data

Operating voltage feed:	19.2 ...32 V
Operating current:	460 mA, maximum
Maximum load: (at operating voltage of 19.2 V and sensor current of 400 mA)	28 ohms
Setting range, constant current:	180 ... 400 mA
Setting range, zero point:	± 50 mV (Ux)
Setting range, sensitivity:	5 ...27 mV (Ux)
Temperature range:	5 °C ... 40 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	46 x 24 mm
Weight:	12 g

11.2.9 MPI 10 HL8101 Passiv Input Unit

Order No.: 10024276
Function

- power source for passive sensors (24 VDC)
- supply module for HL sensors
- sensor current, 100 ...400 mA
- prepares the Ux bridge signal

Technical Data

Operating voltage feed:	19.2 ... 32 V
Operating current:	240 mA, maximum
Maximum load: (at operating voltage of 19.2 V and sensor current of 210 mA)	36 ohms
Setting range, constant current:	100 ... 230 mA
Setting range, zero point:	820 ohms ± 50 ohms (semiconductor resistor)
Setting range, sensitivity:	24 ... 1100 mV
Temperature range:	5 °C ... 40 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	46 x 24 mm
Weight:	12 g

11.2.10 MPI 10 HL8113 Passiv Input Unit

Order No.: 10024280
Function

- power source for passive sensors (24 VDC)
- supply module for HL sensors
- sensor current, 100 ... 400 mA
- prepares the Ux bridge signal

Technical Data

Operating voltage feed:	19.2 ... 32 V
Operating current:	240 mA, maximum
Maximum load: (at operating voltage of 19.2 V and sensor current of 210 mA)	36 ohms
Setting range, constant current:	100 ... 230 mA
Setting range, zero point:	10 Kohms ± 1 K
Setting range, sensitivity:	24 ... 1100 mV
Temperature range:	5 °C ... 40 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	46 x 24 mm
Weight:	12 g

11.2.11 MCI 10/MCI 20/MCI 20 BFE Current Input Unit

Order No. MCI 20: 10043997
Order No. MCI 20 BFE: 10044020
Function

- current/voltage source for active 4 ... 20 mA sensors (24 VDC)
- maximum current load for sensor supply ≤ 400 mA
- current limitation for sensor power supply (0.7 ... 2A)
- voltage output short circuit-resistant
- current limitation for 4-20 mA signal input (30 mA)
- multiplier resistor, 100 ohms (4 ... 20 mA = 0.4 ... 2.00 V)
- signal input options MCI 10: 4 ... 20 mA/contact/0 ... 24 V/0 ... 100 mV
- signal input options MCI 20: 4 ... 20 mA

Technical Data

Operating voltage feed:	18.5 ... 32 V
Operating current:	1 mA
Current input (current limitation):	0 ... 30 mA
Contact input:	0 ... 27.5 V
0 ... 100 mV signal voltage input:	0 ... 112 mV
0 ... 24 V input:	0 ... 27.5 V
Temperature range:	5 °C ... 40 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	46 x 24 mm
Weight:	7 g

11.2.12 MRO 10-8 Relais Output Unit

Order No.: 10018946
Function

- relay module, installed on rear of rack
- 8 relays for common alarms, 1st-4th alarms, error, horn, inhibit, power
- actuated by the MGO module
- relays locked via the MST module (LOCR)
- switching status display (green LED, made = ON)

Technical Data

Relay operating voltage:	24 VDC
Relay operating current:	7 mA
Contact type:	change-over contact
Contact load capacity:	see relay contact data
Temperature range:	5 °C ... 40 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	125 x 69 mm
Weight:	142 g

11.2.13 MRC 10-TS Relais Connector

Order No.: 10021676
Function

- connection module for 5 MRO-8-TS/MRO-16-TS modules
- divides 2 x 40-channel MGO ribbon cables over 5 x 20-channel MRO ribbon cables
- connections for EXT, INT, and BAT relay power supplies
- connection for relay locking

Technical Data

Relay operating voltage: (INT, EXT, BAT)	19 ... 32 VDC
Relay operating current:	7 mA
Relay operating current 5 x MRO8-TS:	280 mA
Relay operating current 5 x MRO16-TS:	560 mA
Temperature range:	5 °C ... 40 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	90 x 153 x 65 mm
Weight:	180 g

11.2.14 MRO 10-8-TS Relais Output Unit (Rail-Mount Installation)

Order No.: 10021674
Function

- relay module, installed on mounting rail
- actuated by the MGO module
- relays locked via the MRC-TS module (LOCK)
- switching status display (green LED, made = ON)

Technical Data

Relay operating voltage:	19 ... 32 VDC
Relay operating current:	7 mA
Contact type:	change-over contact
Contact load capacity:	see relay contact data
Temperature range:	5 °C ... 40 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	90 x 71 x 68 mm
Weight:	160 g

11.2.15 MRO 10-16-TS Redundant Relais Output Unit (Rail-Mount Installation)

Order No.: 10021430
Function

- relay module, installed on mounting rail
- actuated by 2 MGO modules
- relays locked via the MRC module (LOCK)
- switching status display (green LED, made = ON)
- series connection of 2 contacts
- connection across 2 terminals
- contacts closed = status good

Technical Data

Relay operating voltage:	19 ... 32 VDC
Relay operating current:	7 mA
Contact type:	normally open
Contact load capacity:	see relay contact data
Temperature range:	5 °C ... 40 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	90 x 103 x 65 mm
Weight:	201 g

11.2.16 Relay Contact Data

Maximum switching voltage:	400 VAC 300 VDC
Nominal current:	3 A
Maximum switching power:	
- a.c. voltage:	1500 VA
- d.c. voltage	24 VDC/3 A
(from load limit curve)	50 VDC/0.3 A
	100 VDC/0.1 A

11.2.17 MAO 10 Analog Output Unit

Order No.: 10021050
Function

- 4 ... 20 mA output driver, measurement signal outputs
- optionally with electrically isolated outputs
- data transmission via the CAN bus

Technical Data

Operating voltage feed:	19.2 ... 32 V
Operating current:	150 mA (maximum)
Temperature range:	5 °C ... 40 °C

Humidity:	0 ... 90 % relative humidity noncondensing
Maximum load:	500 ohms
Output current 4 ... 20 mA:	0 ... 24 mA
Dimensions:	100 x 160 mm
Weight:	127 g

11.2.18 MIB 20 Interconnection Board

Order No.: 10032525
Function

- rack rear-panel wiring for 3 x MCP, 2 x MDA, 8 x MAI, 2 x MGO modules
- power supply for all modules (INT, EXT, BAT)
- connection for 3 x 24 VDC feed, screw terminals
- provides uninterruptible 24-V-system power
- data transfer between the modules over a CAN or SPI bus
- 2 system error relay, 1 change-over contact, 3 connecting terminals
- DII switch for CAN rack ID, CAN bit rate, CAN bus terminating resistor
- 7 “dedicated” slots for 3 x MCP, 2 x MDA, and 2 x MDO modules
- 7 “free” slots for MAI, MPI, MLI, MBI, MGO, and MGI modules
- electric connection for the inserted modules
- connection modules (MST, MAT, etc.) are plugged into the rear of the MIB

Technical Data

Operating voltage feed:		19.2 ... 32 V
Maximum allowable operating current:		
	feed (+24 v)	20 A
	(GND):	32 A
Feed connector cross section:		4 mm², flexible 6 mm², rigid
Power supply terminals:		EXT, INT, BAT
Setting elements: (rack no., CAN bit rate)		10-channel DIL switch
Contact load capacity, system error relay		3 A
Temperature range:		5 °C ... 40 °C
Weight:		0 ... 90 % relative humidity noncondensing
Abmessungen:		377 x 128 mm
Weight:		650 g

11.2.19 MAT 10 Analog Terminal Unit

Order No.: 10015759
Function

- connecting terminals for remote measuring heads

Technical Data

Number of measuring head connections:	8
Number of terminals per sampling point:	5
Allowable wire cross section	1,5 mm^2
Temperature range:	5 °C ... 40 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	125 x 50 mm
Weight:	155 g

11.2.20 MSP 10 System Power Unit

Order No.: 10020340
Function

- rack power supply, 150 VA

Technical Data

Operating voltage, feed:	85 ... 265 VAC
Maximum operating current:	2 $A_{(100\ VAC\ Input)}$; 1 $A_{(200\ VAC\ Input)}$
Maximum switch on current:	50 A at 230 V (cold start)
Power correction factor:	according to EN 61000-3-2
Interference emissions:	according to EN 55011/EN 55022-B
Output voltage:	24 VDC
Maximum output current:	6.5 A
Temperature range:	5 °C ... 40 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	65 x 92 x 198 mm
Weight:	850 g

11.2.21 MST 10 System Terminals

Order No.: 10020133
Function

- connection module for system expansions
- installation at rear of rack
- connection ports: CAN A, CAN B, RS 232 (IPC), RS 232 (printer)
- alarm reset, horn reset

Technical Data

Allowable wire cross section:	1.5 mm^2
Temperature range:	5 °C ... 40 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	125 x 76 mm
Weight:	102 g

11.2.22 MF 110 (Fire Input Unit)*

Order No.: 10046265
Function

- Power supply for up to 20 fire detectors
- Evaluate status of the switches
- Conductor control
- Connection of zener barrier or current separator optional
- Operation with an external power supply is optional.
- Earth current fault monitor
- Output for earth current fault

Technical Data

Internal supply voltage:	19.2 ... 32 V
External supply voltage:	23 ... 32 V
External battery reverse polarity protection:	Yes
Operating current:	max. 47 mA
Output voltage:	max. 22 V
Output current:	max. 42 mA
Temperature range:	5 °C ... 40 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	46 x 24 mm
Weight:	10 g

* With regard to fire and smoke detection, the SUPREMA has not been evaluated to any Canadian standard by a third party agency.

11.2.23 MSI 10 (Switch Input Unit)

Order No.: 10048285
Function

- Power supply for external switches
- Evaluate status of the switches
- The operation with an external power supply is optional.

Technical Data

Internal supply voltage:	19.2 ... 32 V
External supply voltage:	19.2 ... 32 V
External battery reverse polarity protection:	Yes
Operating current:	max. 30 mA
Output voltage:	max. 15 V
Output current:	max. 8 mA
Temperature range:	5 °C ... 40 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	46 x 24 mm
Weight:	8 g

11.2.24 MAT-TS 320 Flammable/Toxic Adapter

Order No. Flammable: 10049234
Order No. Toxic: 10049235
Function

- Terminal connectors for gas detectors

Technical Data

No. of measure gas detectors:	8
No. of terminals per gas detector:	Flammable: 3 Toxic: 2
Maximum wire cross section:	2,5 mm^2
Temperature range:	5 °C ... 40 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	155 x 90 x 60 mm
Weight:	200g

11.2.25 MAT-TS 330 Fire Input (Qatar Version)*

Order No.: 10049236
Function

- Terminals for fire detectors, push-button switches, smoke detectors

* With regard to fire and smoke detection, the SUPREMA has not been evaluated to any Canadian standard by a third party agency.

Technical Data

Number of fire detectors:	8
Number of terminals per fire detector:	2 Connection: 10-way ribbon cable
Reset input:	Connection for a normally open contact 10 mA maximum
Maximum wire cross section:	2.5 mm^2
Supply voltage INT EXT BAT:	19 ... 32 VDC
Maximum power consumption:	1 A

Outputs:

Earth fault :	Changeover Relay contact
Voltage control:	Changeover Relay contact (24DC electrically separated)
Temperature range:	5 °C ... 40 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	155 x 90 x 60 mm
Weight:	260 g

11.2.26 Dummy Relay

Order No.: 10052880
Function

Operating temperature range:	-20 °C ... 40 °C
Storage temperature range:	-20 °C ... 50 °C
Operating voltage:	18 ... 32 VDC
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	approx. 29 x 30 x 8 mm
Weight:	approx. 5 g

11.2.27 MAR Analog Redundant

Order No.: 10022152
Function

This module is used for the redundant processing of input signals. The measurement values are digitised in parallel with the MAI module by a 12-bit ADC and transferred to the second MDA (B). The function here is identical to that of the MAI module.
The supply and input signal take-over are provided by the MAI.
In redundant systems, a MAR module is required for every MAI module.

Temperature range:	5 °C ... 40 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	95 x 24 mm
Weight:	15 g

12. SUPREMA Sensor Data Sheets

The individual sensor connections are illustrated below. In addition, passive sensors are monitored by SUPREMA for open or short circuits and these failures are reported as shown. For active sensors, the input current signal is monitored, so that each failure is detected and reported by the SUPREMA system.

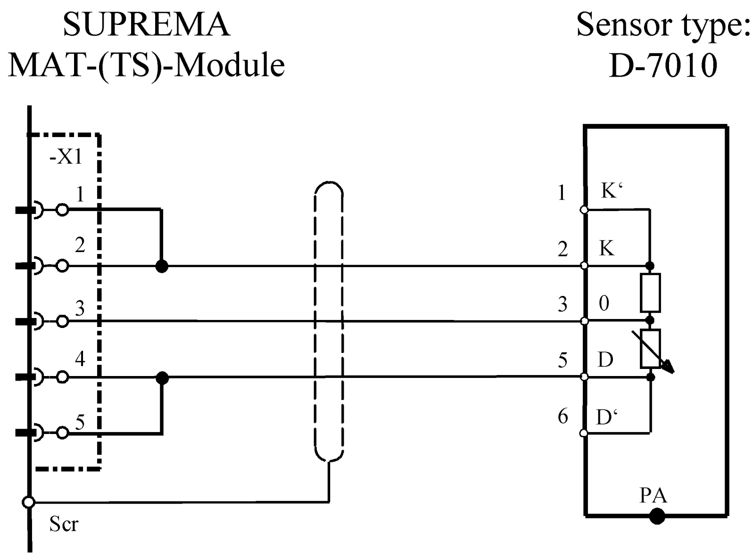
There are also lists containing details of the operating current, power requirement of the sensors, the maximum allowable cable lengths (maximum allowable cable resistance) and the screening. For further information on the sensors, please see the Operating and Maintenance Instructions for the individual sensor types.

Attention! For passive sensors, a 3-wire operation is conform to the requirements according EN 50054 to output resistance up to 1.7 Ohm per lead resp. up to 3.4 Ohm loop resistance. If the loop resistance exceed 3.4 Ohm the 5-wire Operation mode is recommended generally.

Attention! Only at use of the MCI 20-module with part no. 10043997 and 10044020 meets the requirements according to EN 50054 for active sensors at 3-wire operation.

12.1 SUPREMA Sensor Data Sheet D-7010 (3-wire)

Order No.: D0791601



The cable screen is connected at the SUPREMA and the D-7010. The sensor cable must be installed interruption-free (no terminal boxes, terminal distribution etc.).
The bridges -X1/1 -X1/2 and -X1/4 -X1/5 may alternatively be set as solder jumpers on the MAT10 and MAT10-TS Module.

Connection module: MPI 10/WT 10/passive/3-wire/Constand current/Presetting required

Sensor simulation module: WT 100 = catalytic combustion (Order No.: 10030263)

Attention! **Before connecting measuring head, reduce sensor current to minimum!**

Connection data:

Bridge current	270 mA/300 mA only for methane
Maximum nominal current	330 mA
Maximum nominal voltage	≤ 6.2 V
Power consumption	≤ 1.8 W (without cable length)
Cable type	3-core, 80 % screened
Maximum loop resistance	28 ohms
Maximum cable length	850 m (at 1.5 mm^2 cross section per wire)
Cable diameter	7 ... 14 mm, with connection Pg 21 up to17 mm
Cross section per wire allowed	0.75 ... 1.5 mm^2
Cable inlet	PG 13.5 (can be extended to Pg 21)

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 54/EN 60529
Explosion protection	II 2G EEx d e IIC T5/T6
Certificate	DMT 98 ATEX E 016 X
Temperature	-20 °C to +40 °C (T6) / -20 °C to +55 °C (T5)
Humidity	5 ... 95 % rel. humidity; noncondensing

Pressure	950 ... 1100 hPa
Weight	approx. 1.24 kg
Dimensions W x D x H	150 mm x 88 mm x 158 mm
Housing material	Aluminium Die cast (polyester-coated)
For further details see operation manual. (Order No.:D0791150)	

Startup:	**Presetting required —> before first calibration**
Presetting:	Connect digital voltmeter to MAI card jacks. Bridge current setting —> 270 mA or 300 mA (for CH_4) Zero adjustment by zero gas —> Zero setting to **Ua = 400 ... 450 mV** Sensitivity adjustment with measuring gas —> Measuring range level **Ua = 1950 ... 2100 mV** or by means of the value of the existing gas concentration according to: **Ua (mV) = C / 100 * 1600 + 400** **C = Span gas concentration in % of measuring range**
Warm-up period:	≤ 120 s according to EN 50054, 15 min minutes for presetting, 2 hours for calibration
Function test:	Span gas application via: Integrated span gas inlet piece with 0,5 l/min, (for standard test gases) or test cap with 1,0 l/ min, (Order No.: D6079762) or splashwater-proof housing SG 70 with 1 l/min or pump adapter PA 70 with 1.0 l/ min
Calibration:	Calibration procedure according to SUPREMA operation manual For measuring components allowed, measuring ranges, lower alarm levels and conditions for calibration see list of components (Order No.: D0792420) Possible other measuring components and measuring ranges on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms
XXXX = no change of indication

Open-circuit at the MAT-(TS)-Module	Wire -X1/2	Wire -X1/3	Wire -X1/4	Bridge -X1/1 /-X1/2	Bridge -X1/4 /-X1/5	Disconnect plug of MAT-(TS)
Failure indication	X	X	X	XX	X	X

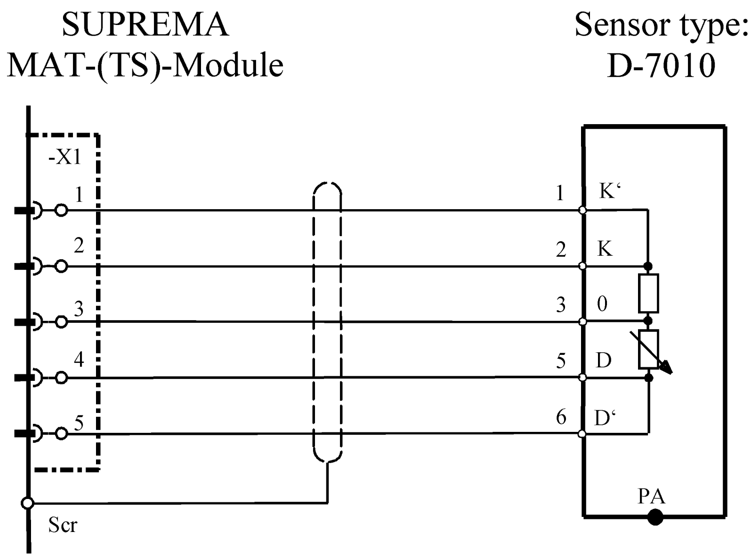
Open-circuit at max. cable length	Wire -X1/2	Wire -X1/3	Wire -X1/4
Failure indication	X	X	X

Short-circuit at the MAT-(TS)-Module	Wire -X1/2/-X1/3	Wire -X1/2/-x1/4	Wire -X1/3/-X1/4
Failure indication	XX	X	X

Short-circuit at max. cable length	Wire -X1/2/-X1/3	Wire -X1/2/-X1/4	Wire -X1/3/-X1/4
Failure indication	XX	XXXX	X
At conductor resis-tance 0 ... 1.7 Ohm per lead	XX	X	X

12.2 SUPREMA Sensor Data Sheet D-7010 (5-wire)

Order No.: D0791601



The cable screen is connected at the SUPREMA and the D-7010.

Connection module:	MPI 10/WT 10/passive/5-wire/Constant current /Presetting required
Sensor simulation module:	WT 100 = catalytic combustion (Order No.: 10030263)
Attention!	**Before connecting measuring head, reduce sensor current to minimum!**

Connection data:

Bridge current	270 mA/300 mA only for methane
Maximum nominal current	330 mA
Maximum nominal voltage	≤ 6.2 V
Power consumption	≤ 1.8 W (without cable length)
Cable type	5-core, 80 % screened
Maximum loop resistance	28 ohms
Maximum cable length	1000 m (at 1.5 mm² cross section per wire)
Cable diameter	7...14 mm, alternatively with PG 21 up to 17 mm
Cross section per wire allowed	0.75 ... 1.5 mm²
Cable inlet	PG 13.5 (can be extended to Pg 21)

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 54/EN 60 529
Explosion protection	II 2G EEx d e IIC T5/T6
Certificate	DMT 98 ATEX E 016 X
Temperature	-20 °C to +40 °C (T6) / -20 °C to +55 °C (T5)
Humidity	5 ... 95 % rel. humidity; noncondensing

Pressure	950 ... 1100 hPa
Weight	approx. 1.24 kg
Dimensions W x D x H	150 mm x 88 mm x 158 mm
Housing material	Aluminum Die cast (polyester-coated)

Startup:	**Presetting required —> before first calibration and when changing sensor**
Presetting:	Connect digital voltmeter to MAI card jacks. Bridge current setting —> 270 mA or 300 mA (for CH_4) Zero adjustment by zero gas —> Zero setting to **Ua = 400 ... 450 mV** Sensitivity adjustment with measuring gas -> Measuring range level at **Ua = 1900 ... 2100 mV** or by means of the value of the existing gas concentration according to: **Ua (mV) = C (Span gas concentration in % of measuring range)/100 * 1600 + 400**
Warm-up period:	≤ 120 s according to EN 50054, 15 minutes for presetting, 2 hours for calibration
Function test:	Span gas application via: Integrated span gas inlet piece with 0.5 l/min, (for standard test gases) or test cap with 1.0 l/ min, (Order No.: D6079762) or splashwater-proof housing SG 70 with 1l/min or pump adapter PA 70 with 1.0 l/ min
Calibration:	Calibration procedure according to SUPREMA operation manual For measuring components allowed, measuring ranges, lower alarm levels and conditions for calibration see list of components (Order No.: D0792420) Possible other measuring components and measuring ranges on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL -LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms
XXXX = no status indication (signal change)

Open-circuit at the MAT-(TS)-Module	Wire -X1/1	Wire -X1/2	Wire -X1/3	Wire -X1/4	Wire -X1/5	Disconnect plug of MAT-(TS)
Failure indication	XX	X	X	X	X	X

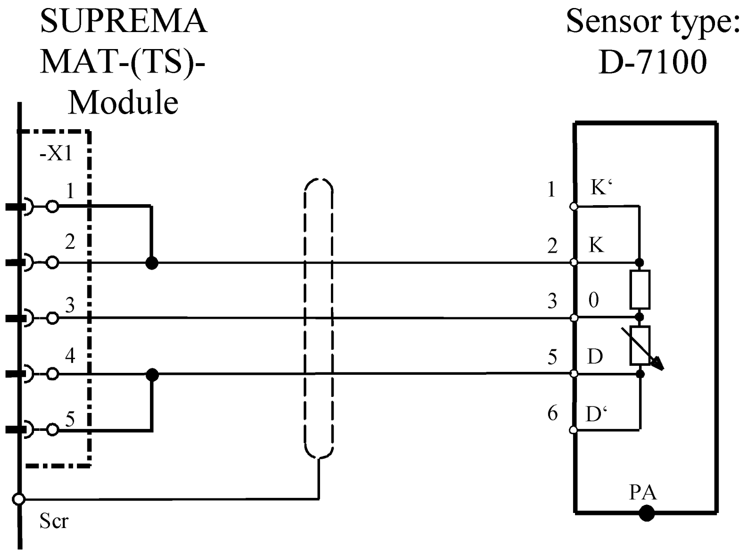
Open-circuit at max. cable length	Wire -X1/1	Wire -X1/2	Wire -X1/3	Wire -X1/4	Wire -X1/5	Disconnect plug of MAT-(TS)
Failure indication	XX	X	X	X	X	X

Shor-circuit at the MAT-(TS)-Module	Wire -X1/1/ -X1/2	Wire -X1/1/ -X1/3	Wire -X1/1/ -X1/4	Wire -X1/1/ -X1/5	Wire -X1/2/ -X1/3	Wire -X1/2/ -X1/4	Wire -X1/2/ -X1/5	Wire -X1/3/ -X1/4	Wire -X1/3/ -X1/5	Wire -X1/4/ -X1/5
Failure indication	X	XX	X	X	XX	X	X	X	X	XX

Shor-circuit at max. cable length	Wire -X1/1/ -X1/2	Wire -X1/1/ -X1/3	Wire -X1/1/ -X1/4	Wire -X1/1/ -X1/5	Wire -X1/2/ -X1/3	Wire -X1/2/ -X1/4	Wire -X1/2/ -X1/5	Wire -X1/3/ -X1/4	Wire -X1/3/ -X1/5	Wire -X1/4/ -X1/5
Failure indication	XXXX	XX	X	X	XX	X	X	X	X	XXXX

12.3 SUPREMA Sensor Data Sheet D-7100 (3-wire)

Order No.: D0791610



The cable screen is conected at the SUPREMA and the D-7100. The sensor cable must be installed interruption-free (no terminal boxes, terminal distribution etc.). The bridges -X1/1 -X1/2 and -X1/4 -X1/5 can also be set as solder bridges on the MAT 10 and MAT 10-TS Module.

Connection module: MPI 10/WT 10/passive/3-wire/Constant current/Presetting required

Sensor simulation module: WT 100 (Order No.: 10030264)

Attention! **Before connecting measuring head, reduce sensor current to minimum!**

Connection data:

Bridge current	270 mA/300 mA only for methane
Maximum nominal current	330 mA
Maximum nominal voltage	≤ 2.8 V
Power consumption	≤ 1.0 W (without cable length)
Cable type	3-core, 80 % screened
Maximum loop resistance	36 ohms
Maximum cable length	1200 m (at 1.5 mm² cross section per wire)
Cable diameter	7...14 mm, with connection Pg 21 up to 17 mm
Cross section per wire allowed	0.75 ... 1.5 mm²
Cable inlet	PG 13.5 (can be extended to Pg 21)

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 54/EN 60529
Explosion protection	II 2G EEx d e IIC T5/T6
Certificate	DMT 98 ATEX E 016 X
Temperature	-20 °C to +40 °C (T6) / -20 °C to +55 °C (T5)
Humidity	5 ... 95 % rel. humidity; noncondensing

Pressure	950 ... 1100 hPa
Weight	approx. 1.24 kg
Dimensions W x D x H	150 mm x 88 mm x 158 mm
Housing material	Aluminum Die cast (polyester-coated)

Startup:	**Presetting required —> before first calibration and when changing sensor**
Presetting:	Connect digital voltmeter to MAI card jacks. Bridge current setting —> 270 mA or 300 mA (for CH_4) Zero adjustment by zero gas —> Zero setting to **Ua = 400 ... 450 mV** Sensitivity adjustment with measuring gas —> Measuring range level at **Ua = 1900 ... 2100 mV** or by means of the value of the existing gas concentration according to: **Ua (mV) = C (Span gas concentration in % of measuring range) / 100 * 1600 + 400**
Warm-up period:	≤ 120 s according to EN 50054, 15 minutes for presetting, 2 hours for calibration
Function test:	Span gas application via: Integrated span gas inlet piece with 0.5 l/min, (standard test gases) or test cap with 1.0 l/min, (Order No.: D6079762) or splashwater-proof housing SG 70 with 1 l/min or pump adapter PA 70 with 1.0 l/min
Calibration:	Calibration procedure according to SUPREMA operation manual For measuring components allowed, measuring ranges, lower alarm levels and conditions for calibration see list of components (Order No.: D0792420) Possible other measuring components and measuring ranges on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms
XXXX = no change of indication

Open-circuit at the MAT-(TS)-Module	Wire -X1/2	Wire -X1/3	Wire -X1/4	Bridge -X1/1 /-X1/2	Bridge -X1/4 /-X1/5	Disconnect plug of MAT-(TS)
Failure indication	X	X	X	XX	X	X

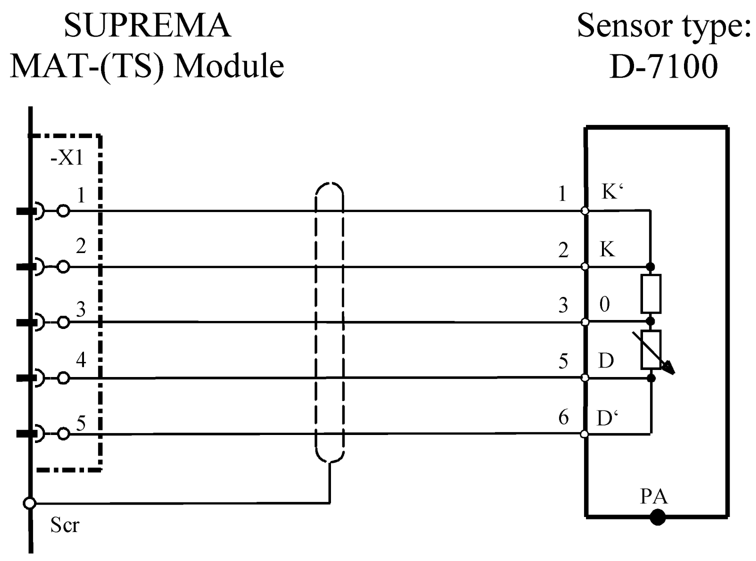
Open-circuit at max. cable length	Wire -X1/2	Wire -X1/3	Wire -X1/4
Failure indication	X	X	X

Short-circuit at the MAT-(TS)-Module	Wire -X1/2 /-X1/3	Wire -X1/2 /-X1/4	Wire -X1/3/-X1/4
Failure indication	XX	X	X

Short-circuit at max. cable length	Wire -X1/2/-X1/3	Wire -X1/2/-X1/4	Wire -X1/3/-X1/4
Failure indication	XX	XXXX	X
At conductor resistance 0 ... 1.7 Ohm per lead	XX	X	X

12.4 SUPREMA Sensor Data Sheet D-7100 (5-wire)

Order No.: D0791610



The cable screen is connected at the SUPREMA and the D-7100.

Connection module: MPI 10/WT 10/passive/5-wire/Constant current/Presetting required

Sensor simulation module: WT 100 (Order No.: 10030264)

Attention! **Before connecting measuring head, reduce sensor current to minimum!**

Connection data:

Bridge current	270 mA/300 mA only for methane
Maximum nominal current	330 mA
Maximum nominal voltage	≤ 2.8 V
Power consumption	≤ 1.0 W (without cable length)
Cable type	5-core, 80 % screened
Maximum loop resistance	36 ohms
Maximum cable length	1500 m (at 1.5 mm² cross section per wire)
Cable diameter	7...14 mm, with connection Pg 21 up to 17 mm
Cross section per wire allowed	0.75 ... 1,5 mm²
Cable inlet	Standard PG 13.5 (can be extended to Pg 21)

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 54
Explosion protection	II 2G EEx d e IIC T5/T6
Certificate	DMT 98 ATEX E 016 X
Temperature	-20 °C to +40 °C (T6) / -20 °C to +55 °C (T5)
Humidity	5 ... 95 % rel. humidity; noncondensing

Pressure	950 ... 1100 hPa
Weight	approx. 1.24 kg
Dimensions W x D x H	150 mm x 88 mm x 158 mm
Housing material	Aluminium Die cast (polyester-coated)

Startup:	**Presetting required —> before first calibration and when changing sensor**
Presetting:	Connect digital voltmeter to MAI card jacks. Bridge current setting —> 270 mA and 300 mA (for CH_4) Zero adjustment by zero gas —> Zero setting to **Ua = 400 ... 450 mV** Sensitivity adjustment with measuring gas —> Measuring range level at **Ua = 1900 ... 2100 mV** or by means of the value of the existing gas concentration according to: **Ua (mV) = C (Span gas concentration in % of measuring range) / 100 * 1600 + 400**
Warm-up period:	≤ 60 s according to EN 50054, 15 minutes for presetting, 2 hours for calibration
Function test:	Span gas application via: Integrated span gas inlet piece with 0.5 l/min (for standard test gases) or test cap with 1.0 l/min (Order No.: D6079762) or splashwater-proof housing SG 70 with 1 l/min or pump adapter PA 70 with 1.0 l/min
Calibration:	Calibration procedure according to SUPREMA operation manual For measuring components allowed, measuring ranges, lower alarm levels and for calibration conditions see list of components (Order No.: D0792420) Possible other measuring components and measuring ranges on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms
XXXX = no status indication (siganl change)

Open-circuit at the MAT-(TS)-Module	Wire -X1/1	Wire -X1/2	Wire -X1/3	Wire -X1/4	Wire -X1/5	Disconnect plug of MAT-(TS)
Failure indication	XX	X	X	X	X	X

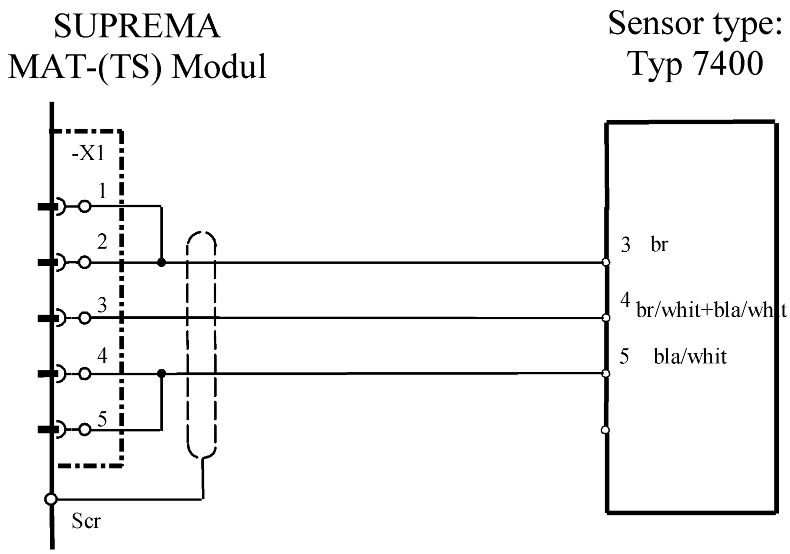
Open-circuit at max. cable length	Wire -X1/1	Wire -X1/2	Wire -X1/3	Wire -X1/4	Wire -X1/5	Disconnect plug of MAT-(TS)
Failure indication	XX	X	X	X	X	X

Short-circuit at the MAT-(TS)-Module	Wire -X1/1/ -X1/2	Wire -X1/1/ -X1/3	Wire -X1/1/ -X1/4	Wire -X1/1/ -X1/5	Wire -X1/2/ -X1/3	Wire -X1/2/ -X1/4	Wire -X1/2/ -X1/5	Wire -X1/3/ -X1/4	Wire -X1/3/ -X1/5	Wire -X1/4/ -X1/5
Failure indication	X	XX	X	X	XX	X	X	X	X	XX

Short-circuit at max. cable length	Wire -X1/1/ -X1/2	Wire -X1/1/ -X1/3	Wire -X1/1/ -X1/4	Wire -X1/1/ -X1/5	Wire -X1/2/ -X1/3	Wire -X1/2/ -X1/4	Wire -X1/2/ -X1/5	Wire -X1/3/ -X1/4	Wire -X1/3/ -X1/5	Wire -X1/4/ -X1/5
Failure indication	XXXX	XX	X	X	XX	X	X	X	X	XXXX

12.5 SUPREMA Sensor Data Sheet D-7400

Order No.: D0714702



The cable screen is only connected to the SUPREMA. **Remove 2 x 120 ohms!** Alternatively, the bridges -X1/1 -X1/2 and -X1/4 -X1/5 can be set as solder bridges on the MAT 10 and MAT 10-TS Module.

Connection module: MPI 10/WT 10/passive/3-wire/Constant current/Presetting required

Sensor simulation module: WT 100 (Order No.: 10030263)

Attention! **Before connecting measuring head, reduce sensor current to minimum!**

Connection data:

Bridge current	310 mA for all measuring components
Maximum power consumption	350 mA
Power consumption	≤ 1 W (without cable length)
Cable type	3-core, 80 % screened
Maximum loop resistance	8 ohms loop resistance
Maximum cable length	300 m (at 1.5 mm^2 cross section per wire)
Cable diameter	8 ... 12 mm
Cross section per wire allowed	0.75 ... 1.5 mm^2
Cable inlet	PG 13.5

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 54 (Housing) EN 60529
Explosion protection	none
Temperature	0 °C up to +40 °C
Humidity	5 ... 95 % rel. humidity; noncondensing
Pressure	950 ... 1100 hPa
Weight	approx. 0.26 kg
Dimensions W x D x H	94 mm x 58 mm x 135 mm

Startup:	**Presetting required —> before first calibration and when changing sensor**
Presetting:	Connect digital voltmeter to MAI card jacks. Bridge current setting —> 270 mA resp. 300 mA (for CH_4) Zero adjustment by zero gas —> Zero setting to **Ua = 400 ... 450 mV** Sensitivity adjustment with measuring gas —> Measuring range level at **Ua = 1950 ... 2100 mV** or by means of the value of the existing gas concentration according to: **Ua (mV) = C (Span gas concentration in % of measuring range) / 100 * 1600 + 400**
Warm-up period:	≤ 60 s according to EN 50054, 15 minutes for presetting, 2 hours for calibration
Function test:	Span gas application via: Test cap (Calibration Adaptor Assembly) 0.25 l/min
Calibration:	Calibration procedure according to SUPREMA operation manual For measuring components allowed, measuring ranges, lower alarm levels and conditions for calibration see list of components. Possible other measuring components and measuring ranges on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms
XXXX = no change of indication

Open-circuit at the MAT-(TS)-Module	Wire -X1/2	Wire -X1/3	Wire -X1/4	Bridge -X1/1 /-X1/2	Bridge -X1/4 /-X1/5	Disconnect plug of MAT-(TS)
Failure indication	X	X	X	XX	X	X

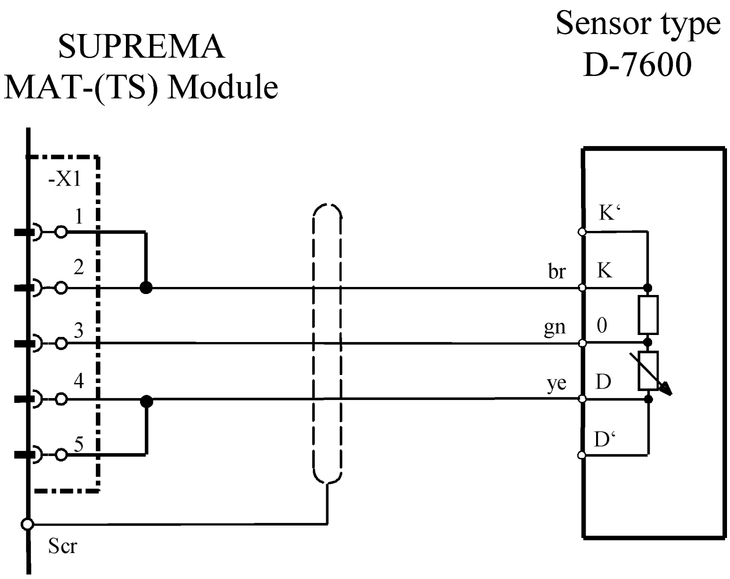
Open-circuit at max. cable length	Wire -X1/2	Wire -X1/3	Wire -X1/4
Failure indication	X	X	X

Short-circuit at the MAT-(TS)-Module	Wire -X1/2/-X1/3	Wire -X1/2/-X1/4	Wire -X1/3/-X1/4
Failure indication	XX	X	X

Short-circuit at max. cable length	Wire -X1/2/-X1/3	Wire -X1/2/-X1/4	Wire -X1/3/-X1/4
Failure indication	XX	XXXX	X
At conductor resis-tance 0 ... 1.7 Ohm per lead	XX	X	X

12.6 SUPREMA Sensor Data Sheet D-7600 (3-wire)

Order No.: D0715618



The cable screen is only connected to the SUPREMA.
Alternatively, the bridges -X1/1 -X1/2 and -X1/4 -X1/5 can be set as solder bridges on the MAT 10 and MAT 10-TS Module.

Connection module: MPI 10/WT 100/passive/3-wire/Constant current/Presetting required

Sensor simulation module: WT 100 (Order No.: 10030263)

Attention! **Before connecting measuring head, reduce sensor current to minimum!**

Connection data:

Bridge current	270 mA/300 mA only for methane
Maximum nominal current	350 mA
Maximum nominal voltage	≤ 3 V
Power consumption	≤ 1W (without cable length)
Cable type	3-core, 80 % screened
Maximum loop resistance	36 ohms (Cable resistance)
Maximum cable length	1200 m (at 1.5 mm^2 cross section per wire)
Cable diameter	7 ... 13.5 mm
Cross section per wire allowed	0.75 ... 1.5 mm^2
Cable inlet	PG 13.5

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 42 according to DIN 400 50
Explosion protection	(Ex) sd 3n G5
Certificate	III B/E -24529
Temperature	-20 °C to +40 °C
Humidity	0 ... 95 % rel. humidity; noncondensing

Pressure	950 ... 1100 hPa
Weight	approx. 430 g
Dimensions W x D x H	80 mm x 55 mm x 125 mm
Housing material	Die-cast housing Polyamide 6

Startup:	**Presetting required —> before first calibration and when changing sensor**	
Presetting:	Connect digital voltmeter to MAI card jacks. Bridge current setting —> 270 mA resp. 300 mA (for CH_4) Zero adjustment by zero gas —> Zero setting to **Ua = 400 ... 450 mV** Sensitivity adjustment with measuring gas —> Measuring range level **Ua = 1950 ... 2100 mV** or by means of the value of the existing gas concentration according to: **Ua (mV) = C (Span gas concentration in % of measuring range) / 100 * 1600 + 400**	
Warm-up period:	≤ 60 s according to EN 50054, 15 minutes for presetting, 2 hours for calibration	
Function test:	Span gas application via:	PK10 with 1.0 l/min or PV10 with 1.0 l/min or splashwater-proof housing with 1 l/min
Calibration:	Calibration procedure according to SUPREMA operation manual For measuring components allowed, measuring ranges, lower alarm levels and conditions for calibration see list of components. (Order No.: D0792420) Possible other measuring components and measuring ranges on request.	

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms
XXXX = no change of indication

Open-circuit at the MAT-(TS)-Module	Wire -X1/2	Wire -X1/3	Wire -X1/4	Bridge -X1/1 /-X1/2	Bridge -X1/4 /-X1/5	Disconnect plug of MAT-(TS)
Failure indication	X	X	X	XX	X	X

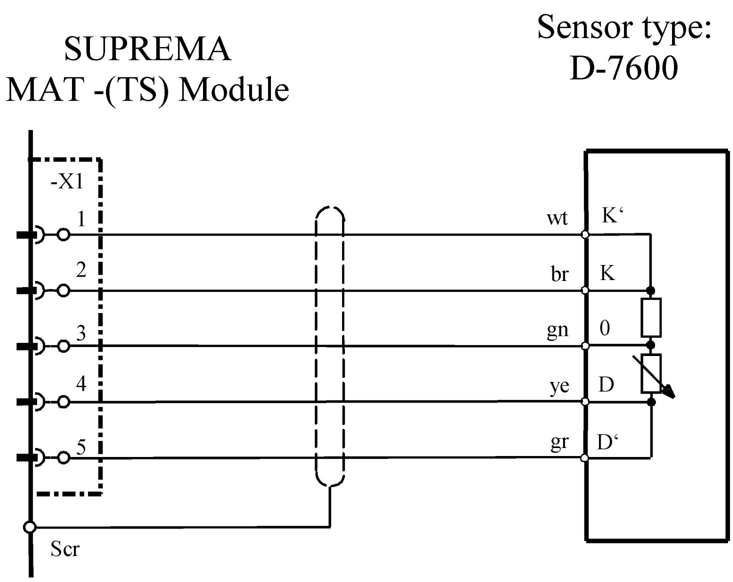
Open-circuit at max. cable length	Wire -X1/2	Wire -X1/3	Wire -X1/4
Failure indication	X	X	X

Short-circuit at the MAT-(TS)-Module	Wire -X1/2/-X1/3	Wire -X1/2/-X1/4	Wire -X1/3/-X1/4
Failure indication	XX	X	X

Short-circuit at max. cable length	Wire -X1/2/-X1/3	Wire -X1/2/-X1/4	Wire -X1/3/-X1/4
Failure indication	XX	XXXX	X
At conductor resistance 0 ... 1.7 Ohm per lead	XX	X	X

12.7 SUPREMA Sensor Data Sheet D-7600 (5-wire)

Order No.: D0715618



The cable screen is only connected to the SUPREMA.

Connection module: MPI 10/WT 100/passive/5-wire/Constant current/Presetting required

Sensor simulation module: WT 100 (Order No.: 10030263)

Attention! **Before connecting measuring head, reduce sensor current to minimum!**

Connection data:

Bridge current	270 mA/300 mA only for methane
Maximum nominal current	350 mA
Maximum nominal voltage	≤ 3 V
Power consumption	≤ 1 W (without cable length)
Cable type	5-core, 80 % screened
Maximum loop resistance	36 ohms
Maximum cable length	1500 m (at 1.5 mm^2 cross section per wire)
Cable diameter	7...13,5 mm
Cross section per wire allowed	0.75 ... 1.5 mm^2
Cable inlet	Pg 13.5

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 42 according to DIN 400 50
Explosion protection	(Ex) sd 3n G5
Certificate	III B/E -24529
Temperature	-20 °C to +40 °C
Humidity	0 ... 95 % rel. humidity; noncondensing

Pressure	950 ... 1100 hPa
Weight	approx. 430 g
Dimensions W x D x H	80 mm x 55 mm x 125 mm
Housing material	Die-cast housing Polyamide 6

Startup:	**Presetting required —> before first calibration and when changing sensor**	
Presetting:	Connect digital voltmeter to MAI card jacks. Bridge current setting —> 270 mA resp. 300 mA (for CH_4) Zero adjustment by zero gas —> Zero setting to **Ua = 400 ... 450 mV** Sensitivity adjustment with measuring gas —> Measuring range level **Ua = 1950 ... 2100 mV** or by means of the value of the existing gas concentration according to: **Ua (mV) = C (Span gas concentration in % of measuring range) / 100 * 1600 + 400**	
Warm-up period:	≤ 60 s according to EN 50054, 15 minutes for presetting, 2 hours for calibration	
Function test:	Span gas application via:	PK10 with 1.0 l/min or PV10 with 1.0 l/min or splashwater-proof housing with 1 l/min
Calibration:	Calibration procedure according to SUPREMA operation manual For measuring components allowed, measuring ranges, lower alarm levels and conditions for calibration see list of components. (Order No.: D0792420) Possible other measuring components and measuring ranges on request.	

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms
XXXX = no status indication (´signal change)

Open-circuit at the MAT-(TS)-Module	Wire -X1/1	Wire -X1/2	Wire -X1/3	Wire -X1/4	Wire -X1/5	Disconnect plug of MAT-(TS)
Failure indication	XX	X	X	X	X	X

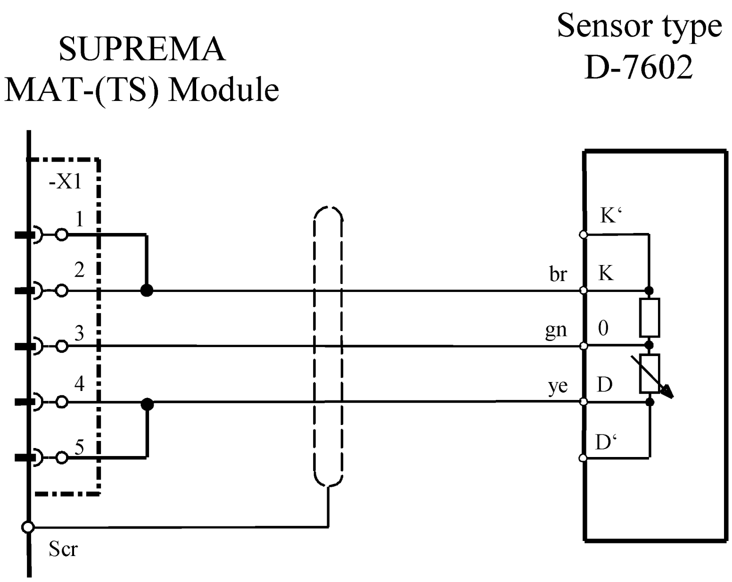
Open-circuit at max. cable length	Wire -X1/1	Wire -X1/2	Wire -X1/3	Wire -X1/4	Wire -X1/5	Disconnect plug of MAT-(TS)
Failure indication	XX	X	X	X	X	X

Short-circuit at the MAT-(TS)-Module	Wire -X1/1/ -X1/2	Wire -X1/1/ -X1/3	Wire -X1/1/ -X1/4	Wire -X1/1/ -X1/5	Wire -X1/2/ -X1/3	Wire -X1/2/ -X1/4	Wire -X1/2/ -X1/5	Wire -X1/3/ -X1/4	Wire -X1/3/ -X1/5	Wire -X1/4/ -X1/5
Failure indication	X	XX	X	X	XX	X	X	X	X	XX

Short-circuit at max. cable length	Wire -X1/1/ -X1/2	Wire -X1/1/ -X1/3	Wire -X1/1/ -X1/4	Wire -X1/1/ -X1/5	Wire -X1/2/ -X1/3	Wire -X1/2/ -X1/4	Wire -X1/2/ -X1/5	Wire -X1/3/ -X1/4	Wire -X1/3/ -X1/5	Wire -X1/4/ -X1/5
Failure indication	XXXX	XX	X	X	XX	X	X	X	X	XXXX

12.8 SUPREMA Sensor Data Sheet D-7602 (3-wire)

Order No.: D0715619



The cable screen is only connected to the SUPREMA.
Alternatively, the bridges -X1/1 -X1/2 and -X1/4 -X1/5 can be set as solder bridges on the MAT 10 resp. MAT 10-TS Module.

Connection module: MPI 10/WT 100/passive/3-wire/Constant current/Presetting required

Sensor simulation module: WT 100 (Order No.: 10030263)

Attention! **Before connecting measuring head, reduce sensor current to minimum!**

Connection data:

Bridge current	310 mA for all measuring components
Maximum nominal current	350 mA
Maximum nominal voltage	≤ 3 V
Power consumption	≤ 1 W (without cable length)
Cable type	3-core, 80 % screened
Maximum loop resistance	36 ohms (Cable resistance)
Maximum cable length	1200 m (at 1.5 mm^2 cross section per wire)
Cable diameter	7 ... 13.5 mm
Cross section per wire allowed	0.75 ... 1.5 mm^2
Cable inlet	PG 13.5

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 42 according to DIN 400 50
Explosion protection	(Ex) sd 3n G5
Certificate	III B/E -24529
Temperature	-20 °C to +40 °C
Humidity	0 ... 95 % rel. humidity; noncondensing

Pressure	950 ... 1100 hPa
Weight	approx. 430 g
Dimensions W x D x H	80 mm x 55 mm x 125 mm
Housing material	Die-cast housing Polyamide 6

Startup:	**Presetting required —> before first calibration and when changing sensor**
Presetting:	Connect digital voltmeter to MAI card jacks. Bridge current setting —> 310 mA for all measuring components Zero adjustment by zero gas —> Zero setting to **Ua = 400 ... 450 mV** Sensitivity adjustment with measuring gas —> Measuring range level **Ua = 1950 ... 2100 mV** or by means of the value of the existing gas concentration according to: **Ua (mV) = C (Span gas concentration in % of measuring range) / 100 * 1600 + 400**
Warm-up period:	≤ 60 s according to EN 50054, 15 minutes for presetting, 2 hours for calibration
Function test:	Span gas application via: PK10 with 1.0 l/min or PV10 with 1.0 l/min or splashwater-proof housing with 1 l/min
Calibration:	Calibration procedure according to SUPREMA operation manual For measuring components allowed, measuring ranges, lower alarm levels and conditions for calibration see list of components. Possible other measuring components and measuring ranges on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms
XXXX = no change of indication

Open-circuit at the MAT-(TS)-Module	Wire -X1/2	Wire -X1/3	Wire -X1/4	Bridge -X1/1 /-X1/2	Bridge -X1/4 /-X1/5	Disconnect plug of MAT-(TS)
Failure indication	X	X	X	XX	X	X

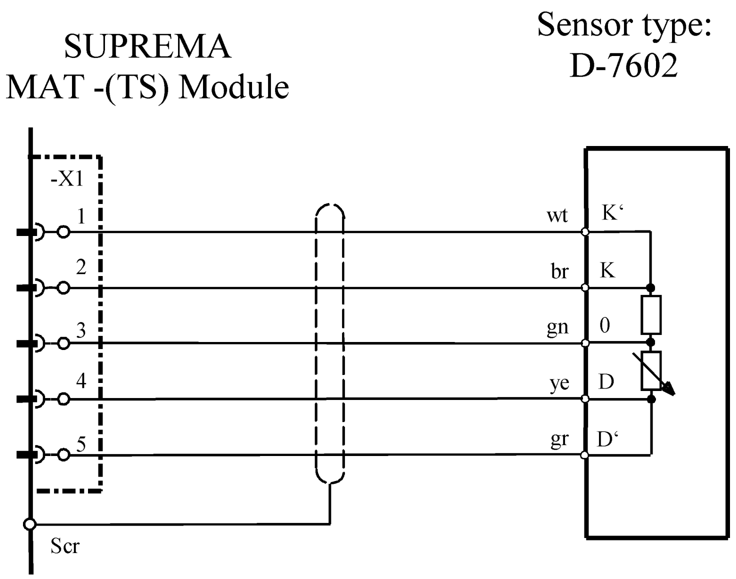
Open-circuit at max. cable length	Wire -x1/2	Wire -X1/3	Wire -X1/4
Failure indication	X	X	X

Short-circuit at the MAT-(TS)-Module	Wire -X1/2/-X1/3	Wire -X1/2/-X1/4	Wire -X1/3/-X1/4
Failure indication	XX	X	X

Short-circuit at max. cable length	Wire -X1/2/-X1/3	Wire -X1/2/-X1/4	Wire -X1/3/-X1/4
Failure indication	XX	XXXX	X
At conductor resis-tance 0 ... 1.7 Ohm per lead	XX	X	X

12.9 SUPREMA Sensor Data Sheet D-7602 (5-wire)

Order No.: D0715619



The cable screen is only connected to the SUPREMA.

Connection module: MPI 10/WT 100/passive/5-wire/Constant current/Presetting required

Sensor simulation module: WT 100 (Order No.: 10030263)

Attention! **Before connecting measuring head, reduce sensor current to minimum!**

Connection data:

Bridge current	310 mA for all measuring components
Maximum nominal current	350 mA
Maximum nominal voltage	≤ 3 V
Power consumption	≤ 1 W (without cable length)
Cable type	5-core, 80 % screened
Maximum loop resistance	36 ohms
Maximum cable length	1500 m (at 1.5 mm^2 cross section per wire)
Cable diameter	7 ... 13.5 mm
Cross section per wire allowed	0.75 ... 1.5 mm^2
Cable inlet	Pg 13.5

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 42 according to DIN 400 50
Explosion protection	(Ex) sd 3n G5
Certificate	III B/E -24529
Temperature	-20 °C to +40 °C
Humidity	0 ... 95 % rel. humidity; noncondensing

Pressure	950 ... 1100 hPa
Weight	approx. 430 g
Dimensions W x D x H	80 mm x 55 mm x 125 mm
Housing material	Die-cast housing Polyamide 6

Startup:	**Presetting required —> before first calibration and when changing sensor**
Presetting:	Connect digital voltmeter to MAI card jacks. Bridge current setting —> 310 mA for all measuring components Zero adjustment by zero gas —> Zero setting to **Ua = 400 ... 450 mV** Sensitivity adjustment with measuring gas —> Measuring range level **Ua = 1950 ... 2100 mV** or by means of the value of the existing gas concentration according to: **Ua (mV) = C (Span gas concentration in % of measuring range) / 100 * 1600 + 400**
Warm-up period:	≤ 60 s according to EN 50054, 15 minutes for presetting, 2 hours for calibration
Function test:	Span gas application via: PK10 with 1.0 l/min or PV10 with 1.0 l/min or splashwater-proof housing with 1 l/min
Calibration:	Calibration procedure according to SUPREMA operation manual For measuring components allowed, measuring ranges, lower alarm levels and conditions for calibration see list of components. Possible other measuring components and measuring ranges on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms
XXXX = no status indication (signal change)

Open-circuit at the MAT-(TS)-Module	Wire -X1/1	Wire -X1/2	Wire -X1/3	Wire -X1/4	Wire -X1/5	Disconnect plug of MAT-(TS)
Failure indication	XX	X	X	X	X	X

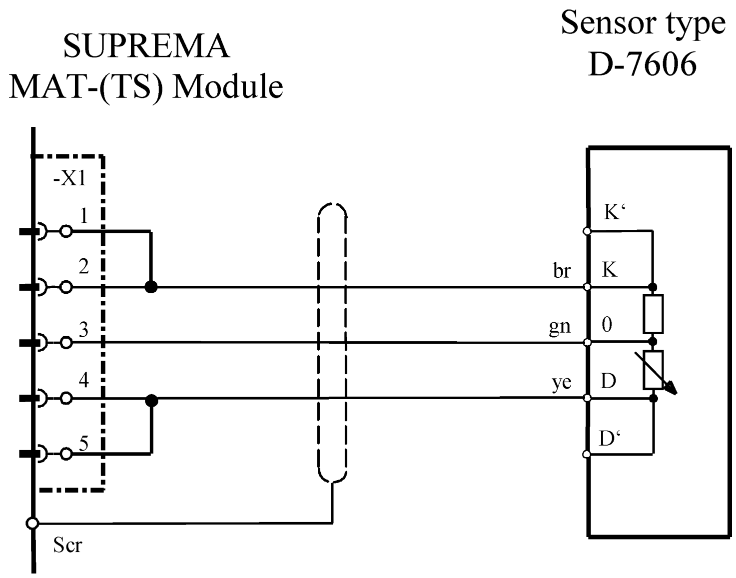
Open-circuit at max. cable length	Wire -X1/1	Wire -X1/2	Wire -X1/3	Wire -X1/4	Wire -X1/5	Disconnect plug of MAT-(TS)
Failure indication	XX	X	X	X	X	X

Short-circuit at the MAT-(TS)-Module	Wire -X1/1/ -X1/2	Wire -X1/1/ -X1/3	Wire -X1/1/ -X1/4	Wire -X1/1/ -X1/5	Wire -X1/2/ -X1/3	Wire -X1/2/ -X1/4	Wire -X1/2/ -X1/5	Wire -X1/3/ -X1/4	Wire -X1/3/ -X1/5	Wire -X1/4/ -X1/5
Failure indication	X	XX	X	X	XX	X	X	X	X	XX

Short-circuit at max. cable length	Wire -X1/1/ -X1/2	Wire -X1/1/ -X1/3	Wire -X1/1/ -X1/4	Wire -X1/1/ -X1/5	Wire -X1/2/ -X1/3	Wire -X1/2/ -X1/4	Wire -X1/2/ -X1/5	Wire -X1/3/ -X1/4	Wire -X1/3/ -X1/5	Wire -X1/4/ -X1/5
Failure indication	XXXX	XX	X	X	XX	X	X	X	X	XXXX

12.10 SUPREMA Sensor Data Sheet D-7606 (3-wire)

Order No.: D0715690



The cable screen is only connected to the SUPREMA.
Alternatively, the bridges -X1/1 -X1/2 and -X1/4 -X1/5 can be set as solder bridges on the MAT 10 and MAT 10-TS Module.

Connection module:	MPI 10/WT 100/passive/3-wire/Constant current/Presetting required
Sensor simulation module:	WT 100 (Order No.: 10030263)
Attention!	**Before connecting measuring head, reduce sensor current to minimum!**

Connection data:

Bridge current	270 mA/300 mA only for methane
Maximum nominal current	350 mA
Maximum nominal voltage	$\leq$ 3 V
Power consumption	$\leq$ 1 W (without cable length)
Cable type	3-core, 80 % screened
Maximum loop resistance	36 ohms (Cable resistance)
Maximum cable length	1200 m (at 1.5 mm^2 cross section per wire)
Cable diameter	7 ... 13.5 mm
Cross section per wire allowed	0.75 ... 1.5 mm^2
Cable inlet	PG 13.5

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 42 according to DIN 400 50
Explosion protection	(Ex) sd 3n G5
Certificate	III B/E -24529
Temperature	-20 °C to +40 °C
Humidity	0 ... 99 % rel. humidity; noncondensing

Pressure	950 ... 1100 hPa
Weight	approx. 430 g
Dimensions W x D x H	80 mm x 55 mm x 125 mm
Housing material	Die-cast housing Polyamide 6

Startup:	**Presetting required —> before first calibration and when changing sensor**
Presetting:	Connect digital voltmeter to MAI card jacks. Bridge current setting —> 270 mA resp. 300 mA (for CH_4) Zero adjustment by zero gas —> Zero setting to **Ua = 400 ... 450 mV** Sensitivity adjustment with measuring gas —> Measuring range level **Ua = 1950 ... 2100 mV** or by means of the value of the existing gas concentration according to: **Ua (mV) = C (Span gas concentration in % of measuring range) / 100 * 1600 + 400**
Warm-up period:	≤ 60 s according to EN 50054, 15 minutes for presetting, 2 hours for calibration
Function test:	Span gas application via: PK10 with 1.0 l/min or PV10 with 1.0 l/min or splashwater-proof housing with 1 l/min
Calibration:	Calibration procedure according to SUPREMA operation manual For measuring components allowed, measuring ranges, lower alarm levels and conditions for calibration see list of components. (Order No.: D0792420) Possible other measuring components and measuring ranges on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms
XXXX = no change of indication

Open-circuit at the MAT-(TS)-Module	Wire -X1/2	Wire -X1/3	Wire -X1/4	Bridge -X1/1 /-X1/2	Bridge -X1/4 /-X1/5	Disconnect plug of MAT-(TS)
Failure indication	X	X	X	XX	X	X

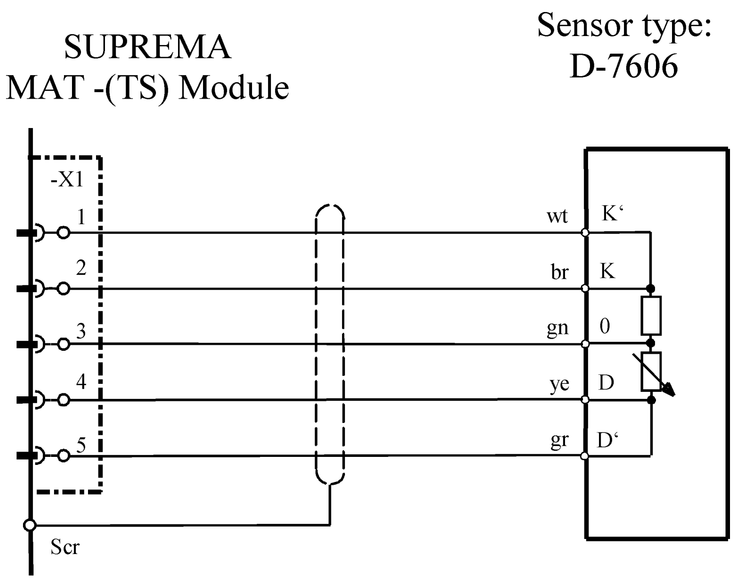
Open-circuit at max. cable length	Wire -X1/2	Wire -X1/3	Wire -X1/4
Failure indication	X	X	X

Short-circuit at the MAT-(TS)-Module	Wire -X1/2/-X1/3	Wire -X1/2/-X1/4	Wire -X1/3/-X1/4
Failure indication	XX	X	X

Short-circuit at max. cable length	Wire -X1/2/-X1/3	Wire -X1/2/-X1/4	Wire -X1/3/-X1/4
Failure indication	XX	XXXX	X
At conductor resis-tance 0 ... 1.7 Ohm per lead	XX	X	X

12.11 SUPREMA Sensor Data Sheet D-7606 (5-wire)

Order No.: D0715690



The cable screen is only connected to the SUPREMA.

Connection module: MPI 10/WT 100/passive/5-wire/Constant current/Presetting required

Sensor simulation module: WT 100 (Order No.: 10030263)

Attention! **Before connecting measuring head, reduce sensor current to minimum!**

Connection data:

Bridge current	270 mA/300 mA only for methane
Maximum nominal current	350 mA
Maximum nominal voltage	≤ 3 V
Power consumption	≤ 1 W (without cable length)
Cable type	5-core, 80 % screened
Maximum loop resistance	36 ohms
Maximum cable length	1500 m (at 1.5 mm^2 cross section per wire)
Cable diameter	7 ... 13,5 mm
Cross section per wire allowed	0.75 ... 1.5 mm^2
Cable inlet	Pg 13.5

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 42 according to DIN 400 50
Explosion protection	(Ex) sd 3n G5
Certificate	III B/E -24529
Temperature	-20 °C to +40 °C
Humidity	0 ... 95 % rel. humidity; noncondensing

Pressure	950 ... 1100 hPa
Weight	approx. 430 g
Dimensions W x D x H	80 mm x 55 mm x 125 mm
Housing material	Die-cast housing Polyamide 6

Startup:	**Presetting required —> before first calibration and when changing sensor**
Presetting:	Connect digital voltmeter to MAI card jacks. Bridge current setting —> 270 mA resp. 300 mA (for CH_4) Zero adjustment by zero gas —> Zero setting to **Ua = 400 ... 450 mV** Sensitivity adjustment with measuring gas —> Measuring range level **Ua = 1950 ... 2100 mV** or by means of the value of the existing gas concentration according to: **Ua (mV) = C (Span gas concentration in % of measuring range) / 100 * 1600 + 400**
Warm-up period:	≤ 60 s according to EN 50054, 15 minutes for presetting, 2 hours for calibration
Function test:	Span gas application via: PK10 with 1.0 l/min or PV10 with 1.0 l/min or splashwater-proof housing with 1 l/min
Calibration:	Calibration procedure according to SUPREMA operation manual For measuring components allowed, measuring ranges, lower alarm levels and conditions for calibration see list of components. (Order No.: D0792420) Possible other measuring components and measuring ranges on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms
XXXX = no status indication (signal change)

Open-circuit at the MAT-(TS)-Module	Wire -X1/1	Wire -X1/2	Wire -X1/3	Wire -X1/4	Wire -X1/5	Disconnect plug of MAT-(TS)
Failure indication	XX	X	X	X	X	X

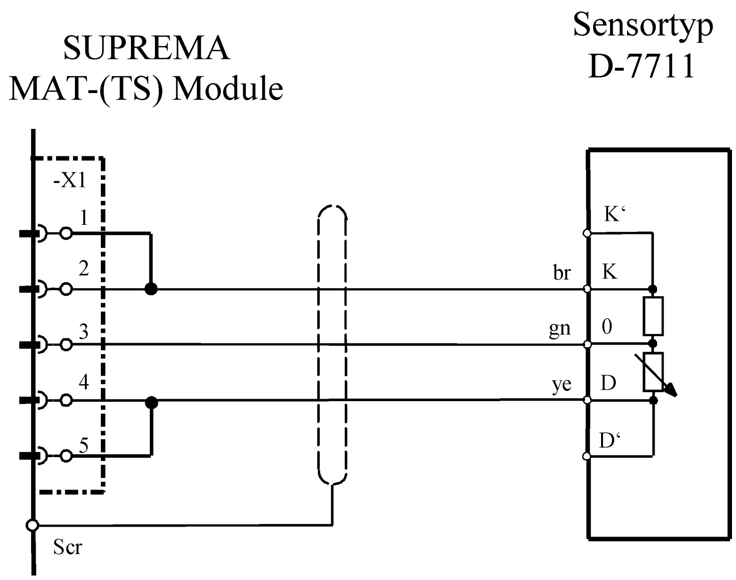
Open-circuit at max. cable length	Wire -X1/1	Wire -X1/2	Wire -X1/3	Wire -X1/4	Wire -X1/5	Disconnect plug of MAT-(TS)
Failure indication	XX	X	X	X	X	X

Short-circuit at the MAT-(TS)-Module	Wire -X1/1/ -X1/2	Wire -X1/1/ -X1/3	Wire -X1/1/ -X1/4	Wire -X1/1/ -X1/5	Wire -X1/2/ -X1/3	Wire -X1/2/ -X1/4	Wire -X1/2/ -X1/5	Wire -X1/3/ -X1/4	Wire -X1/3/ -X1/5	Wire -X1/4/ -X1/5
Failure indication	X	XX	X	X	XX	X	X	X	X	XX

Short-circuit at max. cable length	Wire -X1/1/ -X1/2	Wire -X1/1/ -X1/3	Wire -X1/1/ -X1/4	Wire -X1/1/ -X1/5	Wire -X1/2/ -X1/3	Wire -X1/2/ -X1/4	Wire -X1/2/ -X1/5	Wire -X1/3/ -X1/4	Wire -X1/3/ -X1/5	Wire -X1/4/ -X1/5
Failure indication	XXXX	XX	X	X	XX	X	X	X	X	XXXX

12.12 SUPREMA Sensor Data Sheet D-7711 K/D-7711 K-PR (3-wire)

Order No.: D0715642



The cable screen is only connected to the SUPREMA.
Alternatively, the bridges -X1/1 -X1/2 and -X1/4 -X1/5 can be set as solder bridges on the MAT 10 and MAT 10-TS Module.

Connection module: MPI 10/WT 100/passive/3-wire/Constant current/Presetting required

Sensor simulation module: WT 100 (Order No.: 10030263)

Attention! **Before connecting measuring head, reduce sensor current to minimum!**

Connection data:

Bridge current	K: 300 mA for all measuring components K-PR: 310 mA for all measuring components
Maximum nominal current	330 mA
Maximum nominal voltage	≤ 3.0 V
Power consumption	≤ 1,0 W (without cable length)
Cable type	3-core, 80 % screened
Maximum loop resistance	36 ohms
Maximum cable length	1200 m (at 1.5 mm² cross section per wire)
Cable diameter	7 ... 13.5 mm
Cross section per wire allowed	0.75 ... 1.5 mm²
Cable inlet	Pg 13.5

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 42 according to DIN 400 50
Explosion protection	II 2G EEx d II C T4
Certificate	PTB 01 ATEX 1152 X
Temperature	-40 °C to +100 °C
Humidity	0 ... 95 % rel. humidity; noncondensing

Pressure	950 ... 1100 hPa
Weight	approx. 0.72 kg
Dimensions W x D x H	50 mm x 40 mm x 50 mm
Housing material	1.4305, V2A

Startup:	**Presetting required —> before first calibration and when changing sensor**
Presetting:	Connect digital voltmeter to MAI card jacks. Bridge current setting —> 300 mA for all measuring components Zero adjustment by zero gas —> Zero setting to **Ua = 400 ... 450 mV** Sensitivity adjustment with measuring gas —> Measuring range level **Ua = 1950 ... 2100 mV** or by means of the value of the existing gas concentration according to: **Ua (mV) = C (Span gas concentration in % of measuring range) / 100 * 1600 + 400**
Warm-up period:	≤ 60 s according to EN 50054, 15 minutes for presetting, 2 hours for calibration
Function test:	Span gas application via: PK10 with 1.0 l/min or PV10 with 1.0 l/min
Calibration:	Calibration procedure according to SUPREMA operation manual For measuring components allowed, measuring ranges, lower alarm levels and conditions for calibration see list of components. Possible other measuring components and measuring ranges on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms
XXXX = no change of indication

Open-circuit at the MAT-(TS)-Module	Wire -X1/2	Wire -X1/3	Wire -X1/4	Bridge -X1/1 /-X1/2	Bridge -X1/4 /-X1/5	Disconnect plug of MAT-(TS)
Failure indication	X	X	X	XX	X	X

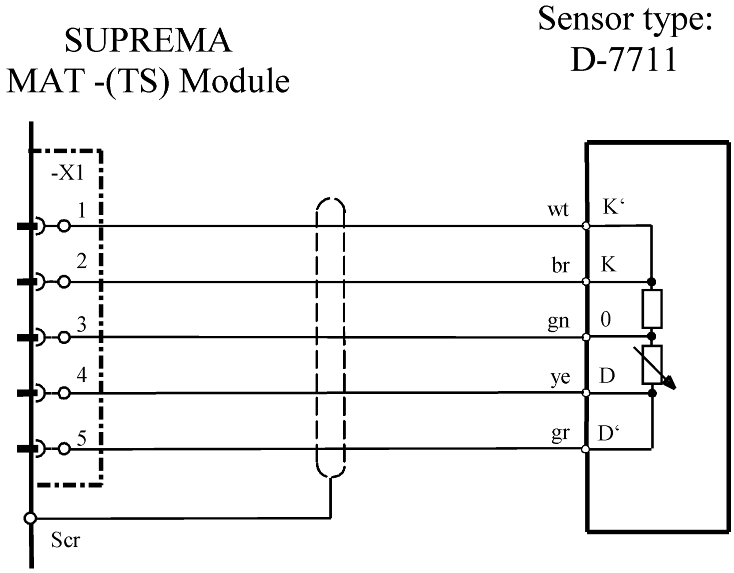
Open-circuit at max. cable length	Wire -X1/2	Wire -X1/3	Wire -X1/4
Failure indication	X	X	X

Short-circuit at the MAT-(TS)-Module	Wire -X1/2/-X1/3	Wire -X1/2/-X1/4	Wire -X1/3/-X1/4
Failure indication	XX	X	X

Short-circuit at max. cable length	Wire -X1/2/-X1/3	Wire -X1/2/-X1/4	Wire -X1/3/-X1/4
Failure indication	XX	XXXX	X
At conductor resistance 0 ... 1.7 Ohm per lead	XX	X	X

12.13 SUPREMA Sensor Data Sheet D-7711 K/D-7711 K-PR (5-wire)

Order No.: D0715642



The cable screen is only connected to the SUPREMA.

Connection module:	MPI 10/WT 100/passive/5-wire/Constant current/Presetting required
Sensor simulation module:	WT 100 (Order No.: 10030263)
Attention!	**Before connecting measuring head, reduce sensor current to minimum!**

Connection data:

Bridge current	K: 300 mA for all measuring components K-PR: 310 mA for all measuring components
Maximum nominal current	330 mA
Maximum nominal voltage	≤ 3.0 V
Power consumption	≤ 1.0 W (without cable length)
Cable type	5-core, 80 % screened
Maximum loop resistance	36 ohms
Maximum cable length	1500 m (at 1.5 mm² cross section per wire)
Cable diameter	7 ... 13.5 mm
Cross section per wire allowed	0.75 ... 1.5 mm²
Cable inlet	Pg 13.5

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 42 according to DIN 400 50
Explosion protection	II 2G EEx d II C T4
Certificate	PTB 01 ATEX 1152 X
Temperature	-40 °C to +100 °C
Humidity	0 ... 95 % rel. humidity; noncondensing

Pressure	950 ... 1100 hPa
Weight	approx. 0.72 kg
Dimensions W x D x H	50 mm x 40 mm x 50 mm
Housing material	1.4305 V2A

Startup:	**Presetting required —> before first calibration and when changing sensor**
Presetting:	Connect digital voltmeter to MAI card jacks. Bridge current setting —> 300 mA for all measuring components Zero adjustment by zero gas —> Zero setting to **Ua = 400 ... 450 mV** Sensitivity adjustment with measuring gas —> Measuring range level **Ua = 1950 ... 2100 mV** or by means of the value of the existing gas concentration according to: **Ua (mV) = C (Span gas concentration in % of measuring range) / 100 * 1600 + 400**
Warm-up period:	≤ 60 s according to EN 50054, 15 minutes for presetting, 2 hours for calibration
Function test:	Span gas application via: PK10 with 1.0 l/min or PV10 with 1.0 l/min
Calibration:	Calibration procedure according to SUPREMA operation manual For measuring components allowed, measuring ranges, lower alarm levels and conditions for calibration see list of components. Possible other measuring components and measuring ranges on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms
XXXX = no status indication (signal change)

Open-circuit at the MAT-(TS)-Module	Wire -X1/1	Wire -X1/2	Wire -X1/3	Wire -X1/4	Wire -X1/5	Disconnect plug of MAT-(TS)
Failure indication	XX	X	X	X	X	X

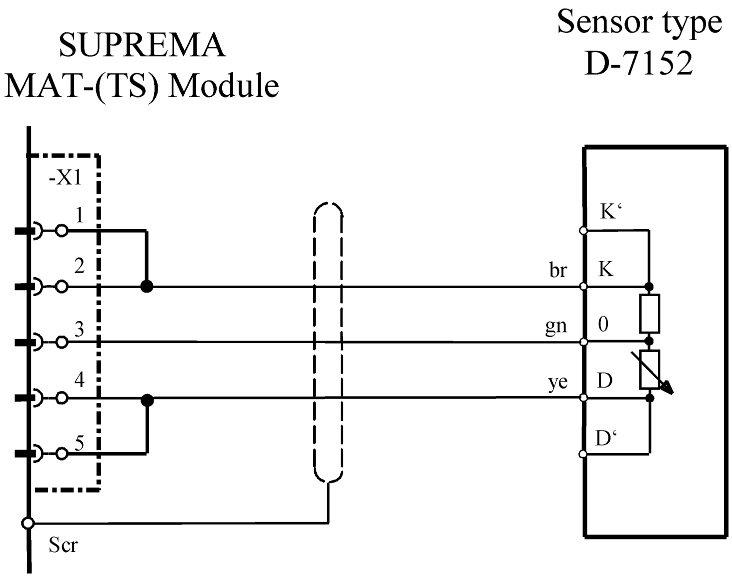
Open-circuit at max. cable length	Wire -X1/1	Wire -X1/2	Wire -X1/3	Wire -X1/4	Wire -X1/5	Disconnect plug of MAT-(TS)
Failure indication	XX	X	X	X	X	X

Short-circuit at the MAT-(TS)-Module	Wire -X1/1/ -X1/2	Wire -X1/1/ -X1/3	Wire -X1/1/ -X1/4	Wire -X1/1/ -X1/5	Wire -X1/2/ -X1/3	Wire -X1/2/ -X1/4	Wire -X1/2/ -X1/5	Wire -X1/3/ -X1/4	Wire -X1/3/ -X1/5	Wire -X1/4/ -X1/5
Failure indication	X	XX	X	X	XX	X	X	X	X	XX

Short-circuit at max. cable length	Wire -X1/1/ -X1/2	Wire -X1/1/ -X1/3	Wire -X1/1/ -X1/4	Wire -X1/1/ -X1/5	Wire -X1/2/ -X1/3	Wire -X1/2/ -X1/4	Wire -X1/2/ -X1/5	Wire -X1/3/ -X1/4	Wire -X1/3/ -X1/5	Wire -X1/4/ -X1/5
Failure indication	XXXX	XX	X	X	XX	X	X	X	X	XXXX

12.14 SUPREMA Sensor Data Sheet D-7152 K (3-wire)

Order No.: D0715685



The cable screen is only connected to the SUPREMA.
Alternatively, the bridges -X1/1 -X1/2 and -X1/4 -X1/5 can be set as solder bridges on the MAT 10 or MAT 10-TS Module.

Connection module: MPI 10/WT 100/passive/3-wire/Constant current/Presetting required

Sensor simulation module: WT 100 (Order No.: 10030263)

Attention! **Before connecting measuring head, reduce sensor current to minimum!**

Connection data:

Bridge current	310 mA for all measuring components
Maximum nominal current	330 mA
Maximum nominal voltage	≤ 3.0 V
Power consumption	≤ 1.0 W (without cable length)
Cable type	3-core, 80 % screened
Maximum loop resistance	36 ohms (Cable resistance)
Maximum cable length	1200 m (at 1.5 mm² cross section per wire)
Cable diameter	7 ... 13.5 mm
Cross section per wire allowed	0.75 ... 1.5 mm²
Junction box	E Ex e (Order No.: D0715205)

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 42 according to DIN 400 50
Explosion protection	II 2G EEx d II C T6
Certificate	PTB 01 ATEX 1152 X
Temperature	-40 °C to +60 °C
Humidity	0 ... 95 % rel. humidity; noncondensing

Pressure	950 ... 1100 hPa
Weight	approx. 0.72 kg
Dimensions W x D x H	50 mm x 40 mm x 50 mm
Housing material	1.4305 V2A

Startup:	**Presetting required —> before first calibration and when changing sensor**
Presetting:	Connect digital voltmeter to MAI card jacks. Bridge current setting —> 310 mA for all measuring components Zero adjustment by zero gas —> Zero setting to **Ua = 400 ... 450 mV** Sensitivity adjustment with measuring gas —> Measuring range level **Ua = 1950 ... 2100 mV** or by means of the value of the existing gas concentration according to: **Ua (mV) = C (Span gas concentration in % of measuring range) / 100 * 1600 + 400**
Warm-up period:	≤ 60 s according to EN 50054, 15 minutes for presetting, 2 hours for calibration
Function test:	Span gas application via: PK10 with 1.0 l/min or PV10 with 1.0 l/min
Calibration:	Calibration procedure according to SUPREMA operation manual For measuring components allowed, measuring ranges, lower alarm levels and conditions for calibration see list of components. Possible other measuring components and measuring ranges on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms
XXXX = no change of indication

Open-circuit at the MAT-(TS)-Module	Wire -X1/2	Wire -X1/3	Wire -X1/4	Bridge -X1/1 /-X1/2	Bridge -X1/4 /-X1/5	Disconnect plug of MAT-(TS)
Failure indication	X	X	X	XX	X	X

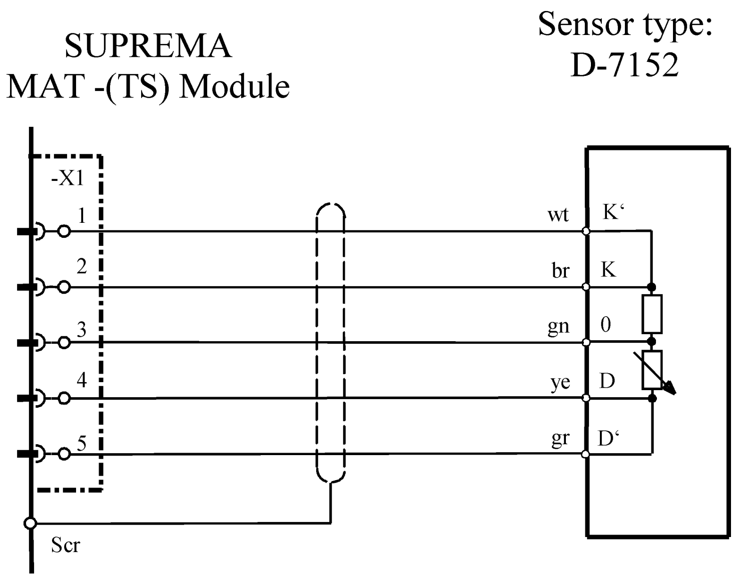
Open-circuit at max. cable length	Wire -X1/2	Wire -X1/3	Wire -X1/4
Failure indication	X	X	X

Short-circuit at the MAT-(TS)-Module	Wire -X1/2/-X1/3	Wire -X1/2/-X1/4	Wire -X1/3/-X1/4
Failure indication	XX	X	X

Short-circuit at max. cable length	Wire -X1/2/-X1/3	Wire -X1/2/-X1/4	Wire -X1/3/-X1/4
Failure indication	XX	XXXX	X
At conductor resistance 0 ... 1.7 Ohm per lead	XX	X	X

12.15 SUPREMA Sensor Data Sheet D-7152 K (5-wire)

Order No.: D0715685



The cable screen is only connected to the SUPREMA.

Connection module: MPI 10/WT 100/passive/5-wire/Constant current/Presetting required

Sensor simulation module: WT 100 (Order No.: 10030263)

Attention! **Before connecting measuring head, reduce sensor current to minimum!**

Connection data:

Bridge current	310 mA for all measuring components
Maximum nominal current	330 mA
Maximum nominal voltage	≤ 3.0 V
Power consumption	≤ 1.0 W (without cable length)
Cable type	5-core, 80 % screened
Maximum loop resistance	36 ohms
Maximum cable length	1500 m (at 1.5 mm^2 cross section per wire)
Sensor Cable	9 mm (1.5 m connection line, 5-core potted)
Junction box	E Ex e (Order No.: D0715205)
Cross section per wire allowed	0.75 ... 1.5 mm^2
Cable diameter	7 ... 13.5 mm

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 42 according to DIN 400 50
Explosion protection	II 2G EEx d II C T6
Certificate	PTB 01 ATEX 1152 X
Temperature	-40 °C to +60 °C
Humidity	0 ... 95 % rel. humidity; noncondensing

Pressure	950 ... 1100 hPa
Weight	approx. 0.72 kg
Dimensions W x D x H	50 mm x 40 mm x 50 mm
Housing material	1.4305 V2A

Startup:	**Presetting required —> before first calibration and when changing sensor**
Presetting:	Connect digital voltmeter to MAI card jacks. Bridge current setting —> 310 mA for all measuring components Zero adjustment by zero gas —> Zero setting to **Ua = 400 ... 450 mV** Sensitivity adjustment with measuring gas —> Measuring range level **Ua = 1950 ... 2100 mV** or by means of the value of the existing gas concentration according to: **Ua (mV) = C (Span gas concentration in % of measuring range) / 100 * 1600 + 400**
Warm-up period:	≤ 60 s according to EN 50054, 15 minutes for presetting, 2 hours for calibration
Function test:	Span gas application via: PK10 with 1.0 l/min or PV10 with 1.0 l/min
Calibration:	Calibration procedure according to SUPREMA operation manual For measuring components allowed, measuring ranges, lower alarm levels and conditions for calibration see list of components. Possible other measuring components and measuring ranges on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms
XXXX = no status indication (signal change)

Open-circuit at the MAT-(TS)-Module	Wire -X1/1	Wire -X1/2	Wire -X1/3	Wire -X1/4	Wire -X1/5	Disconnect plug of MAT-(TS)
Failure indication	XX	X	X	X	X	X

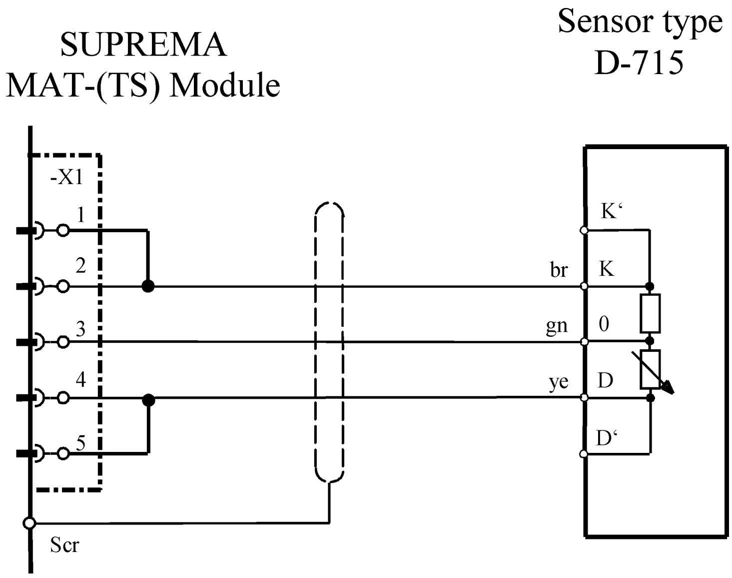
Open-circuit at max. cable length	Wire -X1/1	Wire -X1/2	Wire -X1/3	Wire -X1/4	Wire -X1/5	Disconnect plug of MAT-(TS)
Failure indication	XX	X	X	X	X	X

Short-circuit at the MAT-(TS)-Module	Wire -X1/1/ -X1/2	Wire -X1/1/ -X1/3	Wire -X1/1/ -X1/4	Wire -X1/1/ -X1/5	Wire -X1/2/ -X1/3	Wire -X1/2/ -X1/4	Wire -X1/2/ -X1/5	Wire -X1/3/ -X1/4	Wire -X1/3/ -X1/5	Wire -X1/4/ -X1/5
Failure indication	X	XX	X	X	XX	X	X	X	X	XX

Short-circuit at max. cable length	Wire -X1/1/ -X1/2	Wire -X1/1/ -X1/3	Wire -X1/1/ -X1/4	Wire -X1/1/ -X1/5	Wire -X1/2/ -X1/3	Wire -X1/2/ -X1/4	Wire -X1/2/ -X1/5	Wire -X1/3/ -X1/4	Wire -X1/3/ -X1/5	Wire -X1/4/ -X1/5
Failure indication	XXXX	XX	X	X	XX	X	X	X	X	XXXX

12.16 SUPREMA Sensor Data Sheet D-715 K (3-wire)

Order No.: D0715601



The cable screen is only connected to the SUPREMA.
Alternatively, the bridges -X1/1 -X1/2 and -X1/4 -X1/5 can be set as solder bridges on the MAT 10 resp. MAT 10-TS Module.

Connection module:	MPI 10/WT 100/passive/3-wire/Constant current/Presetting required
Sensor simulation module:	WT 100 (Order No.:10030263)
Attention!	**Before connecting measuring head, reduce sensor current to minimum!**

Connection data:

Bridge current	270 mA/300 mA only for methane
Maximum nominal current	330 mA
Maximum nominal voltage	≤ 3.0 V
Power consumption	≤ 1.0 W (without cable length)
Cable type	3-core, 80 % screened
Maximum loop resistance	36 ohms (Cable resistance)
Maximum cable length	1200 m (at 1.5 mm^2 cross section per wire)
Cable diameter	7 ... 13.5 mm
Cross section per wire allowed	0.75 ...1.5 mm^2
Junction box	E Ex e (Order No.: D0715205)

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 42 according to DIN 400 50
Explosion protection	II 2G EEx d II C T6
Certificate	PTB 01 ATEX 1152 X
Temperature	-40 °C to + 60 °C
Humidity	0 ... 95 % rel. humidity; noncondensing

Pressure	950 ... 1100 hPa
Weight	approx. 0.72 kg
Dimensions W x D x H	80 mm x 55 mm x 125 mm
Housing material	1.4305 V2A

Startup:	**Presetting required —> before first calibration and when changing sensor**
Presetting:	Connect digital voltmeter to MAI card jacks. Bridge current setting —> 270 mA/300mA only for methane Zero adjustment by zero gas —> Zero setting to **Ua = 400 ... 450 mV** Sensitivity adjustment with measuring gas —> Measuring range level **Ua = 1950 ... 2100 mV** or by means of the value of the existing gas concentration according to: **Ua (mV) = C (Span gas concentration in % of measuring range) / 100 * 1600 + 400**
Warm-up period:	≤ 60 s according to EN 50054, 15 minutes for presetting, 2 hours for calibration
Function test:	Span gas application via: PK10 with 1.0 l/min or PV10 with 1.0 l/min
Calibration:	Calibration procedure according to SUPREMA operation manual For measuring components allowed, measuring ranges, lower alarm levels and conditions for calibration see list of components. Possible other measuring components and measuring ranges on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms
XXXX = no change of indication

Open-circuit at the MAT-(TS)-Module	Wire -X1/2	Wire -X1/3	Wire -X1/4	Bridge -X1/1 /-X1/2	Bridge -X1/4 /-X1/5	Disconnect plug of MAT-(TS)
Failure indication	X	X	X	XX	X	X

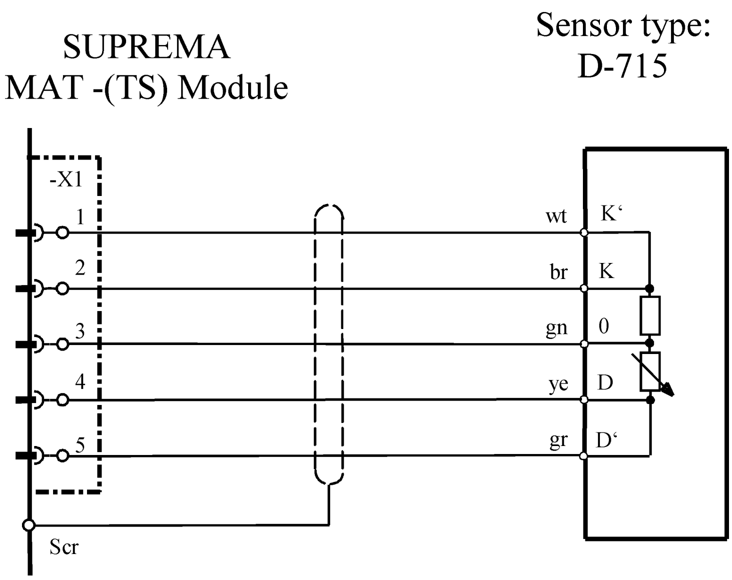
Open-circuit at max. cable length	Wire -X1/2	Wire -X1/3	Wire -X1/4
Failure indication	X	X	X

Short-circuit at the MAT-(TS)-Module	Wire -X1/2/-X1/3	Wire -X1/2/-X1/4	Wire -X1/3/-X1/4
Failure indication	XX	X	X

Short-circuit at max. cable length	Wire -X1/2/-X1/3	Wire -X1/2/-X1/4	Wire -X1/3/-X1/4
Failure indication	XX	XXXX	X
At conductor resis-tance 0 ... 1.7 Ohm per lead	XX	X	X

12.17 SUPREMA Sensor Data Sheet D-715 K (5-wire)

Order No.: D0715601



The cable screen is only connected to the SUPREMA.

Connection module: MPI 10/WT 100/passive/5-wire/Constant current/Presetting required

Sensor simulation module: WT 100 (Order No.: 10030263)

Attention! **Before connecting measuring head, reduce sensor current to minimum!**

Connection data:

Bridge current	270 mA/300 mA only for methane
Maximum nominal current	330 mA
Maximum nominal voltage	≤ 3.0 V
Power consumption	≤ 1.0 W (without cable length)
Cable type	5-core, 80 % screened
Maximum loop resistance	36 ohms (Cable resistance)
Maximum cable length	1500 m (at 1.5 mm^2 cross section per wire)
Cable diameter	7 ... 13.5 mm 9 mm (1.5 m connection line, 5-core potted)
Cross section per wire allowed	0.75 ... 1.5 mm^2
Junction box	E Ex e (Order No.: D0715205)

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 42 according to DIN 400 50
Explosion protection	II 2G EEx d II C T6
Certificate	PTB 01 ATEX 1152 X
Temperature	-40 °C to +60 °C
Humidity	0 ... 95 % rel. humidity; noncondensing

Pressure	950 ... 1100 hPa
Weight	approx. 0.72 kg
Dimensions W x D x H	50 mm x 40 mm x 50 mm
Housing material	1.4305 V2A

Startup:	**Presetting required —> before first calibration and when changing sensor**
Presetting:	Connect digital voltmeter to MAI card jacks. Bridge current setting —> 270 mA/300 mA only for methane Zero adjustment by zero gas —> Zero setting to **Ua = 400 ... 450 mV** Sensitivity adjustment with measuring gas —> Measuring range level **Ua = 1950 ... 2100 mV** or by means of the value of the existing gas concentration according to: **Ua (mV) = C (Span gas concentration in % of measuring range) / 100 * 1600 + 400**
Warm-up period:	≤ 60 s according to EN 50054, 15 minutes for presetting, 2 hours for calibration
Function test:	Span gas application via: PK10 with 1.0 l/min or PV10 with 1.0 l/min
Calibration:	Calibration procedure according to SUPREMA operation manual For measuring components allowed, measuring ranges, lower alarm levels and conditions for calibration see list of components. Possible other measuring components and measuring ranges on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms
XXXX = no status indication (signal change)

Open-circuit at the MAT-(TS)-Module	Wire -X1/1	Wire -X1/2	Wire -X1/3	Wire -X1/4	Wire -X1/5	Disconnect plug of MAT-(TS)
Failure indication	XX	X	X	X	X	X

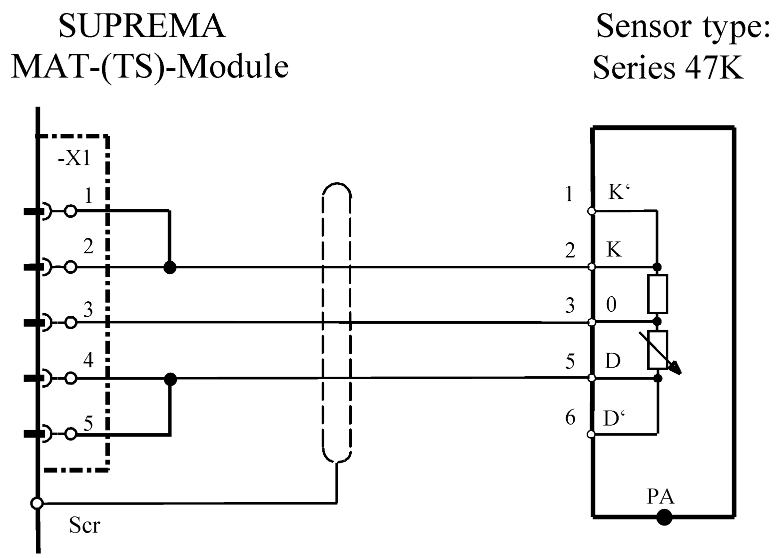
Open-circuit at max. cable length	Wire -X1/1	Wire -X1/2	Wire -X1/3	Wire -X1/4	Wire -X1/5	Disconnect plug of MAT-(TS)
Failure indication	XX	X	X	X	X	X

Short-circuit at the MAT-(TS)-Module	Wire -X1/1/ -X1/2	Wire -X1/1/ -X1/3	Wire -X1/1/ -X1/4	Wire -X1/1/ -X1/5	Wire -X1/2/ -X1/3	Wire -X1/2/ -X1/4	Wire -X1/2/ -X1/5	Wire -X1/3/ -X1/4	Wire -X1/3/ -X1/5	Wire -X1/4/ -X1/5
Failure indication	X	XX	X	X	XX	X	X	X	X	XX

Short-circuit at max. cable length	Wire -X1/1/ -X1/2	Wire -X1/1/ -X1/3	Wire -X1/1/ -X1/4	Wire -X1/1/ -X1/5	Wire -X1/2/ -X1/3	Wire -X1/2/ -X1/4	Wire -X1/2/ -X1/5	Wire -X1/3/ -X1/4	Wire -X1/3/ -X1/5	Wire -X1/4/ -X1/5
Failure indication	XXXX	XX	X	X	XX	X	X	X	X	XXXX

12.18 SUPREMA Sensor Data Sheet Series 47K-ST, -PRP (3-wire)

Order No.: according to ordering information



The cable screen is only connected to the SUPREMA.
Alternatively, the bridges -X1/1 -X1/2 and -X1/4 -X1/5 can be set as solder bridges on the MAT 10-TS module.

Connection module: MPI - WT 100/passive/3-wire/Constant current/Presetting required

Sensor simulation module: WT (= catalytic combustion), (Order No.: 10030263)

Attention! **Before connecting measuring head, reduce sensor current to minimum!**

Connection data:

Bridge current	310 mA
Maximum nominal current	350 mA
Power consumption	1.0 W typical (without cable length)
Cable type	3-core, 80 % screened
Maximum loop resistance	36 ohms
Maximum cable length	1000 m (at 1.5 mm^2 cross section per wire)
Cable diameter	8 ... 13.5 mm
Cross section per wire allowed	1.0 ... 2.5 mm^2
Connection box EEx d 2 x 3/4'' NPT	Order No.: 10051080
Connection box EEx e 2 x M25 x 1.5 mm	Order No.: 10051091

Conditions for use:

Mounting	Wall mounting
Explosion protection/Sensor	II 2G EEx d IIC T4 (-40 °C ... +90 °C) – ST II 2G EEx d IIC T6 (-40 °C ... +40 °C) – PRP
Certificate/Sensor	INERIS 03 ATEX 0208
Terminal box EEx d 2 x 3/4'' NPT Dimensions W x D x H Weight Temperature	CESI 012 ATEX 105 100 x 100 x 100 mm 400 g -40 °C ... +55 °C (T5) / -40 °C ... +40 °C (T6)

Terminal box EEx e 2 x M25 x 1.5 mm Dimensions W x D x H Weight Temperature	KEMA 99 ATEX 3853 90 x 90 x 75 mm 490 g -20 °C ... +55 °C (T5) / -20 °C ... +40 °C (T6)
Humidity	0 ... 95 % rel. humidity; noncondensing
Pressure	100 ± 20 hPa
For further details see operation manual. (Order no.: 10052472)	

Startup:	**Presetting required —> before first calibration and when changing sensor**
Presetting:	Connect digital voltmeter to MAI card jacks. Bridge current setting —> 310 mA Zero adjustment by zero gas —> Zero setting to **Ua = 400 ... 450 mV** Sensitivity adjustment with measuring gas —> Measuring range level **Ua = 1950 ... 2100 mV** or by means of the value of the existing gas concentration according to: **Ua (mV) = C (Span gas concentration in % of measuring range) / 100 * 1600 + 400**
Warm-up period:	15 minutes for presetting 2 hours for calibration
Function test:	Span gas application via: test cap with 1.0 l/min (Order-No.: 10049316)
Calibration:	Calibration procedure according to SUPREMA operation manual For measuring components allowed, measuring ranges, lower alarm levels and conditions for calibration see list of components. (Order-No.: D0792420) Possible other measuring components and measuring ranges on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms
XXXX = no change of indication

Open-circuit at the MAT-(TS)-Module	Wire -X1/2	Wire -X1/3	Wire -X1/4	Bridge -X1/1 /-X1/2	Bridge -X1/4 /-X1/5	Disconnect plug of MAT-(TS)
Failure indication	X	X	X	XX	X	X

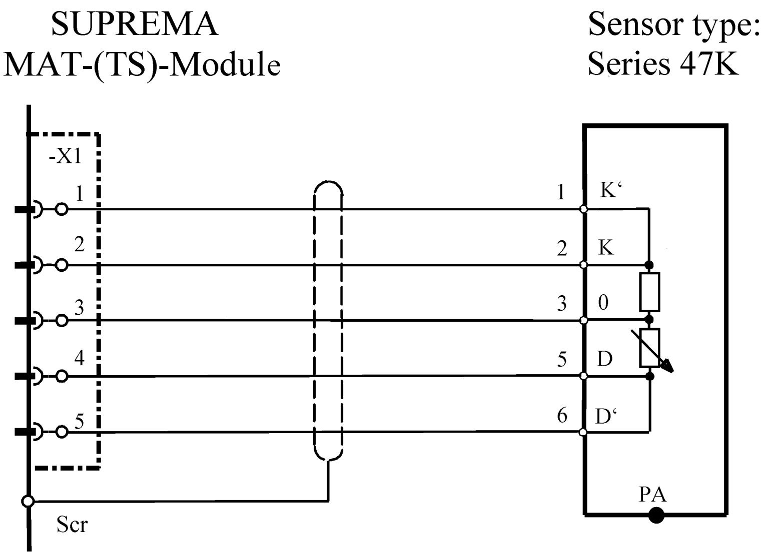
Open-circuit at max. cable length	Wire -X1/2	Wire -X1/3	Wire -X1/4
Failure indication	X	X	X

Short-circuit at the MAT-(TS)-Module	Wire -X1/2 /-X1/3	Wire -X1/2 /-X1/4	Wire -X1/3/-X1/4
Failure indication	XX	X	X

Short-circuit at max. cable length	Wire -X1/2 /-X1/3	Wire -X1/2 /-X1/4	Wire -X1/3/-X1/4
Failure indication	XX	XXXX	X
At conductor resistance 0 ... 1.7 ohms per lead	XX	X	X

12.19 SUPREMA Sensor Data Sheet Series 47K-ST, -PRP (5-wire)

Order No.: according to ordering information



The cable screen is only connected to the SUPREMA.
Alternatively, the bridges -X1/1 -X1/2 and -X1/4 -X1/5 can be set as solder bridges on the MAT 10-TS module.

Connection module: MPI - WT 100/passive/5-wire/Constant current/Presetting required

Sensor simulation module: WT (= catalytic combustion), (Order No.: 10030263)

Attention! **Before connecting measuring head, reduce sensor current to minimum!**

Connection data:

Bridge current	310 mA
Maximum nominal current	350 mA
Power consumption	1.0 W typical (without cable length)
Cable type	5-core, 80 % screened
Maximum loop resistance	36 ohms
Maximum cable length	1200 m (at 1.5 mm^2 cross section per wire)
Cable diameter	8 ... 13.5 mm
Cross section per wire allowed	1.0 ... 2.5 mm^2
Connection box EEx d 2 x 3/4'' NPT	Order No.: 10051080
Connection box EEx e 2 x M25 x 1.5 mm	Order No.: 10051091

Conditions for use:

Mounting	Wall mounting
Explosion protection/Sensor	II 2G EEx d IIC T4 (-40 °C ... +90 °C) – ST II 2G EEx d IIC T6 (-40 °C ... +40 °C) – PRP
Certificate/Sensor	INERIS 03 ATEX 0208
Terminal box EEx d 2 x 3/4'' NPT Dimensions W x D x H Weight Temperature	CESI 012 ATEX 105 100 x 100 x 100 mm 400 g -40 °C ... +55 °C (T5) / -40 °C ... +40 °C (T6)

Terminal box EEx e 2 x M25 x 1.5 mm Dimensions W x D x H Weight Temperature	KEMA 99 ATEX 3853 90 x 90 x 75 mm 490 g -20 °C ... +55 °C (T5) / -20 °C ... +40 °C (T6)
Humidity	0 ... 95 % rel. humidity; noncondensing
Pressure	100 ± 20 hPa
For further details see operation manual. (Order no.: 10052472)	

Startup:	**Presetting required —> before first calibration and when changing sensor**
Presetting:	Connect digital voltmeter to MAI card jacks. Bridge current setting —> 310 mA Zero adjustment by zero gas —> Zero setting to **Ua = 400 ... 450 mV** Sensitivity adjustment with measuring gas —> Measuring range level **Ua = 1950 ... 2100 mV** or by means of the value of the existing gas concentration according to: **Ua (mV) = C (Span gas concentration in % of measuring range) / 100 * 1600 + 400**
Warm-up period:	15 minutes for presetting 2 hours for calibration
Function test:	Span gas application via: test cap with 1.0 l/min (Order-No.: 10049316)
Calibration:	Calibration procedure according to SUPREMA operation manual For measuring components allowed, measuring ranges, lower alarm levels and conditions for calibration see list of components. (Order-No.: D0792420) Possible other measuring components and measuring ranges on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms
XXXX = no change of indication

Open-circuit at the MAT-(TS)-Module	Wire -X1/1	Wire -X1/2	Wire -X1/3	Wire -X1/4	Wire -X1/5	Disconnect plug of MAT-(TS)
Failure indication	XX	X	X	X	X	X

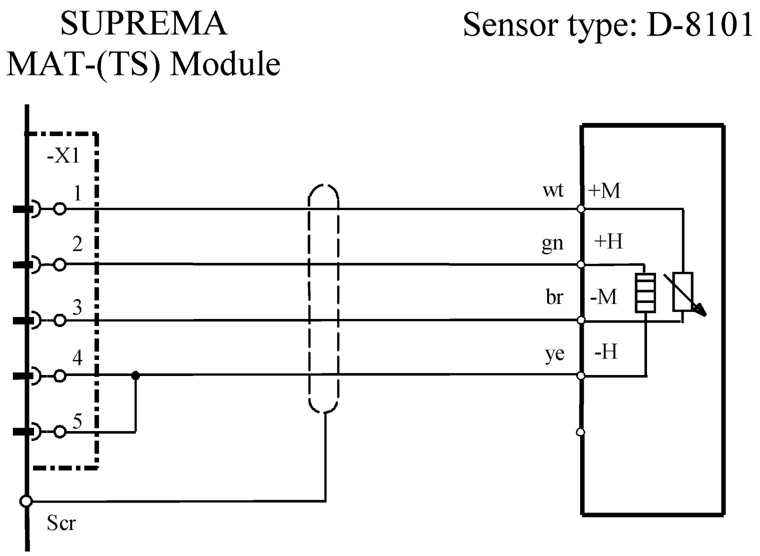
Open-circuit at max. cable length	Wire -X1/1	Wire -X1/2	Wire -X1/3	Wire -X1/4	Wire -X1/5	Disconnect plug of MAT-(TS)
Failure indication	XX	X	X	X	X	X

Short-circuit at the MAT-(TS)-Module	Wire -X1/1/ -X1/2	Wire -X1/1/ -X1/3	Wire -X1/1/ -X1/4	Wire -X1/1/ -X1/5	Wire -X1/2/ -X1/3	Wire -X1/2/ -X1/4	Wire -X1/2/ -X1/5	Wire -X1/3/ -X1/4	Wire -X1/3/ -X1/5	Wire -X1/4/ -X1/5
Failure indication	X	XX	X	X	XX	X	X	X	X	XX

Short-circuit at max. cable length	Wire -X1/1/ -X1/2	Wire -X1/1/ -X1/3	Wire -X1/1/ -X1/4	Wire -X1/1/ -X1/5	Wire -X1/2/ -X1/3	Wire -X1/2/ -X1/4	Wire -X1/2/ -X1/5	Wire -X1/3/ -X1/4	Wire -X1/3/ -X1/5	Wire -X1/4/ -X1/5
Failure indication	XXXX	XX	X	X	XX	X	X	X	X	XXXX

12.20 SUPREMA Sensor Data Sheet D-8101

Order No.: D0715672



The cable screen is only connected to the SUPREMA.
Alternatively, the bridge -X1/4 -X1/5 may be performed as a solder-bridge on the MAT-10- resp. on the MAT-10-TS-module. (The bridge is from status G of MPI 10 module no longer required.)

Connection module: MPI 10/HL 8101/passive/4-wire/Constant current/Presetting required

Sensor simulation module: HL (Order No.: 10030264)

Attention! **Before connecting measuring head, reduce sensor current to minimum!**

Connection data:

Bridge current	118 mA ± 2 mA
Maximum nominal current	150 mA
Maximum nominal voltage	10 V
Power consumption	approx. 0.6 W (without cable length)
Cable type	4-core, 80 % screened
Maximum loop resistance	36 ohms
Maximum cable length	1500 m (at 1.5 mm^2 cross section per wire)
Cable diameter	7 ... 13.5 mm
Cross section per wire allowed	0.75 ... 1.5 mm^2
Cable inlet	Pg 13.5

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 42 according to DIN 400 50
Explosion protection	(Ex) sd 3n G5
Certificate	III B/E -27349
Temperature	-20 °C to +40 °C
Humidity	10 ... 95 % rel. humidity; noncondensing

Pressure	950 ... 1100 hPa
Weight	approx. 430 g
Dimensions W x D x H	80 mm x 55 mm x 125 mm
Housing material	Die-cast housing Polyamide 6

Startup:	**Presetting required —> before first calibration and when changing sensor**
Presetting:	Connect digital voltmeter to MAI card jacks. Bridge current setting —> 118 mA for all components Zero adjustment by zero gas —> Zero setting to **Ua = 400 ... 450 mV** Sensitivity adjustment with measuring gas —> Measuring range level **Ua = 1950 ... 2100 mV**
Warm-up period:	15 minutes for presetting, 48 hours for calibration
Function test:	Span gas application via: PK 10 with 1.0 l/min or PV 10 with 1.0 l/min
Calibration:	Calibration procedure according to SUPREMA operation manual For measuring components allowed, measuring ranges, lower alarm levels and conditions for calibration see list of components. Possible other measuring components and measuring ranges on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms
XXXX = no change of indication

Open-circuit at min. cable length	Wire -X1/1	Wire -X1/2	Wire -X1/3	Wire -X1/4	Bridge -X1/4 / -X1/5	Disconnect plug of MAT-(TS)
Failure indication	X	X	X	X	XXXX	X

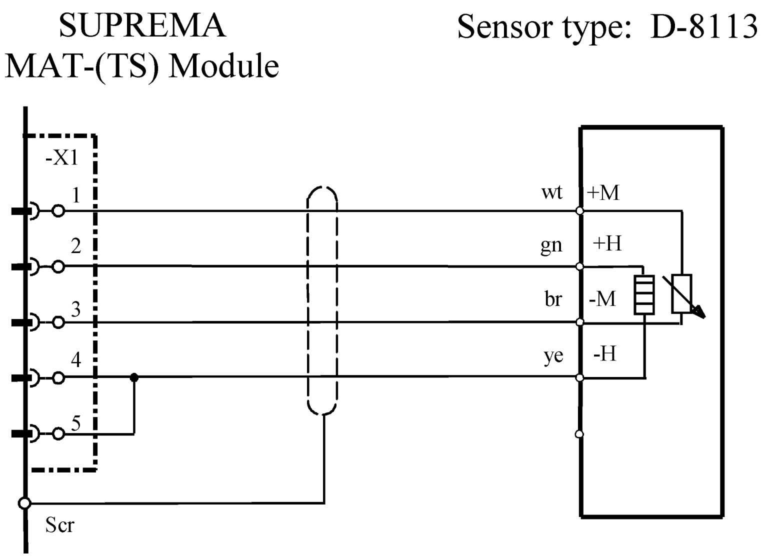
Open-circuit at max. cable length	Wire -X1/1	Wire -X1/2	Wire -X1/3	Wire -X1/4
Failure indication	X	X	X	X

Short-circuit min. cable length	Wire -X1/1/-X1/2	Wire -X1/1/-X1/3	Wire -X1/1/-X1/4	Wire -X1/2/-X1/3	Wire -X1/2/-X1/4	Wire -X1/3/-X1/4
Failure indication	XXXX	XX	X	XX	XXXX	XX

Short-circuit max. cable length	Wire -X1/1/-X1/2	Wire -X1/1/-X1/3	Wire -X1/1/-X1/4	Wire -X1/2/-X1/3	Wire -X1/2/-X1/4	Wire -X1/3/-X1/4
Failure indication	XXXX	XX	XXXX	X	XXXX	X

12.21 SUPREMA Sensor Data Sheet D-8113

Order No.: D0715674



The cable screen is only connected to the SUPREMA.
Alternatively, the bridge -X1/4 -X1/5 may be performed as a solder-bridge on the MAT-10- resp. on the MAT-10-TS-module. (The bridge is from status G of MPI 10 module no longer required.)

Connection module: MPI 10/HL 8113/passive/4-wire/Constant current/Presetting required

Sensor simulation module: HL (Order No.: 10030264)

Attention! **Before connecting measuring head, reduce sensor current to minimum!**

Connection data:

Bridge current	165 mA ± 2 mA
Maximum nominal current	190 mA
Maximum nominal voltage	10 V
Power consumption	approx. 0.9 W (without cable length)
Cable type	4-core, 80 % screened
Maximum loop resistance	36 ohms
Maximum cable length	1500 m (at 1.5 mm^2 cross section per wire)
Cable diameter	7 ... 13.5 mm
Cross section per wire allowed	0.75 ... 1.5 mm^2
Cable inlet	Pg 13.5

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 42 according to DIN 400 50
Explosion protection	(Ex) sd 3n G5
Certificate	III B/E -27349
Temperature	-20 °C to +40 °C
Humidity	10 ... 95 % rel. humidity; noncondensing

Pressure	950 ... 1100 hPa
Weight	approx. 430 g
Dimensions W x D x H	80 mm x 55 mm x 125 mm
Housing material	Die-cast housing Polyamide 6

Startup:	**Presetting required —> before first calibration and when changing sensor**
Presetting:	Connect digital voltmeter to MAI card jacks. Bridge current setting —> 165 mA for all components Zero adjustment by zero gas —> Zero setting to **Ua = 400 ... 450 mV** Sensitivity adjustment with measuring gas —> Measuring range level **Ua = 1950 ... 2100 mV**
Warm-up period:	15 minutes for presetting, 48 hours for calibration
Function test:	Span gas application via: PK10 with 1.0 l/min or PV10 with 1.0 l/min
Calibration:	Calibration procedure according to SUPREMA operation manual For measuring components allowed, measuring ranges, lower alarm levels and conditions for calibration see list of components. Possible other measuring components and measuring ranges on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms
XXXX = no change of indication

Open-circuit at min. cable length	Wire -X1/1	Wire -X1/2	Wire -X1/3	Wire -X1/4	Bridge -X1/4 / -X1/5	Disconnect plug of MAT-(TS)
Failure indication	X	X	X	X	XXXX	X

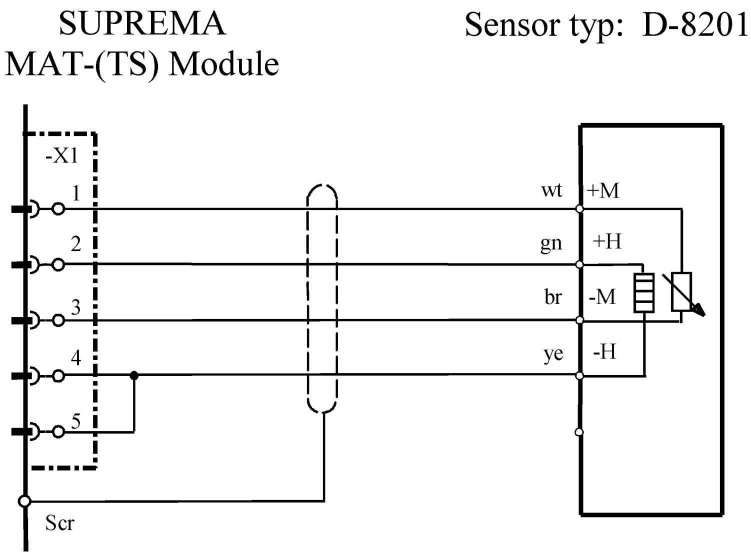
Open-circuit at max. cable length	Wire -X1/1	Wire -X1/2	Wire -X1/3	Wire -X1/4
Failure indication	X	X	X	X

Short-circuit at min. cable length	Wire -X1/1/-X1/2	Wire -X1/1/-X1/3	Wire -X1/1/-X1/4	Wire -X1/2/-X1/3	Wire -X1/2/-X1/4	Wire -X1/3/-X1/4
Failure indication	XXXX	XX	X	XX	XXXX	XX

Short-circuit at max. cable length	Wire -X1/1/-X1/2	Wire -X1/1/-X1/3	Wire -X1/1/-X1/4	Wire -X1/2/-X1/3	Wire -X1/2/-X1/4	Wire -X1/3/-X1/4
Failure indication	XXXX	XX	XXXX	X	XXXX	X

12.22 SUPREMA Sensor Data Sheet D-8201

Order No.: D0715643



The cable screen is only connected to the SUPREMA.
Alternatively, the bridge -X1/4 -X1/5 may be performed as a solder-bridge on the MAT-10- resp. on the MAT-10-TS-module. (The bridge is from status G of MPI 10 module no longer required.)

Connection module: MPI 10/HL 8101/passive/4-wire/Constant current/Presetting required

Sensor simulation module: HL (Order No.: 10030264)

Attention! **Before connecting measuring head, reduce sensor current to minimum!**

Connection data:

Bridge current	118 mA ± 2 mA
Maximum nominal current	150 mA
Maximum nominal voltage	10 V
Power consumption	approx. 0.6 W (without cable length)
Cable type	4-core, 80 % screened
Maximum loop resistance	36 ohms
Maximum cable length	1500 m (at 1.5 mm² cross section per wire)
Cable diameter	7 ... 13.5 mm
Cross section per wire allowed	0.75 ... 1.5 mm²
Cable inlet	Pg 13.5

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 42 according to DIN 400 50
Explosion protection	(Ex) sd 3n G5
Certificate	III B/E -27349
Temperature	-20 °C to +40 °C
Humidity	10 ... 95 % rel. humidity; noncondensing

Pressure	950 ... 1100 hPa
Weight	approx. 0.72 kg
Dimensions W x D x H	50 mm x 40 mm x 50 mm
Housing material	1.4305 V2A

Startup:	**Presetting required —> before first calibration and when changing sensor**
Presetting:	Connect digital voltmeter to MAI card jacks. Bridge current setting —> 118 mA for all components Zero adjustment by zero gas —> Zero setting to **Ua = 400 ... 450 mV** Sensitivity adjustment with measuring gas —> Measuring range level **Ua = 1950 ... 2100 mV**
Warm-up period:	15 minutes for presetting, 48 hours for calibration
Function test:	Span gas application via: PK10 with 1.0 l/min or PV10 with 1.0 l/min
Calibration:	Calibration procedure according to SUPREMA operation manual For measuring components allowed, measuring ranges, lower alarm levels and conditions for calibration see list of components. Possible other measuring components and measuring ranges on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms
XXXX = no change of indication

Open-circuit at min. cable length	Wire -X1/1	Wire -X1/2	Wire -X1/3	Wire -X1/4	Bridge -X1/4/ -X1/5	Disconnect plug of MAT-(TS)
Failure indication	X	X	X	X	XXXX	X

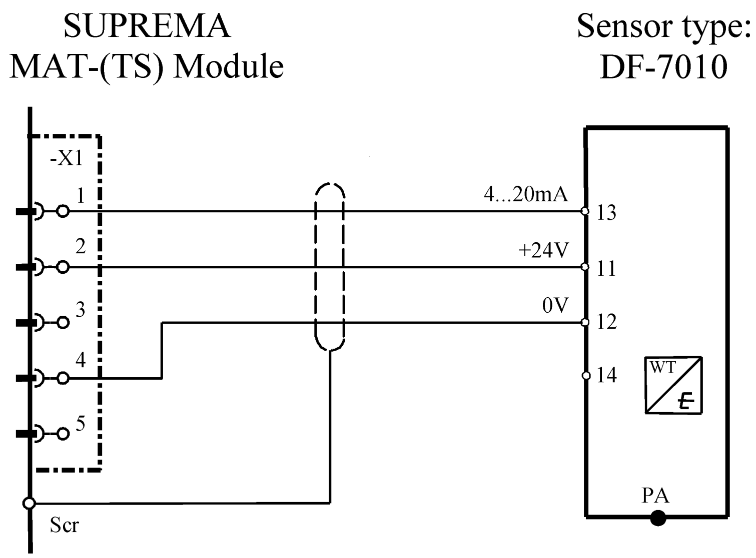
Open-circuit at max. cable length	Wire -X1/1	Wire -X1/2	Wire -X1/3	Wire -X1/4
Failure indication	X	X	X	X

Short-circuit at min. cable length	Wire -X1/1/-X1/2	Wire -X1/1/-X1/3	Wire -X1/1/-X1/4	Wire -X1/2/-X1/3	Wire -X1/2/-X1/4	Wire -X1/3/-X1/4
Failure indication	XXXX	XX	X	XX	XXXX	XX

Short-circuit at max. cable length	Wire -X1/1/-X1/2	Wire -X1/1/-X1/3	Wire -X1/1/-X1/4	Wire -X1/2/-X1/3	Wire -X1/2/-X1/4	Wire -X1/3/-X1/4
Failure indication	XXXX	XX	XXXX	X	XXXX	X

12.23 SUPREMA Sensor Data Sheet DF-7010

Order No.: D0792602



The cable screen is connected to the SUPREMA and the DF-7010.

Connection module: MCI 10/MCI 20 (active/3-wire/4 ... 20 mA linear/current supply)

Sensor simulation module: **4 ... 20 mA** (Order No.: 10030262)

Connection data:

Supply voltage	16 ... 32 VDC
Maximum power consumption	120 mA
Power consumption	4.0 W (without cable length)
Cable type	3-core, 80 % screened
Maximum burden	200 ohms
Maximum cable length	1000 m (at 1.5 mm² cross section per wire)
Cable diameter	6 ... 12 mm
Cross section per wire allowed	0.5 ... 2.5 mm²
Cable inlet	Pg 13.5

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 54 according to EN 60529
Explosion protection	II 2G EEx d m e[[ib]] IIC T6
Certificate	DMT 99 ATEX E 023 X
Temperature	-20 °C to +40 °C
Humidity	5 ... 95 % rel. humidity; noncondensing
Pressure	950 ... 1100 hPa
Weight	approx. 1.5 kg
Dimensions W x D x H	150 x 88 x 158
For further details see operation manual. (Order No.: D0792151)	

Startup:	After switching on the supply voltage, the DF-7010 initiates a self-test.
	Ia = 3 mA (adjustable) —> After 5 minutes, the instrument changes over to measuring operation. Ia = 4 mA Explosion range: Before opening the terminal compartment, power to the measuring head must be switches off.
Status signals:	On SUPREMA operation, the adjustable status signals CALIBRATION and FAILURE must be set to the following values: Calibration —> 3 mA Failure —> 2 mA Cable defect —> 0 mA Indication at the SUPREMA display: Signal error
Function test:	Span gas application via: Integrated span gas inlet piece with 0.5 l/min, (for standard test gases) or test cap with 1.0 l/min, (Order No.: D6079762) or splashwater-proof housing SG 70 with 1 l/min or pump adapter PA 70 with 1.0 l/min
Calibration:	New or modified calibration is made on the spot by means of the AUER CONTROL operation module. Operation manual AUER-CONTROL Order No.: 0792-124 Calibration demand of SUPREMA measuring points —> (INHIBIT/alarm suppression) current output in calibration mode —> 3 mA After confirmation, changeover to measuring operation. Approved measuring components, calibrating conditions, measuring ranges, alarm levels and linearisation tables see list of components: (Order No.: D0792420) Possible other measuring components on request.
Sensor substitution module	4 ... 20 mA/Order No.: 10030262

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms
XXXX = no change of indication

Open-circuit at the MAT-(TS)-Module	Wire -X1/1	Wire -X1/2	Wire -X1/4	Disconnect plug of MAT-(TS)
Failure indication	X	X	X	X

Open-circuit at max. cable length	Wire -X1/1	Wire -X1/2	Wire -X1/4
Failure indication	X	X	X

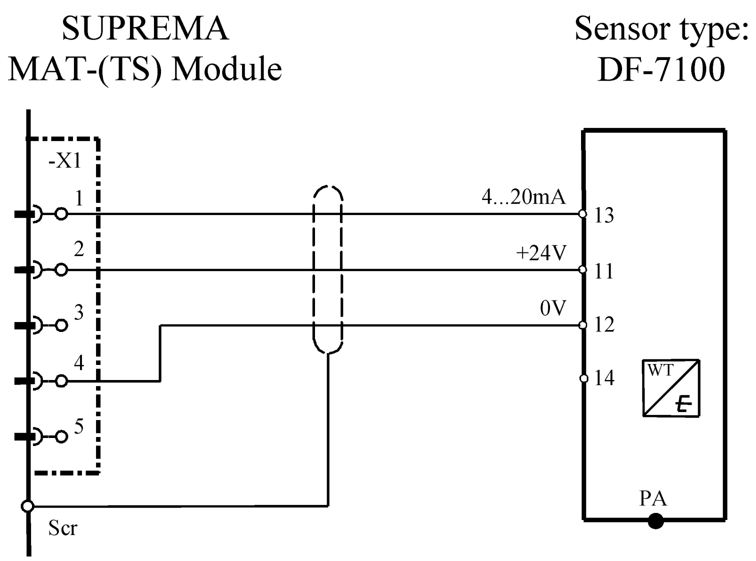
Short-circuit at the MAT-(TS)-Module	Wire -X1/1/-X1/2	Wire -X1/1/-X1/4	Wire -X1/2/-X1/4
Failure indication	XX	X	X

Short-circuit max. cable length	Wire -X1/1/-X1/2	Wire -X1/1/-X1/4	Wire -X1/2/-X1/4
Failure indication*	XX	XXX	X
Failure indication**	XX	X	X

* MCI 10
** MCI 20

12.24 SUPREMA Sensor Data Sheet DF-7100

Order No.: D0792611



The cable screen is connected to the SUPREMA and the DF-7100.

Connection module: MCI 10/MCI 20 (active/3-wire/4 ... 20 mA linear/current supply)

Sensor simulation module: **4 ... 20 mA** (Order No.: 10030262)

Connection data:

Supply voltage	16 ... 32 VDC
Operation current	approx. 100 mA
Power consumption	2.5 W (without cable length)
Cable type	3-core, 80 % screened
Maximum burden	200 ohms
Maximum cable length	1000 m (at 1.5 mm² cross section per wire)
Cable diameter	8 ... 12 mm
Cross section per wire allowed	0.5 ... 2.5 mm²
Cable inlet	Pg 13.5

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 54 according to EN 60529
Explosion protection	II 2G EEx d m e[[ib]] IIC T6
Type test approval	DMT 99 ATEX E 023 X
Temperature	-20 °C to +40 °C
Humidity	5 ... 95 % rel. humidity; noncondensing
Pressure	950 ... 1100 hPa
Weight	approx. 1.5 kg
Housing material	Aluminium Die cast (polyester-coated)
Dimensions W x D x H	150 mm x 88 mm x 158 mm
For further details see operation manual. (Order No.: D0792151)	

Startup:	After switching on the supply voltage, the DF-7010 initiates a self-test.
	Ia = 3 mA (adjustable) —> After 5 minutes, the instrument changes over to measuring operation. Ia = 4 mA Explosion range: Before opening the terminal compartment, power to the measuring head must be switches off.
Status signals:	On SUPREMA operation, the adjustable status signals CALIBRATION and FAILURE must be set to the following values: Calibration —> 3 mA Failure —> 2 mA Cable defect —> 0 mA Indication at the SUPREMA display: Signal error
Function test:	Span gas application via: Integrated span gas inlet piece with 0.5 l/min, (for standard test gases) or test cap with 1.0 l/min (Order No.: D6079762) or splashwater-proof housing SG 70 with 1 l/min or pump adapter PA 70 with 1.0 l/min
Calibration:	New or modified calibration is made on the spot by means of the AUER CONTROL operation module. Operation manual AUER-CONTROL Order No.: 0792-124 Calibration demand of SUPREMA measuring points —> (INHIBIT/alarm suppression) current output in calibration mode —> 3 mA After confirmation, changeover to measuring operation. Approved measuring components, calibrating conditions, measuring ranges, alarm levels and linearisation tables see list of components: (Order No.: D0792420) Possible other measuring components on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms
XXXX = no change of indication

Open-circuit at the MAT-(TS)-Module	Wire -X1/1	Wire -X1/2	Wire -X1/4	Disconnect plug of MAT-(TS)
Failure indication	X	X	X	X

Open-circuit at max. cable length	Wire -X1/1	Wire -X1/2	Wire -X1/4
Failure indication	X	X	X

Short-circuit at the MAT-(TS)-Module	Wire -X1/1/-X1/2	Wire -X1/1/-X1/4	Wire -X1/2/-X1/4
Failure indication	XX	X	X

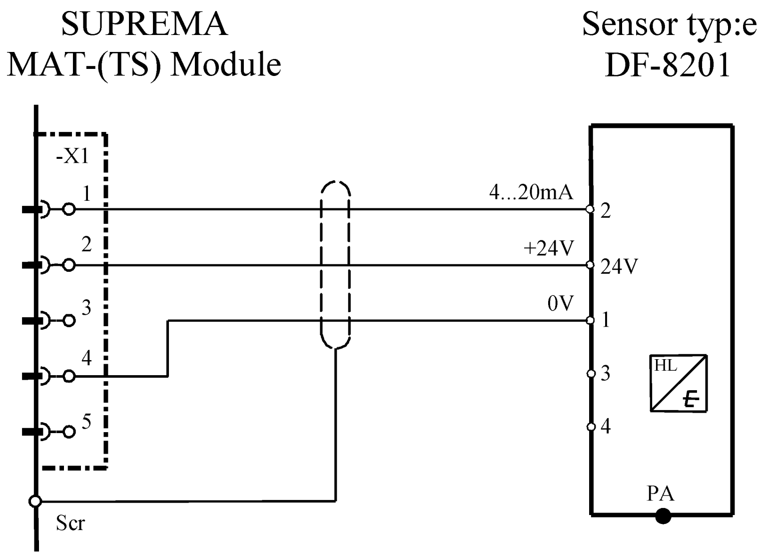
Short-circuit max. cable length	Wire -X1/1/-X1/2	Wire -X1/1/-X1/4	Wire -X1/2/-X1/4
Failure indication*	XX	XXX	X
Failure indication**	XX	X	X

* MCI 10

** MCI 20

12.25 SUPREMA Sensor Data Sheet DF-8201

Order No.: D0756661



The cable screen is connected at the SUPREMA and the DF-8201.

Connection module: MCI 10/MCI 20 (active/3-wire/4 ... 20 mA non-linear/current source)

Sensor simulation module: **4 ... 20 mA** (Order No.: 10030262)

Connection data:

Supply voltage	13 ... 30 VDC
Maximum power consumption	50 mA
Power consumption	1.5 W (without cable length)
Cable type	3-core, 80 % screened
Maximum burden	200 ohms
Maximum cable length	1000 m (at 1.5 mm^2 cross section per wire)
Cable diameter	8 ... 13.5 mm
Cross section per wire allowed	0.5 ... 1.5 mm^2 spring terminals
Cable inlet	Cable gland PG 13.5 mm

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 42/EN 60529
Explosion protection	no
Type test approval	none
Temperature	-20 °C to +40 °C
Humidity	10 up to 90 % rel. humidity
Pressure	950 ... 1100 hPa
Weight	approx. 0.65 kg
Dimensions W x D x H	100 mm x 95 mm x 165 mm
Housing material	Stainless steel plate

Startup:	DF-8201 is consisting of VHL10 + TGS813 (S1 and S2 open)
	Connection according to drawing 0756D-413 (part of the operation manual)
Warm-up period:	2 hours minimum (for operation readiness), 48 hours for calibration
Function test:	Application of span gas or reference gas via test cap (Order No.: D6079762) (0,5 l/min)
Calibration:	Not using dry testgas. Approved measuring components, calibrating conditions, measuring ranges, alarm levels and linearisation tables see list of components: Possible other measuring components on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms
XXXX = Shift of Measurement value

Open-circuit at the MAT-(TS)-Module	Wire -X1/1	Wire -X1/2	Wire -X1/4	Disconnect plug of MAT-(TS)
Failure indication	X	X	XX	X

Open-circuit at max. cable length	Wire -X1/1	Wire -X1/2	Wire -X1/4
Failure indication	X	X	XX

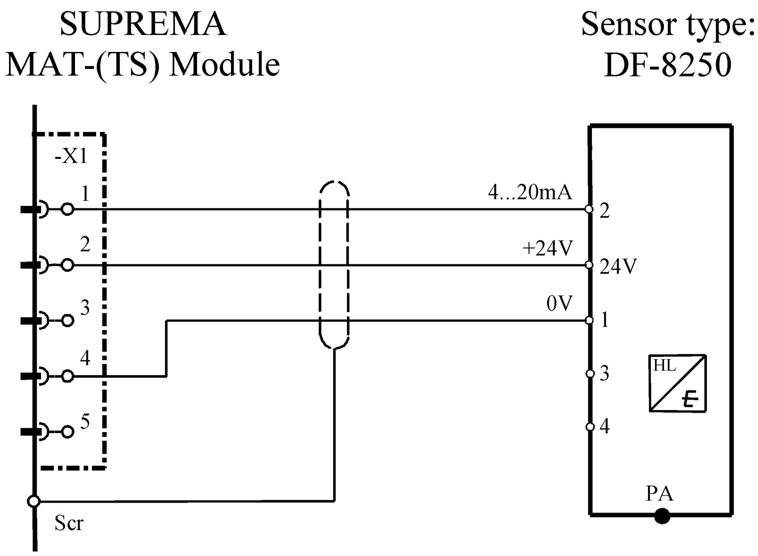
Short-circuit at the MAT-(TS)-Module	Wire -X1/1/-X1/2	Wire -X1/1/-X1/4	Wire -X1/2/-X1/4
Failure indication	XX	X	X

Short-circuit max. cable length	Wire -X1/1/-X1/2	Wire -X1/1/-X1/4	Wire -X1/2/-X1/4
Failure indication*	XX	XXXX	XX
Failure indication**	XX	X	X

* MCI 10
** MCI 20

12.26 SUPREMA Sensor Data Sheet DF-8250

Order No.: D0756662



The cable screen is connected at the SUPREMA and the DF-8250.

Connection module: MCI 10/MCI 20 (active/3-wire/4 ... 20 mA/current supply)

Sensor simulation module: HL (Order No.: 10030264)

Connection data:

Supply voltage	13 ... 30 VDC
Maximum power consumption	50 mA
Power consumption	1.5 W (without cable length)
Cable type	3-core, 80 % screened
Maximum burden	200 ohms
Maximum cable length	1000 m (at 1.5 mm^2 cross section per wire)
Cable diameter	8 ... 13.5 mm
Cross section per wire allowed	0.5 ... 1.5 mm^2 spring terminals
Cable inlet	Cable gland PG 13.5 mm

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 42/EN 60529
Explosion protection	no
Type test approval	none
Temperature	-20 °C to +40 °C
Humidity	10 up to 90 % rel. humidity
Pressure	950 ... 1100 hPa
Weight	approx. 0.65 kg
Dimensions W x D x H	100 mm x 95 mm x 165 mm
Housing material	Stainless steel plate

Startup:	DF-8250 is consisting of VHL10 + TGS812 (S1 and S2 closed)
	Connection according to drawing 0756D-413 (part of the operation manual)
Warm-up period:	2 hours minimum (for operation readiness), 48 hours for calibration
Function test:	Application of span gas or reference gas via test cap (Order No.: D6079762) (0.5 l/min)
Calibration:	Not using dry testgas. Approved measuring components, calibrating conditions, measuring ranges, alarm levels and linearisation tables see list of components: Possible other measuring components on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms
XXXX = Change of Measurement value

Open-circuit at the MAT-(TS)-Module	Wire -X1/1	Wire -X1/2	Wire -X1/4	Disconnect plug of MAT-(TS)
Failure indication	X	X	XX	X

Open-circuit at max. cable length	Wire -X1/1	Wire -X1/2	Wire -X1/4
Failure indication	X	X	XX

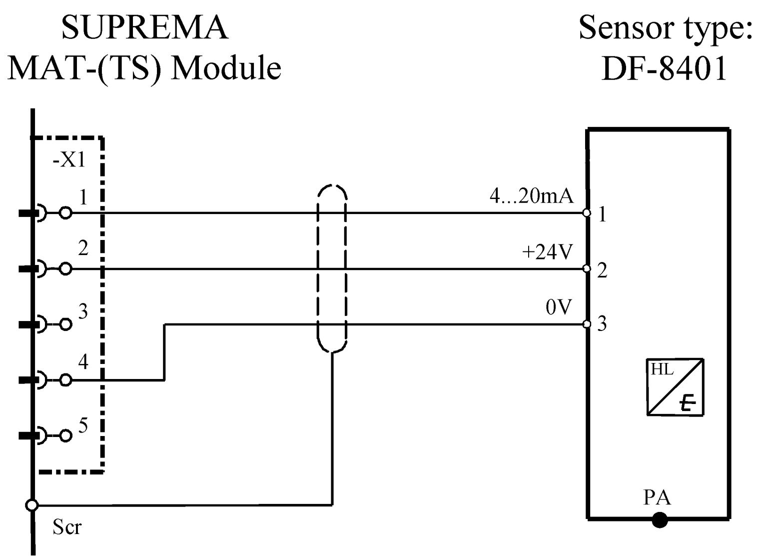
Short-circuit at the MAT-(TS)-Module	Wire -X1/1/-X1/2	Wire -X1/1/-X1/4	Wire -X1/2/-X1/4
Failure indication	XX	X	X

Short-circuit max. cable length	Wire -X1/1/-X1/2	Wire -X1/1/-X1/4	Wire -X1/2/-X1/4
Failure indication*	XX	XXXX	XX
Failure indication**	XX	X	X

* MCI 10
** MCI 20

12.27 SUPREMA Sensor Data Sheet DF-8401

Order No.: D0745720



The cable screen is connected at the SUPREMA and the DF-8401.

Connection module: MCI 10/MCI 20 (ac tive/3-wire/4 ... 20 mA non-linear/current supply)

Sensor simulation module: **4 ... 20 mA** (Order No.: 10030262)

Connection data:

Supply voltage	16 ... 32 VDC
Maximum power consumption	200 mA (Switch-on current 400 mA short-term)
Power consumption	5 W (without cable length)
Cable type	3-core, 80 % screened
Maximum burden	400 ohms
Maximum cable length	1000 m (at 1.5 mm^2 cross section per wire)
Cable diameter	8 ... 12 mm
Cross section per wire allowed	0.75 ... 2.5 mm^2
Cable inlet	PG 13.5

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 54 according to EN 60529
Explosion protection	none
Type test approval	none
Temperature	-20 °C to +40 °C
Humidity	5 ... 90 % rel. humidity; noncondensing
Pressure	900 ... 1100 hPa
Weight	approx. 1.1 kg
Dimensions W x D x H	120 mm x 82 mm x 130 mm

Startup:	After switching on the operational voltage, the measuring head is ready for operation after approx. 15 minutes.	
Warm-up period:	15 minutes minimum (for presetting), 2 hours for calibration	
Function test:	Span gas application via:	PK10 with 1.0 l/min or PV10 with 1.0 l/min or splashwater-proof housing with 1 l/min
Calibration:	Calibration procedure according to SUPREMA operation manual For measuring components allowed, measuring ranges, lower alarm levels and conditions for calibration see list of components. (Order No.: D0792420) Possible other measuring components and measuring ranges on request.	

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms

Open-circuit at the MAT-(TS)-Module	Wire -X1/1	Wire -X1/2	Wire -X1/4	Disconnect plug of MAT-(TS)
Failure indication	X	X	XX	X

Open-circuit at max. cable length	Wire -xX1/1	Wire -X1/2	Wire -X1/4
Failure indication	X	X	XX

Short-circuit at the MAT-(TS)-Module	Wire -X1/1/-X1/2	Wire -X1/1/-X1/4	Wire -X1/2/-X1/4
Failure indication	XX	X	X (a)

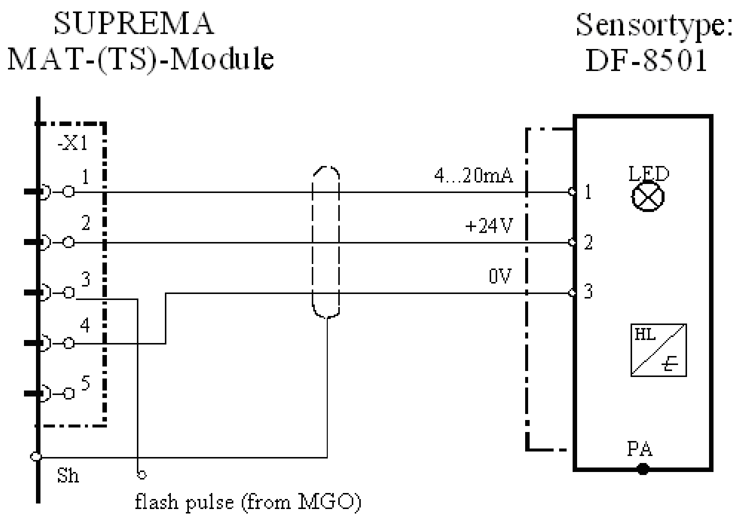
Short-circuit max. cable length	Wire -X1/1/-X1/2	Wire -X1/1/-X1/4	Wire -X1/2/-X1/4
Failure indication*	XX	XXX	XX
Failure indication**	XX	X	X

* MCI 10
** MCI 20

(a) – After removing the short-circuit, disconnect for a short-time wire -X1/4 or plug/MAT-(TS).

12.28 SUPREMA Sensor Data Sheet DF-8501*

Order No.: D0793703



The cable screen is connected at the SUPREMA and the DF-8501.

Connection module: MCI 10/MCI 20 (active/3-wire/4 ... 20 mA non-linear/current supply)

Sensor simulation module: **4 ... 20 mA** (Order No.: 10030262)

Connection data:

Supply voltage	16 ... 24 VDC
Power consumption	5 W (without cable length)
Maximum power consumption	200 mA/Switch-on current up to 400 mA
Cable type	3-core, 80 % screened
Maximum burden	200 ohms
Maximum cable length	1000 m (at 1.5 mm² cross section per wiret)
Cable diameter	8 ... 14 mm (16 mm special design)
Cross section per wire allowed	0.5 ... 2.5 mm²
Cable inlet	Plug connection

Conditions for use:

Mounting	Wall mounting/Hanging device
Ingress protection	IP 54 according to EN 60529
Explosion protection	none
Type test approval	none
Temperature	-20 °C to +40 °C
Humidity	20 ... 90 % rel. humidity; noncondensing
Pressure	950 ... 1100 hPa
Weight	approx. 1.4 kg
Dimensions W x D x H	120 mm x 80 mm x 122 mm
For further details see operation manual. (Order No.: D0792151)	

Startup:	After switching on the operational voltage, the smoldering fire detector is ready for operation after approx. 15 minutes.
Function test:	Application of span gas for smoldering fire detector 0793-050 with the function tester FT-8501 0793-750 When measuring head is connected to SUPREMA, measuring head LED has no function.
Calibration:	The smoldering fire detector is supplied with smoldering fire calibration. Calibration only at the manufacturer's.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms

Open-circuit at the MAT-(TS)-Module	Wire -X1/1	Wire -X1/2	Wire -X1/4	Disconnect plug of MAT-(TS)
Failure indication	X	X	XX	X

Open-circuit at max. cable length	Wire -X1/1	Wire -X1/2	Wire -X1/4
Failure indication	X	X	XX

Short-circuit at the MAT-(TS)-Module	Wire -X1/1/-X1/2	Wire -X1/1/-X1/4	Wire -X1/2/-X1/4
Failure indication	XX	X	X (a)

Short-circuit max. cable length	Wire -X1/1/-X1/2	Wire -X1/1/-X1/4	Wire -X1/2/-X1/4
Failure indication*	XX	XXX	XX
Failure indication**	XX	X	X

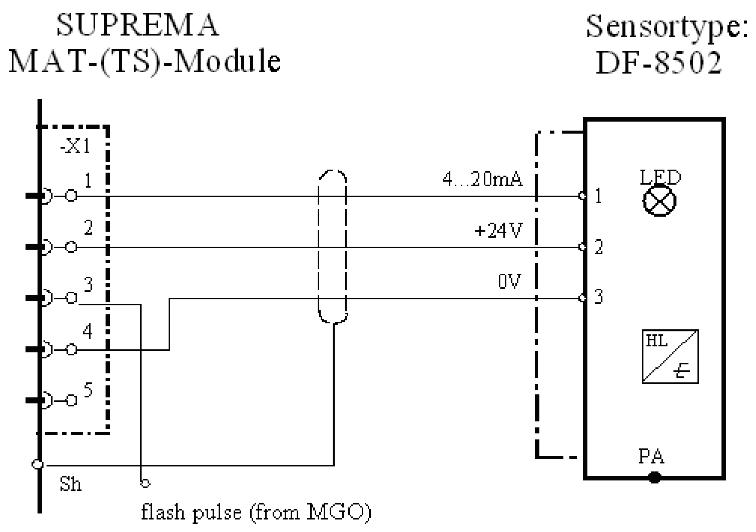
* MCI 10
** MCI 20

(a) – After removing the short-circuit, disconnect for a short-time wire -X1/4 or plug/MAT-(TS).

* With regard to fire and smoke detection, the SUPREMA has not been evaluated to any Canadian standard by a third party agency.

12.29 SUPREMA Sensor Data Sheet DF-8502*

Order No.: D0793705



The cable screen is connected at the SUPREMA and the DF-8502.

Connection module: MCI 10/MCI 20 (active/3-wire/4 ... 20 mA non-linear/current supply)

Sensor simulation module: **4 ... 20 mA** (Order No.: 10030262)

Connection data:

Supply voltage	16 ... 24 VDC
Power consumption	5 W (without cable length)
Maximum power consumption	200 mA/Switch-on current up to 400 mA
Cable type	3-core, 80 % screened
Maximum burden	200 ohms
Maximum cable length	1000 m (at 1.5 mm² cross section per wire)
Cable diameter	8 ... 14 mm (16 mm special design)
Cross section per wire allowed	0.5 ... 2.5 mm²
Cable inlet	Plug connection

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 54 according to EN 60529
Explosion protection	none
Type test approval	none
Temperature	-20 °C to +40 °C
Humidity	20 ... 90 % rel. humidity; noncondensing
Pressure	950 ... 1100 hPa
Weight	approx. 1.4 kg
Dimensions W x D x H	120 mm x 80 mm x 122 mm

Startup:	After switching on the operational voltage, the smoldering fire detector is ready for operation after approx. 15 minutes.
Function test:	Application of span gas for smoldering fire detector 0793-050 with the function tester FT-8501 0793-750 When measuring head is connected to SUPREMA, measuring head LED has no function.
Calibration:	The smoldering fire detector is supplied with smoldering fire calibration. Calibration only at the manufacturer's.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms

Open-circuit at the MAT-(TS)-Module	Wire -X1/1	Wire -X1/2	Wire -X1/4	Disconnect plug of MAT-(TS)
Failure indication	X	X	XX	X

Open-circuit at max. cable length	Wire -X1/1	Wire -X1/2	Wire -X1/4
Failure indication	X	X	XX

Short-circuit at the MAT-(TS)-Module	Wire -xX1/1/-X1/2	Wire -X1/1/-X1/4	Wire -X1/2/-X1/4
Failure indication	XX	X	X (a)

Short-circuit max. cable length	Wire -X1/1/-X1/2	Wire -X1/1/-X1/4	Wire -X1/2/-X1/4
Failure indication*	XX	XXX	XX
Failure indication**	XX	X	X

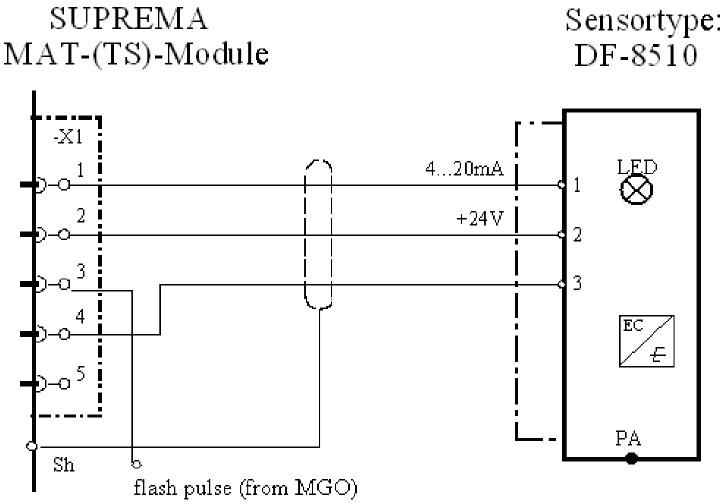
* MCI 10
** MCI 20

(a) – After removing the short-circuit, disconnect for a short-time wire -X1/4 or plug/MAT-(TS).

* With regard to fire and smoke detection, the SUPREMA has not been evaluated to any Canadian standard by a third party agency.

12.30 SUPREMA Sensor Data Sheet DF-8510*

Order No.: D0793730



The cable screen is connected at the SUPREMA and the DF-8510.

Connection module: MCI 10/MCI 20 (active/2-wire/4 ... 20 mA linear/current supply)

Sensor simulation module: **4 ... 20 mA** (Order No.: 10030262)

Connection data:

Supply voltage	16 ... 32 VDC
Maximum power consumption	50 mA
Cable type	2-core, 80 % screened
Maximum burden	200 ohms
Maximum cable length	1000 m (at 1.5 mm² cross section per wire)
Cable diameter	8 ... 14 mm
Cross section per wire allowed	0.5 ... 2.5 mm²
Cable inlet	Connection plug

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 54 according to EN 60529
Explosion protection	none
Type test approval	none
Temperature	-20 °C to +40 °C
Humidity	5 ... 90 % rel. humidity; noncondensing
Pressure	950 ... 1100 hPa
Weight	approx. 1.4 kg
Dimensions W x D x H	120 mm x 80 mm x 122 mm

Startup:	After switching on the operational voltage, the smoldering fire detector is ready for operation after approx. 15 minutes.
Function test:	Application of span gas for smoldering fire detector 0793-050 with the function tester FT-8501 0793-750 When measuring head is connected to SUPREMA, measuring head LED has no function.
Calibration:	The smoldering fire detector is supplied with smoldering fire calibration. Calibration only at the manufacturer’s.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)

XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)

Open-circuit at the MAT-(TS)-Modulex	Wire -X1/1	Wire -X1/4	Disconnect plug of MAT-(TS)
Failure indication	X	X	X

Open-circuit at max. cable length	Wire -X1/1	Wire -X1/4
Failure indication	X	X

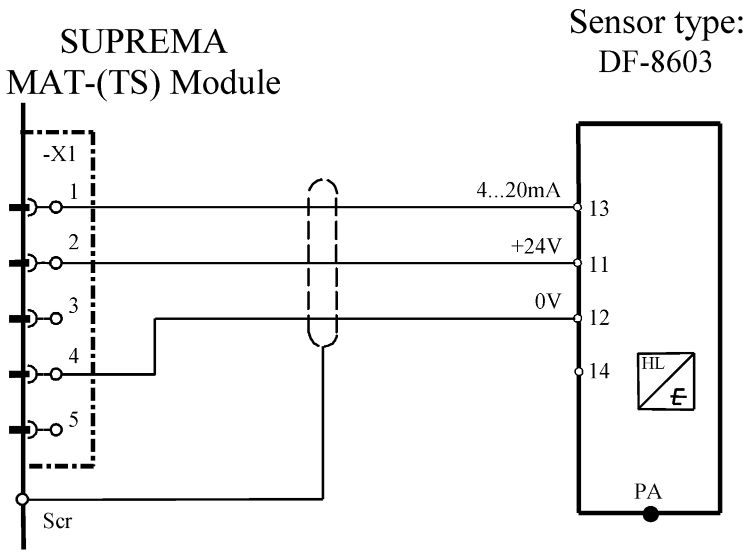
Short-circuit at the MAT-(TS)-Module	Wire -X1/1/-X1/4
Failure indication	XX

Short-circuit at max. cable length	Wire -X1/1/-X1/4
Failure indication	XX

* With regard to fire and smoke detection, the SUPREMA has not been evaluated to any Canadian standard by a third party agency.

12.31 SUPREMA Sensor Data Sheet DF-8603

Order No.: 10044123



The cable screen is connected at the SUPREMA and the DF-8603.

Connection module: MCI 10/MCI 20 (active/3-wire/4 ... 20 mA non-linear/current supply)

Sensor simulation module: **4 ... 20 mA** (Order No.: 10030262)

Connection data:

Supply voltage	16 ... 32 VDC
Maximum power consumption	120 mA
Cable type	3-core, 80 % screened
Maximum burden	200 ohms
Maximum cable length	1000 m (at 1.5 mm² cross section per wire)
Cable diameter	6 ... 12 mm
Cross section per wire allowed	0.5 ... 2.5 mm²
Cable inlet	PG 13.5

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 54 according to EN 60529
Explosion protection	II 2G EEx d m e[[ib]] IIC T6
Type test approval	DMT 99 ATEX E021X
Temperature	-20 °C to +40 °C
Humidity	20 ... 95 % rel. humidity; noncondensing
Pressure	900 ... 1100 hPa
Weight	approx. 1.5 kg
Dimensions W x D x H	150 mm x 88 mm x158 mm
Housing material	Aluminium Die cast (polyester-coated)

Startup:	After switching on the operational voltage, the measuring head is ready for operation after approx. 15 minutes.
Warm-up period:	15 minutes minimum (for presetting), 2 hours for calibration
Function test:	Span gas application via: Test cap with 0.5 l/min (Order No.: D6079762) Splashwater-proof housing SG 70 with 1 l/min Pump adapter PA 70 with 1.0 l/min
Calibration:	Calibration procedure according to SUPREMA operation manual Calibration of the DF-8603 according to operation manual For measuring components allowed, measuring ranges, lower alarm levels and conditions for calibration see list of components. (Order No: D0792420) Possible other measuring components and measuring ranges on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms

Open-circuit at the MAT-(TS)-Module	Wire -X1/1	Wire -X1/2	Wire -X1/4	Disconnect plug of MAT-(TS)
Failure indication	X	X	X	X

Open-circuit at max. cable length	Wire -X1/1	Wire -X1/2	Wire -X1/4
Failure indication	X	X	X

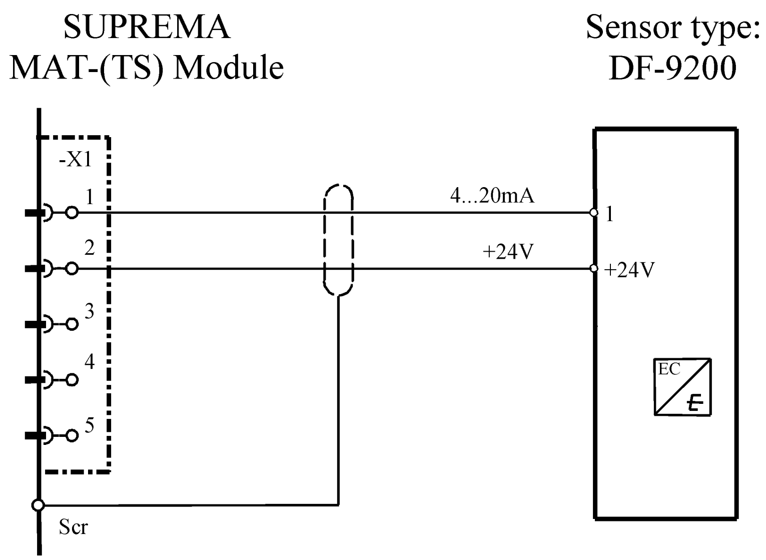
Short-circuit at the MAT-(TS)-Module	Wire -X1/1/-X1/2	Wire -X1/1/-X1/4	Wire -X1/2/-X1/4
Failure indication	XX	X	X

Short-circuit max. cable length	Wire -X1/1/-X1/2	Wire -X1/1/-X1/4	Wire -X1/2/-X1/4
Failure indication*	XX	XXX	X
Failure indication**	XX	X	X

* MCI 10
** MCI 20

12.32 SUPREMA Sensor Data Sheet DF-9200

Order No.: D0756 xxx (xxx-according to the list of components)



The cable screen is connected at the SUPREMA and the DF-9200.

Connection module: MCI 10/MCI 20 (active/2-wire/4 ... 20 mA linear)

Sensor simulation module: **4 ... 20 mA** (Order No.: 10030262)

Connection data:

Supply voltage	10 ... 30 VDC
Maximum power consumption	40 mA
Cable type	2-core, 80 % screened
Power consumption	1 W (without cable length)
Maximum burden	500 ohms
Maximum cable length	2000 m (at 1.5 mm^2 cross section per wire)
Cable diameter	8 ... 14 mm (16 mm special design)
Cross section per wire allowed	0.5 ... 2.5 mm^2
Cable inlet	Cable gland Pg 13.5 mm

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 42
Explosion protection	none
Certificate	none
Temperature	min -10 to -40 °C (depending on component)
Humidity	5 ... 95 % rel. humidity; noncondensing
Pressure	950 ... 1100 hPa
Weight	approx. 0.65 kg
Housing material	Stainless steel (CrNi)
Dimensions W x D x H	100 mm x 95 mm x 165 mm
Case material	Plate of High-grade steel

Startup:	Installation of electrochemical cells is made by user or service staff. Installation of type A or B according to installation instructions is part of the operation manual. (Order No.: D0765129)
	After x minutes (depending from measuring cell) —> Ia = 4 mA
Function test:	Application of span gas or reference gas via test cap (Order No.: D6079762) (1 l/min)
Calibration:	Depending on component (according to list of components) Approved measuring components, calibrating conditions, measuring ranges, alarm levels and linearisation tables see list of components: D0792420 Possible other measuring components on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)

XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)

Open-circuit at the MAT-(TS)-Module	Wire -X1/1	Wire -X1/2	Disconnect plug of MAT-(TS)
Failure indication	X	X	X

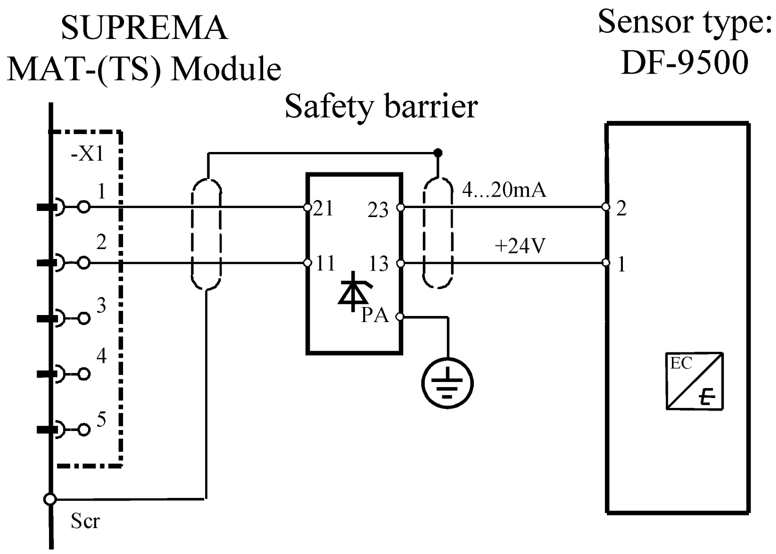
Open-circuit at max. cable length	Wire -X1/1	Wire -X1/2
Failure indication	X	X

Short-circuit at the MAT-(TS)-Module	Wire -X1/1/-X1/2
Failure indication	XX

Short-circuit at max. cable length	Wire -X1/1/-X1/2
Failure indication	XX

12.33 SUPREMA Sensor Data Sheet DF-9500 EX

Order No.: D0742xxx (xxx-according to the list of components)



The cable screen is connected at the SUPREMA and the DF 9500.
The zener barrier must be installed apart from the explosion range.

Connection module: MCI 10/MCI 20 (active/2-wire/4 ...0 mA linear/current sink)

Sensor simulation module: **4 ... 20 mA** (Order No.: 10030262)

Safety barrier allowed: **SB – 2427, complete** (Order No.: 10034362)

Connection data:

Supply voltage	14 ... 28 VDC
Supply current	4 ... 30 mA
Maximum power consumption	50 mA
Power consumption	0,4 W (without cable length)
Cable type	2-core, 80 % screened
Maximum burden	500 ohms with Safety barrier
Maximum cable length	2000 m (at 1.5 mm^2 cross section per wire)
Cable diameter	9 ... 13.5 mm
Cross section per wire allowed	0.5 ... 2.5 mm^2
Cable inlet	PG 13.5

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 42 (Sensor) IP 63 (Housing)
Explosion protection	II 2G EEx ia IIC T6
Certificate	DMT 01 ATEX E 152 X
Temperature	min. 20 °C to +40 °C (depending on component)
Humidity	min. 20 ... 80 % rel. humidity (depending on component)

Pressure	900 ... 1100 hPa
Weight	approx. 1.0 kg
Dimensions W x D x H	122 mm x 81 mm x 152 mm
Housing material	Polyester

Startup:	For connections see operation manual.
Warm-up periods:	For O_2 < 60 s according to EN 50104: The warm-up periods are depending on the component and can be seen in the list of components.
Function test:	Application of span gas or reference gas via: PK 10 resp. PV 10 (1 l/min)
Calibration:	Depending on component (according to list of components) Approved measuring components, calibrating conditions, measuring ranges, alarm levels and codes see list of components: D 0742 E 458 Possible other measuring components on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)

XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)

Open-circuit at the MAT-(TS)-Module	Wire -X1/1	Wire -X1/2	Disconnect plug of MAT-(TS)
Failure indication	X	X	X

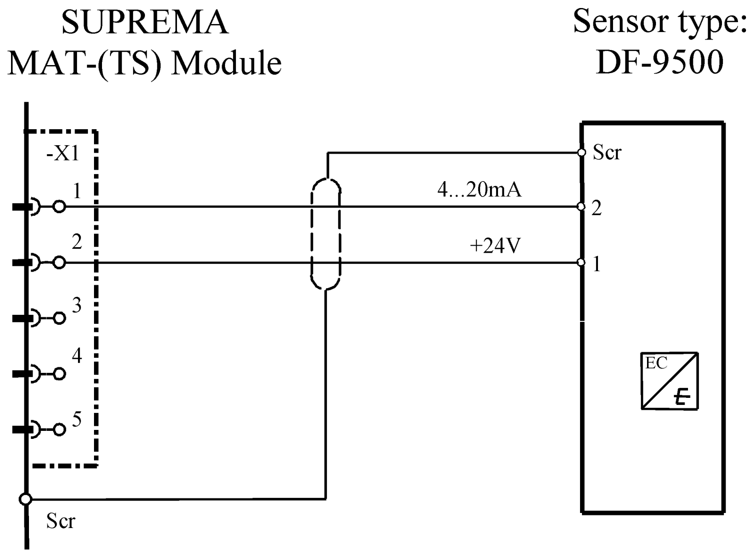
Open-circuit at max. cable length	Wire -X1/1	Wire -X1/2
Failure indication	X	X

Short-circuit at the MAT-(TS)-Module	Wire -X1/1/-X1/2
Failure indication	XX

Short-circuit at max. cable length	Wire -X1/1/-X1/2
Failure indication	XX

12.34 SUPREMA Sensor Data Sheet DF-9500

Order No.: D0742xxx (xxx-according to the list of components)



The cable screen is connected at the SUPREMA and the DF-9500.

Connection module: MCI 10/MCI 20 (active/2-wire/4 ... 20 mA linear/sink)

Sensor simulation module: **4 ... 20 mA** (Order No.: 10030262)

Connection data:

Supply voltage	14 ... 28 VDC
Supply current	4 ... 30 mA
Maximum power consumption	50 mA
Power consumption	1 W (without cable length)
Cable type	2-core, 80 % screened
Maximum burden	500 ohms
Maximum cable length	2000 m (at 1.5 mm² cross section per wire)
Cable diameter	9 ... 13.5 mm
Cross section per wire allowed	0.5 ... 2.5 mm²
Cable inlet	PG 13.5

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 42 (Sensor) IP 63 (Housing)
Explosion protection	II 2G EEx ia IIC T6
Certificate	DMT 01 ATEX E 152 X
Temperature	min. 20°C to + 40 °C (depending on component)
Humidity	min. 20 ... 80 % rel. humidity (depending on component)
Pressure	900 ... 1100 hPa
Weight	approx. 1.0 kg
Dimensions W x D x H	122 x 81 x 152 mm
Housing material	Polyester

Startup:	The input modules (MCI 10) are presetted at 4 ... 20 mA. Check with the sensor simulation module possible After startup, longer dead periods and sensor changes, the warm-up period of the electrochemical sensors is 3 hours minimum.
Warm-up periods:	For O_2 < 60 s according to EN 50104: The warm-up periods are depending on the component and can be seen in the list of components.
Function test:	Application of span gas or reference gas via: PK 10 resp. PV 10 (1 l/min)
Calibration:	Depending on component (according to list of components) Approved measuring components, calibrating conditions, measuring ranges, alarm levels and codes see list of components: D 0742 E 458 Possible other measuring components on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)

XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)

Open-circuit at the MAT-(TS)-Module	Wire -X1/1	Wire -X1/2	Disconnect plug of MAT-(TS)
Failure indication	X	X	X

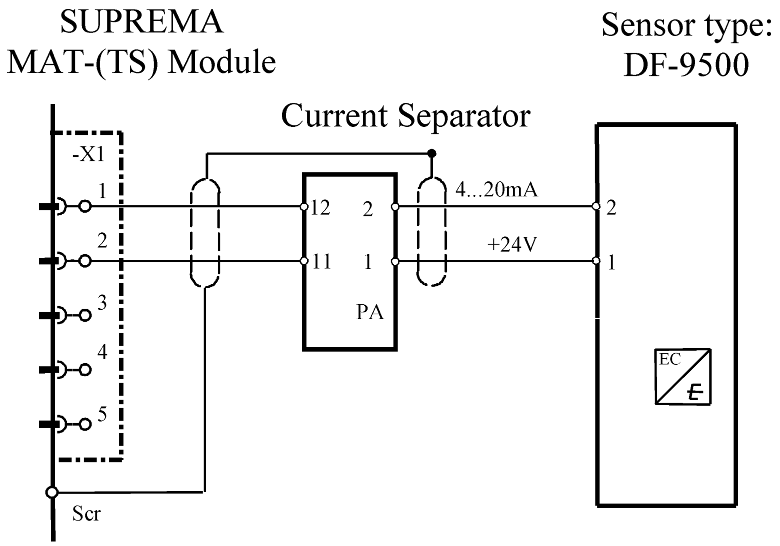
Open-circuit at max. cable length	Wire -X1/1	Wire -X1/2
Failure indication	X	X

Short-circuit at the MAT-(TS)-Module	Wire -X1/1/-X1/2
Failure indication	XX

Short-circuit at max. cable length	Wire -X1/1/-X1/2
Failure indication	XX

12.35 SUPREMA Sensor Data Sheet DF-9500 Tr (Current Separator)

Order No.: D0742xxx (xxx-according to the list of components)



Screening: The screen is connected to the screen rail in the rack and also at the measuring head. Near the current separator, the screen can be connected to terminals.

Attention! Do not connect the screen to potential equalisation terminals. Screen connections must be kept separate from potential equialisation.

Connection module: MCI 10/MCI 20 (active/2-wire/4 ... 20 mA linear/sink)

Sensor simulation module: **4 ... 20 mA (Order No.: 10030262)**

Current separator approved: **KFDO-CS_Ex1.51P** (Order No.: 10029683)

Connection data:

Supply voltage	14 ... 28 VDC
Supply current	4 ... 30 mA
Maximum power consumption	50 mA
Power consumption	0.4 W (without cable length)
Cable type	2-core, 80 % screened
Maximum burden	500 ohms with current separator
Maximum cable length	2000 m (at 1.5 mm^2 cross section per wire)
Cable diameter	9 ... 13.5 mm
Cross section per wire allowed	0.5 ... 2.5 mm^2
Cable inlet	PG 13.5

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 42 (Sensor) IP 63 (Housing)
Explosion protection	II 2G EEx ia IIC T6
Certificate	DMT 01 ATEX E 152 X
Temperature	min. 20 °C to +40 °C (depending on component)
Humidity	min. 20 ... 80 % rel. humidity (depending on component)

Pressure	900 ... 1100 hPa
Weight	approx. 1.0 kg
Dimensions W x D x H	122 x 81 x 152 mm
Housing material	Polyester

Startup:	For connections see operation manual.
Warm-up periods:	For O_2 < 60 s according to EN 50104: The warm-up periods are depending on the component and can be seen in the list of components.
Function test:	Application of span gas or reference gas via: PK 10 resp. PV 10 (1 l/min)
Calibration:	Depending on component (according to list of components) Approved measuring components, calibrating conditions, measuring ranges, alarm levels and codes see list of components: D 0742 E 458 Possible other measuring components on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)

XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)

Open-circuit at the MAT-(TS)-Module	Wire -X1/1	Wire -X1/2	Disconnect plug of MAT-(TS)
Failure indication	X	X	X

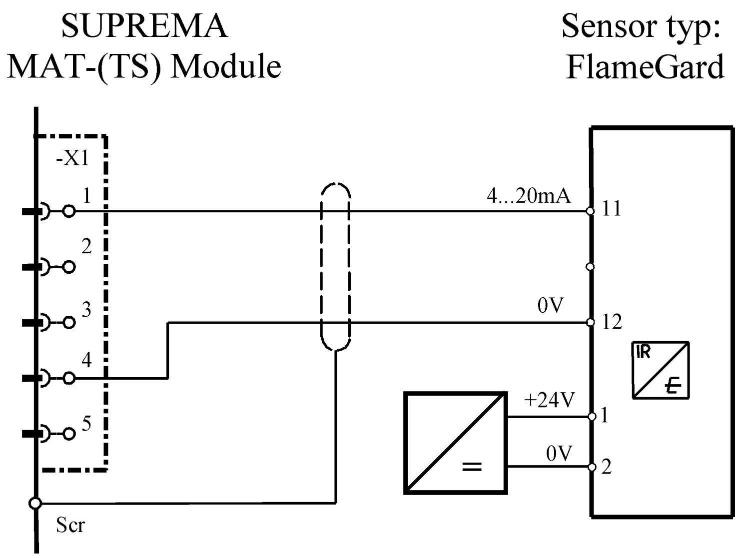
Open-circuit at max. cable length	Wire -X1/1	Wire -X1/2
Failure indication	X	X

Short-circuit at the MAT-(TS)-Module	Wire -X1/1/-X1/2
Failure indication	XX

Short-circuit at max. cable length	Wire -X1/1/-X1/2
Failure indication	XX

12.36 SUPREMA Sensor Data Sheet FlameGard*

Order No.: D 0770772



Connection module: MCI 10/MCI 20 (active/3-wire/4 ... 20 mA/current supply)

Sensor simulation module: **4 ... 20 mA** (Order No.: 10030262)

Connection data:

Supply voltage	18 ... 32 VDC via power pack
Detector power consumption	150 mA /200 mA Peak
Cable type	2-core, 80 % screened (Signal line)
Maximum burden	600 ohms
Maximum cable length	420 m (at 1.5 mm^2 cross section per wire)
Cable diameter	8 ... 14 mm
Cross section per wire allowed	0.5 ... 2.5 mm^2
Cable inlet approved	EExd M20 x 1.5 with reduction 25 x 1.5

Conditions for use:

Mounting	Wall mounting above adjustment bracket
Ingress protection	IP 67 according to NEMA 250 type 6
Explosion protection	EEx d IIB T6
SIRA Certificate No.	Ex 96C1067 A
Temperature	-20 °C up to +55 °C
Humidity	5 ... 95 % rel. humidity; noncondensing
Pressure	950 ... 1100 hPa
Weight	approx. 3.5 kg
Dimensions W x D x H	132 mm x 120 mm x 132 mm

Startup:	After switching on the supply voltage, the instrument initiates a self-test. Ia = 3 mA (adjustable); —> After approx. 5 minutes, the instrument changes over to measuring operation. Ia = 4 mA Explosion range: Before opening the terminal compartment, power to the measuring head must be switched off.
Status signals:	Failure —> 2 mA: Cable defect —> 0 mA Indication at the SUPREMA display: Signal failure
Function test:	Flame test
Calibration:	According to operation manual.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)

XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)

Open-circuit at the MAT-(TS)-Module	Wire -X1/1	Wire -X1/4	Disconnect plug of MAT-(TS)
Failure indication	X	X	X

Open-circuit at max. cable length	Wire -X1/1	Wire -X1/4
Failure indication	X	X

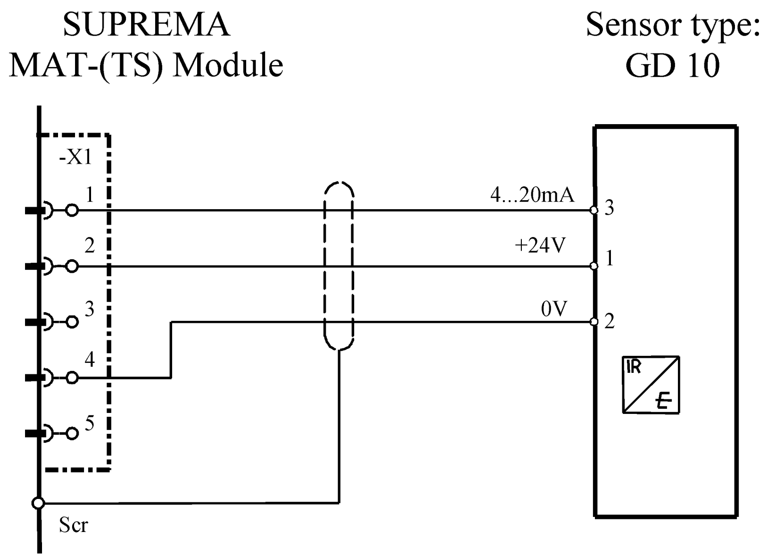
Short-circuit at the MAT-(TS)-Module	Wire -X1/1/-X1/4
Failure indication	X

Short-circuit at max. cable length	Wire -X1/1/-X1/4
Failure indication	X

* With regard to fire and smoke detection, the SUPREMA has not been evaluated to any Canadian standard by a third party agency.

12.37 SUPREMA Sensor Data Sheet GD 10

Order No.: D0770 731 Standard Methane
D0770 732 Standard Ethene
D0770 733 Standard Propane
D0770 603 Special Calibration



The cable screen is connected at the SUPREMA and the GD-10.

Connection module: MCI 10/MCI 20 (active/3-wire/4 ... 20 mA/current supply)

Sensor simulation module: **4 ... 20 mA** (Order No.: 10030262)

Connection data:

Supply voltage	18 ... 32 VDC
Current consumption	approx. 3,5 W (without cable length)
Switch-on current	0,3 A für 0.3 s
Cable type	3-core, 80 % screened
Maximum burden	500 ohms
Maximum cable length	840 m (at 1.5 mm² cross section per wire)
Cable diameter	5.0 ... 9.0 mm (for enclosed Ex cable inlet)
Cross section per wire allowed	0.5 ... 1.5 mm²
Cable inlet	Both sides possible/M20 x 1.5
For explosion protection	Approved cable inlet and Blind plug necessary EEx e (M20 x 1,5)

Conditions for use:

Mounting	Wall mounting/or by flange
Ingress protection	IP 66/IP 67 EN 60529
Explosion protection	CENELECE Ex d IIC T6 (EEx e for terminal connection)
Temperature	-25 °C up to +55 °C (-40 °C up to +70 °C for storage)
Humidity	0 ... 95 % rel. humidity; noncondensing

Pressure	950 ... 1100 hPa
Weight	approx. 2.9 kg
Dimensions	Diameter approx. 100 mm; Length approx. 250 mm
Housing material	Stainless steel(ASMT 316/DIN1.4401)
For further details see operation manual. (Order No.: D0770041)	

Startup:	After switching on the supply voltage, the instrument initiates a self-test. Ia = 0 mA; —> After approx. 60 sec. the instrument changes over to measuring operation. Ia = 4 mA (Zero) Explosion range: Before opening the terminal compartment, power to the measuring head must be switched off.
Status signals:	If the optics is contaminated more than 70 % —> Ia is reaching 1 mA Indication at the SUPREMA display: Signal failure Sensor failure (failure of electronics or measuring path break) —> Ia reaches 0 mA Indication at the SUPREMA display: Signal failure
Function test:	Span gas application via gas inlet piece: Weather protection housing —> 4.0 l/min (at approx. 0 m/s wind speed) Flow cell —> approx. 1.0 l/min (independent from the wind velocity)
Calibration:	New calibrations or calibration changes can only be made by MSA AUER service personnel or by specialists authorized by MSA AUER. For approved measuring components, calibrating conditions, measuring ranges, alarm levels and linearisation tables see list of components (Order No.: D0770405) or appendix 2 of the operation manual Possible other measuring components on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms
XXXX = INHIBIT / supressed

Open-circuit at the MAT-(TS)-Module	Wire -X1/1	Wire -X1/2	Wire -X1/4	Disconnect plug of MAT-(TS)
Failure indication	X	X	XXXX	X

Open-circuit at max. cable length	Wire -X1/1	Wire -X1/2	Wire -X1/4
Failure indication	X	X	XXXX

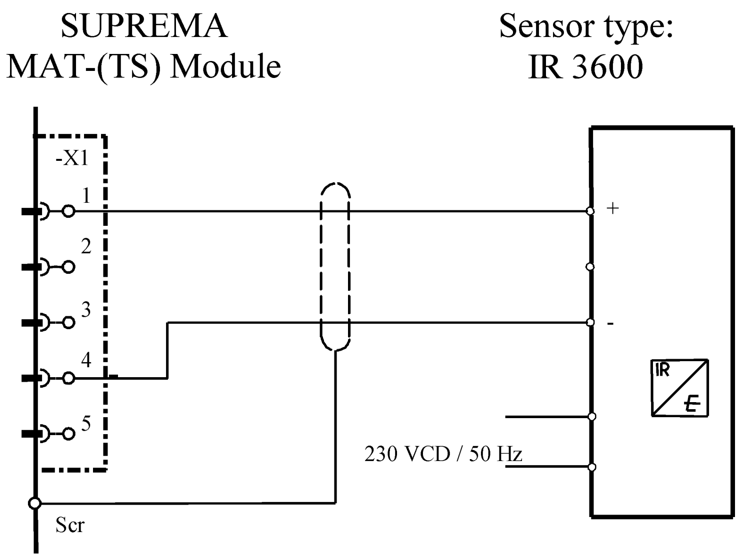
Short-circuit at the MAT-(TS)-Module	Wire -X1/1/-X1/2	Wire -X1/1/-X1/4	Wire -X1/2/-X1/4
Failure indication	XX	XXXX	X

Short-circuit max. cable length	Wire -X1/1/-X1/2	Wire -X1/1/-X1/4	Wire -X1/2/-X1/4
Failure indication*	XX	XX	X
Failure indication**	XX	X	X

* MCI 10
** MCI 20

12.38 SUPREMA Sensor Data Sheet IR-3600

Order No.: D0745603



The cable screen is connected at the SUPREMA

Connection module: MCI 10/MCI 20 (active/2-wire/4 ... 20 mA/current supply)

Sensor simulation module: **4 ... 20 mA** (Order No.: 10030262)

Connection data:

Supply voltage	Connection 230 VAC/50 Hz/10 VA with non-fused earthed conductor connection
Cable type signal	2-core, 80 % screened
Maximum burden	500 ohms
Maximum cable length	420 m (at 1.5 mm^2 cross section per wire)
Cable diameter	6 ... 12 mm power supply and output contact cables
Cable diameter	4 ... 8 mm for signal cable
Cross section per wire allowed	1.5 mm^2

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 54
Explosion protection	none
Temperature	0 °C up to +35 °C, up to +45 °C short-time
Humidity	20 ... 95 % rel. humidity; noncondensing
Pressure	950 ... 1100 hPa
Weight	approx. 2 kg
Dimensions W x D x H	184 mm x 135 mm x 193 mm

Startup:	After switching on the operational voltage, the measuring head is ready for operation after approx. 5 minutes.
Warm-up period:	5 minutes for presetting, 30 minutes for calibration
Calibration/IR 3600	According to operation manual
Calibration/SUPREMA	Calibration procedure according to SUPREMA operation manual For measuring components allowed, measuring ranges, lower alarm levels see operation manual Possible other measuring components and measuring ranges on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms

Open-circuit at the MAT-(TS)-Module	Wire -X1/1	Wire -X1/4	Disconnect plug of MAT-(TS)
Failure indication	X	X	X

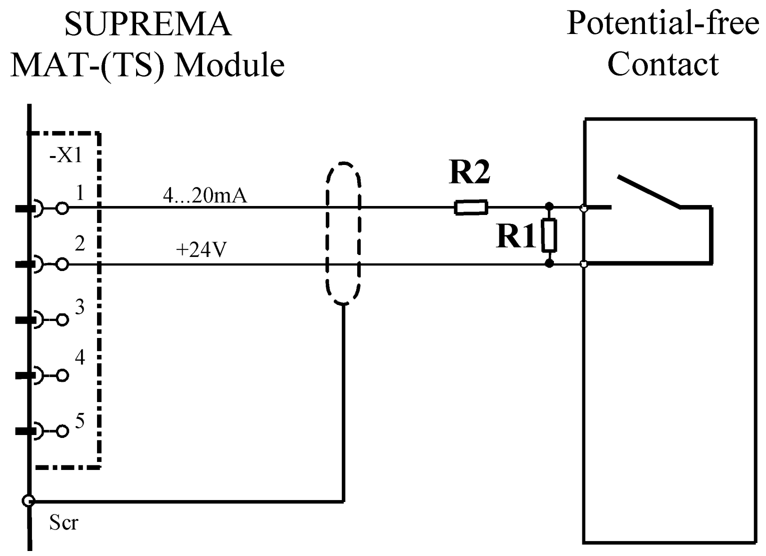
Open-circuit at max. cable length	Wire -X1/1	Wire -X1/4
Failure indication	X	X

Short-circuit at the MAT-(TS)-Module	Wire -X1/1/-X1/4
Failure indication	X

Short-circuit at max. cable length	Wire -X1/1/-X1/4
Failure indication	X

12.39 SUPREMA Sensor Data Sheet Contact

Connection: potential-free contact



Connection module: MCI 10 (BR101 and BR102 open) Standard configuration (passive/2-wire/4 ... 20 mA/current supply)

Sensor simulation module: **4 ... 20 mA** (Order No.: 10030262)

Ohms resistors to generate an input current: **R1 = 2.7 kΩ (0.5 W)**
R2 = 1.8 kΩ (0.5 W)

Connection data:

Cable type	2-core, 80 % screened
Maximum cable length	1000 m (at 1.5 mm^2 cross section per wire)
Cable diameter	8 ... 12 mm
Cross section per wire allowed	0.75 ... 2.5 mm^2
Min. contact closure time	2 seconds

Configuration Menu:

Settings/Measuring points/Sensor data	Sensor	Pressure button
	Measuring range	0 ... 100
	Unity	Units any
Settings/Measuring points/Alarms	1th alarm/level	30.00
	Above alarm level	Alarm contact is shut
	Below alarm level	Alarm contact is opened
	Latching	Alarm latching
	2nd to 4th alarm	deactivated
	2nd to 4th level	deactivated

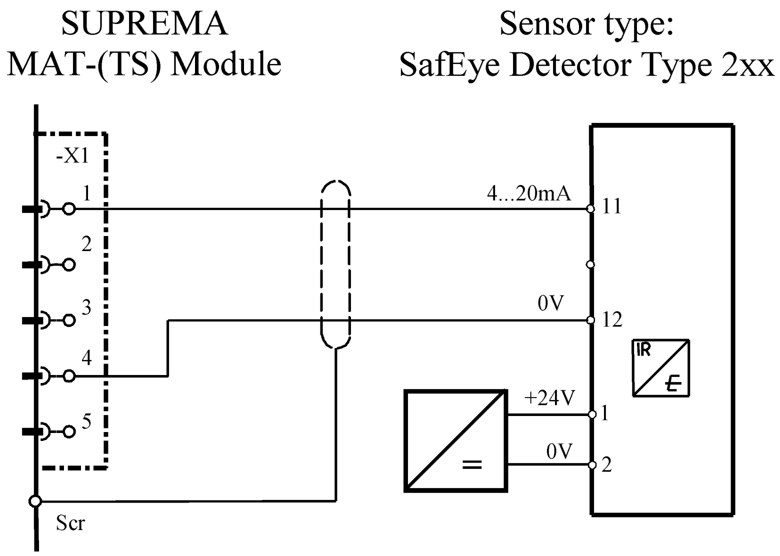
The left-hand cursor key has to be activated in the input field limit value (2nd to 4th alarm) as long as only zeros are displayed. Then press press the lower cursor key: the field content is deleted (indication: ”——“), the alarm is deactivated (PC operation software: to delete field inputs (DEL key, then confirm by the ENTER key).

All other inputs in the *Settings/Measuring Points* menu may be chosen freely.

Note: The potential-free contacts can also be used to carry out a lamp test or relay status of contacts. Use of these contacts for this purpose is identical to an alarm and will also trigger the collective alarm.

12.40 SUPREMA Sensor Data Sheet SafEye Type 2xx

Order No.: D070xxx (xxx-according to type key)



Connection module:	MCI 10/MCI 20 (active/2-wire/4 ... 20 mA linear/current source)
Sensor simulation module:	**4 ... 20 mA** (Order No.: 10030262)
Attention!	**Voltage supply for detector and luminous source from 2 separate power packs.**

Connection data:

Supply voltage	18 ... 32 VDC (2 x external)
Current consumption detector	150 mA/200 mA Peak
Current consumption luminous source	100 mA/220 mA Peak
Cable type	3-core, 80 % screened
Maximum burden	600 ohms
Maximum cable length	420 m (at 1.5 mm^2 cross section per wire)
Cable diameter	8 ... 14 mm
Cross section per wire allowed	0.5 ... 2.5 mm^2
Cable inlet approved	EExd M20 x 1.5 with reduction 25 x 1.5

Conditions for use:

Mounting	Wall mounting above adjustment bracket
Ingress protection	IP 67 according to NEMA 250 type 6
Explosion protection	EEx d IIB T6
SIRA Certificate No.	Ex 96C1067 A
Temperature	-20 °C up to +55 °C
Humidity	5 ... 95 % rel. humidity; noncondensing

Pressure	950 ... 1100 hPa
Weight detector	approx. 3.9 kg
Weight source	approx. 4.9 kg
Dimensions W x D x H (detec.)	132 mm x 115 mm x 132 mm
Dimensions W x D x H (source)	132 mm x 115 mm x 132 mm

Startup:	After switching on the supply voltage, the instrument initiales a self-test. Ia = 3 mA (adjustable); —> After 5 minutes, the instrument changes over to measuring operation. Ia = 4 mA Explosion range: Before opening the terminal compartment, power to the measuring head must be switched off.
Status signals:	Calibration —> 3 mA ; Failure —> 2 mA: Cable defect —> 0 mA Indication at the SUPREMA display: Signal failure
Function test:	IR test filter
Calibration:	Calibration demand of SUPREMA measuring points —> (INHIBIT/ alarm suppression) current output in calibration mode —> 3 mA After confirmation, changeover to measuring operation. For approved measuring components, calibrating conditions, measuring ranges, alarm levels and linearisation tables see list of components. (Order No.: 0770406) Possible other measuring components on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)

XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)

Open-circuit at the MAT-(TS)-Module	Wire -X1/1	Wire -X1/4	Disconnect plug of MAT-(TS)
Failure indication	X	X	X

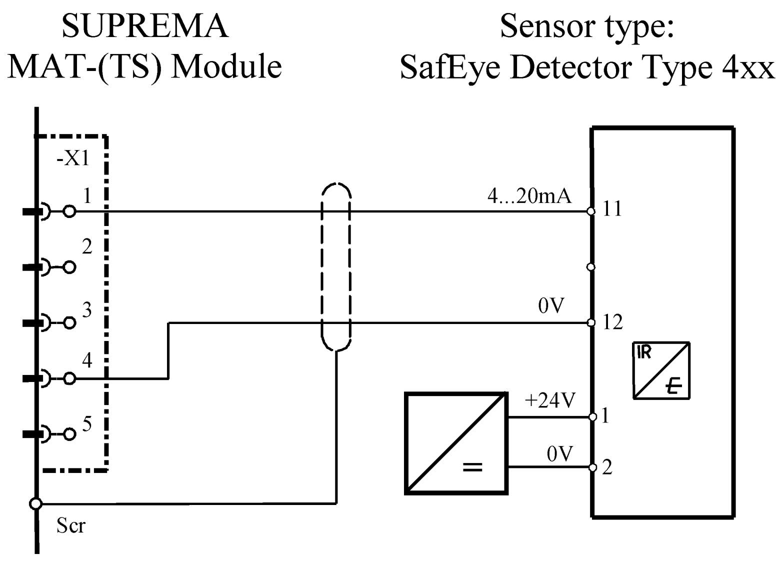
Open-circuit at max. cable length	Wire -X1/1	Wire -X1/4
Failure indication	X	X

Short-circuit at the MAT-(TS)-Module	Wire -X1/1/-X1/4
Failure indication	X

Short-circuit at max. cable length	Wire -X1/1/-X1/4
Failure indication	X

12.41 SUPREMA Sensor Data Sheet SafEye Type 4xx/UV

Order No.: D070xxx (xxx-according to type key)



Connection module: MCI 10/MCI 20 (active/2-wire/4 ... 20 mA linear/current source)

Sensor simulation module: **4 ... 20 mA** (Order No.: 10030262)

Attention! **Voltage supply for detector and luminous source from 2 separate power packs.**

Connection data:

Supply voltage	18 ... 32 VDC (2 x extern)
Current consumption detector	150 mA/200 mA Peak
Current consumption source	100 mA/220 mA Peak
Cable type	2-core, 80 % screened
Maximum burden	600 ohms
Maximum cable length	420 m (at 1.5 mm^2 cross section per wire)
Cable diameter	8 ... 14 mm
Cross section per wire allowed	0.5 ... 2.5 mm^2
Cable inlet	EExd M20 x 1.5 with reduction 25 x 1.5

Conditions for use:

Mounting	Wall mounting above adjustment bracket
Ingress protection	IP 67 according to NEMA 250 type 6
Explosion protection	EEx d IIB T6
SIRA Certificate No.	Ex 96C1067 A
Temperature	-20 °C up to +55 °C
Humidity	5 ... 95 % rel. humidity; noncondensing

Pressure	950 ... 1100 hPa
Weight detector	approx. 3.9 kg
Weight source	approx. 4.9 kg
Dimensions W x D x H (detec.)	132 mm x 115 mm x 132 mm
Dimensions W x D x H (source)	132 mm x 115 mm x 132 mm

Startup:	After switching on the supply voltage, the instrument initiales a self-test. Ia = 3 mA (adjustable); —> After 5 minutes, the instrument changes over to measuring operation. Ia = 4 mA Explosion range: Before opening the terminal compartment, power to the measuring head must be switched off.
Status signals:	Calibration —> 3 mA ; Failure —> 2 mA: Cable defect —> 0 mA Indication at the SUPREMA display: Signal failure
Function test:	UV test filter
Calibration:	Calibration demand of SUPREMA measuring points —> (INHIBIT/ alarm suppression) current output in calibration mode —> 3 mA After confirmation, changeover to measuring operation. For approved measuring components, calibrating conditions, measuring ranges, alarm levels and linearisation tables see list of components. (Order No.: 0770406) Possible other measuring components on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)

XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)

Open-circuit at the MAT-(TS)-Module	Wire -X1/1	Wire -X1/4	Disconnect plug of MAT-(TS)
Failure indication	X	X	X

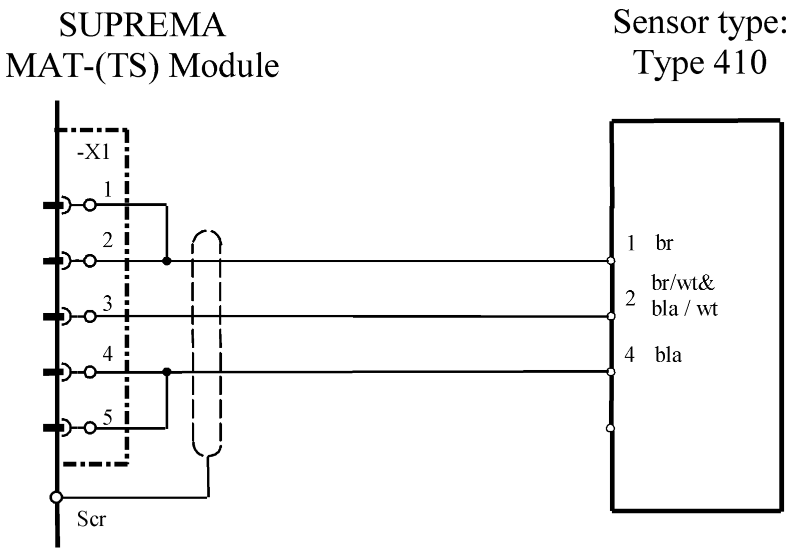
Open-circuit at max. cable length	Wire -X1/1	Wire -X1/4
Failure indication	X	X

Short-circuit at the MAT-(TS)-Module	Wire -X1/1/-X1/4
Failure indication	X

Short-circuit at max. cable length	Wire -X1/1/-X1/4
Failure indication	X

12.42 SUPREMA Sensor Data Sheet Type 410 WT (3-wire)

Order No.: 10000135 (Alu) M25
10000137 (V2A) M20



The cable screen is only connected to the SUPREMA.
Perhaps remove 2 x 120 ohms!
Alternatively, the bridges -X1/1 -X1/2 and -X1/4 -X1/5 can be set as solder bridges on the MAT 10 or MAT 10-TS Module.

Connection module: MPI 10/WT 100/passive/3-wire/Constant current/Presetting required

Sensor simulation module: WT 100 (Order No.: 10030264)

Attention! **Before connecting measuring head, reduce sensor current to minimum!**

Connection data:

Bridge current	310 mA for all measuring components
Maximum power consumption	350 mA
Power consumption	1 W (without cable length)
Cable type	3-core, 80 % screened
Maximum loop resistance	8 ohms loop resistance
Maximum cable length	300 m (at 1.5 mm^2 cross section per wire)
Cable diameter	8 ... 12 mm
Cross section per wire allowed	0.75 ... 2.5 mm^2
Cable inlet	Ex-M25 / M20

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 54 according to EN 60529
Explosion protection	EXs IIC T6
Temperature	-25 °C up to +55 °C (-20 °C up to +40 °C in the explosion range) (-25 °C ... +55 °C for storage)
Humidity	5 ... 95 % rel. humidity; noncondensing

Pressure	950 ... 1100 hPa
Weight	approx. 1.2 kg
Dimensions W x D x H	120 mm x 72 mm x 140 mm

Startup:	**Presetting required —> before first calibration and when changing sensor**	
Presetting:	Connect digital voltmeter to MAI card jacks. Bridge current setting —> 310 mA for all measuring components Zero adjustment by zero gas —> Zero setting to **Ua = 400 ... 450 mV** Sensitivity adjustment with measuring gas —> Measuring range level **Ua = 1950 ... 2100 mV** or by means of the value of the existing gas concentration according to: **Ua (mV) = C (Span gas concentration in % of measuring range) / 100 * 1600 + 400**	
Warm-up period:	15 minutes minimum for presetting, 2 hours for calibration	
Function test:	Span gas application via:	Test cap (Calibration Adaptor Assembly) 0,25 l/min
Calibration:	Calibration procedure according to SUPREMA operation manual For measuring components allowed, measuring ranges, lower alarm levels and conditions for calibration see list of components. Possible other measuring components and measuring ranges on request.	

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms
XXXX = no change of indication

Open-circuit at the MAT-(TS)-Module	Wire -X1/2	Wire -X1/3	Wire -X1/4	Bridge -X1/1/-X1/2	Bridge -X1/4/-X1/5	Disconnect plug of MAT-(TS)
Failure indication	X	X	X	XX	X	X

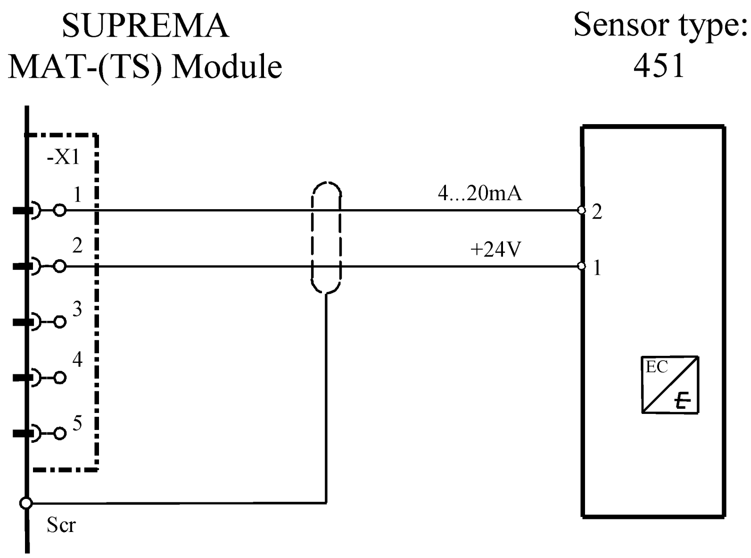
Open-circuit at max. cable length	Wire -X1/2	Wire -X1/3	Wire -X1/4
Failure indication	X	X	X

Short-circuit at the MAT-(TS)-Module	Wire -X1/2/-X1/3	Wire -X1/2/-X1/4	Wire -X1/3/-X1/4
Failure indication	XX	X	X

Short-circuit at max. cable length	Wire -X1/2/-X1/3	Wire -X1/2/-X1/4	Wire -X1/3/-X1/4
Failure indication	XX	XXXX	X

12.43 SUPREMA Sensor Data Sheet Type 451

Measuring range: CO, Order No.: 10000163
Measuring range: 0 ... 50 ppm H_2S, Order No.: 10000166



Connection module: MCI 10/MCI 20 (active/2-wire/4 ... 20 mA linear/current sink)

Sensor simulation module: **4 ... 20 mA** (Order No.: 10030262)

Connection data:

Supply voltage	14 ... 30 VDC
Maximum power consumption	50 mA
Cable type	2-core, 80 % screened
Maximum burden	500 ohms
Maximum cable length	1000 m (at 1.5 mm^2 cross section per wire)
Cable diameter	8 ... 14 mm
Cross section per wire allowed	0.5 ... 2.5 mm^2
Cable inlet	EEXe II M20/M25

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 65
Explosion protection	Exsd IIC T6
BASEEFA Certifikate No.	EX88Y5200X
Temperature	-20 °C up to +40 °C
Humidity	15 ... 90 % rel. humidity; noncondensing
Pressure	950 ... 1100 hPa
Weight	approx. 1.7 kg
Dimensions W x D x H	120 mm x 72 mm x 218 mm

Startup:	Explosion range: Before opening the terminal compartment, power to the measuring head must be switched off. After startup, longer dead periods and sensor changes, the warm-up period of the electrochemical sensors is 3 hours minimum.
Warm-up periods:	The warm-up periods are depending on the component and are to be seen in the list of components.
Function test:	Application of span gas or reference gas via: Test cap
Calibration:	Depending on component (according to list of components) For approved measuring components, calibrating conditions, measuring ranges, alarm levels and codes see list of components. Possible other measuring components on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)

XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)

Open-circuit at the MAT-(TS)-Module	Wire -X1/1	Wire -X1/2	Disconnect plug of MAT-(TS)
Failure indication	X	X	X

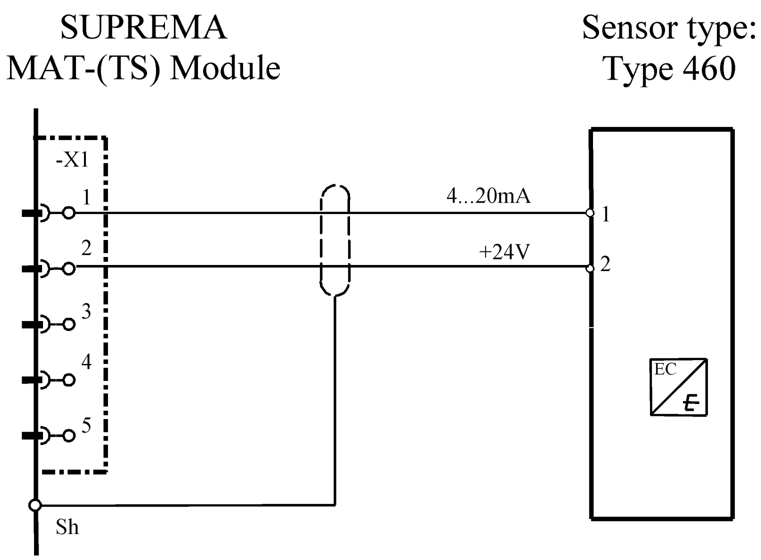
Open-circuit at max. cable length	Wire -X1/1	Wire -X1/2
Failure indication	X	X

Short-circuit at the MAT-(TS)-Module	Wire -X1/1/-X1/2
Failure indication	XX

Short-circuit at max. cable length	Wire -X1/1/-X1/2
Failure indication	XX

12.44 SUPREMA Sensor Data Sheet Type 460

Measuring range: 0 ... 25 Vol.-% O_2, (0 ... 60 mV), no module, Order No.: 10000169



The cable screen is connected to the SUPREMA and to the Type 460.

Connection module: MCI 10/MCI 20 (active/2-wire/4 ... 20 mA linear/current sink)

Sensor simulation module: **4 ... 20 mA** (Order No.: 10030262)

Connection data:

Supply voltage	14 ... 30 VDC
Maximum power consumption	50 mA
Cable type	2-core, 80 % screened
Maximum burden	500 ohms
Maximum cable length	1000 m (at 1.5 mm^2 cross section per wire)
Cable diameter	8 ... 14 mm
Cross section per wire allowed	0.5 ... 2.5 mm^2
Cable inlet	EEXe II M20/M25

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 65
Explosion protection	Exsd IIC T6
BASEEFA Certifikate No.	EX88Y5200X
Temperature	-15 °C to +40 °C
Humidity	0 ... 95 % rel. humidity; noncondensing
Pressure	950 ... 1100 hPa
Weight	approx. 1.7 kg
Dimensions W x D x H	120 mm x 72 mm x 218 mm

Startup:	Explosion range: Before opening the terminal compartment, power to the measuring head must be switched off. After startup, longer dead periods and sensor changes, the warm-up period of the electrochemical sensors is 3 hours minimum.
Warm-up periods:	The warm-up periods are depending on the component and are to be seen in the list of components.
Function test:	Span gas application or reference as application via test cap (Calibration Adaptor Assembly)
Calibration:	Depending on component (according to list of components) For approved measuring components, calibrating conditions, measuring ranges, alarm levels and codes see list of components. Possible other measuring components on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)

Open-circuit at the MAT-(TS)-Module	Wire -X1/1	Wire -X1/2	Disconnect plug of MAT-(TS)
Failure indication	X	X	X

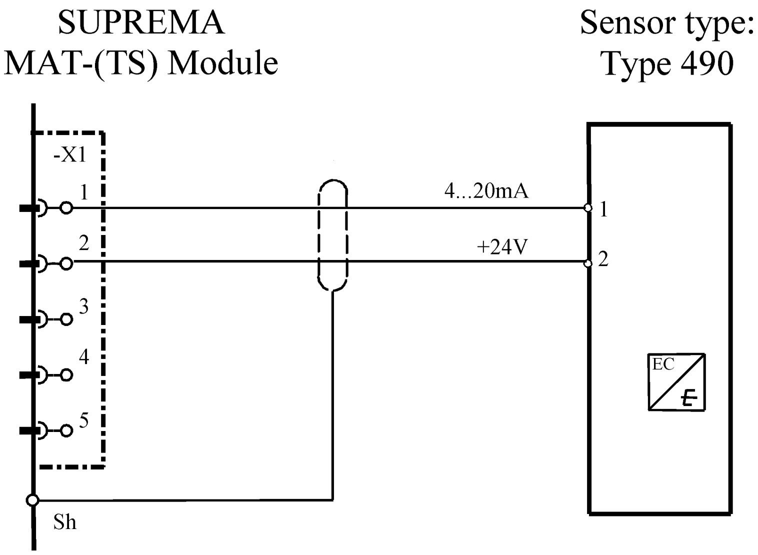
Open-circuit at max. cable length	Wire -X1/1	Wire -X1/2
Failure indication	X	X

Short-circuit at the MAT-(TS)-Module	Wire -X1/1/-X1/2
Failure indication	XX

Short-circuit at max. cable length	Wire -X1/1/-X1/2
Failure indication	XX

12.45 SUPREMA Sensor Data Sheet Type 490/O_2

Measuring range: 0 ... 25 % O_2, Order No.: 10000162



Connection module: MCI 10/MCI 20 (active/2-wire/4 ... 20 mA/current sink)

Sensor simulation module: **4 ... 20 mA** (Order No.: 10030262)

Connection data:

Supply voltage	14 ... 30 VDC
Maximum power consumption	50 mA
Cable type	2-core, 80 % screened
Maximum burden	500 ohms
Maximum cable length	1000 m (at 1.5 mm^2 cross section per wire)
Cable diameter	8 ... 14 mm
Cross section per wire allowed	0.5 ... 2.5 mm^2
Cable inlet	EEXe II M20 / M25

Conditions for use:

Mounting	Wall mounting
Ingress protection	IP 65
Explosion protection	Exsd IIC T6
BASEEFA Certifikate No.	EX88Y5200X
Temperature	-5 °C to +40 °C
Humidity	0 ... 95 % rel. humidity; noncondensing
Pressure	950 ... 1100 hPa
Weight	approx. 1.7 kg
Dimensions W x D x H	120 mm x 72 mm x 218 mm

Startup:	Explosion range: Before opening the terminal compartment, power to the measuring head must be switched off.
Status signals:	Calibration —> 3 mA ; Failure —> 2 mA: Cable defect —> 0 mA Indication at the SUPREMA display: Signal failure
Function test:	Test filter
Calibration:	For approved measuring components, calibrating conditions, measuring ranges, alarm levels and codes see list of components. Possible other measuring components on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)

XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)

Open-circuit at the MAT-(TS)-Module	Wire -X1/1	Wire -X1/2	Disconnect plug of MAT-(TS)
Failure indication	X	X	X

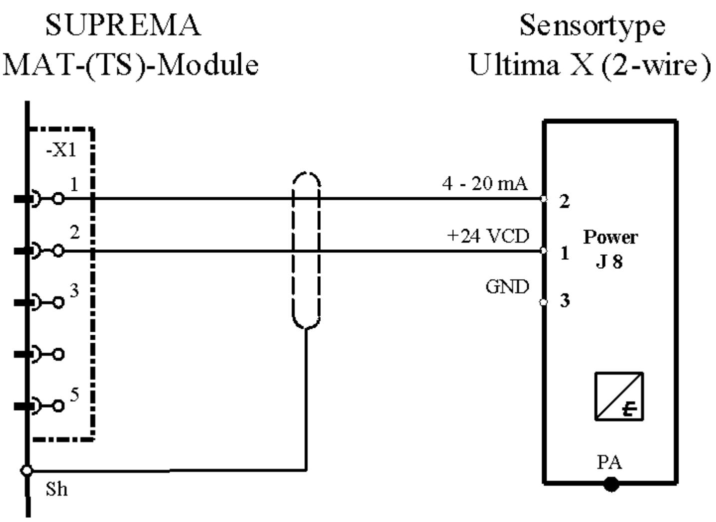
Open-circuit at max. cable length	Wire -X1/1	Wire -X1/2
Failure indication	X	X

Short-circuit at the MAT-(TS)-Module	Wire -X1/1/-X1/2
Failure indication	XX

Short-circuit at max. cable length	Wire -X1/1/-X1/2
Failure indication	XX

12.46 SUPREMA Sensor Data Sheet UltimaX (2-wire for Tox and O_2)

Order No.: 10044xxx (xxx-according to order sheet)



Connection module: MCI 10/MCI 20 (active/2-wire/4 ... 20 mA/current sink)

Sensor simulation module: **4 ... 20 mA** (Order No.: 10030262)

Connection data:

Supply voltage	19 ... 30 VDC
Maximum power consumption	40 mA
Cable type	2-core, 80 % screened
Maximum burden	500 ohms
Maximum cable length	1600 m (at 1.5 mm^2 cross section per wire)
Cable diameter	9 ... 17 mm
Cross section per wire allowed	0.75 ... 2.5 mm^2

Conditions for use:

Mounting	Wall mounting/Mounting with mounting clamp Separate sensor possible (remote sensor)
Ingress protection	IP 66/IP 67 EN 60529
Certificate	DMT 02 ATEX E 202 X II 2G EEx d IIC T4, -40 °C ≤ Ta ≤ +60 °C
Temperature	-40 °C to +60 °C see operation manual
Humidity	15 ... 95 % rel. humidity; noncondensing
Pressure	800 ... 1200 hPa
Weight	approx. 4.7 kg
Dimensions W x D x H	160.3 mm x 99.3 mm x 261.1 mm
Housing material	Stainless steel (ASMT 316/DIN 1.4401)
For further details see operation manual, Order No.: 10046690	

Startup:	After switching on the supply voltage the UltimaX initiates a self-test. After approximately 30 sec. the instrument changes over to measuring operation.
Warm-up periods:	The warm-up periods are depending on the component and can be seen in the list of components.
Function test:	Application of span gas or reference gas via UltimaX test cap
Calibration:	Dependent from component (see list of components) For approved measuring components, calibrating conditions, measuring ranges, alarm levels and codes see list of components. Possible other measuring components on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)

XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)

Open-circuit at the MAT-(TS)-Module	Wire -X1/1	Wire -X1/4	Disconnect plug of MAT-(TS)
Failure indication	X	X	X

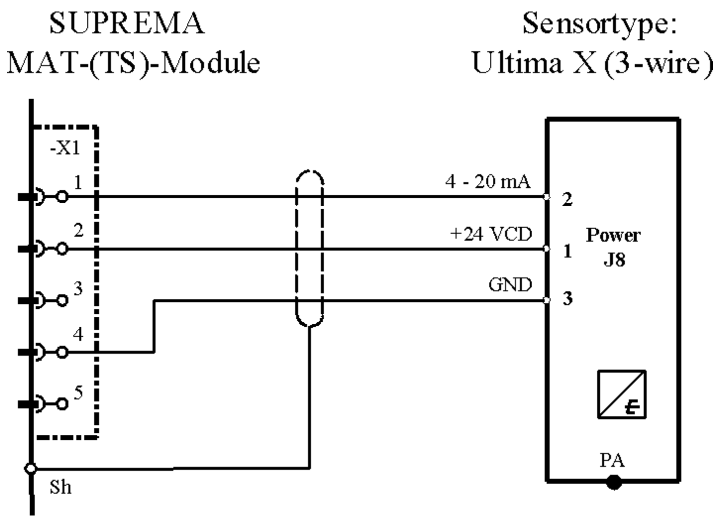
Open-circuit at max. cable length	Wire -X1/1	Wire -X1/4
Failure indication	X	X

Short-circuit at the MAT-(TS)-Module	Wire -X1/1/-X1/4
Failure indication	XX

Short-circuit at max. cable length	Wire -X1/1/-X1/4
Failure indication	XX

12.47 SUPREMA Sensor Data Sheet UltimaX (3-wire for Explosive Gases/Tox and O_2)

Order No.: 10044xxx (xxx-according to order sheet)



Connection module: MCI 10/MCI 20 (active/3-wire/4 ... 20 mA/current source)

Sensor simulation module: **4 ... 20 mA** (Order No.: 10030262)

Variant: Tox and O_2 with electrochemical cell

Variant: explosive gases with catalytic sensors

Connection data:

Supply voltage	19 ... 30 VDC
Maximum power consumption	Electrochemical: 60 mA/Catalytic: 200 mA
Cable type	3-core, 80 % screened
Maximum burden	500 ohms
Maximum cable length	Electrochemical: 2000 m/Catalytic: 800 m (1.5 mm^2 cross section per wire)
Cable diameter	9 ... 17 mm
Cross section per wire allowed	0.75 ... 2.5 mm^2

Conditions for use:

Mounting	Wall mounting/Mounting bracket Remote sensor option
Ingress protection	IP 66/IP 67 EN 60529
Certificate	DMT 02 ATEX E 202 X II 2G EEx d IIC T4, -40 °C ≤ Ta ≤ +60 °C
Temperature	-40 °C to +60 °C see operation manual
Humidity	15 ... 95 % rel. humidity; noncondensing
Pressure	800 ... 1200 hPa
Weight	approx. 4.7 kg
Dimensions W x D x H	160.3 mm x 99.3 mm x 261.1 mm
Housing material	Stainless steel (ASMT 316/DIN 1.4401)
For further details see operation manual, Order No.: 10046690	

Startup:	After switching on the supply voltage the UltimaX initiates a self-test. After approximately 30 sec. the instrument changes over to measuring operation.
Warm-up periods:	The warm-up periods depend on the gas.
Function test:	Application of span gas or reference gas via UltimaX test cap
Calibration:	Depending on gas (see list of gases) For allowed measuring ranges, lower alarm levels and conditions for calibration see list of gases. Possible other gases on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms

Open-circuit at the MAT-(TS)-Module	Wire -X1/1	Wire -X1/2	Wire -X1/4	Disconnect plug of MAT-(TS)
Failure indication	X	X	X	X

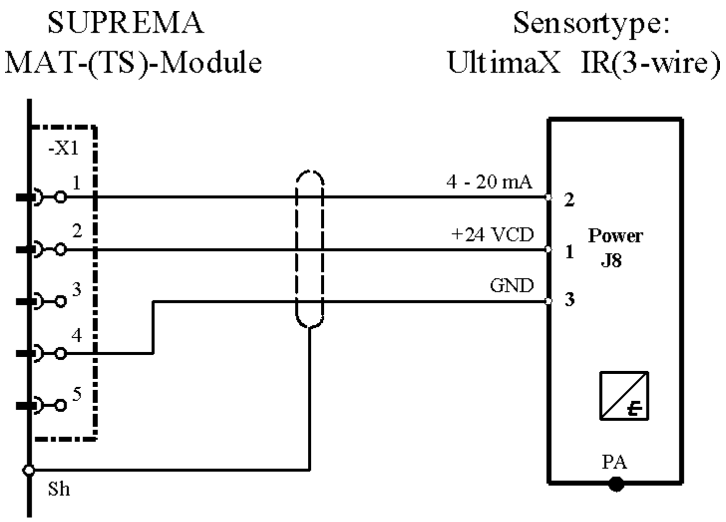
Open-circuit at max. cable length	Wire -X1/1	Wire -X1/2	Wire -X1/4
Failure indication	X	X	X

Short-circuit at the MAT-(TS)-Module	Wire -X1/1/-X1/2	Wire -X1/1/-X1/4	Wire -X1/2/-X1/4
Failure indication	XX	X	X

Short-circuit max. cable length	Wire -X1/1/-X1/2	Wire -X1/1/-X1/4	Wire -X1/2/-X1/4
Failure indication	XX	XXX	X

12.48 SUPREMA Sensor Data Sheet UltimaX IR

Order No.: 10044xxx (xxx-according to order sheet)



Connection module:	MCI 10/MCI 20 (Infrared/active/3-wire/4 ... 20 mA/current source)
Sensor simulation module:	**4 ... 20 mA** (Order No.: 10030262)

Connection data:

Supply voltage	19 ... 30 VDC
Maximum power consumption	350 mA
Cable type	3-core, 80 % screened
Maximum burden	500 ohms
Maximum cable length	500 m (1.5 mm^2 cross section per wire)
Cable diameter	9 ... 17 mm
Cross section per wire allowed	0.75 ... 2.5 mm^2

Conditions for use:

Mounting	Wall mounting/Mounting bracket Remote sensor option
Ingress protection	IP 66/IP 67 EN 60529
Certificate	DMT 02 ATEX E 202 X II 2G EEx d IIC T4, -40 °C ≤ Ta ≤ +60 °C
Temperature	-40 °C to +60 °C see operation manual
Humidity	15 ... 95 % rel. humidity; noncondensing
Pressure	800 ... 1200 hPa
Weight	approx. 4.7 kg
Dimensions W x D x H	160.3 mm x 99.3 mm x 296.5 mm
Housing material	Stainless steel (ASMT 316/DIN 1.4401)
For further details see operation manual, Order No.: 10046690	

Startup:	After switching on the supply voltage the instrument initiates a self-test. After approximately 30 sec. the instrument changes over to measuring operation.
Function test:	Span gas via UltimaX IR test cap
Calibration:	New calibrations or calibration changes can only be made by MSA AUER service personnel or by specialists authorized by MSA AUER. For allowed measuring ranges, lower alarm levels and conditions for calibration see list of gases: Possible other measuring components on request.

Open or Short Circuit Fault Indication:

X = Signal failure (FAIL-LED)
XX = Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)
XXX = only alarms

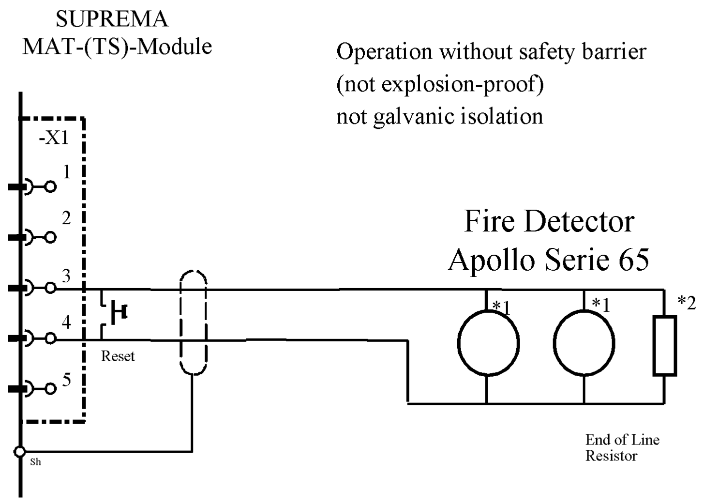
Open-circuit at the MAT-(TS)-Module	Wire -X1/1	Wire -X1/2	Wire -X1/4	Disconnect plug of MAT-(TS)
Failure indication	X	X	X	X

Open-circuit at max. cable length	Wire -X1/1	Wire -X1/2	Wire -X1/4
Failure indication	X	X	X

Short-circuit at the MAT-(TS)-Module	Wire -X1/1/-X1/2	Wire -X1/1/-X1/4	Wire -X1/2/-X1/4
Failure indication	XX	X	X

Short-circuit max. cable length	Wire -X1/1/-X1/2	Wire -X1/1/-X1/4	Wire -X1/2/-X1/4
Failure indication	XX	XXX	X

12.49 SUPREMA Sensor Data Sheet Fire Detector Apollo Series 65 (not explosion-proof) Internal Power Supply (without safety barrier)*



*1 Apollo Fire Detector Series 65
Connect according to Apollo Mounting support 45681-200 Series 60/65 connection diagram.
Max. 20 Fire Detectors
*2 End of Line Resistor 2K2/0,5 W according to Apollo connection diagram 45681-200

Connection module:

MFI 10 (Fire Input Module) Configuration: Internal power supply, without Zener barrier. (Switch position S101: 1 + 2 = ON, 3 + 4 = OFF) Adjust potentiometer P101 to left position

Connection data:

Maximum nominal current	42 mA
Maximum nominal voltage	22 V
Power consumption	≤1.5 W (including cable length)
Cable type	2-core, 80 % screened
Maximum loop resistance	10 ohms (cable resistance)
Maximum cable length	400 m (1.5 mm^2 cross section per wire)
Cross section per wire allowed	0.5 ... 2.5 mm^2

Conditions for use:

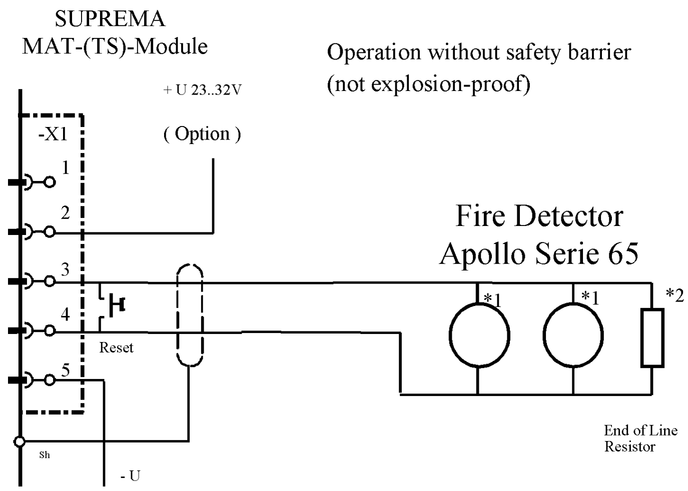
Mounting	Wall mounting
Ingress protection	IP 42 according to DIN 400 50
Explosion protection	-
Certificate	-
Temperature	Type SMOKE detector -20 °C to +60 °C Type HEAT detector -20 °C to +90 °C
Humidity	0 ... 95 % rel. humidity; noncondensing
Pressure	950 ... 1100 hPa
Weight	approx. 120 kg
Dimensions	Diameter 100 mm x 50 mm
Housing material	

Simulation of normal operation / Alarm / RESET / Open or short-circuit fault indication:

Simulation	Effect
Normal operation END OF LINE resistor 2K2 connected according to circuit diagram	Normal operation
Alarm END OF LINE resistor 2K2 connected according to circuit diagram Connect resistor 1.0 K 1% 0.5 W between terminals 3 and 4	Alarm message
RESET Connect wire jumper between terminals 3 and 4	Alarm message disappears, normal operation. Failure message after 45 s maximum appears.
Open-circuit of line END OF LINE resistor 2K2 not connected	Failure message
Line short-circuit END OF LINE resistor short-circuited	Failure message after 45 s maximum.

* With regard to fire and smoke detection, the SUPREMA has not been evaluated to any Canadian standard by a third party agency.

12.50 SUPREMA Sensor Data Sheet Fire Detector Apollo Series 65 (not explosion-proof) External Power Supply (without safety barrier)*



*1 Apollo Fire Detector Series 65
Connect according to Apollo Mounting support 45681-200 Series 60/65 diagram.
Max. 20 Fire Detectors
*2 End of Line Resistor 2K2/0.5 W in the last detector according to connection

Connection module:

MFI 10 (Fire Input Module)
Configuration: External power supply, without Zener barrier.
(Switch position S101: 1 + 2 + 4 = OFF, 3 = ON)
Adjust potentiometer P101 to left position

Connection data:

Maximum nominal current	42 mA
Maximum nominal voltage	22 V
Power consumption	≤1.5 W (including cable length)
Cable type	2-core, 80 % screened
Maximum loop resistance	50 ohms (cable resistance)
Maximum cable length	2000 m (1.5 mm^2 cross section per wire)
Cross section per wire allowed	0.5 ... 2.5 mm^2

Conditions for use:

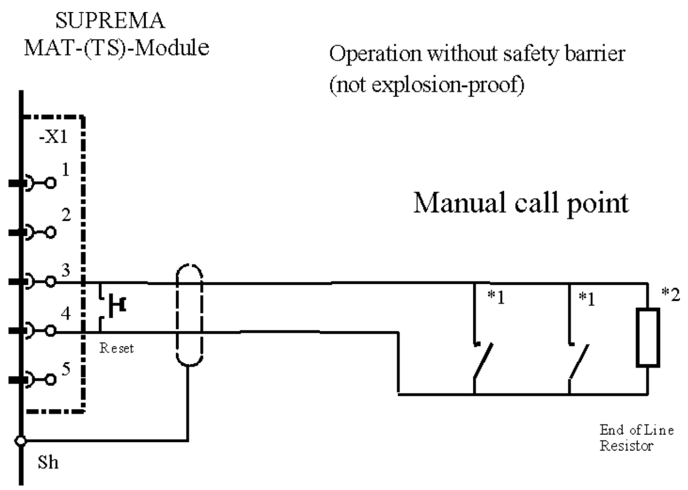
Mounting	Wall mounting
Ingress protection	IP 42 according to DIN 400 50
Explosion protection	-
Certificate	-
Temperature	Type SMOKE detector -20 °C to +60 °C Type HEAT detector -20 °C to +90 °C
Humidity	0 ... 95 % rel. humidity; noncondensing
Pressure	950 ... 1100 hPa
Weight	approx. 120 kg
Dimensions	Diameter 100 mm x 50 mm
Housing material	Plastic

Simulation of normal operation / Alarm / RESET / Open or short-circuit fault indication:

Simulation	Effect
Normal operation	
External power supply 23 ... 32 V connected according to circuit diagram	Normal operation
END OF LINE resistor 2K2 connected according to circuit diagram	
Alarm	
External power supply 23 ... 32 V connected according to circuit diagram	
END OF LINE resistor 2K2 connected according to circuit diagram	
Connect resistor 1.0 K 1 % 0.5 W between terminal 3 and 4	Alarm message
RESET	
Connect wire jumper between terminals 3 and 4	Alarm message disappears, normal operation. After max. 45 s failure message appears.
Open-circuit of line	
External power supply 23 ... 32 V connected according to circuit diagram	
END OF LINE resistor 2K2 not connected	Failure message
Line short-circuit	
External power supply 23 ... 32 V connected according to circuit diagram	
END OF LINE resistor short-circuited	Failure message max. 45 s after short-circuit
Interruption of the supply voltage	
External power supply 23 ... 32 V not connected	Failure message
END OF LINE resistor 2K2 connected according to circuit diagram	

* With regard to fire and smoke detection, the SUPREMA has not been evaluated to any Canadian standard by a third party agency.

12.51 SUPREMA Sensor Data Sheet for Push-Button Detector (not explosion-proof) Internal Power Supply (without safety barrier)



*1 Push-button detector
Se Tec DKM-KR42 with LED max. 20 pieces
Connect according to diagram inside the push-button detector
*2 End of Line Resistor 2K2 / 0.5 W according to connection diagram inside the detector

Connection module:

MFI 10 (Fire Input Module)*
Configuration: Internal power supply, without Zener barrier.
(Switch position S101: 1 + 2 = ON, 3 + 4 = OFF)
Adjust potentiometer P101 to left position

Connection data:

Maximum nominal current	42 mA
Maximum nominal voltage	22 V
Power consumption	≤1.5 W (including cable length)
Cable type	2-core, 80 % screened
Maximum loop resistance	10 ohms (cable resistance)
Maximum cable length	400 m (1.5 mm² cross section per wire)
Cross section per wire allowed	0.5 ... 2.5 mm²

Conditions for use:

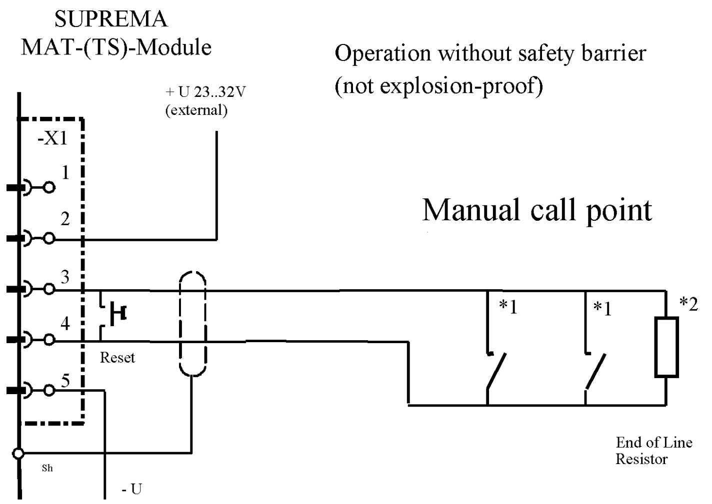
Mounting	Wall mounting
Ingress protection	IP 42 according to DIN 400 50
Explosion protection	-
Certificate	-
Temperature	-
Humidity	-
Pressure	-
Weight	-
Dimensions	125 x 125 x 36 mm
Housing material	Plastic

* With regard to fire and smoke detection, the SUPREMA has not been evaluated to any Canadian standard by a third party agency.

Simulation of normal operation / Alarm / RESET / Open or short-circuit fault indication:

Simulation	Effect
Normal operation END OF LINE resistor 2K2 connected according to circuit diagram	Normal operation
Alarm END OF LINE resistor 2K2 connected according to circuit diagram Connect resistor 1.0 K 1% 0.5 W between terminals 3 and 4	Alarm message
RESET Connect wire jumper between terminals 3 and 4	Alarm message disappears, normal operation. After approximately 45 s failure message appears.
Open-circuit of line END OF LINE resistor 2K2 not connected	Failure message
Line short-circuit END OF LINE resistor short-circuited	Failure message after max. 45 s.

12.52 SUPREMA Sensor Data Sheet for Push-Button Detector (not explosion-proof) External Power Supply (without safety barrier)



*1 Push-button detector
Se Tec DKM-KR42 with LED max. 20 pieces
Connect according to diagram inside the push-button detector
*2 End of Line Resistor 2K2 / 0.5 W according to connection diagram inside the detector

Connection module:

MFI 10 (Fire Input Module)*
Configuration: External power supply, without Zener barrier.
(Switch position S101: 1 + 2 + 4 = OFF, 3 = ON)
Adjust potentiometer P101 to left position

Connection data:

Maximum nominal current	42 mA
Maximum nominal voltage	22 V
Power consumption	≤1.5 W (including cable length)
Cable type	2-core, 80 % screened
Maximum loop resistance	50 ohms (cable resistance)
Maximum cable length	2000 m (1.5 mm^2 cross section per wire)
Cross section per wire allowed	0.5 ... 2.5 mm^2

Conditions for use:

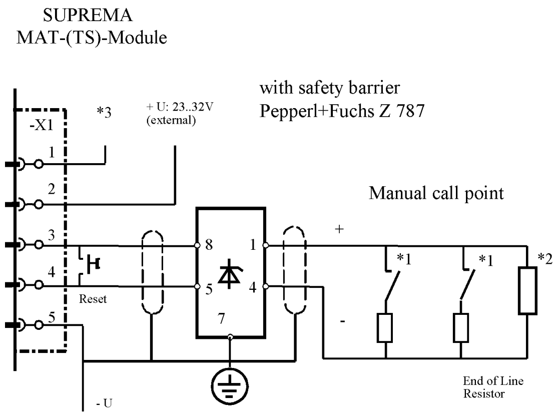
Mounting	Wall mounting
Ingress protection	IP 42 according to DIN 400 50
Explosion protection	-
Certificate	-
Temperature	-
Humidity	-
Pressure	-
Weight	-
Dimensions	125 x 125 x 36 mm
Housing material	Plastic

* With regard to fire and smoke detection, the SUPREMA has not been evaluated to any Canadian standard by a third party agency.

Simulation of normal operation / Alarm / RESET / Open or short-circuit fault indication:

Simulation	Effect
Normal operation END OF LINE resistor 2K2 connected according to circuit diagram	Normal operation
Alarm END OF LINE resistor 2K2 connected according to circuit diagram Connect resistor 1.0 K 1% 0.5 W between terminals 3 and 4	Alarm message
RESET Connect wire jumper between terminals 3 and 4	Alarm message disappears, normal operation. After approximately 45 s failure message appears.
Open-circuit of line END OF LINE resistor 2K2 not connected	Failure message
Line short-circuit END OF LINE resistor short-circuited	Failure message after max. 45 s.

12.53 SUPREMA Sensor Data Sheet Explosion-proof Push-Button Detector with Barrier Z 787



*1 Connect push-button detector according to manufacturer's specification; MEDC NG16 6JF Type BGI WIRING DIAGRAM BGE/I/W + PBE/IW
Contact type: NORMALLY OPEN (terminal 2–3 inside the detector)
Carry out installation according to NFPA 72
With resistor 2.2 KOhms / 0.5 W in series with the contact; max. 10 Pieces
With zener diode 10 V / 1.3 W in series with the contact; max. 20 Pieces
Check polarity

*2 End of Line Resistor 2K2 / 0.5 W to be mounted in the last mounting support of the detection zone circuit or in the portable detector according to the documents specified under *1.

*3 Indication of leakage current. In the case of failure, the „OPEN COLLECTOR" transistor is conducting to terminal 5

Connection module:

MFI 10 (Fire Input Module)*
Configuration: External power supply, with Zener barrier
(Switch position S101: 1 + 2 = OFF, 3 + 4 = ON)
Set potentiometer P101 to left position.

Connection data:

Maximum nominal current	42 mA
Maximum nominal voltage	22 V
Power consumption	≤1.5 W (including cable length)
Cable type	2-core, 80 % screened
Maximum loop resistance	50 ohms (cable resistance)
Maximum cable length	2000 m (1.5 mm^2 cross section per wire)
Cross section per wire allowed	0.5 ... 2.5 mm^2

Conditions for use:

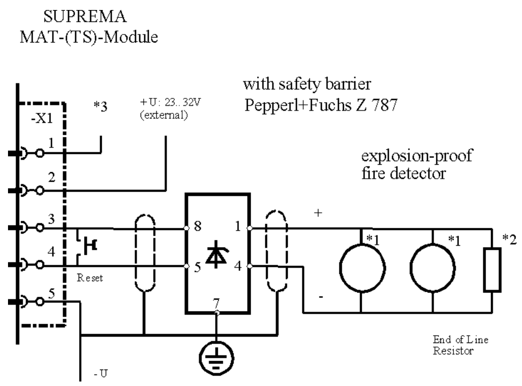
Mounting	Wall mounting
Ingress protection	IP 54 according to DIN 400 50
Explosion protection	yes
Certificate	BASEEFA 03ATEX0084X
Temperature	-20 °C to +55 °C
Humidity	-
Pressure	-
Weight	approx. 1100 g
Dimensions	120 x 125 x 75 mm
Housing material	Aluminium, pressure-resistant

* With regard to fire and smoke detection, the SUPREMA has not been evaluated to any Canadian standard by a third party agency.

Simulation of normal operation / Alarm / RESET / Open or short-circuit fault indication:

Simulation	Effect
Normal operation	
External power supply 23 ... 32 V connected according to circuit diagram	Normal operation
END OF LINE resistor 2K2 connected according to circuit diagram	
Connect resistor 10 K 0.5 W between terminal 1 and 2	Voltage of terminal 1–2 shall be <0.1 V
Alarm	
External power supply 23 ... 32 V connected according to circuit diagram	
END OF LINE resistor 2K2 connected according to circuit diagram	
Connect resistor 1.0 K 1 % 0.5 W between terminal 3 and 4	Alarm message
RESET	
Connect wire jumper between terminals 3 and 4	Normal operation After max. 45 s failure message appears.
Open-circuit of line	
External power supply 23 ... 32 V connected according to circuit diagram	
END OF LINE resistor 2K2 not connected	Failure message
Line short-circuit	
External power supply 23 ... 32 V connected according to circuit diagram	
END OF LINE resistor short-circuited	Failure message
Interruption of the supply voltage	
External power supply 23 ... 32 V not connected	Failure message after max. 45 s
END OF LINE resistor 2K2 connected according to circuit diagram	
Leakage current	
External power supply 23 ... 32 V connected according to circuit diagram	
END OF LINE resistor 2K2 connected according to circuit diagram	
Connect resistor 10 K 0.5 W between terminal 1 and 2	
Connect resistor 18 K between terminals 4 and 5, or connect resistor 330R between terminals 3 and 5.	Failure message Voltage of terminals 1–2 shall be >22 V

12.54 SUPREMA Sensor Data Sheet Ex-Fire Detector Apollo Series 60 with Barrier Z 787*



*1 Connect according to manufacturer´s specification for Apollo Series 60:
SERIES 60 INTRINSICALLY SAFE SYSTEM DRAWING Z209883. Carry out installation according to NFPA 72.
Only the mounting support Order No. 45681-207 specified in the data sheets must be used.
For each detection zone circuit, max. 20 fire detectors are allowed.
*2 End of Line Resistor 2K2 / 0.5 W has to be mounted in the last mounting support of the detection zone circuit or in the portable detector according to the documents specified under *1
*3 Indication of leakage current. In the case of failure, the „OPEN COLLECTOR” transistor is conducting to terminal 5

Connection module:

MFI 10 (Fire Input Module)
Configuration: External power supply, with Zener barrier
(Switch position S101: 1 + 2 = OFF, 3 + 4 = ON)
Set potentiometer P101 to left position.

Connection data:

Maximum nominal current	42 mA
Maximum nominal voltage	22 V
Power consumption	≤1.5 W (including cable length)
Cable type	2-core, 80 % screened
Maximum loop resistance	50 ohms (cable resistance)
Maximum cable length	2000 m (1.5 mm^2 cross section per wire)
Cross section per wire allowed	0.5 ... 2.5 mm^2

Conditions for use:

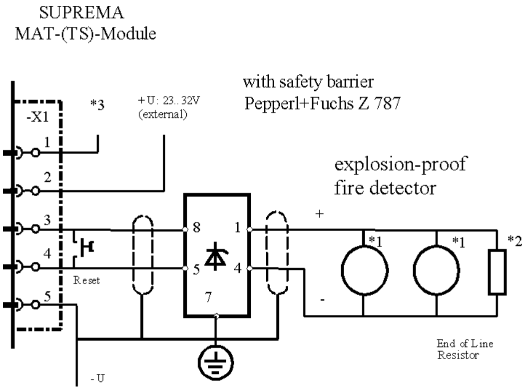
Mounting	Wall mounting
Ingress protection	IP 42 according to DIN 400 50
Explosion protection	yes
Certificate	BASEEFA EX97D2054 BAS02ATEX1288
Temperature	SMOKE detector -20 °C to +60 °C HEAT detector -20 °C to +105 °C
Humidity	0 ... 95 % rel. humidity; noncondensing
Pressure	950 ... 1100 hPa
Weight	approx. 153 g including mounting support
Dimensions	Diameter 100 mm x 50 mm including mounting support
Housing material	Plastic

Simulation of normal operation / Alarm / RESET / Open or short-circuit fault indication:

Simulation	Effect
Normal operation	
External power supply 23 ... 32 V connected according to circuit diagram	Normal operation
END OF LINE resistor 2K2 connected according to circuit diagram	
Connect resistor 10 K 0.5 W between terminal 1 and 2	Voltage of terminal 1–2 shall be <0.1 V
Alarm	
External power supply 23 ... 32 V connected according to circuit diagram	
END OF LINE resistor 2K2 connected according to circuit diagram	
Connect resistor 1.0 K 1 % 0.5 W between terminal 3 and 4	Alarm message
RESET	
Connect wire jumper between terminals 3 and 4	Normal operation After max. 45 s failure message appears.
Open-circuit of line	
External power supply 23 ... 32 V connected according to circuit diagram	
END OF LINE resistor 2K2 not connected	Failure message
Line short-circuit	
External power supply 23 ... 32 V connected according to circuit diagram	
END OF LINE resistor short-circuited	Failure message
Interruption of the supply voltage	
External power supply 23 ... 32 V not connected	Failure message
END OF LINE resistor 2K2 connected according to circuit diagram	
Leakage current	
External power supply 23 ... 32 V connected according to circuit diagram	
END OF LINE resistor 2K2 connected according to circuit diagram	
Connect resistor 10 K 0.5 W between terminal 1 and 2	
Connect resistor 18 K between terminals 4 and 5, or connect resistor 330R between terminals 3 and 5.	Failure message Voltage of terminals 1–2 shall be >22 V

* With regard to fire and smoke detection, the SUPREMA has not been evaluated to any Canadian standard by a third party agency.

12.55 SUPREMA Sensor Data Sheet Explosions-Proof Fire Detector CERBERUS DO1101EX/DT1101EX with Barrier Z 787*



*1 Connect according to manufacturer´s specification. CERBERUS DO1101EX / DT1101EX: Document No. e1469. Only the mounting support Order No. 45681-207 specified in the data sheets must be used. For each detection zone circuit, max. 20 fire detectors are allowed. Carry out installation according to NFPA 72

*2 End-of-Line Resistor 2K2 / 0.5 W to be mounted in the last mounting support of the detection zone circuit or in the portable detector according to the documents specified in *1.

*3 Indication of leakage current. In the case of failure, the „OPEN COLLECTOR" transistor is conducting to terminal 5

Connection module:

MFI 10 (Fire Input Module) Configuration: External power supply, with Zener barrier (Switch position S101: 1 + 2 = OFF, 3 + 4 = ON) Set potentiometer P101 to left position.

Connection data:

Maximum nominal current	42 mA
Maximum nominal voltage	22 V
Power consumption	≤1.5 W (including cable length)
Cable type	2-core, 80 % screened
Maximum loop resistance	50 ohms (cable resistance)
Maximum cable length	2000 m (1.5 mm² cross section per wire)
Cross section per wire allowed	0.5 ... 2.5 mm²

Conditions for use:

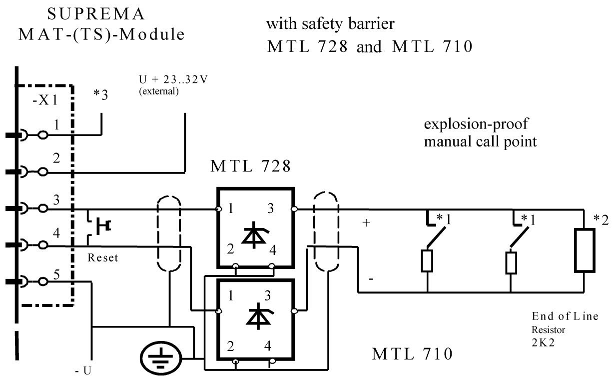
Mounting	Wall mounting
Ingress protection	IP 42 according to DIN 400 50
Explosion protection	EEXib IICT4
Certificate	DO 1101A-EX PTB 02 ATEX 2135 DT1101A-EX: PTB 02 ATEX 2097
Temperature	DO1101: -25 °C to +50 °C DT1101: -25 °C to +70 °C
Humidity	DO1101: 0 ... 95 % rel. humidity; noncondensing DT1101: 0 ... 100 % rel. hum.; surface condensing
Pressure	950 ... 1100 hPa
Weight	approx. 130 g
Dimensions	Diameter 115 mm x 55 mm including mounting support
Housing material	Plastic

Simulation of normal operation / Alarm / RESET / Open or short-circuit fault indication:

Simulation	Effect
Normal operation	
External power supply 23 ... 32 V connected according to circuit diagram	Normal operation
END OF LINE resistor 2K2 connected according to circuit diagram	
Connect resistor 10 K 0.5 W between terminal 1 and 2	Voltage of terminal 1–2 shall be <0.1 V
Alarm	
External power supply 23 ... 32 V connected according to circuit diagram	
END OF LINE resistor 2K2 connected according to circuit diagram	
Connect resistor 1.0 K 1 % 0.5 W between terminal 3 and 4	Alarm message
RESET	
Connect wire jumper between terminals 3 and 4	Normal operation After max. 45 s failure message appears.
Open-circuit of line	
External power supply 23 ... 32 V connected according to circuit diagram	
END OF LINE resistor 2K2 not connected	Failure message
Line short-circuit	
External power supply 23 ... 32 V connected according to circuit diagram	
END OF LINE resistor short-circuited	Failure message after max. 45 s
Interruption of the supply voltage	
External power supply 23 ... 32 V not connected	Failure message
END OF LINE resistor 2K2 connected according to circuit diagram	
Leakage current	
External power supply 23 ... 32 V connected according to circuit diagram	
END OF LINE resistor 2K2 connected according to circuit diagram	
Connect resistor 10 K 0.5 W between terminal 1 and 2	
Connect resistor 18 K between terminals 4 and 5, or connect resistor 330R between terminals 3 and 5.	Failure message Voltage terminal 1–2 must be 23 ... 32 V

* With regard to fire and smoke detection, the SUPREMA has not been evaluated to any Canadian standard by a third party agency.

12.56 SUPREMA Sensor Data Sheet Explosion-Proof Push-Button Detector with Barriers MTL 728 and MTL 710



*1 Connect push-button detector according to manufacturer´s specification.
MEDC NG16 6JF Type BGI. WIRING DIAGRAM BGE/I/W + PBE/IW
Contact type: NORMALLY OPEN (terminals 2-3 inside the detector). Carry out installation according to NFPA72
With resistor 1.8 KΩ / 0.5 W in series with the contact; max. 10 Pieces
With zener diode 10 V /1.3 W in series with the contact; max. 20 Pieces
Check polarity

*2 End-of-Line Resistor 2K2 / 0.5 W to be mounted in the last mounting support of the detection zone circuit or in the portable detector according to the documents specified in *1

*3 Indication of leakage current. In the case of failure, the „OPEN COLLECTOR" transistor is conducting to terminal 5

Connection module:

MFI 10 (Fire Input Module)*
Configuration: External power supply, with Zener barrier
(Switch position S101: 1 + 2 = OFF, 3 + 4 = ON)
Set potentiometer P101 to left position.

Connection data:

Maximum nominal current	42 mA
Maximum nominal voltage	22 V
Power consumption	≤1.5 W (including cable length)
Cable type	2-core, 80 % screened
Maximum loop resistance	50 ohms (cable resistance)
Maximum cable length	2000 m (1.5 mm^2 cross section per wire)
Cross section per wire allowed	0.5 ... 2.5 mm^2

Conditions for use:

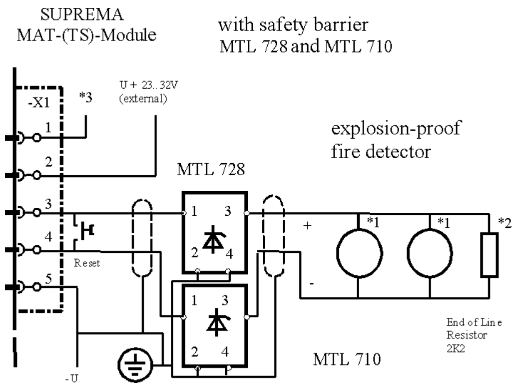
Mounting	Wall mounting
Ingress protection	IP 54 according to DIN 400 50
Explosion protection	yes
Certificate	BASEEFA 03ATEX0084X
Temperature	-20 °C to +55 °C
Humidity	-
Pressure	-
Weight	approx. 1100 g
Dimensions	120 x 125 x 75 mm
Housing material	Aluminium, pressure-resistant

* With regard to fire and smoke detection, the SUPREMA has not been evaluated to any Canadian standard by a third party agency.

Simulation of normal operation / Alarm / RESET / Open or short-circuit fault indication:

Simulation	Effect
Normal operation	
External power supply 23 ... 32 V connected according to circuit diagram	Normal operation
END OF LINE resistor 2K2 connected according to circuit diagram	
Connect resistor 10 K 0.5 W between terminal 1 and 2	Voltage of terminal 1–2 shall be <0.1 V
Alarm	
External power supply 23 ... 32 V connected according to circuit diagram	
END OF LINE resistor 2K2 connected according to circuit diagram	
Connect resistor 1.0 K 1 % 0.5 W between terminal 3 and 4	Alarm message
RESET	
Connect wire jumper between terminals 3 and 4	Normal operation After max. 45 s failure message appears.
Open-circuit of line	
External power supply 23 ... 32 V connected according to circuit diagram	
END OF LINE resistor 2K2 not connected	Failure message
Line short-circuit	
External power supply 23 ... 32 V connected according to circuit diagram	
END OF LINE resistor short-circuited	Failure message
Interruption of the supply voltage	
External power supply 23 ... 32 V not connected	Failure message after max. 45 s
END OF LINE resistor 2K2 connected according to circuit diagram	
Leakage current	
External power supply 23 ... 32 V connected according to circuit diagram	
END OF LINE resistor 2K2 connected according to circuit diagram	
Connect resistor 10 K 0.5 W between terminal 1 and 2	
Connect resistor 18 K between terminals 4 and 5, or connect resistor 330R between terminals 3 and 5.	Failure message Voltage terminal 1–2 must be 23 ... 32 V

12.57 SUPREMA Sensor Data Sheet Explosion-Proof Fire Detector Apollo Series 60 with Barriers MTL 728 and MTL 710*



*1 Connect according to manufacturer´s specification Apollo Series 60: SERIES 60 INTRINSICALLY SAFE SYSTEM DRAWING Z209883. Carry out installation according to NFPA72.
Only the mounting support Order No. 45681-207 specified in the data sheets must be used.
For each detection zone circuit, max. 20 fire detectors are allowed

*2 End-of-Line Resistor 2K2 / 0.5 W to be mounted in the last mounting support of the detection zone circuit or in the portable detector according to the documents specified in *1

*3 Indication of leakage current. In the case of failure, the „OPEN COLLECTOR” transistor is conducting to terminal 5

Connection module:

MFI 10 (Fire Input Module)
Configuration: External power supply, with Zener barrier
(Switch position S101: 1 + 2 = OFF, 3 + 4 = ON)
Set potentiometer P101 to left position.

Connection data:

Maximum nominal current	42 mA
Maximum nominal voltage	22 V
Power consumption	≤1.5 W (including cable length)
Cable type	2-core, 80 % screened
Maximum loop resistance	50 ohms (cable resistance)
Maximum cable length	2000 m (1.5 mm^2 cross section per wire)
Cross section per wire allowed	0.5 ... 2.5 mm^2

Conditions for use:

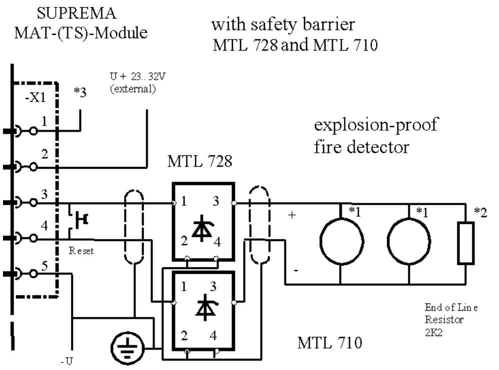
Mounting	Wall mounting
Ingress protection	IP 42 according to DIN 400 50
Explosion protection	yes
Certificate	BASEEFA EX97D2054 BAS02ATEX1288
Temperature	SMOKE detector -20 °C to +60 °C HEAT detector -20 °C to +105 °C
Humidity	0 ... 95 % rel. humidity; noncondensing
Pressure	950 ... 1100 hPa
Weight	approx. 153 g including mounting support
Dimensions	Diameter 100 mm x 50 mm including mounting support
Housing material	Plastic

Simulation of normal operation / Alarm / RESET / Open or short-circuit fault indication:

Simulation	Effect
Normal operation	
External power supply 23 ... 32 V connected according to circuit diagram	Normal operation
END OF LINE resistor 2K2 connected according to circuit diagram	
Connect resistor 10 K 0.5 W between terminal 1 and 2	Voltage of terminal 1–2 shall be <0.1 V
Alarm	
External power supply 23 ... 32 V connected according to circuit diagram	
END OF LINE resistor 2K2 connected according to circuit diagram	
Connect resistor 1.0 K 1 % 0.5 W between terminal 3 and 4	Alarm message
RESET	
Connect wire jumper between terminals 3 and 4	Normal operation After max. 45 s failure message appears.
Open-circuit of line	
External power supply 23 ... 32 V connected according to circuit diagram	
END OF LINE resistor 2K2 not connected	Failure message
Line short-circuit	
External power supply 23 ... 32 V connected according to circuit diagram	
END OF LINE resistor short-circuited	Failure message
Interruption of the supply voltage	
External power supply 23 ... 32 V not connected	Failure message
END OF LINE resistor 2K2 connected according to circuit diagram	
Leakage current	
External power supply 23 ... 32 V connected according to circuit diagram	
END OF LINE resistor 2K2 connected according to circuit diagram	
Connect resistor 10 K 0.5 W between terminal 1 and 2	
Connect resistor 18 K between terminals 4 and 5, or connect resistor 330R between terminals 3 and 5.	Failure message Voltage terminal 1–2 must be 23 ... 32 V

* With regard to fire and smoke detection, the SUPREMA has not been evaluated to any Canadian standard by a third party agency.

12.58 SUPREMA Sensor Data Sheet Explosion-Proof Fire Detector CERBERUS DO1101EX/DT1101EX with Barriers MTL 728 and MTL 710*



*1 Connect according to manufacturer´s specification. CERBERUS Document No. e1469
Tyco M600 Series smoke and heat detectors. Document 01B-04-D12 Issue 1, Date 7/02
Only the mounting support Order No. 45681-207 specified in the data sheets must be used.
*2 End-of-Line Resistor 2K2 / 0.5 W to be mounted in the last mounting support of the detection zone circuit or in the portable detector according to the documents specified under *1
*3 Indication of leakage current. In the case of failure, the „OPEN COLLECTOR" transistor is conducting to terminal 5.

Connection module:

MFI 10 (Fire Input Module) Configuration: External power supply, with Zener barrier (Switch position S101: 1 + 2 = OFF, 3 + 4 = ON) Set potentiometer P101 to left position.

Connection data:

Maximum nominal current	42 mA
Maximum nominal voltage	22 V
Power consumption	≤1.5 W (including cable length)
Cable type	2-core, 80 % screened
Maximum loop resistance	50 ohms (cable resistance)
Maximum cable length	2000 m (1.5 mm^2 cross section per wire)
Cross section per wire allowed	0.5 ... 2.5 mm^2

Conditions for use:

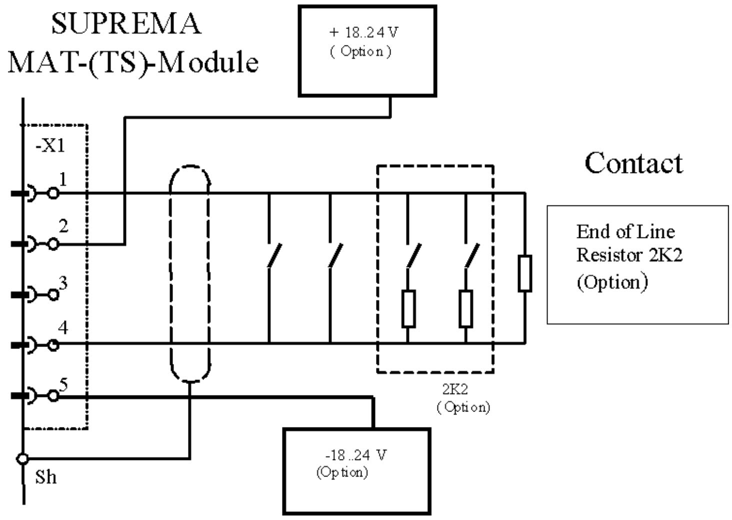
Mounting	Wall mounting
Ingress protection	IP 42 according to DIN 400 50
Explosion protection	EEXib IICT4
Certificate	DO 1101A-EX PTB 02 ATEX 2135 DT1101A-EX: PTB 02 ATEX 2097
Temperature	DO1101: -25 °C to +50 °C DT1101: -25 °C to +70 °C
Humidity	DO1101: 0 ... 95 % rel. humidity; noncondensing DT1101: 0 ... 100 % rel. hum.; surface condensing
Pressure	950 ... 1100 hPa
Weight	approx. 130 g
Dimensions	Diameter 115 mm x 55 mm including support
Housing material	Plastic

Simulation of normal operation / Alarm / RESET / Open or short-circuit fault indication:

Simulation	Effect
Normal operation	
External power supply 23 ... 32 V connected according to circuit diagram	Normal operation
END OF LINE resistor 2K2 connected according to circuit diagram	
Connect resistor 10 K 0.5 W between terminal 1 and 2	Voltage of terminal 1–2 shall be <0.1 V
Alarm	
External power supply 23 ... 32 V connected according to circuit diagram	
END OF LINE resistor 2K2 connected according to circuit diagram	
Connect resistor 1.0 K 1 % 0.5 W between terminal 3 and 4	Alarm message
RESET	
Connect wire jumper between terminals 3 and 4	Normal operation After max. 45 s failure message appears.
Open-circuit of line	
External power supply 23 ... 32 V connected according to circuit diagram	
END OF LINE resistor 2K2 not connected	Failure message
Line short-circuit	
External power supply 23 ... 32 V connected according to circuit diagram	
END OF LINE resistor short-circuited	Failure messageafter max. 45 s
Interruption of the supply voltage	
External power supply 23 ... 32 V not connected	Failure message
END OF LINE resistor 2K2 connected according to circuit diagram	
Leakage current	
External power supply 23 ... 32 V connected according to circuit diagram	
END OF LINE resistor 2K2 connected according to circuit diagram	
Connect resistor 10 K 0.5 W between terminal 1 and 2	
Connect resistor 18 K between terminals 4 and 5, or connect resistor 330R between terminals 3 and 5.	Failure message Voltage terminal 1–2 must be 23 ... 32 V

* With regard to fire and smoke detection, the SUPREMA has not been evaluated to any Canadian standard by a third party agency.

12.59 SUPREMA Sensor Data Sheet Contact



Connection data:

Maximum nominal current	8 mA
Maximum nominal voltage	15 V
Power consumption	≤1.0 W (including cable length)
Cable type	2-core, 80 % screened
Maximum loop resistance	50 ohms (cable resistance)
Maximum cable length	2000 m (1.5 mm² cross section per wire)
Cross section per wire allowed	0.5 ... 2.5 mm²

Conditions for use:

Mounting	depending on the switch type
Ingress protection	-
Explosion protection	no
Certificate	depending on the switch type
Temperature	depending on the switch type
Humidity	depending on the switch type
Pressure	depending on the switch type
Weight	depending on the switch type
Dimensions	depending on the switch type
Housing material	depending on the switch type

Open or short-circuit fault indication at the following configuration:

S101: 1 and 2 = ON; 3 and 4 = OFF (External power supply)
S102: 1 and 2 = ON; 3 and 4 = OFF (Contact type NO)
S103: 3 and 4 = ON (overall line control)

X = Signal failure (FAIL)   XX = Signal - Alarm   N = Failure case has no effect

Open-circuit at the MAT-(TS)-Module	Wire -X1/1	Wire -X1/2	Wire -X1/4	Wire -X1/5	Disconnect plug of MAT-(TS)
Failure indication	X	X	X	X	X

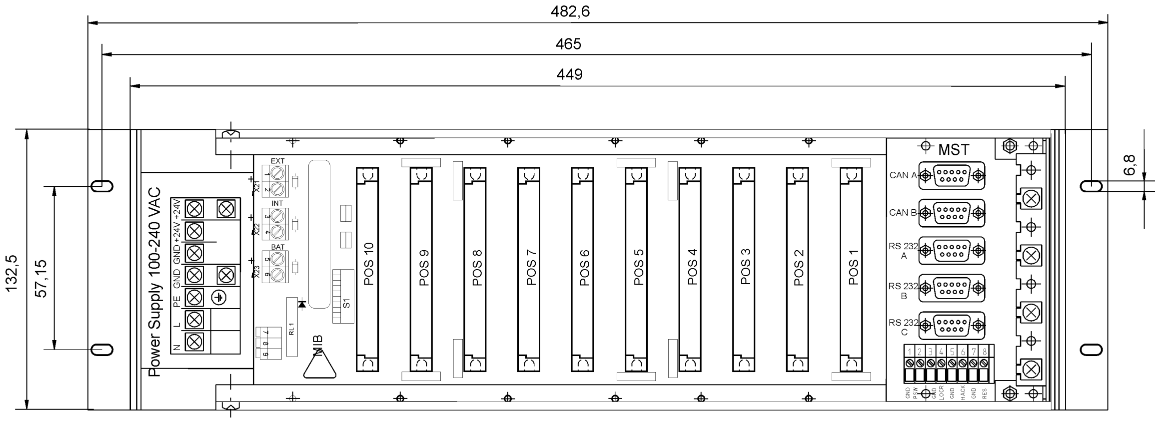
Open-circuit at max. cable length	Wire -X1/1	Wire -X1/2	Wire -X1/4	Wire -X1/4
Failure indication	X	X	X	X

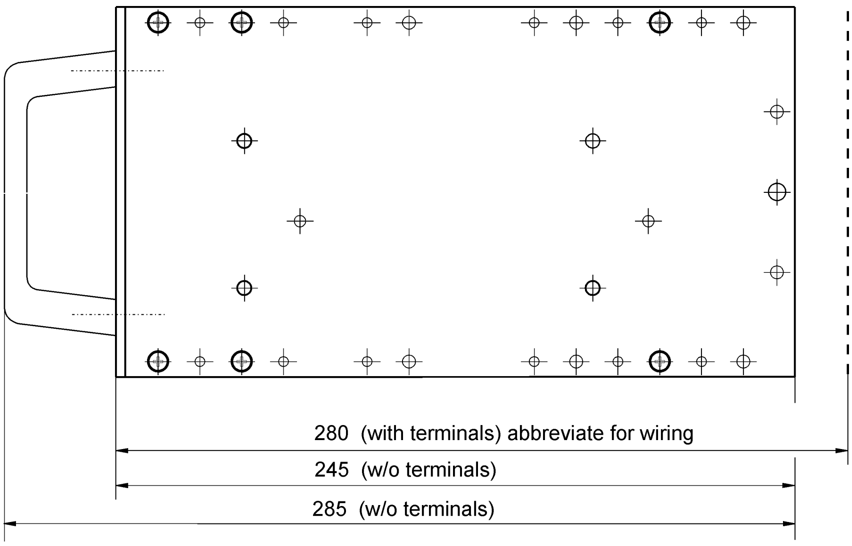
Short-circuit at the MAT-(TS)-Module	Wire -X1/1 with -X1/2	Wire -X1/1 with -X1/4	Wire -X1/1 with -X1/5	Wire -X2/4	Wire -X2/5	Wire -X4/5
Failure indication	X	X	N	X	X	X

Short-circuit at max. Leitungslänge	Wire -X1/1 with -X1/2	Wire -X1/1 with -X1/4	Wire -X1/1 with -X1/5	Wire -X2/4	Wire -X2/5	Wire -X4/5
Failure indication	X	X	N	X	X	X

13. Dimensions

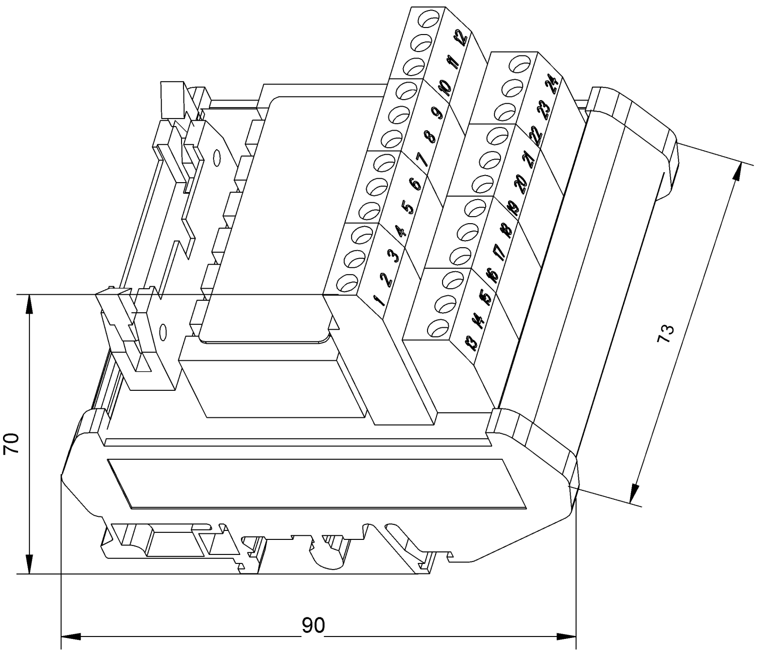
13.1 Rack



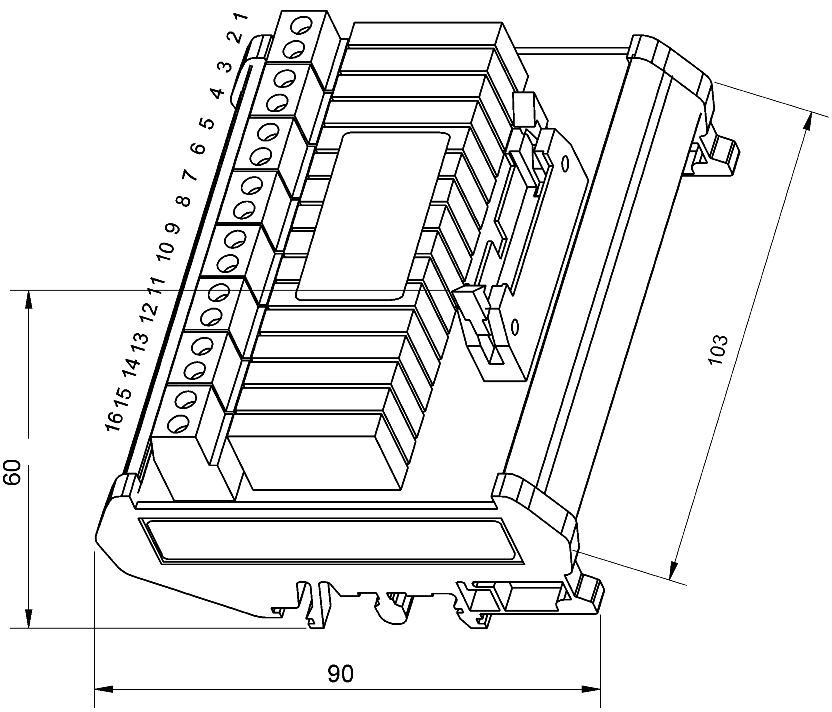


13.2 Rail-mounted Modules

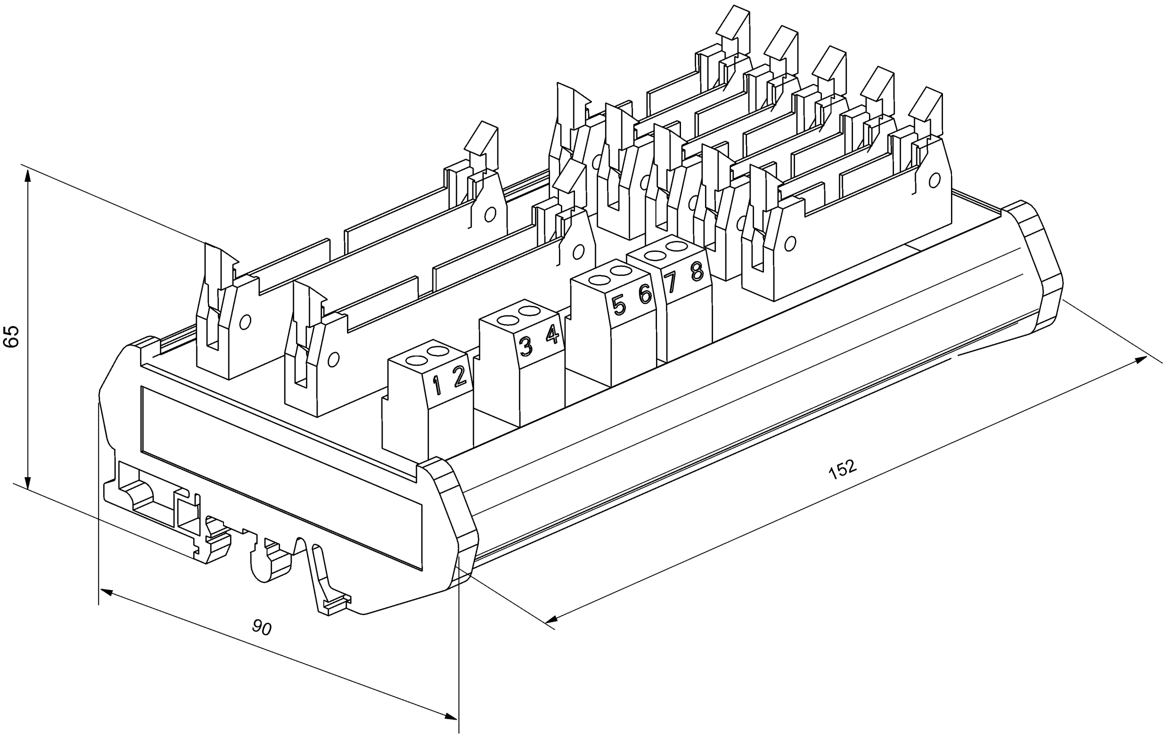
13.2.1 MRO-8-TS Module



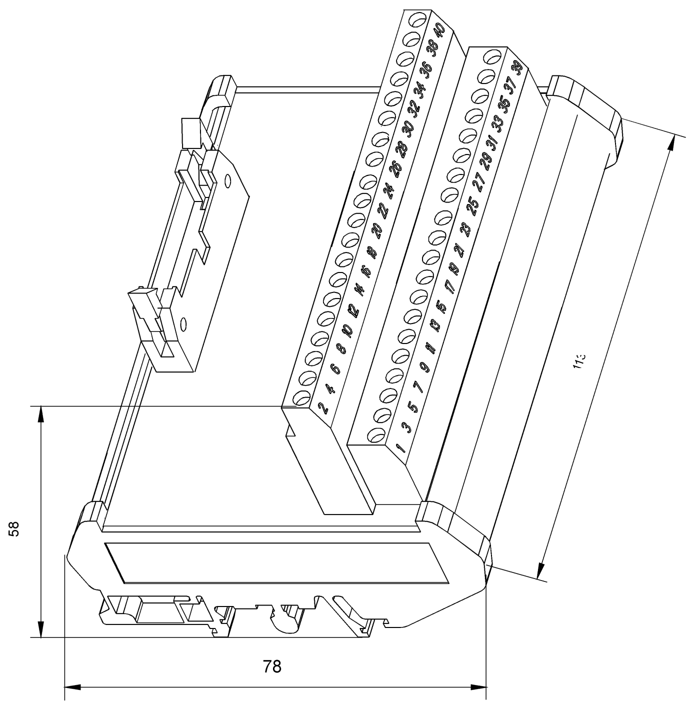
13.2.2 MRO-16-TS Module



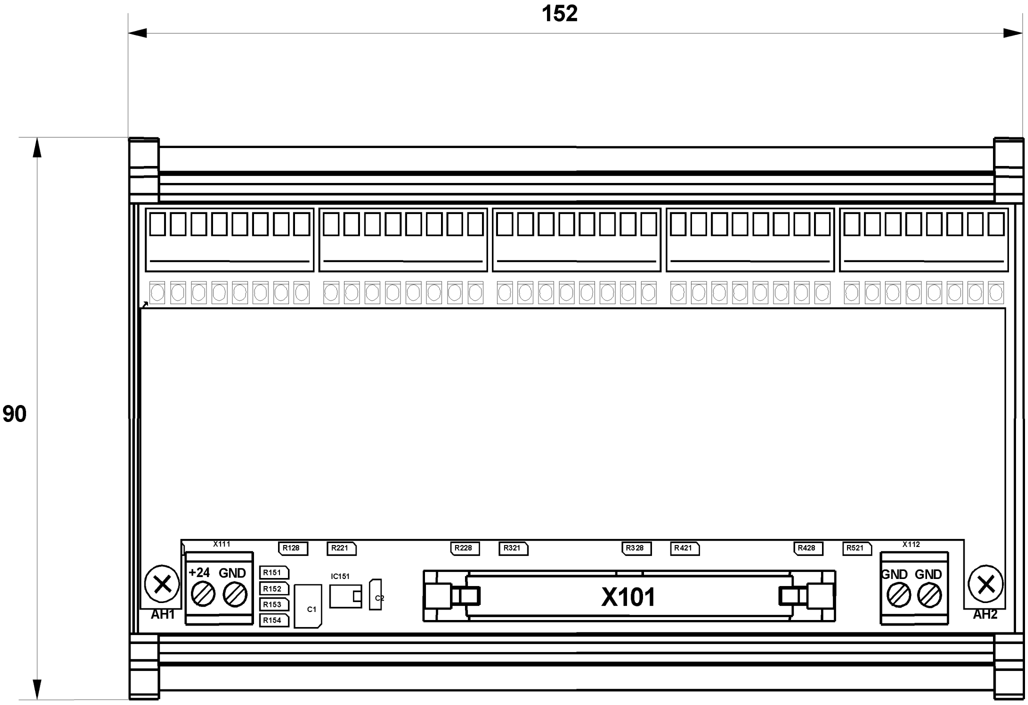
13.2.3 MRC-TS-Module



13.2.4 MGT-40-TS-Module

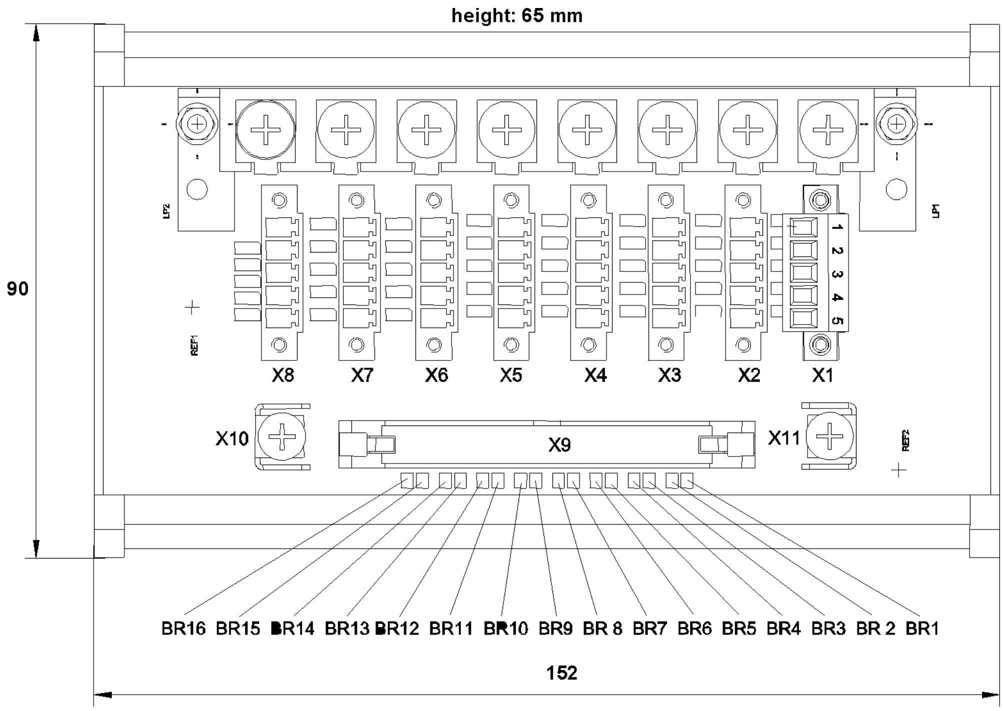


13.2.5 MHD-TS Module



heigth: 65 mm

13.2.6 MAT-TS Module



14. Marking, Certificates and Approvals according to the Directive 94/9/EC (ATEX)

Manufacturer: MSA AUER GmbH
Thiemannstraße 1
D-12059 Berlin

Product: SUPREMA

Type of protection: see Remote Head; the control system must be installed outside of the hazardous area

Marking: Ex II (1) G (2) G

EC-Type Examination Certificate:
DMT 03 ATEX G 003 X

Quality Assurance Notification:
0158

Year of Manufacture: see label

Serial No.: see label

EMC Conformance according to the Directive 89/336/EC
EN 50 270 Type 2, EN 50 081-2

LVD Conformance according to the Directive 73/23/EC
EN 61 010

EC Declaration of Conformity

The manufacturer or his in the community established authorized representative

MSA AUER GmbH
Thiemannstraße 1
D-12059 Berlin

declares that the product:

MSA AUER SUPREMA

bases on the EC-Type Examination Certificate:

DMT 03 ATEX G 003 X

complies with the ATEX directive 94/9/EC, Annex III. Quality Assurance Notification complying with Annex IV of the ATEX Directive 94/9/EC has been issued by EXAM in Bochum, Notified Body number: 0158.

The product is in conformance with the EMC directive 89/336/EC, changed by Directive 91/263/EC, 92/31/EC, 93/68/EC, with the following harmonized norms or normative documentation:

EN 50270 Type 2 EN 50081-2

We further declare that the product complies with the provisions of LVD Directive 73/23/EC as amended by Directives 93/68/EC, with the following harmonized norms or normative documentation:

EN 61 010

Dr. A. Schubert

Dr. Axel Schubert
R & D Instruments

Berlin, August 2004

14.1 Special Conditions for Secure Use According to EG Type Test Approval DMT 03 ATEX G 003 X

- Alarm outputs configured as “new Alarm” shall not be used for safety-relevant purposes.
- The operation of the system fail relays, as well as the relays of the modules connected, must be regularly checked as part of the preventative maintenance (see 7.1).
- Passive remote measuring heads must always be connected to 5-core cable when the 3-core cable length allowed for proper cable control has been exceeded.
- When operating the gas warning System with 4 ... 20 mA interface remote measuring heads with 3-core cable at MCI modules Mat. No. 10021029 or 10041567, the user must take into account that short circuits of the measuring head cable are not recognized in all cases. The proper state of the cable leading to the remote measuring head has to be checked regularly.
- When switching together with 4 ... 20 mA interface remote measuring heads, the specification of the 4 ... 20 mA interface as well as the behaviours below 4 mA and above 20 mA have to be taken into account.
- When operating the gas warning system, the user must consider that for most of the remote measuring heads to be connected the signalisation of special status at the outputs of measuring values is not different from measuring values which only just lie below the measurement range beginning. Moreover, not all special status are signalised at the outputs of measuring values.
- When operating the system with a large number of measure points and relay outputs, the directions for parameter setting of the relay outputs laid down this operation manual have to be kept to.
- When in the field use of the D-7010 remote measuring heads environmental temperatures of above 40 °C cannot be excluded, the alarm levels must not be higher than 90 % of the setting required according to the safety-relevant limit value.
- If the D-7010 remote measuring head has been set at ambient temperatures below +10 °C, a new setting has to be carried out when +20 °C are exceeded for a longer period.
- When the D-7010 remote measuring head has been exposed to concentrations above the measuring range level, zero and sensitivity have to be checked and readjusted, if necessary.
- If the D-7010 or D-7100 remote measuring heads are used with the SG 70 splashwater-proof housing, the following measures must be taken:
  - The alarm levels must not exceed 75 % of the setting which is necessary with regard to the safety-relevant limits.
  - Before start-up it must be made sure that, in view of the considerably longer setting periods, the possible rising speed of the measure gas concentration in the field use cannot lead to safety-endangering situations.
  - Application of span gas via the span gas inlet for calibration and setting must only be done in calm ambient air.

Module	Layout version	Meaning
MIB 20	2	Interconnection Board
MCP 10	10	Central Processing Unit
MDO 10	11	Display & Operation
MDA 10	9	Data Acquisition
MGO 10	15	General Output
MAO 10	6	Analog Output Unit
MAI 20	6	Analogue Input Unit
MAR 10	6	Analogue Redundant
MST 10	8	System Terminals
MPI 10 WT 100 MPI 10 WT 10	6	Passive Sensor Input
MCI 20	11	Current Input
MAT 10	4	Analogue Terminal
MAT 10 TS	6	Analogue Terminal
MUT 10	4	Universal Terminal
MRC 10 TS	3	Relay Connection
MRO 10-8	7	Relay Output (8 Relays)
MRO 10 8-TS	3	Relay Output (8 Relays)
MRO 10 16 TS	3	Relay Output (16 Relays)
MRD 10	2	Relay Dummy
SUPREMA Rack-Type 20/E 20 (With or without internal 150 W power supply)		
SUPREMA CAN BRIDGE CBM		10034641
MGT 40 TS		10026772

Table 14-1: Modules tested according to DMT 03 ATEX G 003 X

Passive Remote Sensors according to DMT 03 ATEX G 003 X

- D-7010
- D-7100
- D-715 K
- D-7152 K
- D-7711 K
- D-7711 K-PR
- Series 47 K-ST
- Series 47 K-PRP

15. Special conditions to comply with the requirements of DIN EN 61508 for SIL 3 according to TUEV Certificate No.

15.1 Conditions for configuration, installation, operation and maintenance

15.1.1 Safety Conditions

1. Two independent sensors must be used in the same area.
2. The sensors in the same area must be connected to different MAI 20 (analogue input) modules.
3. For SIL 3 applications a redundant configuration must be installed in accordance with figure 15-1and figure 15-2. (For higher availability a third processor card may be used).
4. The Locking (Inhibit) of measuring inputs is only allowed during maintenance and repair.
5. After any configuration or parameterisation a verification has to be completed by reading back the data and comparing with the Suprema configuration or parameterisation software.
6. The alarm conditions of the Suprema must be periodically checked together with the typical gas calibration checks. The alarm and relay functions must be tested at least once per year.
7. The locking (inhibit) of measuring points must be safety related processed via the inhibit relay.
8. Failure of measuring points must be safety related signalled via the MS-Fail relay.
9. Sensor cables must be protected from mechanical damage (e. g. by using armoured cable).
10. The relays must be energised under normal conditions.
11. The relay contacts must be protected with a fuse rated at 0.6 of the nominal specified relay contact current.
12. The system fail relay contacts must be safety related processed for warning purposes.
13. All inputs of MSI-Module must be used in open and short circuit detection mode.
14. In galvanically coupled system components the ground connections of all power supplies must be connected.
15. In case of failure of any component the repair or replacement must be completed within 72 hours.
16. Only modules and components with the Hardware and Software-Versions specified in chapter 4.1.1 may be used.
17. The contacts of the relays for the same alarm on subsystem A and B, are to be interconnected serially or to be processed safety-related.
18. The notes in the Operation Manual for installation, operation and maintenance have to be considered.
19. An ambient temperature above 40 °C is to be avoided.
20. All devices connected to one MRO module must have the same voltage level.
21. The ground fault current recognition of the MFI Modules is to be tested at least annually.
22. External power supplies must fulfil, as a minimum, the requirements of EN 60950 and EN 50178.

23. During installation of the SUPREMA – Fire and Gas Warning System the national regulations and standards must be complied with.
24. The installation of the SUPREMA – Fire and Gas Warning System has to be done in such a way that a maximum defree of pollution 1 (EN 60664-1) ist ensured (no or only dry, not conductive contamination arises. The contamination does not habe influence).

15.1.2 System variants and Safety-related signal path

The following illustration shows the variants which are possible for SIL 3 applications:

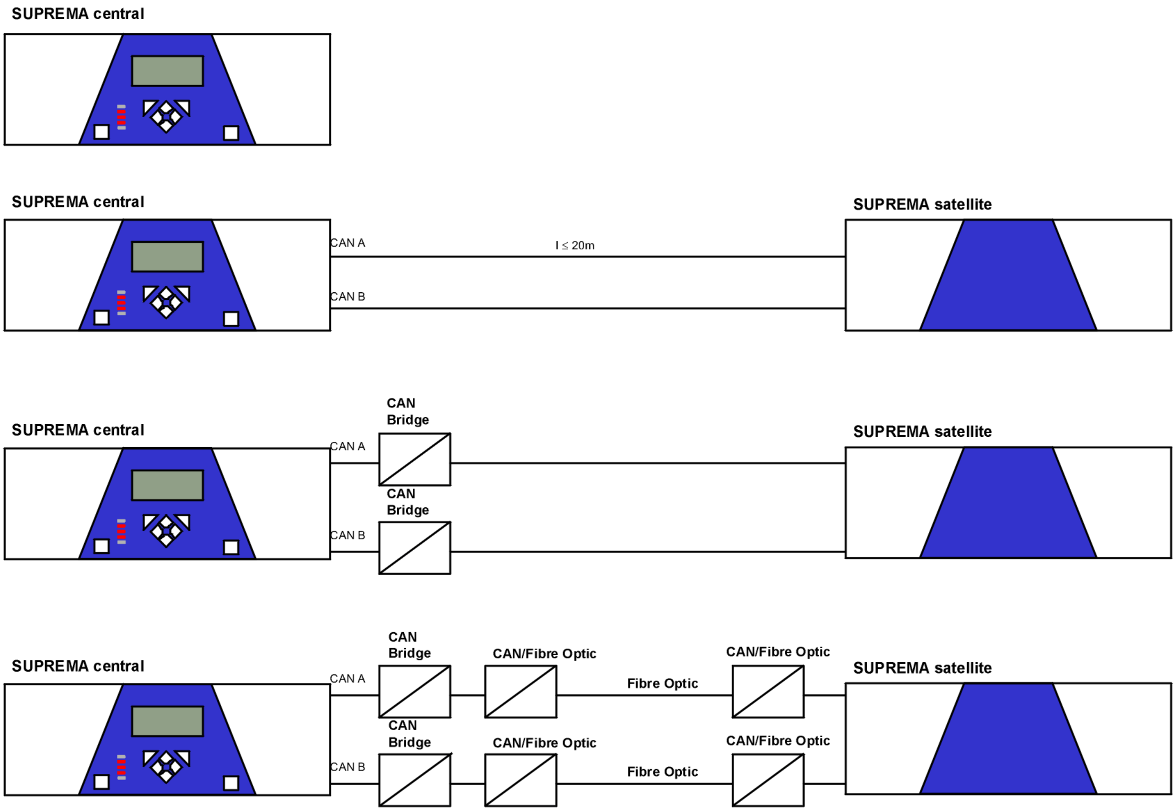


Figure 15-1: System variants for SIL 3

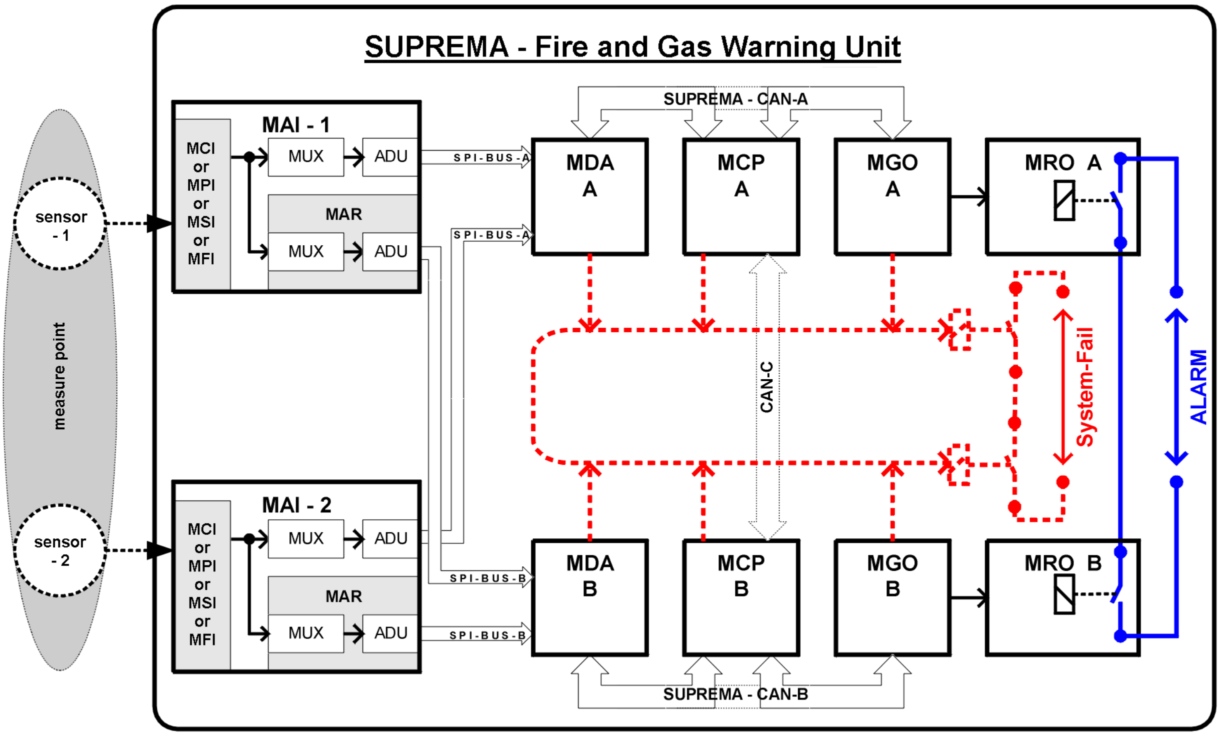


Figure 15-2: Safety-related signal path from the inputs up to the alarm relays

15.2 Listing of the states of versions which are valid for SIL 3

15.2.1 Modules allowed

Only the following modules may be used for SIL 3 applications:

Module	Layout version	"G" state	Meaning
MIB 20	2	A	Interconnection Board
MCP 10	10	A	Central Processing Unit
MDO 10	11	A	Display & Operation
MDA 10	9	A	Data Acquisition
MGO 10	12	A	General Output
MAI 20	6	A	Analogue Input Unit
MAR 10	6	A	Analogue Redundant
MST 10	8	A	System Terminals
MSI 10	4	B	Switch Input
MFI 10*	5	D	Fire Input
MCI 20 MCI 20 BFE	11	E	Current Input
MAT 10	4	B	Analogue Terminal
MAT 10 TS	6	C	Analogue Terminal
MPI 10 WT 100 MPI 10 WT 10 MPI 10 HL8101 MPI 10 HL8113	6	J H H H	Passive Sensor Input
MUT 10	4	A	Universal Terminal
MRC 10 TS	3	B	Relay Connection
MRO 10-8	7	C	Relay Output (8 Relays)
MRO 10 8-TS	3	B	Relay Output (8 Relays)
MRO 10 16 TS	3	C	Relay Output (16 Relays)
MAT TS 320 FLAMMABLE	1	A	Analogue Terminal
MAT TS 320 TOXIC	1	A	Analogue Terminal
MRD 10	2	A	Relay Dummy
SUPREMA Rack-Type 20/E 20 (With or without internal 150 W power supply)		C	
SUPREMA CAN BRIDGE CBM			
SUPREMA CAN-LWL Konverter - Fibre Optics Converter			

For not safety-related applications (e.g. analogue output, data communication to a PLS) the following components can also be used:

Module	Layout version	"G" state	Meaning
MAO 10	6	E	Analogue Output Unit
MHD 10			High Driver
MGT 40 TS			General Terminal
SUPREMA PKV 30-COS/AUER			

* With regard to fire and smoke detection, the SUPREMA has not been evaluated to any Canadian standard by a third party agency.

15.2.2 Software Versions Allowed

Module	Software version	Software version
	Flash resp. EPROM	CPLD
MCP 10	2.02.15	
MDO 10	2.02.15b	
MDA 10	1.02.02	MDA MA01
MAO 10	2.02.01	MAO MA01
MGO 10	2.02.06	MGO MA01
MAI 20		MAI MA01
MAR 10		MAR MA01

15.2.3 Safety-relevant Parameters

- Hardware Failure Tolerance: HFT = 1
- Safe-Failure-Fraction: SFF = 94 %
- Probability of failure per hour:

System without CAN-components: $PFH_1 = 2{,}4 * 10^{-8}$ 1/h

System with CAN-Bridge: $PFH_2 = 3{,}4 * 10^{-8}$ 1/h

System with CAN-Bridge and CAN-LWL: $PFH_3 = 4{,}3 * 10^{-8}$ 1/h

15.3 TUEV-Certificate

TÜV Rheinland/ Berlin-Brandenburg

TÜV

TÜV Anlagentechnik GmbH
Automation, Software und Informationstechnologie

ZERTIFIKAT
CERTIFICATE

Nr./No. 968/EZ 163.00/03

Prüfgegenstand **Product tested**	Feuer- und Gaswarn-einrichtung Fire- and Gaswarning-System	**Hersteller** **Manufacturer**	MSA AUER GmbH Thiemannstrasse 1 12059 Berlin
Typbezeichnung **Type designation**	SUPREMA	**Verwendungs-zweck** **Intended application**	Feststellung und Meldung von Feuer oder gefährlichen Gas-konzentrationen Monitoring and alarming of fires or dangerous gas concentrations

Prüfgrundlagen **Codes and standards forming the basis of testing**	IEC 61508:2000 NFPA 72:2002 EN 50270:1998 EN 50271:2001 EN 50054:1996
Prüfungsergebnis **Test results**	Einsetzbar gemäss Verwendungszweck bis SIL 3 nach IEC 61508. Applicable in accordance with intended purpose up to SIL 3 according to IEC 61508.
Besondere Bedingungen **Specific requirements**	Die Festlegungen in der Betriebsanleitung müssen einge-halten werden. The provisions defined in the user manual shall be maintained.

TÜV Rheinland — Bauart geprüft Type approved — Funktionale Functional — FS — Sicherheit Safety

Der Prüfbericht Nr. 968/EZ 163.00/03 vom 2003-12-17 ist Bestandteil dieses Zertifikates.
Der Inhaber eines für den Prüfgegenstand gültigen Genehmigungs-Ausweises ist berechtigt, die mit dem Prüfgegenstand überein-stimmenden Erzeugnisse mit dem abgebildeten Prüfzeichen zu ver-sehen.

The test report no. 968/EZ 163.00/03 dated 2003-12-17 is an integral part of this certificate.
The holder of a valid licence certificate for the product tested is authorised to affix the test mark shown opposite to products which are identical with the product tested.

TÜV Anlagentechnik GmbH
Geschäftsfeld ASI
Automation, Software und Informationstechnologie
Am Grauen Stein, 51105 Köln
Postfach 91 09 51, 51101 Köln

2003-12-17		H. Gall
Datum/Date	Firmenstempel/Company seal	Unterschrift/Signature

16. Special conditions to comply with the requirements of NFPA 72 for a SUPREMA Fire and Gas Warning System

16.1 Safety Conditions

1. The requirements in NFPA 72 for installation, operation and maintenance must be complied with.
2. The installation of the SUPREMA Fire and Gas Warning System may only be made by technical personnel, that are familiar with the requirements of NFPA 72.
3. If alarm devices are used for the indication of an alarm status, RESET of these devices must be by an external time delay relay (see NFPA 72; Cap. 4.4.3.5.8).
4. Inputs from manually actuated alarms are to be separated from inputs for automatic alarms (e.g. fire alarms).
5. The alarms on the display must clearly indicate the place of their origin.
6. A buffered power supply (e. g. accumulator) has to be used as redundant voltage supply.
7. The earth fault monitoring of the sensors and alarm devices must be ensured.
8. Only sensors, alarm units and alarm devices with NFPA approval may be used. They must correspond to the specification in the Operation Manual.
   The required terminal resistance and the max. number per line has to be considered.
9. After any configuration or setting of parameters a verification has to be completed by reading back the data and comparing it with the SUPREMA configuration or parameter setting software.

17. Ordering Information

17.1 Modules and Accessories

Order No.	Name
10050481	SUPREMA MCP10 - 25 MHz
10015759	SUPREMA MAT Analog Terminals
10022311	SUPREMA MAT-TS Analog Terminals (rail)
10050713	SUPREMA MAI 20 Analog Input
10050714	SUPREMA MAR 10 Analog Redundant
10043997	SUPREMA MCI 20 Current Input
10044020	SUPREMA MCI-20 BFE Current Input
10021028	SUPREMA MPI-WT100 Passive Input
10024279	SUPREMA MPI-WT10 Passive Input
10024276	SUPREMA MPI-HL8101 Passive Input
10024280	SUPREMA MPI-HL8113 Passive Input
10046265	SUPREMA MFI 10 Fire Input*
10048285	SUPREMA MSI 10 Switch Input
10050711	SUPREMA MDA 10 Data Aquisition
10050482	SUPREMA MGO10 General Output
10018946	SUPREMA MRO-8 Relay Output
10021676	SUPREMA MRC-TS Relay Connection
10021674	SUPREMA MRO-8-TS Relay Output (rail)
10021430	SUPREMA MRO-16-TS Relay Output (rail)
10021050	SUPREMA MAO Analog Output
10026772	SUPREMA MGT-40-TS Terminals (rail)
10019468	SUPREMA MUT Universal Terminal
10026178	SUPREMA FRC-40 Flat Ribbon Cable
10029124	SUPREMA FRC-40 Flat Ribbon Cable Type S
10050715	SUPREMA MST 10 System Terminal
10050459	SUPREMA MDO - 25 MHz
10050782	SUPREMA Rack (w/o pw sup,w MDO)
10054728	SUPREMA Rack-E20 150 W (w pw sup,w/o MDO)
10050801	SUPREMA Rack (w/o pw sup,w/o MDO)
10054729	SUPREMA Rack 20 (150 W) (w pw sup,w MDO)

* With regard to fire and smoke detection, the SUPREMA has not been evaluated to any Canadian standard by a third party agency.

Order No.	Name
10030078	SUPREMA CAN-Bus Terminator, D-SUB, female
10030079	SUPREMA CAN-Bus Terminator, D-SUB, male
10030080	SUPREMA CAN-Bus T-Piece
10030081	SUPREMA CAN-Bus Cable, 5 m, D-SUB, male/male
10030082	SUPREMA CAN-Bus Cable, 5 m, D-SUB, female/female
10030083	SUPREMA CAN-Bus Cable, 5 m, D-SUB, female/male
10030084	SUPREMA CAN-Bus Cable, 0,5 m, D-SUB, female/male
10030085	SUPREMA CAN-Bus Cable, 0,5 m, D-SUB, female/female
10030086	SUPREMA CAN-Bus Cable, 0,5 m, D-SUB, male/male
10030087	SUPREMA Flat Ribbon Cable, D-SUB
10029644	SUPREMA RS 232 Cable, 2 m
10030031	SUPREMA Manual, German
10049041	SUPREMA Manual, English
10035191	Printer EPSON LX-300+
10031949	SUPREMA Gateway CAN/MODBUS RTU
10032215	SUPREMA Gateway CAN/PROFIBUS DP
10034641	SUPREMA CAN Bridge CBM (29 Identifier)
10052948	SUPREMA CAN/LWL
10038420	SUPREMA MHD-TS Module
10030262	SUPREMA Sensor-Simulations-Module 4 ... 20 mA
10030263	SUPREMA Sensor-Simulations-Module WT
10030264	SUPREMA Sensor-Simulations-Module HL
10049234	SUPREMA MAT-TS 320 Flammable Adapter
10049235	SUPREMA MAT-TS 320 Toxic Adapter
10049236	SUPREMA MAT-TS 330 Fire Input (Qatar Version)*
10052880	SUPREMA Dummy Relay

Table 17-1: Order No., Modules and Accessories

* With regard to fire and smoke detection, the SUPREMA has not been evaluated to any Canadian standard by a third party agency.

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