Manual

SUPREMATouch

Fire and Gas Warning Unit

Order No. 10121863/02

MSA AUER GmbH
Thiemannstrasse 1
D-12059 Berlin

Germany

The Safety Company

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:

SUPREMA

based 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 DEKRA EXAM in Bochum , Notified Body number:

0158

The product is in conformance with the directive 2004 / 108/ EC, [EMC]:

EN 50270 :2007-05 Type 2 , EN 61000 - 6 - 4 :2007-09

The product is in conformance with the directive 2006 / 95/ EC, [LVD]:

EN 61010-1 :2002-08

Dr. A. Schubert

MSA AUER GmbH
Dr. Axel Schubert
R&D Instruments

Berlin, March 2011

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SUPREMATouch

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1 Safety Regulations

1.1 Correct Use

The SUPREMATouch 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 [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 SUPREMATouch.

The SUPREMATouch 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 SUPREMATouch 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

Monitoring functions are called for in the following areas:

- Production
- Warehousing
- Distribution
- Shipping
- Processing of gases and vapours

Explosion Monitoring for Protecting Industrial Plants and Workers

Continuous monitoring of the atmosphere to detect formation of explosive gas/vapour-air mixtures and to give early warning, long before the lower explosion limit is reached [LEL].

Toxicity Monitoring for Protecting Workers

Continuous monitoring of the atmosphere to detect formation of toxic gas concentrations. Early warning prior to or on reaching the limit values.

Oxygen Monitoring for Protecting 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 Protecting Industrial Plants

Continuous monitoring of inerted atmospheres to detect presence of oxygen. Early warning prior to or on reaching the limit values.

It is imperative that this operating manual be read and observed when using the product. In particular, the safety instructions, as well as the information for the use and operation of the product, must be carefully read and observed. Furthermore, the national regulations applicable in the user's country must be taken into account for a safe use.

Danger!

This product is supporting life and health. Inappropriate use, maintenance or servicing may affect the function of the device and thereby seriously compromise the user's life.

Before use the product operability must be verified. The product must not be used if the function test is unsuccessful, it is damaged, a competent servicing/maintenance has not been made, genuine MSA spare parts have not been used.

Alternative use, or use outside this specification will be considered as non-compliance. This also applies especially to unauthorised alterations to the product and to commissioning work that has not been carried out by MSA or authorised persons.

1.2 Liability Information

MSA accepts no liability in cases where the product has been used inappropriately or not as intended. The selection and use of the product are the exclusive responsibility of the individual operator.

Product liability claims, warranties also as guarantees made by MSA with respect to the product are voided, if it is not used, serviced or maintained in accordance with the instructions in this manual.

1.3 Sensors Which Can Be Connected to the Unit

The following types of active and passive MSA sensors can be connected to the SUPREMATouch 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-8502	MCI	semiconductor	Fire Detection	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 700	MCI	infrared	EX	X	
D-7010	MPI-WT10	catalytic	EX		X
D-7100	MPI-WT100	catalytic	EX		X
Series 47K	MPI-WT100	catalytic	EX		X
Ultima X	MCI	various	EX	X	
FlameGard	MCI	infrared	Flame	X	
PrimaX	MCI	various	EX/TOX/OX	X	
PrimaXIR	MCI	infrared	EX	X	
FlameGard 5 MSIR	MCI	infrared	Flame	X	
FlameGard 5 UV/IR	MCI	infrared/ultraviolet	Flame	X	
FlameGard 5 UV/IR-E	MCI	infrared/ultraviolet	Flame	X	
Ultima MOS-5	MCI	semiconductor	H_2S	X	
Ultima MOS-5E	MCI	semiconductor	H_2S	X	
Ultima OPIR-5	MCI	infrared	EX	X	
UltraSonic EX-5	MCI	acoustic	leakage	X	
UltraSonic IS-5	MCI	acoustic	leakage	X	
MAC	MFI				
Smoke	MFI				
Fire	MFI				
Switch	MSI				

[EX: Explosive gases or vapours; TOX: Toxic gases; OX: Oxygen; Fire Detection: Smoldering Fire Detection; Flame: Flame Detector]

Attention!

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

1.4 Software Status

The operation manual refers to the following software status:

Module	Software version Flash resp. EPROM	Software version CPLD
MCP 20	3.01.02	—
MDO 20	3.01.02	—
MDA 20	2.01.02	—
MAO 10	2.02.01	MAO MA01
MGO 20	3.01.02	—
MAI 20	MAI EA03	MAI MA01
MAR 10	—	MAI MA01

Software status ATEX and TÜV SIL 3

2 System Concept

2.1 Features of the System

- Modular system.
- Compact construction.
- High flexibility.
- 19” rack system for the connection of up to 256 sensors.
- Complete system for up to 64 sensors with common alarm in one 19” rack.
- Maximum number of switching outputs in the system: 512.
- Minimal installation work [bus system].
- Redundancy possible
- Maximum refresh rate of 3-4 seconds for alarm outputs [1-2 s for data acquisition; 1 s for computation; 1 s for data output]
- Maximum refresh rate of 3-5 seconds for signal fail outputs [1-2 s for data acquisition; 1 - 2 s for computation; 1 s for data output]
- Maximum response time of 15 seconds for system fails
- 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 range of the system modules: 19.2 VDC ... 32 VDC.

  Recommended voltage: 24 VDC.
- Card coding is no longer necessary.
- Operation of passive catalytic-/semiconductor-sensors, 3- or 5-wire.
- Automatic pre-setting of passive sensors in first calibration
- Operation of active sensors with 4 ... 20 mA output, 2- or 3-wire.
- System operation via a graphical touch screen with a resolution of 320 x 240 pixels and individual function keys.

- Self-explanatory error messages
- System operation optionally via laptop [Windows user interface].
- PC can be connected to tie the system into the company communications network [data evaluation, data display, etc.]
- Key switch connection or 3-level 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].
- 1 x USB + 1 x RS232 or 2 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.
- Recommended time of usage according to EN 50271: 20 years

2.2 Construction of the Unit

The modules of the SUPREMATouch 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 SUPREMATouch and the sensors is established by a screened remote-measurement cable of the 2, 3, 4 or 5 wire type.

For servicing, the sensors can be electrically isolated from the SUPREMATouch 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.

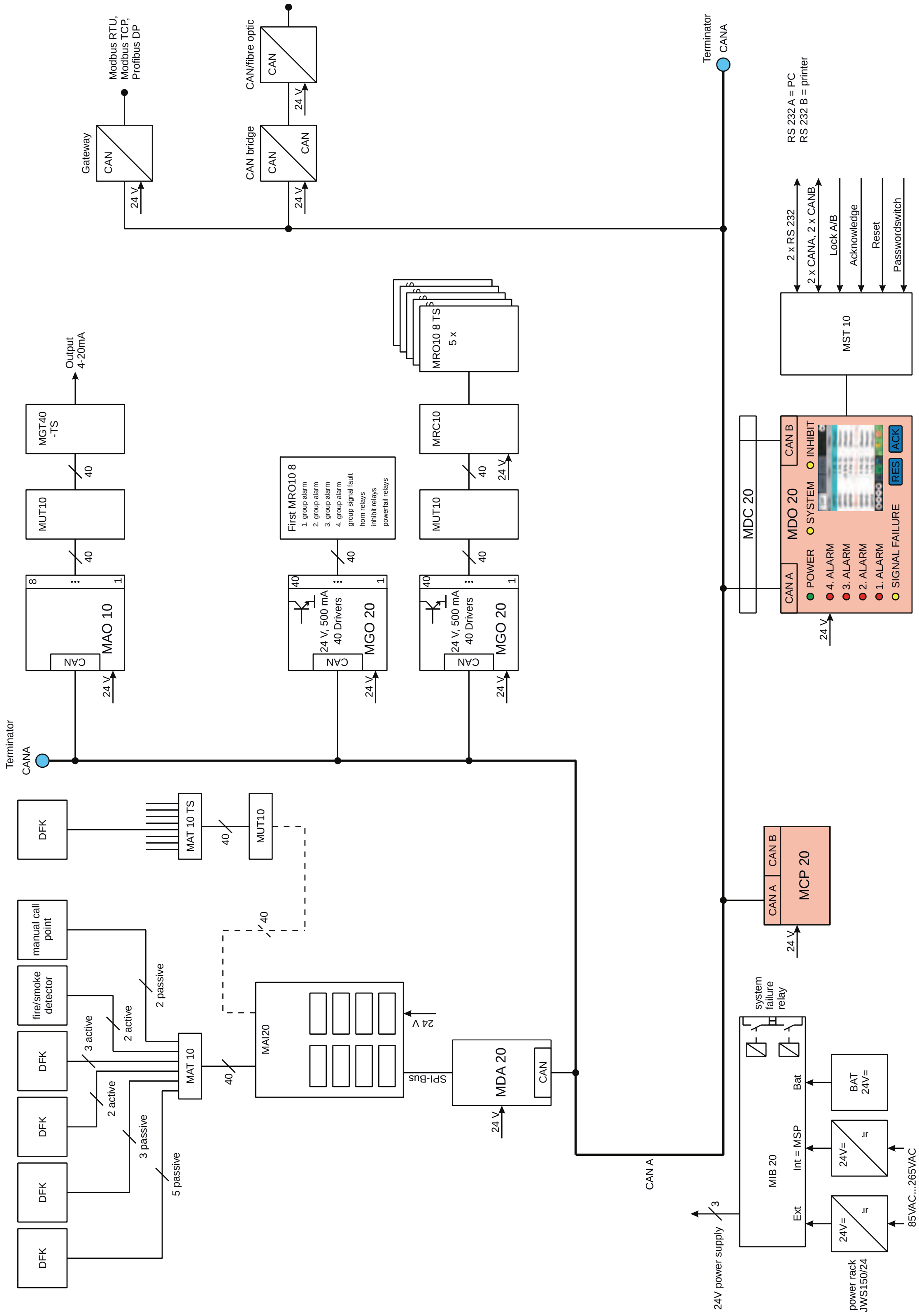


Fig. 1 Block circuit diagram of a system layout [non-redundant]

2.3 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 appropriately. The probability of an undiscovered communications error on the bus is $4.7 * 10^{-14}$. Error statuses on the CAN bus are indicated on the DISPLAY + OPERATION unit [MDO module].

Each module with a microcomputer module has a watchdog timer, which actuates a “wired” OR signal line if the module fails. As a result, the SYSTEM FAILURE common relays on the interconnection board [MIB module] are deactivated. This common failure signal is monitored by the DISPLAY + OPERATION unit .

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. These messages are displayed on the MDO module and, parallel to it, the System Failure is activated by the relevant modules.

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, 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 an urgent need of service [for example the malfunction of a module]. Therefore the connection of the switching outputs of the system failure relays has to enable an immediate triggering message.

3 Operation of the System

3.1 Operation

General

The modular control system's user interface is the integrated operation and display unit . This unit displays alarms and warnings as well as system parameters. Connecting the operating unit to a PC permits a more user friendly operator interface with additional features.

Both the PC program and the SUPREMATouch 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 and input are touch-controlled, which makes use of the integrated operation and display unit very easy.

3.2 Operation and Display unit MDO

General

The operation and display unit includes the following components:

- Colour TFT touch screen with 320 x 240 resolution
- 2 keys
- 8 LED indicators
- 1 beeper

The TFT screen is a full graphic display with a resistive touch panel. The character height is approximately 4 mm.

Fig. 2 Display and Operation Module [MDO]

> **Attention!**
>
> To prevent damage to the touch screen, avoid touching it with sharp objects. Only use fingers or the touch screen pen provided.

LED Indicators and Alarms

The 8 LED indicators provide system and signal status information.
SYSTEM:

- **POWER** [green] power supply on/off
- FAIL [yellow] system specific error [e.g. defective CPU]
- INHIBIT [yellow]
  - on: inputs are inhibited or a calibration is pending
  - blinking: outputs connected to one or more inputs are locked

SIGNAL:

- **AL 1–AL 4** [red] input signal alarms
  [each input can have up to four alarms]
- FAIL [yellow] specific input signal statuses
  [measurement values that are over full-scale, below the measurement range and signal failures]

Alarms can be latching or non-latching [also see Measure Points].

Non-latching alarms:

When a signal exceeds the alarm threshold a new alarm is triggered and the corresponding LED flashes at a frequency of 0.5 Hz. Pressing the ACKNL [acknowledge] key makes the LED change to ‘steady state’. When the signal is below the alarm threshold, the LED will turn off, regardless of whether the alarm has been acknowledged or not. For non-latching alarms, the RESET key has no effect.

Latching alarms:

When a signal exceeds the alarm threshold a new alarm is triggered and the corresponding LED flashes at a frequency of 0.5 Hz. Pressing the ACKNL [acknowledge] key makes the LED change to ‘steady state’. When the signal is no longer exceeding the alarm threshold, the LED remains in ‘steady state’ if the alarm has been acknowledged, or in the ‘flashing state’ if the alarm has not been acknowledged. If the signal is no longer exceeding the alarm threshold and the alarm has been acknowledged, the LED is extinguished by pressing the RESET key. If the signal still exceeds the alarm threshold, pressing RESET has no effect.

Signals that are above full-scale range or signal failures that were caused by an interruption of the digital communication are always latched. Signals below the measurement range are non-latching. Measurement values that are over the full-scale range will trigger all 4 alarms.

If an audible alarm device is connected to the horn relay, it will sound 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.

When a redundant system is used, the RESET or ACKNL key has to be pressed for at least 1 second.

Entering System Parameters

The TFT display touchscreen is used to select data for editing or to enter data. At the top of the screen is a menu, in which an item can be selected by simply tapping it. Tap the up-arrow to return to the higher level menu. If the menu bar contains more entries than can be displayed on the screen, this is indicated with additional arrow button [left/right] in the menu bar.

A window can contain input fields, static fields, check boxes, buttons, etc. All types of controls are used by just touching them.

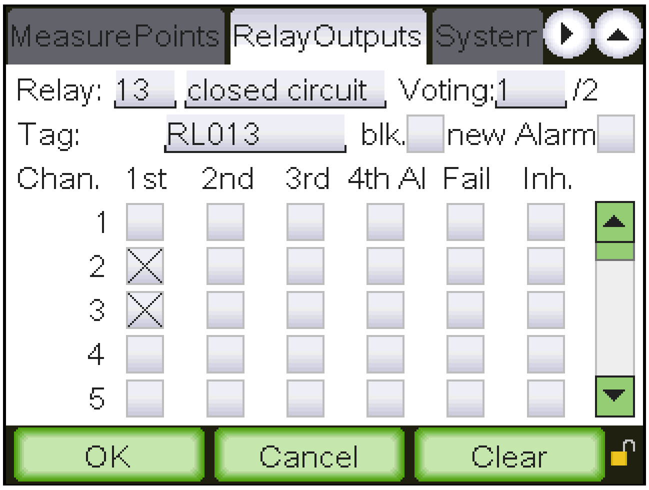


Fig. 3 Menu list and input

The following types of interactive controls are available:

Buttons

Buttons trigger actions. They are used by just touching them.

Selection Fields

Selection fields contain a list of possible values that can be selected. By tapping an item, a new window pops up and shows all available values. To select a new value, tap it and press the “OK” button.

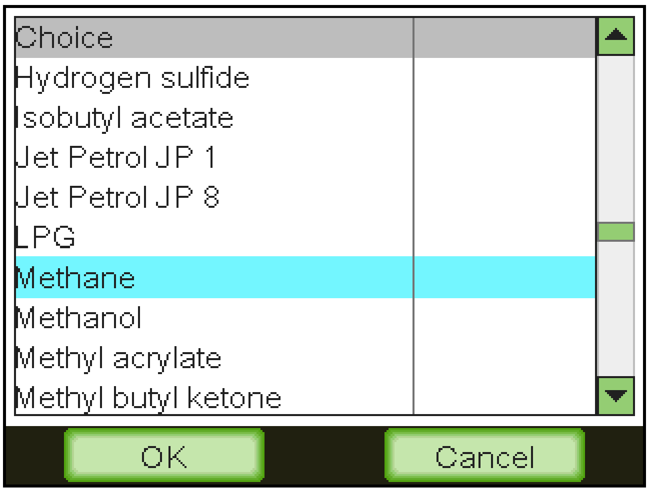


Fig. 4 Selection mask

Number Fields

Number fields can contain integers or decimal numbers that can be changed. By tapping the field, a new window pops up that allows a new value to be entered. To store a new value, press the “OK” button. It is not possible to store a value if it is not in the range indicated by the “min” and “max” values.

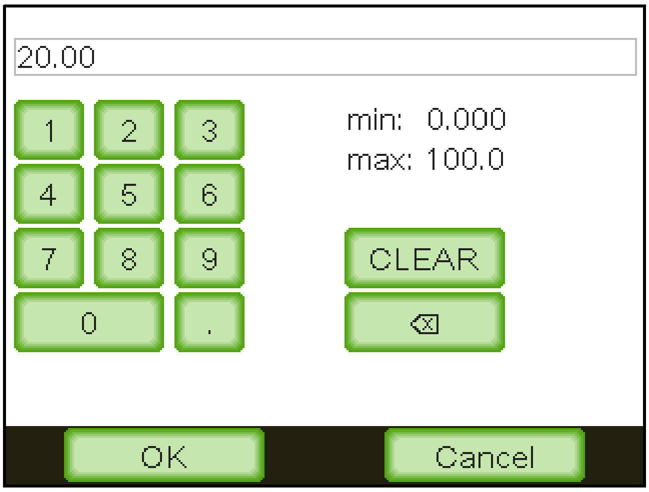


Fig. 5 Number input

Pressing the “CLEAR” button deletes the entered number. Pressing the “⌫” button deletes the last digit.

Text Fields

Text fields can contain numbers, letters and special characters that can be changed by the operator. By tapping the field, a new window pops up and allows editing of the text. To save the text, press the “OK” button.

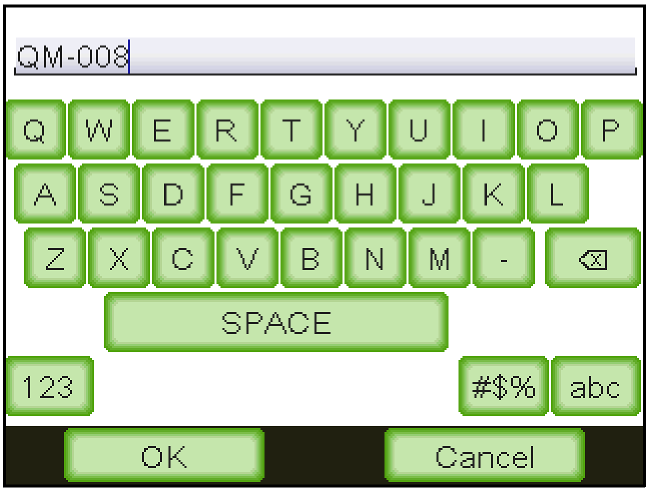


Fig. 6 Text input

The new character is always inserted at the position indicated by the cursor. To change the cursor position, tap the required new position. Pressing the “⌫” button deletes the character in front of the cursor.

Display Fields

Display fields display information that cannot be changed. They are not affected by tapping it.

Check Boxes

Check boxes represent options that can be enabled or disabled. Tapping the box switches between enabled and disabled status.

An enabled check box shows a cross. A disabled check box is empty.

Lists

Lists simply display information. No parameters can be entered. To scroll the list, move it while kept touched or use the scrollbar.

In some lists [e.g. SystemEventList], additional information about the selected item can be displayed by double-tapping it.

3.3 Operation Menu

The operation menu is divided into four submenus:

- Measure
- Setup
- Maintain
- Diagnosis

These submenus can be selected by tapping the corresponding menu item. The “Measure” submenu is automatically activated at system start-up.

If another menu is active and there is no operator activity for 3 minutes, the system returns to the Measure submenu. If an alarm occurs the Measure submenu is automatically activated.

Access Authorisation

In the various windows, data can be displayed and entered and certain actions can be initiated by using the touch screen [e.g., starting a calibration procedure]. However, editing items or initiating actions requires access authorisation by entering the required level of password or operating a keyswitch, if fitted.

Three user groups with different password levels are defined:

- Maintenance
- Parametrisation
- Configuration

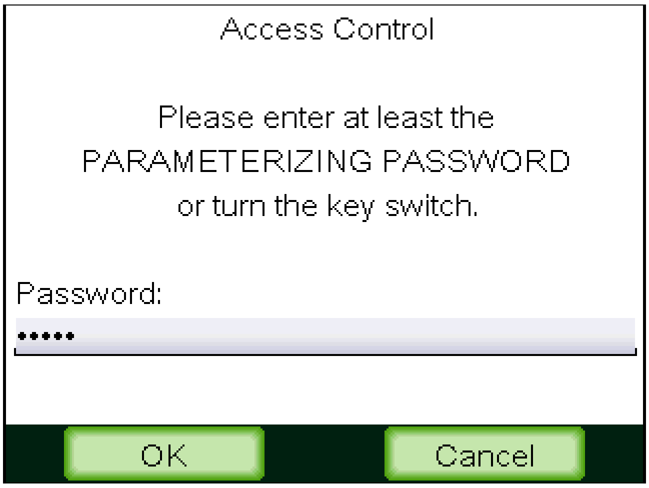


Fig. 7 Access control

If the user wishes to change a value or press a button when the required authorisation is not yet issued, the appropriate password must be entered in the pop up window or the key switch activated. Password authorisation remains in effect until measurement mode is activated either through user input or automatically due to inactivity of 3 minutes or alarms.

Whether password authorisation is still in effect is indicated by a small lock symbol in lower right corner of each password controlled window.

Lock symbol

The system is delivered with the default password “AUER” for all three password levels. MSA recommends to change the passwords immediately.

All of the user functions are available through 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, the integral operation/display and PC. Therefore, to perform an action of that type, the relevant password authorisation will be required and verified. It will remain exclusive for that control unit until measurement mode is activated either through user input or automatically due to inactivity or alarm, after which it will again be possible to switch between the integral operation/display and PC. If a user with modification authorisation is logged in at the PC and there has not been any communication between the PC and SUPREMATouch system for more than 5 minutes, password authorisation will be automatically released.

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

Measure Menu

When the system configuration is successfully completed, the “Measure” menu will appear automatically after the system is started. For display of measured values, it is possible to choose from three display types:

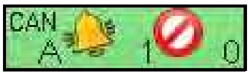
- List [default after start-up]
- Bars
- LEDs

Displayed measurement and status values are updated once per second.

Unlike the common alarm LEDs on the MDO front panel, the touchscreen display of alarms and failures do not flash.

If the operator is in the “List”, “Bars” or “LEDs” window and does not tap any key for 60 seconds, the window automatically starts scrolling [one page per 5 seconds]. To scroll through the list manually use the arrow buttons in the lower left corner of the window or move the list while touching it.

It is possible to manually switch between different modes of displaying the measured information. In one mode all inputs are shown, in the other modes only the inputs in alarm or fail status are shown.



To switch between the modes touch the bell or the sign symbol in the lower right corner of the measure window. If one of these selection modes is chosen, the corresponding symbol has a yellow background. The number of measuring points in alarm and in fail and the CAN bus, A or B, currently selected as the information source is also shown in this area.

It is possible to switch the CAN bus by touching the “CAN” symbol. If the CAN bus is manually selected, the CAN symbol has a yellow background. If the CAN bus is automatically selected, the CAN symbol has a green background.

All Inputs Mode

In this mode, all the measured inputs in the system are displayed. The inputs are arranged by their input number.

This mode is indicated with a green background for the bell symbol.

Alarming Inputs Mode

When no alarm is triggered, this mode behaves like the “All Inputs Mode”.

As soon as alarms are triggered, only the inputs in alarm are displayed, arranged by the time of alarm triggering.

This mode is indicated with a yellow background for the bell symbol.

Failing Inputs Mode

When no point is in fail status, this mode behaves like the “All Inputs Mode”.

As soon as at least one input is in fail status, only the inputs in fail status are displayed, arranged by their input number.

This mode is indicated with a yellow background for the sign symbol.

Power Supply Indicator

The power supply indicator gives an quick overview about the current status of the power supply of the system.

Fig. 8 Power Supply Indicator

The 3 different power supplies are indicated with 3 different symbols. From the left to the right these are: External, Internal, and Battery supply. The status of each supply is indicated with the background colour. Green means "good", grey means "not configured" and yellow means "fail". A power supply is considered as good, if the voltage is below 30V and above 21V [for battery above 22V].

By tapping on the Power Supply Indicator, a window with information about the measuring values of all relevant nodes appears.

Measuring Information

A list item can be selected by tapping it. The selected item has a blue background. By double-tapping an item, a window pops up that shows additional information about the selected input and gives the option to inhibit this input.

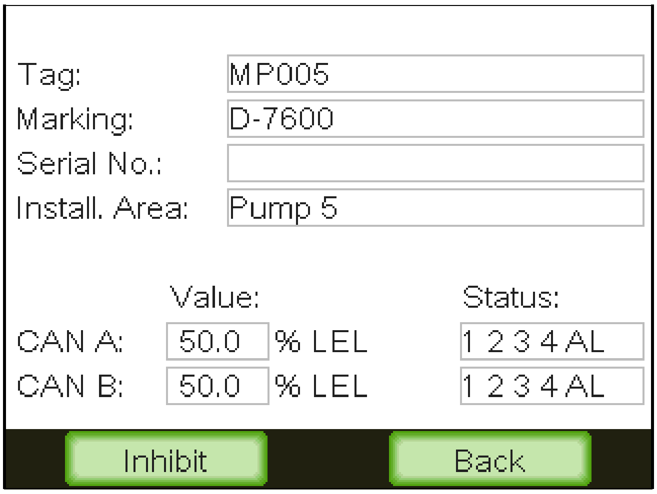


Fig. 9 Measuring information

List Window

In this window, the current input data is displayed in as a text list.

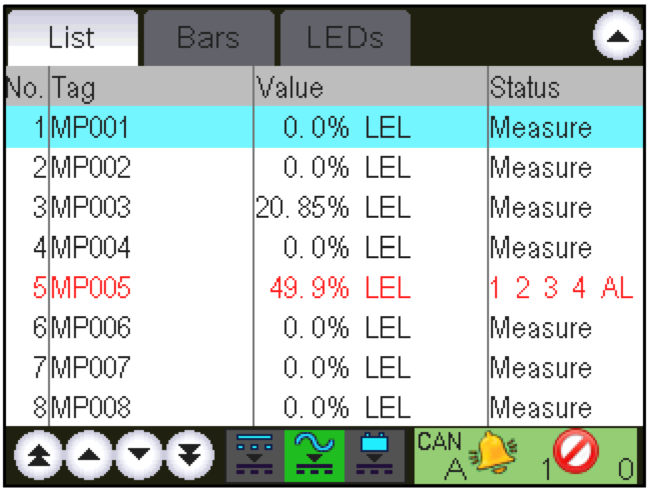


Fig. 10 List display [with a measuring point in Alarm]

The following input data is shown in this display:

No.	The number of the measured input in the system. This number is set by the system and cannot be changed by the user.
Tag	The customer defined input description is displayed here.
Value	Numerical value and dimension of measurement. The measured values are displayed in intervals of 1 second, 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 suppression [during the 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 of 1 second and the following values can be displayed: - “Measure” - “Calib.” [measurement point in calibration mode] - “Inhibit” [measurement point inhibited] - “Overflow” [Measured value above full scale] - “SignalErr.” [Measured value below measurement range, or value missing] - “SystemErr.” [It was not possible for the MDO to get the measured value] - “PA-failed” [presetting error] - For specific sensor types, text can be defined for special statuses. These are labelled with "F:“ [e.g. "F:OpticErr"]. The property is then equivalent to "Signal error". - “suppressed” [alarm suppressed during warm-up period of specific sensor types] - alarms 1, 2, 3 and 4 - Free [sensor has not been installed]

Bar Display

This display shows the measured 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% of full scale.

The corresponding input number is shown under each bar.

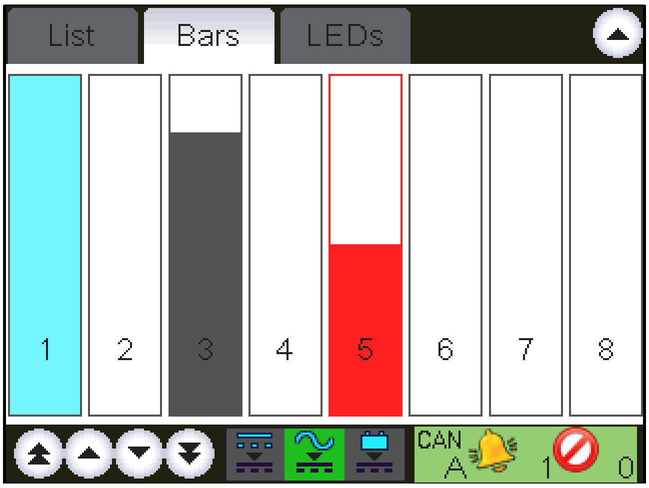


Fig. 11 Bar display

Measured values are normally displayed as solid bars. In error-free operation with no alarms, the bars are grey. Any alarm will cause the corresponding bar to change to red. When a status message occurs for an input, the bar is shown only as an outline with a status identification letter.

Legend:

I	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 not configured no bar is displayed in that column.

LED Display

This window shows the status values of the inputs as LEDs. Each LED column has the corresponding input number below it. In redundant systems, the information is shown separately for each CAN bus.

- LED off [grey]: not inhibited, no alarm, no failure
- LED on: inhibited, alarm, failure

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

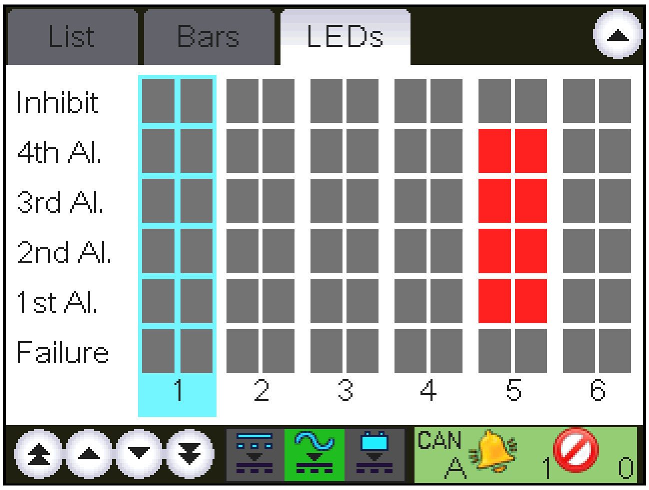


Fig. 12 LED Display

Setup Menu

Using the “Setup” menu, the operator can set parameters for sensor inputs and relay outputs, as well as other system parameters. Although data can be retrieved and displayed, changing and activating of actions is possible only after entering the parameterisation password or operating the key switch. The menu includes six items:

- Measure point
- Relay output
- System
- Time
- Sensors
- Printer

Measure Points Submenu

This window shows all the parameters that describe a sensor input. Input parameters can be viewed and changed.

The Measure Point window is divided into three subwindows:

- Information
- Sensor data
- Alarms

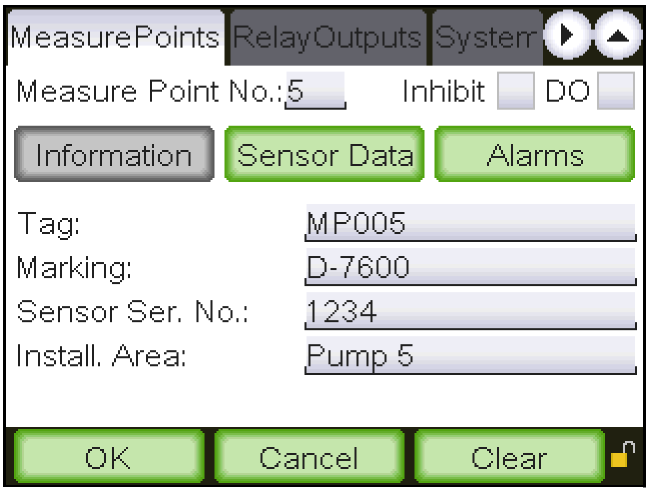


Fig. 13 Measure Point Setup

The following paragraphs describe the functions of the individual window items. The first items described are those that are identical in all three subwindows .

Measure Point No.

Field type: Selection field

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

After an input number is selected, the rest of the window is filled with data if that input has already been set up. If an input number is selected that has not been set up, 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 set up, 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 a password or key switch is required.

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

Inhibit

Field type: Check box

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

DO [Inhibit Digital Outputs]

Field type: Check box

If this checkbox is enabled, assigned **outputs will not be activated** in the event of an alarm or failure of selected measuring points! During a multiple assignment [Voting], the corresponding measuring point is ignored when assessing the status . If this check box is enabled, for at least one of the measuring points, the inhibit LED on the MDO as well as the common alarm relay 'Inhibit' starts blinking with a frequency of 1 Hz.

Information, Sensor Data and Alarms

Field type: Button

Pressing the appropriate button will display the corresponding subwindow.

OK

Field type: Button

Press this button to accept the settings entered in all three subwindows for the selected input. After the button is pressed, the parameters are immediately checked to see whether they are 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 discard the settings entered in all three subwindows for the selected input.

Clear

Field type: Button

Press this button to delete all parameters for the selected input. The input will then return to the status it had before being set up the first time. 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 or linked with a relay output.

"Information" subwindow

The "Information" subwindow contains general data on the selected input.

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 No.

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 installed location of the input device for the selected input.

"Sensor data" subwindow

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

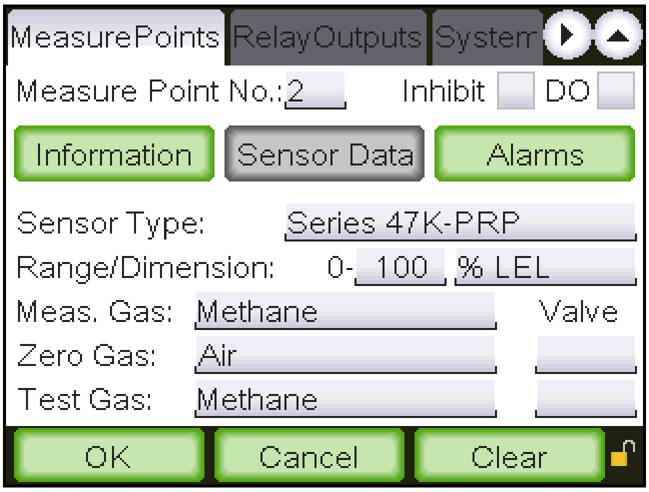


Fig. 14 "Sensor data" subwindow

Sensor Type

Field type: Selection

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

Dimensions

Field type: Selection

The field contains a list of supported measurement dimensions . Set the measurement dimension for the selected input.

Range

Field type: Selection

The field contains a list of supported measurement ranges. Set the measurement range that applies for the selected input.

Meas. Gas

Field type: Selection

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

Zero Gas

Field type: Selection

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

[Zero Gas] Valve No.

Field type: Selection

The field contains a list of available outputs that can be used as zero gas valve output. This valve will be used during the calibration of the input. If no valve should be used, "free" can be selected.

Test Gas

Field type: Selection

The field contains a list of supported 'Test gases' used to calibrate the span-point of the sensors. Set the test gas that will be used to calibrate the sensor at the selected input.

[Test Gas] Valve No.

Field type: Selection

The field contains a list of available outputs that can be used as test gas valve output. This valve will be used during the calibration of the input. If no valve should be used, “free” can be selected.

“Alarms” subwindow

In the “Alarms” subwindow, 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, “latching” or “non-latching” parameters can be set.

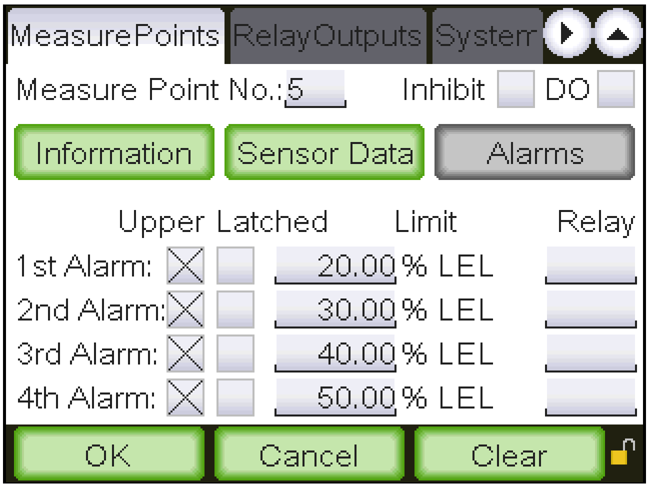


Fig. 15 “Alarms” sub-window

Limit

Field type: decimal number

A limit value can be set for each alarm of the selected input, to trigger on either a rising or falling input signal. This limit value can be set in a range from 0 till the range value set in the sub-window "Sensor Data".

In this field, it is also possible to deactivate an alarm. Press the “Clear” button and confirm with “OK” to deactivate the alarm, which is indicated by the contents of the field being deleted.

Upper [Rising/Falling Alarm]

Field type: Check box

For each alarm, this check box sets the alarm to trigger when the signal is rising or falling. If this box is checked it is a rising alarm, if not checked, it is a falling alarm.

Latched

Field type: Check box

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

This parameter has an effect on the behaviour of the MDO front panel LEDs, on the information in the “Measure“ menu, and on the relay outputs assigned to an alarm.

Relay

Field type: Selection

These fields contain a list of available relay outputs. The relay outputs that will be used for the individual alarms at the selected input can be set here. After selecting a relay output, the relay output assignment window opens up.

Relay output assignment window

This is not a subwindow of the Measure Point menu, but an independent window that can only be reached from the Measure Point menu. It is used to assign relay outputs to the input selected in the Measure Point menu. This window also provides the same function as the “Relay Output” window.

The top three rows of the menu cannot be accessed here and are only shown for information. The behaviour of a relay output depends on its parameter settings and the settings of the appropriate measure points [→ Installation and Start-Up Guide].

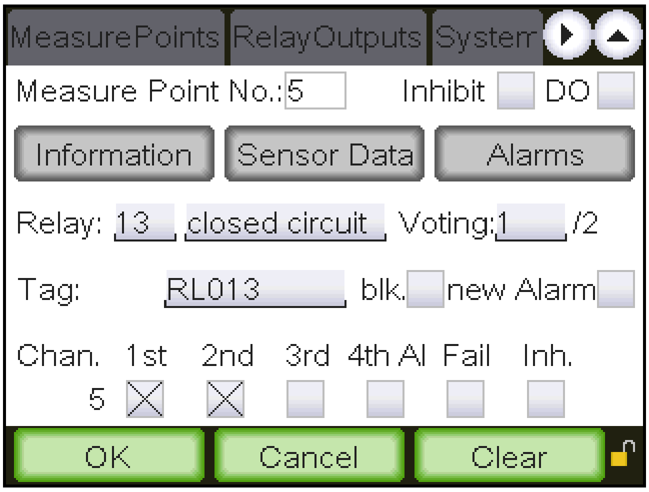


Fig. 16 Relay output assignment

The functions of the individual window elements are described below:

Relay

Field type: Selection field

This field contains a list of all available relay outputs. After an output number is selected, the rest of the window 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 has been selected for which parameters have already been set. If a number is entered that has not been used before, authorisation by means of a password or key switch is required.

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

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

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 shown in the “Chan.” column.

Fail

Field type: Check box

If this condition is set, the selected relay output is switched when an error [fault] occurs for the input displayed in the “Chan.” column.

Inhibit

Field type: Check box

If this condition is set, the selected relay output is switched when the input displayed in the “Chan.” column 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 switched. 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 switched. 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 switched.

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 switched 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 [“closed circuit”]:

  The relay coil is energised in the no alarm status and is de-energised in the alarm status.

- Normally de-energised [“open circuit”]:

  The relay coil is de-energised in the no alarm status and is energised in the alarm status.

Tag

Field type: Text

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

blk. [flashing]

Field type: Checkbox

If this field is set, the relay flashes at a frequency of approx. 1 Hz when activated. This function doesn't work together with the inhibit condition.

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 even if the signal value has been outside the alarm threshold limits.

OK

Field type: Button

Tapping this button validates the settings entered for the selected relay output. When the button is tapped, 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 discards 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 status it was before it was set up the first time.

Relay outputs window

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

The functions of window are similar to the "Relay Output" assignment window 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 11.4, subsection Behaviour of the Relay Outputs].

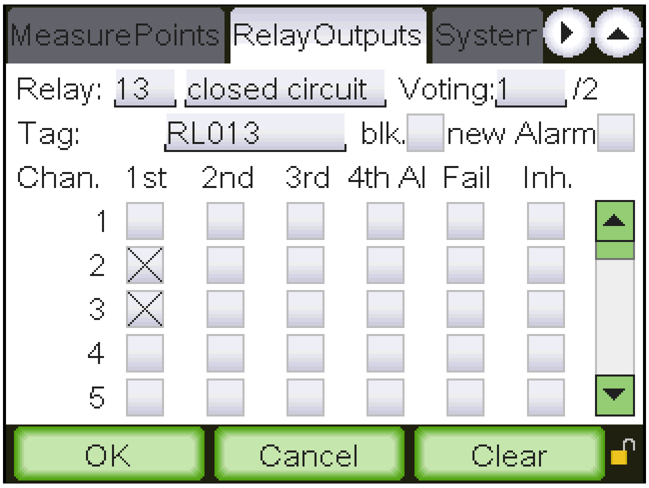


Fig. 17 Relay output

The functions of the individual window elements are described below:

Relay

Field type: Selection

This window 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 No. 9. This window also contains outputs which no longer physically exist, but whose parameters are still stored in the system. These outputs are only removed from selection when the user deletes them in this window.

After an output number is selected, the rest of the window 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 selected for which parameters have already been set. If an output is selected 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 certain fields. This makes it easy to copy the settings from one output to another.

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

Normally energised/Normally de-energised

Field type: Selection

Set the operating mode for the selected relay output:

- Normally energised [closed circuit]:

  The relay coil is energised in the no alarm status and is de-energised in the alarm status. The output delivers in the set-condition [Alarm, Failure] a LOW-Signal, this is called a connected relay is not energised. [The Normally energised principle]

- Normally de-energised [open circuit]:

  The relay coil is de-energised in the no alarm status and is energised in the alarm status. The output delivers in the set-condition [Alarm, Failure] a HIGH-Signal, this is called a connected relay is energised. [The Normally de-energised principle]

Tag

Field type: text

Enter a customer specific designation for the selected relay output.

Blk. [flashing]:

Element type: Checkbox

If this field is set, the relay flashes at a frequency of approx. 1 Hz when activated. This function doesn't work together with the inhibit condition.

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 even if the signal value has been outside the alarm threshold limits.

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 shown in the “channel” column in the specific line.

Fail

Field type: Check box

If this condition is set, the selected relay output is activated when an error [fault] occurs for the input shown in the “channel” column in the specific line.

Inhibit

Field type: Check box

If this condition is set, the selected relay output is activated when the input shown in the “channel” column in the specific line is inhibited.

Voting [Alarm Logic]

Field type: Number input

The value entered in this field applies to the configuration conditions described above. Optional 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 switched. 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.

Advice for multiple links: When creating multiple 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 and the total number of links will be recorded in the system logbook. If the value of the link calculation exceeds 63, a warning is shown. The system will refuse a value over 70 and the user has to reduce the number of 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 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

Tap this button to accept the settings entered for the selected relay output. After the button is pressed, the voting settings are checked to see whether 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

Tapping this button discards the settings entered for the selected relay output.

Clear

Field type: Button

Tapping this button deletes all of the parameters for the selected relay output. The output then returns to the status it was before it was set up the first time. Default values are used as the preliminary settings for the input of certain fields.

System Window

This window displays parameters that affect the entire system.

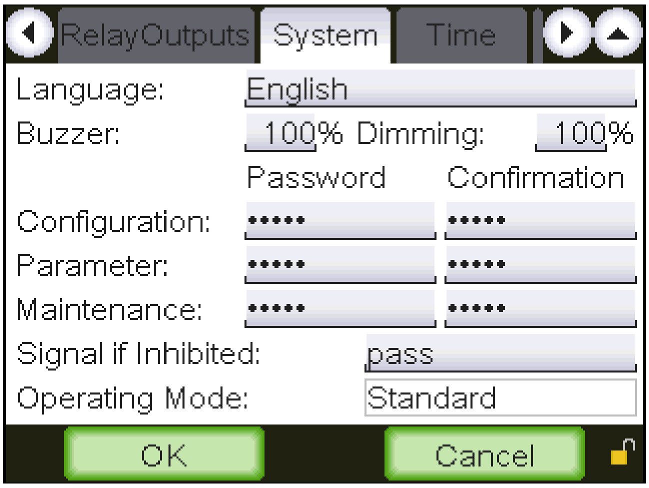


Fig. 18 System

The functions of the individual menu elements are described below:

Language

Field type: Selection

In this field, set the language for the user interface [GUI].

Buzzer

Field type: Number Input

This field sets the loudness of the internal beeper.

Dimming

Field type: Number Input

This field sets the dimming of the display.

Password/Confirmation:

Field type: Text input

There are three password levels available. The authorisation for a higher level automatically includes access to all lower levels. The highest level is the configuration level and the lowest is the maintenance level. Passwords can be changed by entering up to 8 characters. The password must be at least four characters long and can include any character/sign.

Upper and lower case letters are recognised as different.

To remove password protection completely, delete the password. Authorisation can then be obtained only with the key switch or a higher-level password. If all passwords are deleted, a key switch must be present to obtain the authorisation

To guard against typing errors the new password must be entered identically in the Password and Confirmation field before it becomes valid.

Signal if Inhibited

Field type: Selection

If a MAO module is used to output 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 only behaviour that complies with EN 50271 is the function Maintain.

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

Operating Mode:

Field type: Display

This field shows the current operating mode of the SUPREMATouch system. Only two operating modes are available 'Standard' for all countries except China and 'GB16808-2008' which is only for use in China. All information, including the approval information in this manual refer to the "Standard" operating mode.

OK

Field type: Button

Tap this button to accept the settings entered. After the button is tapped, 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 they are not valid, a warning appears.

Cancel

Field type: Button

Tap this button to discard the settings entered.

Time Window

This window displays the date and time of the system.

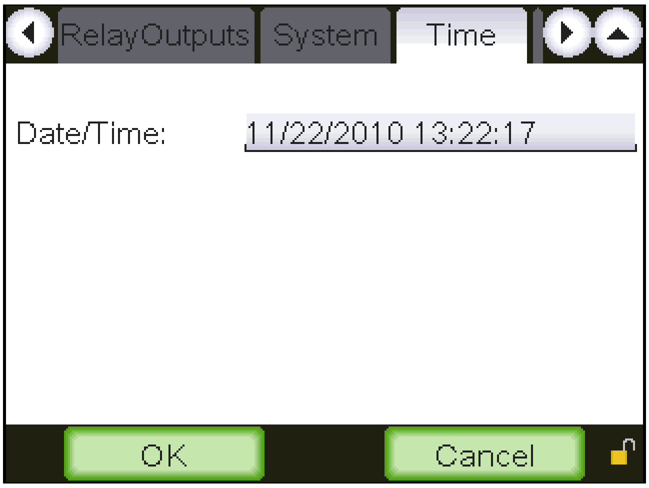


Fig. 19 Date/Time

The functions of the individual window elements are described below:

Date/Time

Field type: Date/Time input

The date and time are set by tapping the input field and entering the new date and time in the date/time field.

After this window is closed, the new date and time is displayed, but it does not become valid until the [OK] button is tapped.

Note: the Date and Time do not automatically adjust for daylight saving

OK

Field type: Button

Tap this button to accept the settings entered. After the button is tapped, 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 they are not valid, a warning appears.

Cancel

Field type: Button

Tap this button to discard the settings entered.

Sensors Submenu

Through the submenu "Sensors", the parameters of the predefined remote sensing heads can be viewed as well as set for some predefined parameter in specific ranges. The menu contains the following items described consecutively in this section:

- Head parameters
- Status texts
- Gas name
- Measuring range
- Dimensions
- Lin.- tables
- Assignment
- Allocation

Head parameters

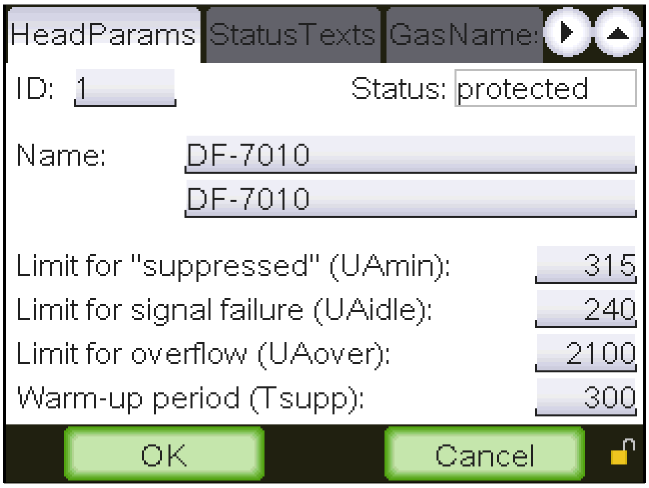


Fig. 20 "Head parameter"

This window displays the significant parameters of the remote sensing heads. During normal operation the SUPREMATouch software permanently checks the detector output signal sent by to the SUPREMATouch. In case the detector output signal falls below UA_{min} an inhibit indication, and below UA_{idle} a fault indication will be set for this measuring point. In case the detector output signal exceeds UAover an overflow will be indicated. Data fields that are not used for a specific remote sensing head are empty.

It is possible to enter user specific data for some active [4…20 mA signal] remote sensing heads. For this purpose, the following fields can be changed: Name [English and local language], UA_{min}, UA_{idle}, UA_{over} and T_{supp}. The “ID” of modifiable remote sensing heads begins with the value “10000” and their status is displayed as “changeable”.

The functions of the individual window elements are described below:

ID [Remote sensing head ID]

Field type: Selection

A remote sensing head can be selected in this field by means of its ID

Status [Status of this data cell]

Field type: Display

This field displays the status of the cell used for data saving. If this status is “protected”, then no data can be changed and the following input fields are simply display fields.

2 x Name [Head name in English [upper] and local language [lower]

Field type: text

In these fields, the name of the remote sensing head is displayed in both supported languages. The remote sensing head can be selected as “Sensor type” in the setting of the measuring points through these names.

The user can freely define the names in changeable remote sensing heads. They must be unique, that is, no name should be given twice. If a name is given for only one language, the same name can also be used for the other language while saving it.

UAmin [Limit for “suppressed”]

Field type: Number [integers]

Adjusting range: 240...350

This field displays the minimum signal UA for the status “suppressed”. Measuring values below this limit value are displayed as “suppressed”. If field is empty [tap “Clear” in the number input window], then this status will not be tested.

This value can only be adjusted for changeable remote sensing heads.

UAidle [Limit for signal failure]

Field type: Number [integers]

Adjusting range: 50…UAmin

This entry displays the minimum signal UA for the status “Signal failure”. Measuring values below this limit value are displayed as “Signal failure”.

This value can only be adjusted changeable remote sensing heads.

UAover [Limit for “overflow”]

Field type: Number [integers]

Adjusting range: 2000…2200

This value defines the sensor signal UA of the remote sensing head for the measuring range overflow display. Measuring values above this value are displayed as “overflow”.

This value can only be adjusted for changeable remote sensing heads.

Tsupp [Warm-up period]

Field type: Number [integers]

Adjusting range: 10…300

The warm-up time in seconds can be set in this field. This specifies how long a sensing head will remain in the warm-up status [display “suppressed”] after it has been switchedon. This time is necessary because different sensing heads need a different length of time to warm up and the correct measuring value is displayed.

This value can only be adjusted for changeable remote sensing heads.

OK

Field type: Button

By tapping this button, the completed settings are applied for the selected head.

Cancel

Field type: Button

By tapping this button, the completed settings are discarded for the selected head.

Status Texts

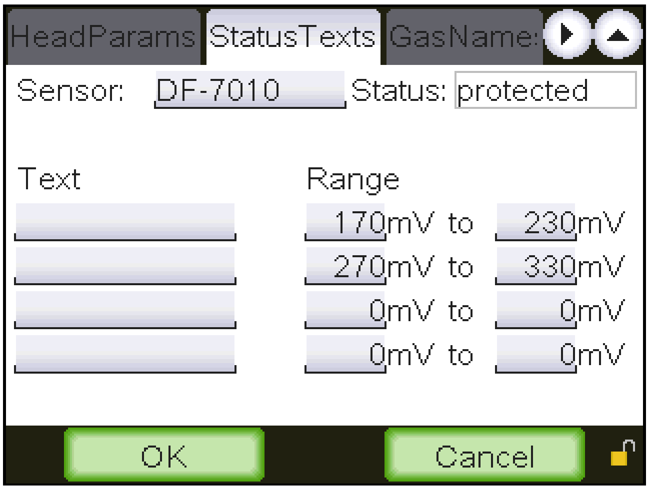


Fig. 21 "Status texts"

This window makes it possible to define sensor type specific texts for specific signal ranges.

These are displayed in the measuring value list with a letter "F" prefix. [e.g. "F:OpticErr"]. Texts can be defined for all remote sensing heads provided that ranges are specified for them. Texts can be defined arbitrarily, the same texts are allowed for more than one sensor.

In addition, the user can freely define the signal ranges in the range from 0 to 400 mV for changeable remote sensing heads. However, the signal ranges must not overlap.

The functions of the individual fields are described below:

Sensor

Field type: Selection

The head, on which status texts should be put or for which it should be changed can be selected with this field.

Status [Status of this cell]

Field type: Display

This field displays the status of the data cell used for data saving. If the status is "protected", no ranges can be defined or changed and the related following input fields are display fields.

Status text

Field type: text

Texts displayed in the measuring value lists can be entered here. This text will be displayed if the measured value lies within the specified signal range.

Range

Field type: Number input

Lower and Upper limits of respective signal range. This signal range can be set in a range from 0 till 400. This is only a display field if the status for this sensing head is "protected".

OK

Field type: Button

By tapping this button, the completed settings are applied for the selected sensing head.

Cancel

Field type: Button

By tapping this button, the settings are discarded for the selected sensing head.

Gas names

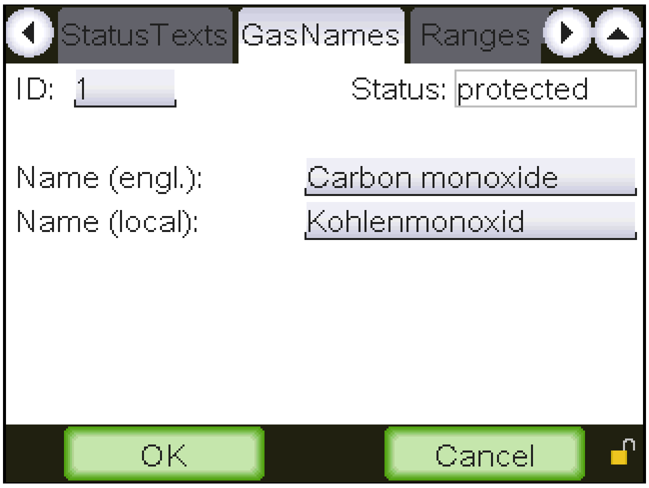


Fig. 22 "Gas names"

This window makes it possible to view protected gas names provided and to adjust some predefined changeable gas names.

User defined texts can be entered. Identical names are not allowed and will be rejected with the message "Error: Name not unique!".

The functions of the individual window fields are described below:

ID [ID of this gas name]

Field type: Selection

A gas name can be selected by means of its ID.

Status [Status of this cell]

Field type: Display

This field displays the status of the cell used for data saving. If the status is "protected", then no data can be changed and the following input fields are simply display fields.

Name [English]

Field type: Text

The English gas name can be entered here.

Name [local]

Field type: Text

The gas name in local language can be entered here.

OK

Field type: Button

By tapping this button, the completed settings for the selected gas name are applied.

Cancel

Field type: Button

By tapping this button, the completed settings for the selected gas name are discarded.

Measuring ranges

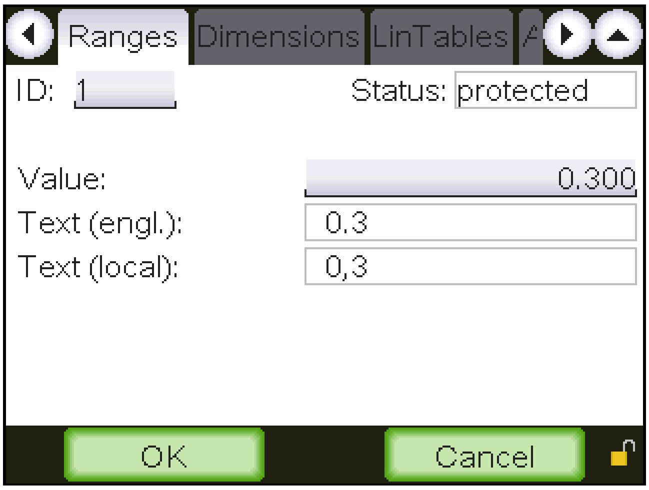


Fig. 23 "Measuring ranges"

This menu makes it possible to view the measuring ranges provided and to adjust some changeable predefined changeable ranges.

User defined ranges can be selected. Identical values are not allowed and will be rejected.

The functions of the individual fields are described below:

ID [ID of this measuring range]

Field type: Selection

A measuring range can be selected by means of its ID.

Status [Status of this cell]

Field type: Display

This field displays the status of the cell used for data saving. If the status is "protected", then no data can be changed and the following input fields are simply display fields.

Value

Element type: Text

Adjusting range: 0.100…99999

The value for the measuring range can be set here.

In case of very high 5-digit measuring range the display may show five arrows pointing upwards/downwards instead of the measured value, if the value can not be displayed with 5 digits.

Text [English]

Field type: Display

The English value for this measuring range is displayed here.

Text [local]

Field type: Display

The value in local language for this measuring range is displayed here.

OK

Field type: Button

By tapping this button, the completed settings for the selected measuring range are applied.

Cancel

Field type: Button

By tapping this button, the completed settings for the selected measuring range are discarded.

Dimensions

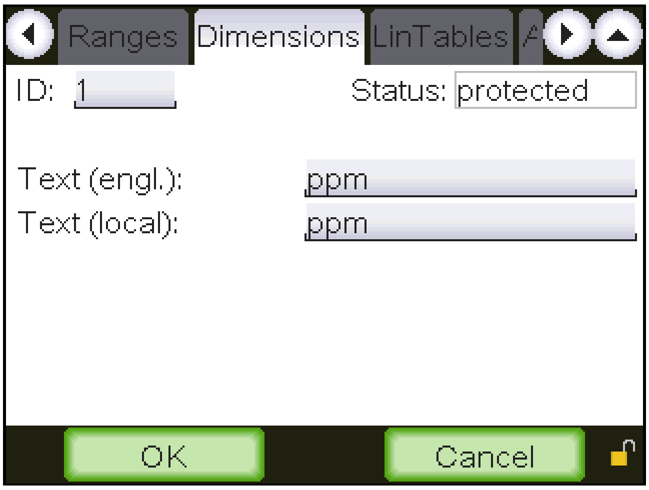


Fig. 24 "Dimensions"

This window makes is possible to view dimensions provided and to adjust some predefined changeable dimensions.

Dimensions can be selected arbitrarily. Identical names are not allowed and will be rejected with the message: "Error: Name not unique!"

The functions of the individual fields are described below:

ID [ID of this Dimension]

Field type: Choice

A dimension can be selected by means of its ID.

Status [Status of this cell]

Field type: Display

This field displays the status of the cell used for data saving. If the status is "protected", then no data can be changed and the following input fields are simply display fields.

Text [English]

Field type: Text

The English text for the dimension can be entered here.

Text [local]

Field type: Text

The text in local language for the dimension can be entered here.

OK

Field type: Button

By tapping this button, the completed settings for the selected dimension are applied.

Cancel

Field type: Button

By tapping this button, the completed settings for the selected dimension are discarded.

Linearity tables

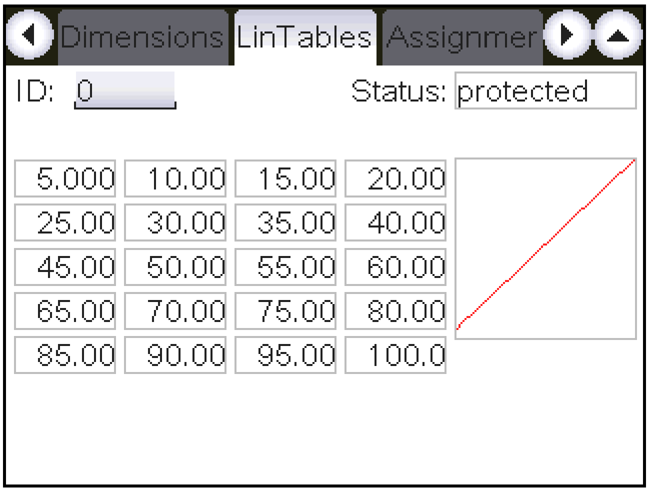


Fig. 25 "Lin. tables" window

This window makes it possible to view provided linearisation tables.

The functions of the individual fields are described below:

ID [ID of this linearisation table]

Field type: Selection

A linearisation table can be selected by means of its ID.

Status [Status of this cell]

Field type: Display

This field displays the status of the cell used for data saving. This status shall always be "protected" so no data can be changed. The following fields are simply display fields.

Node

Field type: Number input [Locked]

Nodes are defined for each 5% increment along the X axis. A typical linearity curve is shown in the diagram on the right.

Assignment

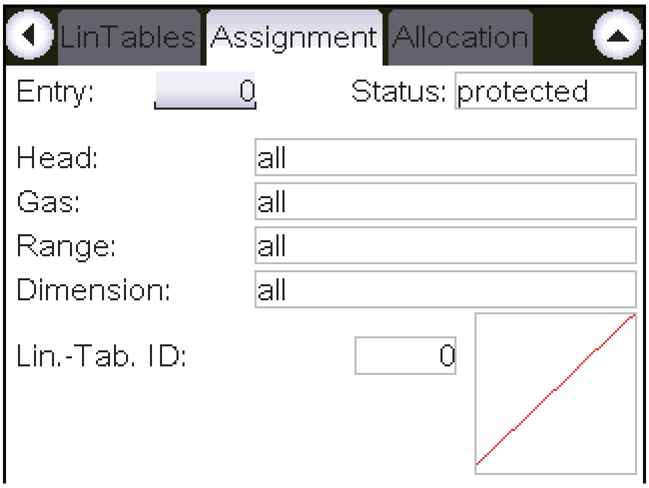


Fig. 26 "Assignment" window

This window makes it possible to view assignments of the sensing heads, gases, ranges, dimensions and linearisation tables.

In the assignment window, all used entries are sorted in a descending sequence of their cell number. When the parameters for sensing head, gas, measuring range and dimension match the values of the corresponding measuring point for the first time, the linearisation table to be used is assigned for the measuring point.

The functions of the individual fields are described below:

Entry [Number of this cell]

Field type: Selection

An assignment entry can be selected by means of its cell through this field.

Status [Status of this cell]

Field type: Display

This field displays the status of the cell used for data saving. This status shall always be "protected" and so no data can be changed.

Head ID and assignment

Field type: Display

This field displays the remote sensing head used in the selected assignment.

Gas ID and assignment

Field type: Display

This field displays the gas name used in the selected assignment.

Range ID and assignment

Field type: Display

This field displays measuring range used in the selected assignment.

Dimension ID and assignment

Field type: Display

This field displays the dimension used in the selected assignment.

Lin. tab. ID

Field type: Display

This field displays the linearisation curve of the selected assignment.

Allocation

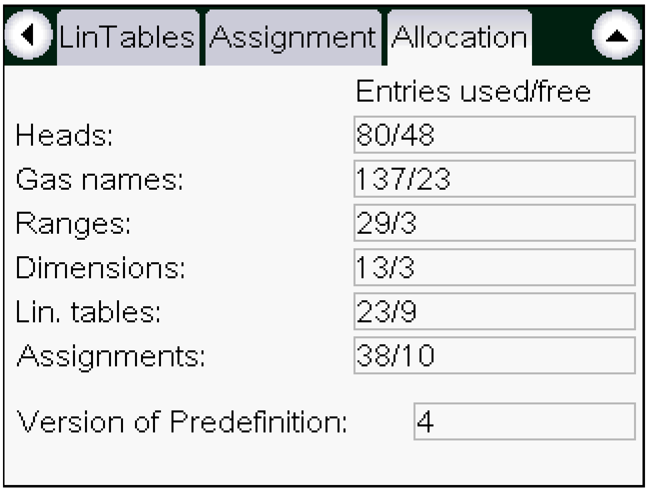


Fig. 27 Allocation

This window displays an overview of how many cells are used for individual parameter operations and how many cells are still free together with the version of the predefined dataset - Version of Predefinition.

Printer

This window makes it possible to change the paper feed format in a printer connected to the SUPREMATouch printer port. There is the possibility to activate and format a printer alive-message.

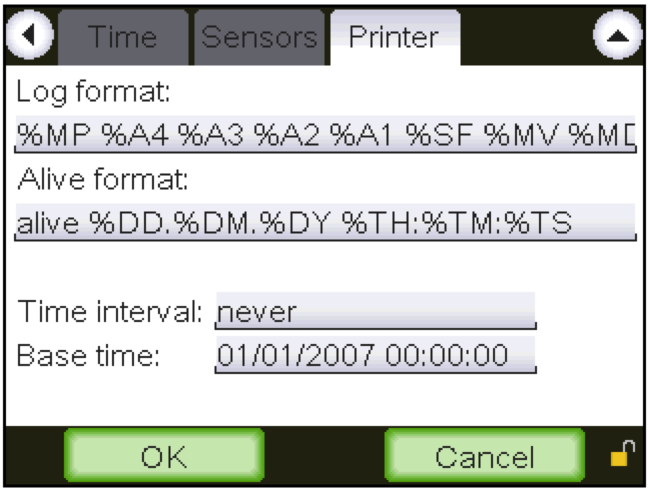


Fig. 28 "Printer" window

Log format

Field type: text

The paper feed format in a printer can be specified here. Apart from free text, predefined tags can be used. See below for a listing of possible tags.

Alive format

Field type: text

The format of the alive-message can be specified here. Apart from free text, predefined tags can be used. See below for a listing of possible tags.

Time interval

Field type: Selection

The time interval/repetition rate of the alive-message [never, annually, monthly, daily, …, every second etc.] can be set here.

Base time

Field type: Date/time input

The base time for the alive-message can be set here.

OK

Field type: Button

By tapping this button, the completed settings are applied.

Cancel

Field type: Button

By tapping this button, the completed settings are discarded.

Available tags:

Tag	Printout
%%	%
%DD	day [length = 2]
%DM	month [length = 2]
%DY	year [length = 2]
%TH	hour [length = 2]
%TM	minute [length = 2]
%TS	second [length = 2]
%A1	’S’ if alarm 1 was set, ’R’ if alarm 1 was reset
%A2	’S’ if alarm 2 was set, ’R’ if alarm 2 was reset
%A3	’S’ if alarm 3 was set, ’R’ if alarm 3 was reset
%A4	’S’ if alarm 4 was set, ’R’ if alarm 4 was reset
%SF	’S’ if signal fail was set, ’R’ if signal fail was reset
%MP	’MP’ and the Measuring point number [length = 5]
%MD	Measuring dimension [length = 5]
%MG	Measuring gas [length = 14]
%MT	Measuring tag [length = 11]
%ML	Measuring place [length = 21]
%MM	Measuring marking [length = 21]
%MS	Measuring serial number [length = 11]
%MV	Measuring value [length = 6]

Maintain Menu

Access to the fields in the “Maintain” menu is restricted. Data can displayed, but changes and deletions are only possible after entering the maintenance password [or higher] or operating a key switch.

Calibration Submenu

To calibrate the individual gas detection inputs a manual 2-point calibration procedure can be used and if required an automatic presetting can be done during the first calibration. After a calibration process has been started using the MDO, ‘Zero’ gas must be applied to the sensing head. Then a ‘Test’ [span] gas must be applied. The results of a calibration are then displayed and saved [see section 7.1 Maintenance and Adjustment].

Attention!

The presetting is applied immediately and cannot be cancelled or discarded.

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

The window is divided into two subwindows:

- “Start calibration”
- “End calibration”

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

The functions of the individual fields are described below.

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

Meas. Point

Field type: Selection

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

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

Tag

Field type: Display

The field shows the designation of the selected input.

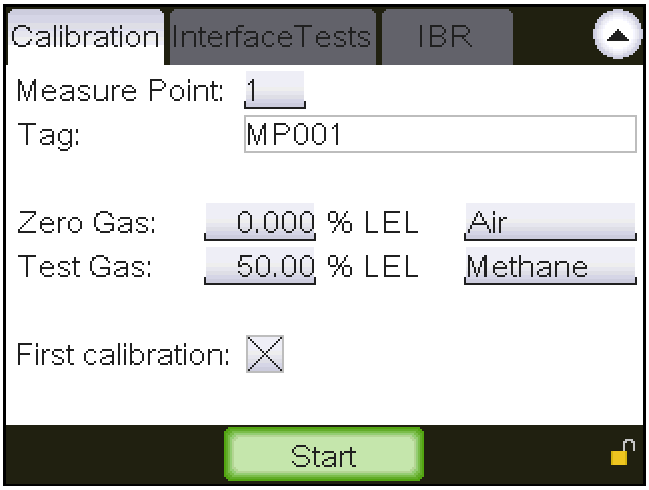


Fig. 29 "Start calibration"

Zero Gas [concentration]

Field type: decimal number

Enter the zero gas concentration [in the defined measuring dimension] in this field. This value can be set in a range between 0 and the range value defined in the measuring point parameters, but 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 the defined measuring dimension] in this field. This value can be set in a range between 10% of the measuring range and the range value defined in the measuring point parameters. 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. The field defaults to the test gas [Measure Point window] for the selected input.

First calibration:

Field type: Checkbox

If this field is set, a first calibration and, if applicable and confirmed, an automatic presetting will be carried out. If a first calibration takes place, entries in the calibration history for the selected measure point will be deleted.

If no previous calibration has been done, a first calibration will always be carried out independent from this setting.

Start

Field type: Button

Pressing this button starts the calibration process and automatically inhibits the output. After the button is tapped, 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” window appears.

Cancel

Field type: Button

Tapping this button discards all settings made.

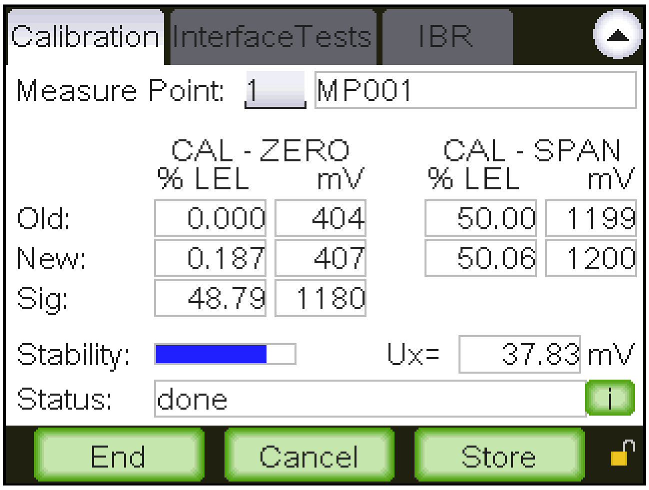


Fig. 30 “End calibration”

Old

Field type: Display

The fields in this line display the data from the last calibration, if the input has already been calibrated.

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

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 similar to the values in the “Old” line. 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 signal value and the current internal signal UA are displayed and updated every second.

Ux

Field type: Display

Displays the current difference signal Ux for passive sensors, if the measure point has already been calibrated. Otherwise no value is displayed [which means: no first calibration has been done]. For active sensors this field is not displayed.

At first 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, whichis the value resulting from the first calibration.

Stability

Field type: Progress bar

Indicator for a stable difference signal Ux. Only when the Progress Bar is full should the measured values be accepted.

Status:

Field type: Display

The current calibration status is briefly displayed in this field. To get more detailed information tap the “i” button beside the Status 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 tapping the “End” button.

Store

Field type: Button

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

Cancel

Field type: Button

Tapping this button will cancel a calibration process at any time, provided there is no presetting in progress. The results up to that time will be voided.

> **Attention!**
>
> The presetting is valid immediately and will always be applied!

Interface Tests

Test of the analogue outputs

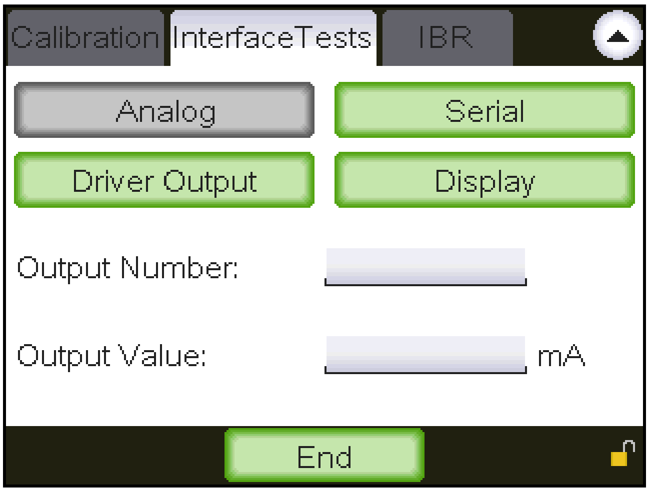


Fig. 31 Test of the analogue outputs

Analogue outputs can be tested with the help of this subwindow. The desired analogue output is selected using the output number field and the current to be tested is set using the output value field. The test can be completed using the “End” button. The regular, input dependent value is displayed again in the output thereafter.

Test of the serial interfaces

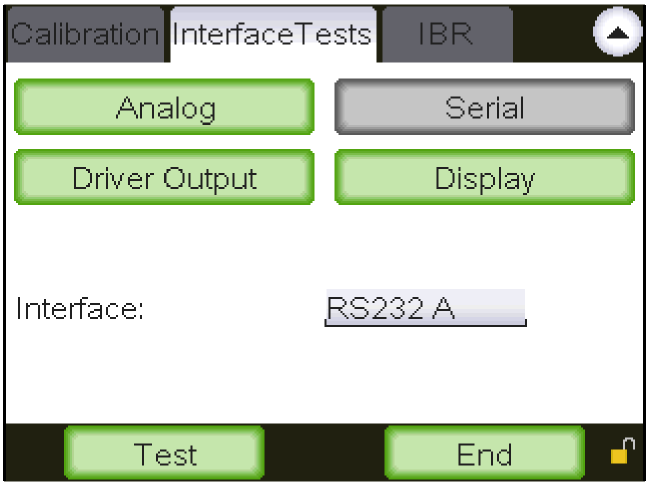


Fig. 32 Test of the serial interfaces

From the list of interfaces in the SUPREMATouch, an interface can be selected. As soon as this interface has been selected, its normal function is inhibited. Therefore, this test can not be carried out via PC/laptop for all serial interfaces.

Attention!

In this test [RS232 A and RS232 B], the system failure is activated after approximately 3 seconds.

Every time the “Test” button is tapped, a test text consisting of all printable characters is sent to the interface. The text is started by the “Carriage-Return” character and terminated by “Line-Feed”.

By selecting another interface or by tapping the “End” button, the interface inhibit is removed.

Test of the digital driver outputs

After an output driver has been selected by its appropriate ‘Partial System’ and output number, the normal output of this driver is inhibited. With the “Output value” field the output test value can be changed. The value set is displayed directly at the output selected. After finishing the test tap the “End” button, or start testing another driver output. The normal status of the previous driver output is automatically restored.

Warning!

This test may trigger alarm devices connected to the system!

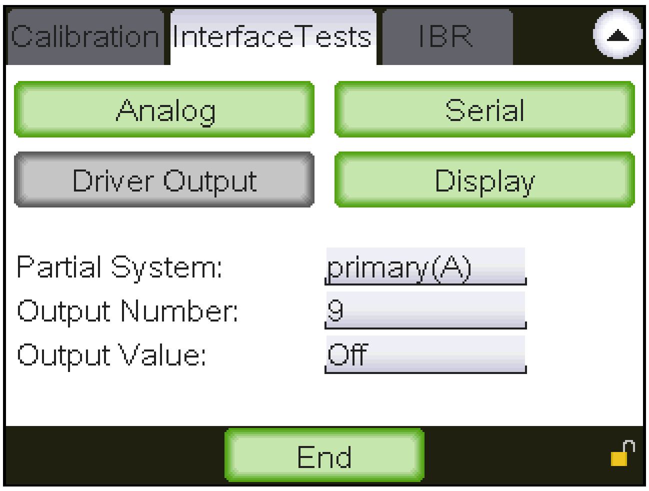


Fig. 33 Test of the digital driver interfaces

Test of the display

Within this window 2 possibilities for the touchscreen interface are available.

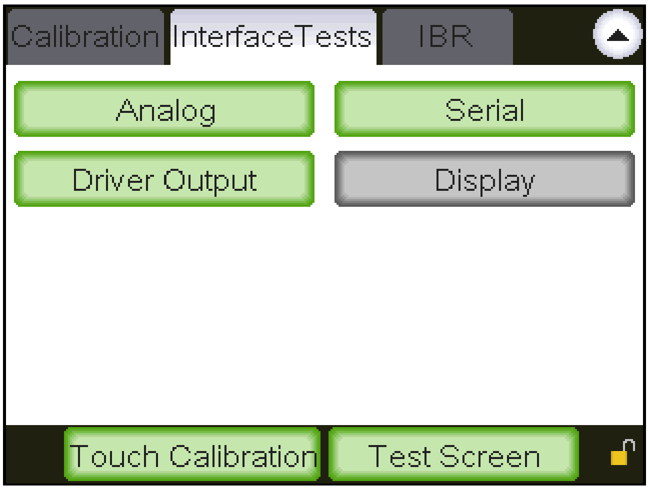


Fig. 34 Display test and calibration

By tapping the “Touch Calibration” button the touchscreen calibration procedure is started. During this procedure several points on the screen have to be touched.

> **Attention!**
>
> A faulty touchscreen calibration may make it impossible to operate the GUI using the touch screen. In this case a new touch calibration process has to be started using a PC.

By tapping the “Test Screen” button a series of 3 test screens will be displayed and all front panel LEDs will be activated serially. To jump to the next test screen, tap anywhere on the screen. The test mode will be left after the 3rd test screen. The first test screen must look like Fig. 35, the 2nd test screen must be completely black and the 3rd test screen must be completely white.

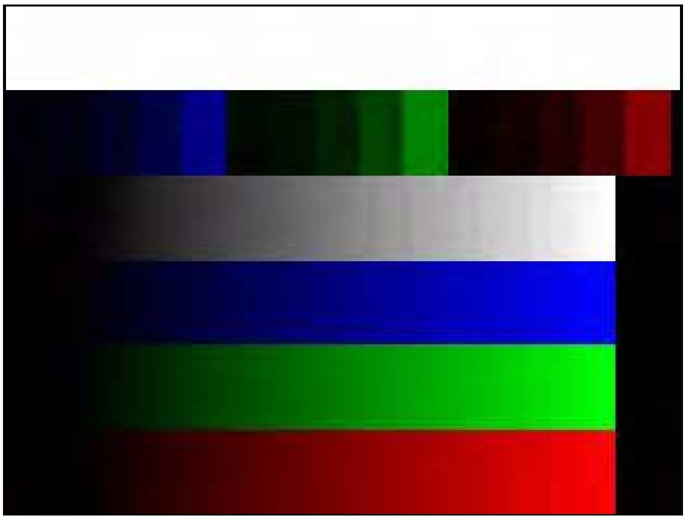


Fig. 35 Test screen

IBR [bridge current] window

This window makes it possible to automatically set the sensor bridge current [I_{BR}].

> **Attention!**
>
> A setting that has been started or carried out cannot be cancelled or discarded!

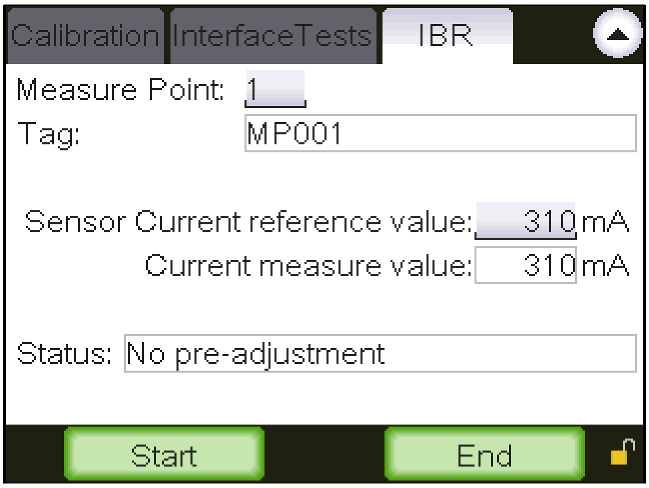


Fig. 36 "IBR"

The functions of the individual fields are described below:

Measuring point

Field type: Selection

The measuring point, for which the sensor current should be set can be selected in this field.

Tag

Field type: Display

This field displays the tag defined for the selected measuring point.

Sensor current reference value

Field type: Number input

Using this field, the value to which the bridge current should be set can be defined. This value is sensor type dependent, but it can also be adjusted for special applications.

Current measure value

Field type: Display

This field displays the actual measured bridge current.

Status

Field type: Display

This field displays the current presetting status of this measuring point.

Start

Field type: Button

The presetting is started by tapping this button.

End

Field type: Button

The presetting is finished by tapping this button.

Diagnostics Menu

Logbook

The logbook contains the following histories:

- Calibration [max. 4 calibration entries and pre-settings for each measuring point]
- System Events [max. 10,000 entries]
- Alarm Events [max. 50,000 entries]
- Signal Events [max. 50,000 entries]
- Configuration changes [max. 400 entries]
- Supply Voltage [max. 200 entries]
- Processor Temperature [max. 200 entries]

All history entries are time-stamped. When a history is full, the oldest entry is overwritten. The calibration history is an exception: Entries of the first calibration and pre-setting are not overwritten.

Selecting an item in the Logbook displays the corresponding history. History entries are shown as list views. To scroll through the list content, just touch and slide. The scroll bar can also be used to scroll vertically.

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 and pre-settings.

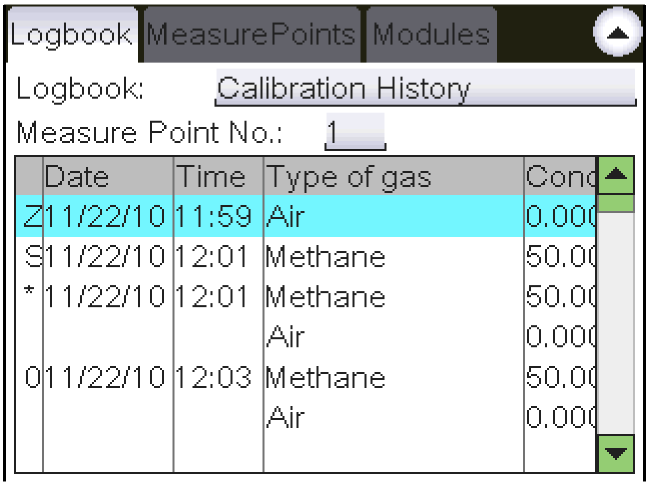


Fig. 37 Calibration history

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 each calibration process consists of two rows, first the test gas and then the zero gas setting. A pre-setting entry is made up of only one 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 “———”.

The type of entry is identified by a character in the first column:

I	Bridge current setting [IBR]
Z	Presetting Zero point [ZERO]
S	Presetting Sensitivity [SPAN]
*	First calibration
Number n	n-last calibration

Each entry includes the following data [if applicable; scroll to see all]:

- Date/Time of accepting and closing the calibration menu
- Gas types for zero and, if applicable, test gases [not used for bridge current setting]
- Gas concentrations for the zero and, if applicable, test gases [not used for bridge current setting]
- Measured values for the zero and test gases
- Difference signal Ux for the zero and test gases [relevant for calibration only]
- Reference value [relevant for pre-settings only]

System Events history

This history stores the system failures and start messages.
Each entry includes the following data:

- Date/Time that the event occurred
- Brief description of the event type
- Additional hexadecimal description of event. [For use by MSA service personnel.]

By double-tapping an entry a window opens containing a detailed error description in plain text.

Alarm events history

In this history, alarm events, acknowledge and reset are saved.
An entry is made up of the following data:

- Date/time of the event
- Brief description of the event

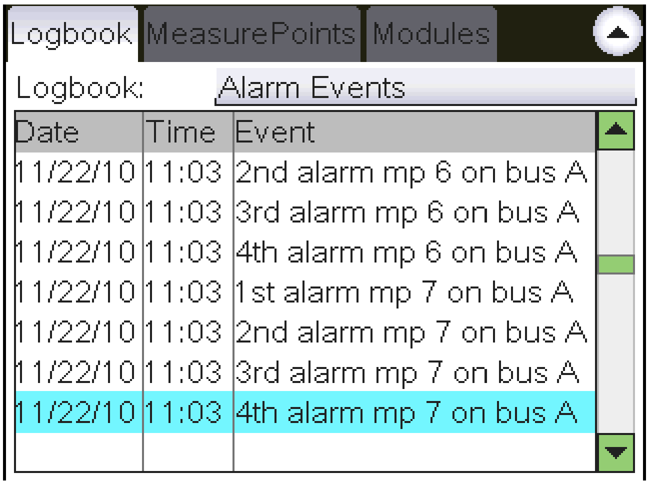


Fig. 38 Alarm events history"

Signal events history

In this history, signal events, acknowledge and reset of signal failures and the switchover of the primary system [only in redundant systems] are saved.
An entry is made up of the following data:

- Date/time of the event
- Brief description of the event

Changes history

This history stores changes of input parameter settings. In changing the assignment of relay outputs of a measuring point, an entry with the connection evaluation is included.

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 voltage crossing the limits 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 the over-limit and under-limit temperature events for the MDA module microprocessors. 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 [°C]
- Information on whether it remained out of the permitted range or returned to it

Measure Points

This displays the current signal measurement values of one input.

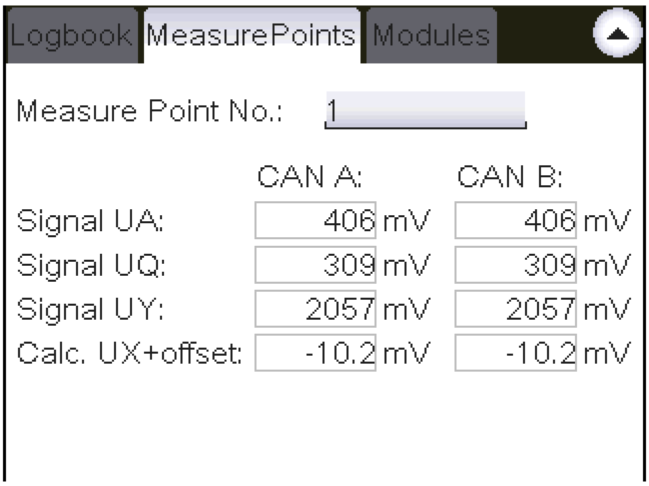


Fig. 39 “Measure Points”

The functions of the individual fields are described below:

Measure Point No.:

Field type: Selection

After selection of a measure point number, the current signals of the selected point are displayed.

Signal UA:

Field type: Display

The amplified sensor signal is displayed in these fields separated by bus.

Signal UQ:

Field type: Display

When passive sensors and MPI modules are used, the bridge current is displayed as a voltage value in these field separated by bus. When active sensors and MCI modules are used, these fields are empty.

Signal UY:

Field type: Display

When passive sensors and MPI modules are used the amplified sensor signal UY is displayed in these fields separated by bus. The signal consists of a fixed gain that depends on the MPI module type used and an offset voltage.

When active sensors and MCI modules are used, these fields are empty.

Calc. UX + offset:

Field type: Display

These fields show the calculated UX value including an offset. These values are calculated based on the measured UY values.

Modules Menu

From the “Module” menu, the user can recall information about the system modules.

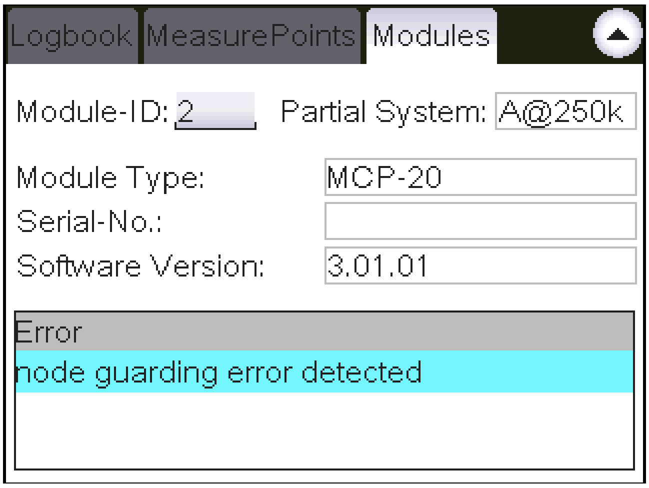


Fig. 40 “Modules”

The functions of the individual fields are described below:

Module ID

Field type: Selection

This field contains the CAN node IDs of all system modules which are connected to the CAN bus. After an ID has been selected, the remaining fields are filled with all data available for this particular module.

Partial System

Field type: Display

In this field, the letter of the partial system to which the module belongs and, for some modules [e.g. MCP-20 and MDO-20], the system CAN baud rate is displayed.

Module Type

Field type: Display

This field contains the type of module selected.

Serial No.

Field type: Display

This field contains the serial number of the module selected [if set].

Software version

Field type: Display

This field displays the software version of the module selected.

Module status

Field type: List

The current errors, if any, of the selected module are displayed in this field.

3.4 PC Operation

All parameters and configuration made with a PC shall use the MSA program called "SUPREMA Manager".

Version and Article Number see chapter 8.

Attention!

All parameters and configuration made with a PC must be checked for correctness on the SUPREMATouch, or they must be checked for correctness on the PC after they have been read back to the PC.

4 Special conditions to comply with the requirements of DIN EN 61508

for SIL 1–3 according to TÜV Certificate

4.1 Conditions for configuration, installation, operation and maintenance

Common Conditions for safety operation

The following criteria have to be considered for all **safety-related applications**

(1) The Locking [Inhibit] of measuring inputs is only allowed during maintenance and repair.

(2) 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.

(3) The alarm conditions of the SUPREMA must be periodically checked together with the typical gas calibration checks.

(4) The alarm and relay functions must be tested at least once per year.

(5) The locking [inhibit] of measuring points must be safety related processed via the inhibit relay.

(6) Failure of measuring points must be safety related signalled via the MS-Fail relay.

(7) Sensor cables must be protected from mechanical damage [e. g. by using armoured cable].

(8) The relays must be energised under normal conditions.

(9) The relay contacts must be protected with a fuse rated at 0.6 of the nominal specified relay contact current.

(10) The system fail relay contacts (even for satellites) must be safety related processed for warning purposes.

(11) All inputs of MSI module must be used in open and short circuit detection mode.

(12) In galvanically coupled system components the ground connections of all power supply must be connected.

(13) In case of failure of any component the repair or replacement must be completed within 72 hours.

(14) Only modules and components with the Hardware and Software Versions specified in chapter 4 may be used.

(15) The notes in the Operation Manual for installation, operation and maintenance have to be considered.

(16) An ambient temperature above 40 °C is to be avoided.

(17) All devices connected to one MRO module must have the same voltage level.

(18) The ground fault current recognition of the MFI modules is to be tested at least annually.

(19) External power supplies must fulfil, as a minimum, the requirements of EN 60950 and EN 50178.

(20) During installation of the SUPREMA - Fire and Gas Warning System the national regulations and standards must be complied with.

(21) The installation of the SUPREMA - Fire and Gas Warning System has to be done in such away that a maximum degree of pollution 1 [EN 60664-1] is ensured [no or only dry, not conductive contamination arises. The contamination does not have influence].

(22) In the case of using the MLE modules the conditions which are described in Technical Report No: 968/EZ 163.04/04 dated 2004-11-22 are to be considered.

Additional conditions to fulfill the requirements of IEC 61508 for a certain SIL

In addition to the general conditions the following criteria have be considered for a specified SIL:

SIL 1:

- A configuration 1 has to be installed in accordance with this chapter.

SIL 2:

- A configuration 1 has to be installed in accordance with this chapter.

  By installing a configuration 2 in accordance with this chapter and using the MRO 8 and/or MRO 8 TS modules the contacts of the relays for the same alarm [Alarm A and Alarm B] of subsystem A and B have to be interconnected serially or processed safety-related.

  [By using the MRO 16 TS modules this interconnecting is already internally realized.]

SIL 3:

- A redundant configuration 3 has to be installed in accordance with this chapter.

  Two independent sensors have to be used in the same area.·The sensors in the same area have to be connected to different MAI 20 [analogue input] modules.

  By installing a configuration 3 in accordance with this chapter and using the MRO 8 and/or MRO 8 TS modules the contacts of the relays for the same alarm [Alarm A and Alarm B] of subsystem A and B have to be interconnected serially or processed safety-related.

  [By using the MRO 16 TS modules this interconnecting is already internally realized.]

Permitted system expansions over CAN BUS

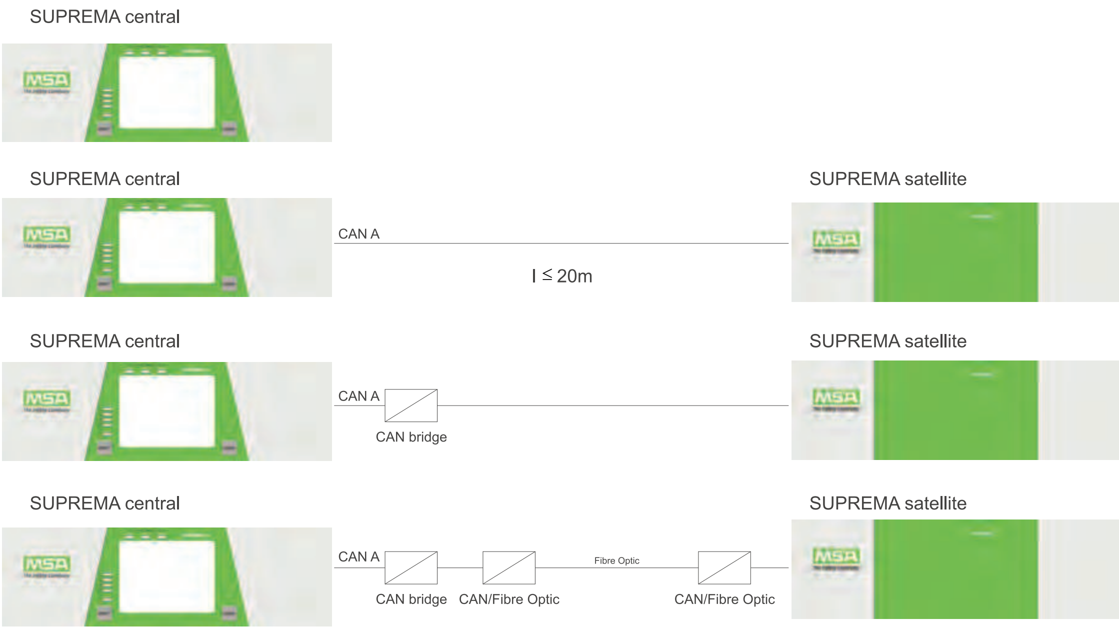


Fig. 41 System expansions with CAN BUS and single-channel-configuration

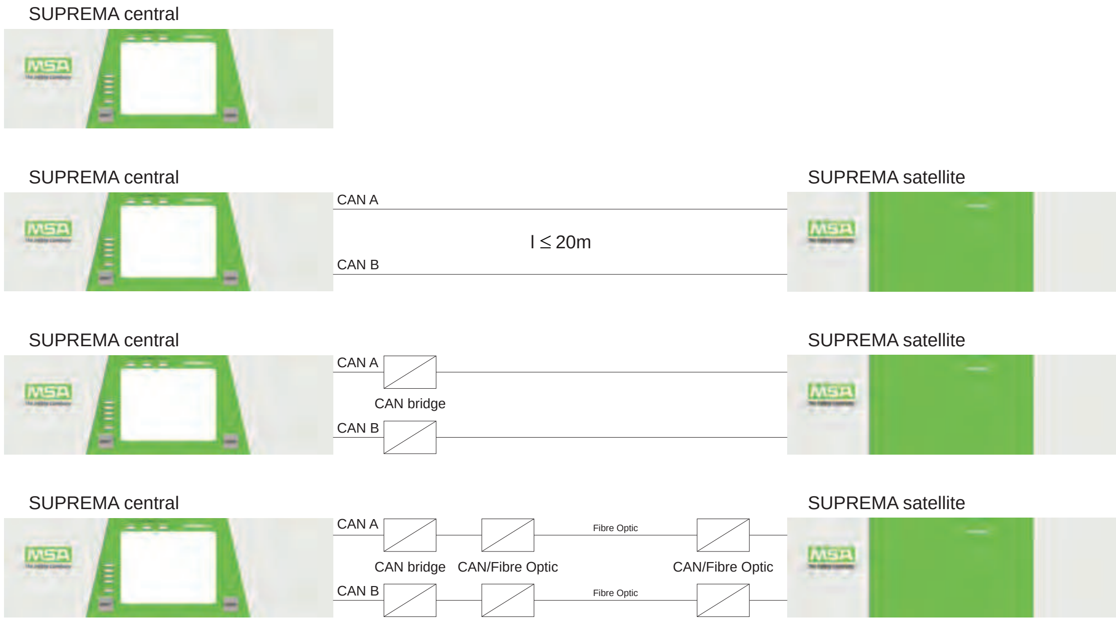


Fig. 42 System expansions with CAN BUS and redundant configuration

Configuration 1

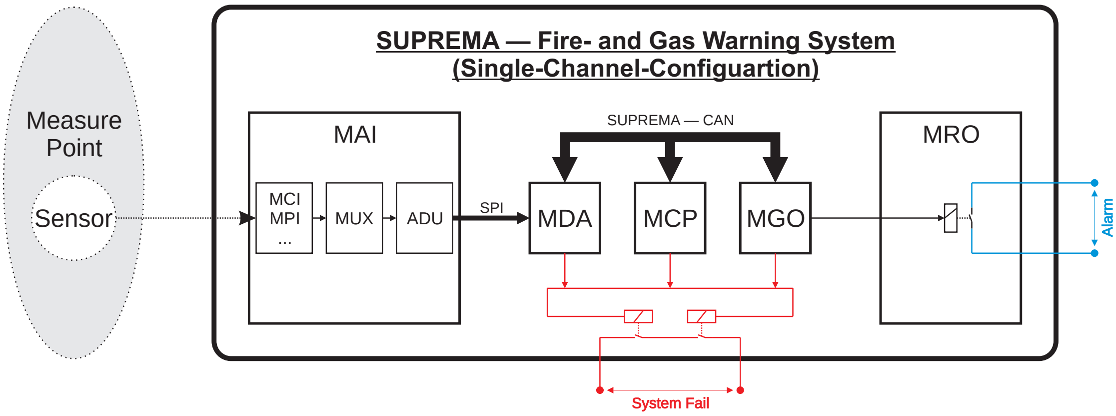


Fig. 43 In case of a single-channel-configuration the MLE Modules can not be used

Configuration 2

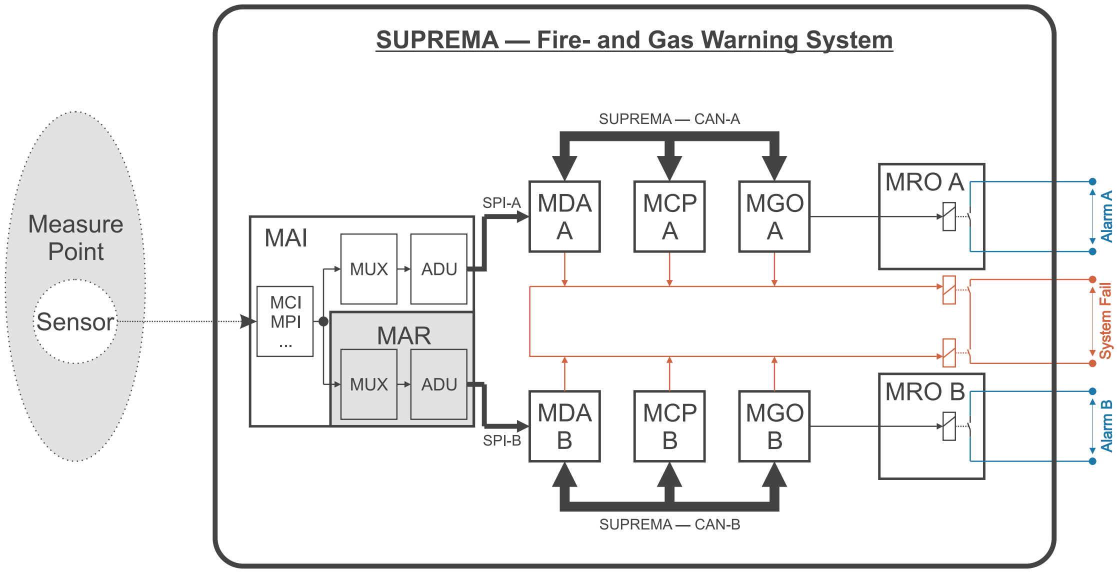


Fig. 44 Configuration without MLE 10 Modules

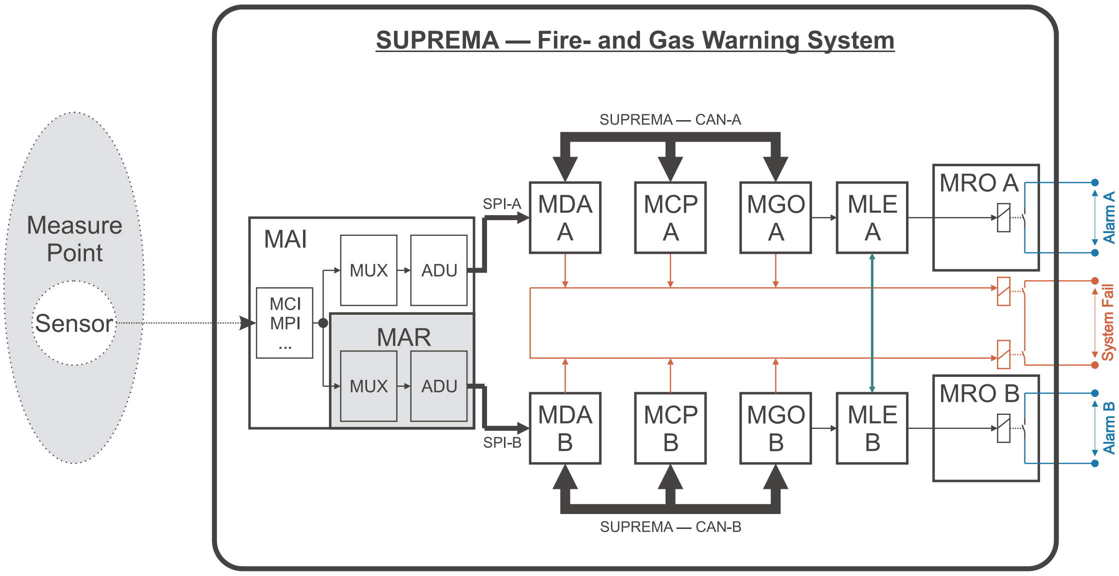


Fig. 45 Configuration with MLE 10 Modules

Configuration 3

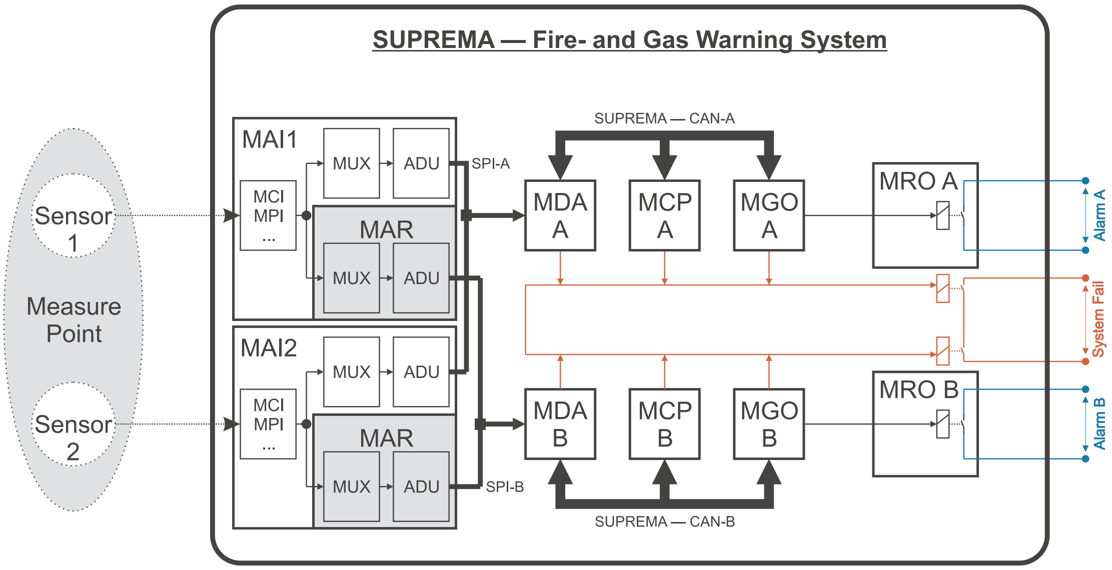


Fig. 46 Configuration without MLE 10 Modules

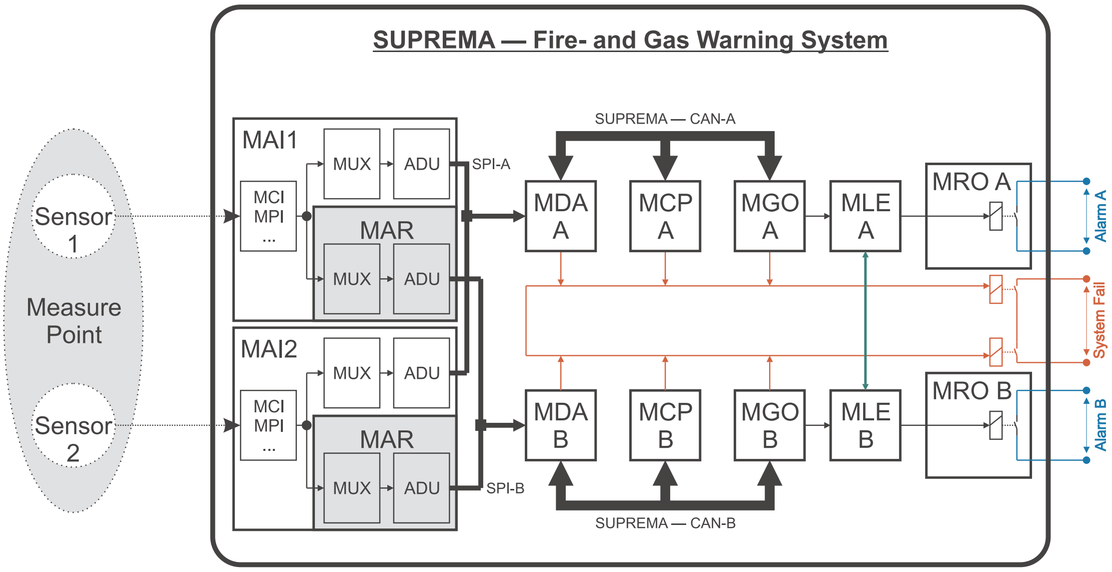


Fig. 47 Configuration with MLE 10 Modules

4.2 Listing of the permitted Hardware Modules and Software Versions

Permitted Hardware Modules

Module	Layout Version	Meaning
MIB 20	2	Interconnection Board
MCP 20	5	Central Processing Unit
MDO 20	3, 4	Display & Operation
MDA 20	4	Data Acquisition
MGO 20	4	General Output
MAI 20	6	Analog Input Unit
MAR 10	6	Analog Redundant
MST 10	8	System Terminals
MSI 10	4	Switch Input
MFI 10	5 7	Fire Input
MCI 20 MCI 20 BFE	11	Current Input
MAT 10	4	Analog Terminal
MAT 10 TS	6	Analog Terminal
MPI 10 WT 100 MPI 10 WT 10 MPI 10 HL 8101 MPI 10 HL 8113	6	Passive Sensor Input
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]
MRO 20-8-TS	1	Relay Output [8 Relays]
MRO 20-16-TS	1	Relay Output [16 Relays]
MRO 10-16-TS-SSR	3	Solid State Relay Output [16 Relays]
MRO20-8-TS-SSR	1	Solid State Relay Output [8 Relays]
MRD 10	1 2	Relay Dummy
MGT 40 TS	10026772 [item number]	General Terminal
MLE 10	4	Logic Extension Modules
SUPREMA Rack-Type 20/E 20 [with or without internal 150 W power supply]		
SUPREMA CAN BRIDGE CBM		
SUPREMA CAN-LWL Konverter - Fibre Optics Converter		
MDC 20	2	Display Connection Module

For non safety-related applications [e.g. analog output, data communication to a PLS] the following components can also be used:

Module	Layout Version	Meaning
MAO 10	6	Analog Output Unit
MHD 10	2	High Driver
SUPREMA PKV 30-COS/AUER		

Permitted Software Versions

Module	Software version	Component
SUPREMA Manager	1.00.00.XXXX	Configuration program
MDA 20	2.01.02	Controller
MGO 20	3.01.02	Controller
MCP 20	3.01.02	Controller
MDO 20	3.01.02	Controller
MAI 20	MAI MA01	CPLD
MAR 10	MAR MA01	CPLD
MAO 10	2.02.01	Controller
	MAO MA01	CPLD
MLE 10	MLE 10_4_XXX_YYY_ZZ	
	[XXX_YYY_ZZ: Ident. No. of the customer specified application, for which a separate suitable qualification has to be verified.]	

Possible Configurations and Acquirable SILs

The following table shows, which configuration has to be selected, to fulfill the requirements of a special SIL.

[LDM = Low Demand Mode; HDM = High Demand or Continuous Mode]

	SIL 1		**SIL 2**		**SIL 3**	
	LDM	HDM	LDM	HDM	LDM	HDM
Configuration 1	X	X	X			
Configuration 2	X	X	X			
Configuration 3	X	X	X	X	X	X

Depending on the selected configuration the following safety-relevant parameters have to be considered while implementing the safety loop:

Safety-relevant parameters without using the MLE 10 Modules

	PFH	PFD	SFF	I_{DU}	I_{DD}	HFT
Configuration 1	$3.8*10^{-7}$ [4% of SIL1]	$< 2*10^{-3}$ [2.1% of SIL1]	97%	393 fit	4555 fit	0
Configuration 2	2.5*10-8 [3% of SIL2]	$1.3*10^{-4}$ [1.3% of SIL2]	97%	393 fit	4555 fit	1 [1]
Configuration 3	8.2*10-9 [8% of SIL3]	$4.0*10^{-5}$ [4.0% of SIL3]	97%	393 fit	4555 fit	1

[1] Except Inputmodules [MCI, MPI, MFI, MSI]; → HFT = 0!

Safety-relevant parameters using the MLE 10 Modules

	PFH	PFD	SFF	HFT
Configuration 1	With and without CAN Modules: $< 4*10^{-7}$	$< 2*10^{-3}$	92%	0
Configuration 2	With and without CAN Modules: $< 7*10^{-8}$	$< 2*10^{-4}$	94%	1 [1]
Configuration 3	Without CAN Modules: $= 3,4*10^{-8}$	$< 2*10^{-5}$	94%	1
	With CAN-Bridge: $= 4,4*10^{-8}$			
	With CAN-Bridge and CAN-LWL: $= 5,3*10^{-8}$			

[1] Except Inputmodules [MCI, MPI, MFI, MSI]; → HFT = 0!

Concerning the configuration variations it has to be considered, that the sensors were not part of the test and their suitability for the respective Safety Integrity Level [SIL] has to be proven seperately.

4.3 TÜV-Certificate

TÜVRheinland®

ZERTIFIKAT
CERTIFICATE

No.: 968/EZ 163.17/11

Product tested	Fire- and Gas warning - System	**Certificate holder**	MSA Auer GmbH Thiemannstraße 1 12059 Berlin Germany
Type designation	SUPREMA details see current "Version Release List"	**Manufacturer**	see certificate holder
Codes and standards forming the basis of testing	IEC 61508 Parts 1-7:2010 EN 50402:2005 + A1:2008 EN 50104:2010		EN 60079-29-1:2007 EN 50270:2006 EN 50271:2010
Intended application	The devices comply with the requirements of the relevant standards and can be used for monitoring and alarming of fires or dangerous gas concentrations up to SIL 3 according to IEC 61508.		
Specific requirements	The instructions of the associated Installation and Operating Manual shall be considered.		
This certificate is valid until 2016-08-22			

Functional Safety Type Approved FS

TÜVRheinland®

The test report-no.: 968/EZ 163.17/11 dated 2011-08-22 is an integral part of this certificate.

The holder of a valid licence certificate for the product tested is authorized to affix the test mark shown opposite to products, which are identical with the product tested.

TÜV Rheinland Industrie Service GmbH
Geschäftsfeld ASI
Automation, Software und Informationstechnologie

Köln, 2011-08-22

Certification Body for FS-Products

Dipl.-Ing. Heinz Gall

Fig. 48 TÜV-Certificate

5 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 Sensor, the control system must be installed outside of the hazardous area
Performance:	DIN EN 60079-29-1 :2008-07 DIN EN 50104 :2011-04 DIN EN 50271 :2011-04 DIN EN 50402 : 2006-03
Marking:	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

Conformance according to the Directive 2004 / 108/ EC [EMC]
DIN EN 50270 : 2007-05 Typ 2, DIN EN 61000 - 6 - 4 : 2007-09

LVD Conformance according to the Directive 73/23/EC [LVD]
DIN EN 61010 : 2002-08

5.1 Special Conditions for Safe Use According to EC-type examination certificate 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 chapter 6].

A test of the display and LEDs on the front panel is available on request [see chapter 3.3, section "Test of the display”] and must be performed at least once per year.

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.

In the case of measurement combustible gases the alarm threshold for the main alarm must be in the latching mode.

For the safety related use of each relay, the alarm and failure relays of the SURPEMA system has to be used in the following condition:

(1) Relay under power

(2) Alarm or fault contact is closed

Thereby it will be assured that the relay contacts will give a failsafe signal at power fail or line disconnection.

When operating the gas warning System in an environment where vibrations cannot be prevented, the MAI20-NASO (Mat. No. 10067221) has to be used instead of a standard MAI.

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 operating 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.

Modules tested according to DMT 03 ATEX G 003 X

Module	Layout version	Meaning
MIB 20	2	Interconnection Board
MCP 20	5	Central Processing Unit
MDO 20	3, 4	Display & Operation
MDA 20	4	Data Acquisition
MGO 20	4	General Output
MAO 10	6	Analog Output Unit
MAI 20	6	Analog Input Unit
MAR 10	6	Analog 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	Analog Terminal
MAT 10 TS	6	Analog 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
SUPREMA CAN LWL Converter		10052948
MDC 20	2	Display Connection Module
MRO 20-8-TS	1	Relay Output [8 Relays]
MRO 20-16-TS	1	Relay Output [16 Relays]
MRO 10-16-TS-SSR	3	Solid State Relay Output [16 Relays]
MRO20-8-TS SSR	1	Solid State Relay Output [8 Relays]

Passive Remote Sensors according to DMT 03 ATEX G 003 X

- D-7010
- D-7100
- Series 47 K-ST
- Series 47 K-PRP
- Series 47 K-HT

Service and Maintenance Guide

SUPREMATouch

Fire and Gas Warning Unit

MSA AUER GmbH
Thiemannstrasse 1
D-12059 Berlin

Germany

6 Maintenance and Service

Attention!

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 SUPREMATouch 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.

6.1 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 60079-29-2 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.

Passive Sensors

Before calibration, make sure that the sensors have recovered.

Attention!

At least 2 people are required to perform the calibration. To avoid communication problems between Person 1 operating the SUPREMATouch 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 supplies 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 SUPREMATouch] 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.

Attention!

Enter the concentration of the measurement gas in the gas mixture used for zero calibration in this field [usually 0%].

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” button.

Attention!

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 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 [100 % 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 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 "Store" button has been pressed. In a first 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 – the bar display is completely filled – actuate "Store" button 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 – the bar display is completely filled – confirm the value by actuating the "Store" button. The value is shown now in the “CAL-SPAN/mV” field.
- Conclude the calibration of the selected input by actuating the "End" button.

Attention!

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 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.

Attention!

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 "Cancel" button. 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.

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 SUPREMATouch 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 first 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 SUPREMATouch, the calibration on the SUPREMATouch 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 with the "OK" button. 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].

Attention!

During this calibration the measuring point must be inhibit [alarm rejection].

> **Attention!**
> No adjustments on the MAI module are either necessary or possible for active sensors.

Calibration with a Variable Power Source

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:

> **Attention!**
> 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 gas concentration.
- Enter 100 % of the measuring range in the field “Test Gas” as the test gas concentration.
- Begin the calibration with the “Start” button.
- After actuating the “Start” button, 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 "Store" button. 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 20 mA, a value of 2.000 mV ± 10 mV should appear here.
- If the value UA is within the tolerance range [2000 mV ± 10 mV], confirm by actuating the "Store" button. The value will appear in the field “CAL-SPAN/ mV”.
- End the calibration of the selected measure point by actuating the "End" button
- 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.

Calibration by Means of the Sensor

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 set-up of the SUPREMATouch [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.

> **Attention!**
>
> At least 2 people are required to perform the calibration. To avoid communication problems between Person 1 operating the SUPREMATouch 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 supplies can be found in the operating and maintenance instructions for the sensor in question.

For the calibration, person 1 [at the SUPREMATouch] 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 gas concentration.
- 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”.

> **Attention!**
>
> 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” button.

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” button, 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 gas has been supplied for a sufficient period of time [the value remains stable], confirm the value by actuating the "Store" button. 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 stable], confirm the value by actuating the "Store" button. The value will appear in the he field “CAL-SPAN / mV”.
- Conclude the calibration of the selected measure point by actuating the "End" button.
- 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 gas supply at the next measure point to be calibrated.

Separate Zero Adjustment

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 SUPREMATouch 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” button] the zero adjustment can be carried out by actuating the „End“ button. The following confirmation dialog must be answered by entering <YES>.

Attention!

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 and if necessary replace the sensor.

Attention!

After the separate zero setting, no SPAN value is shown in the calibration menu and in the logbook for these settings.

6.2 Sensor Simulation Modules

For function test of the SUPREMATouch sensor inputs, simulation modules can be used independently from the sensor type.

Description of Function of Sensor Simulation Module 4 ... 20mA, Catalytic Combustion, Semiconductor

Design

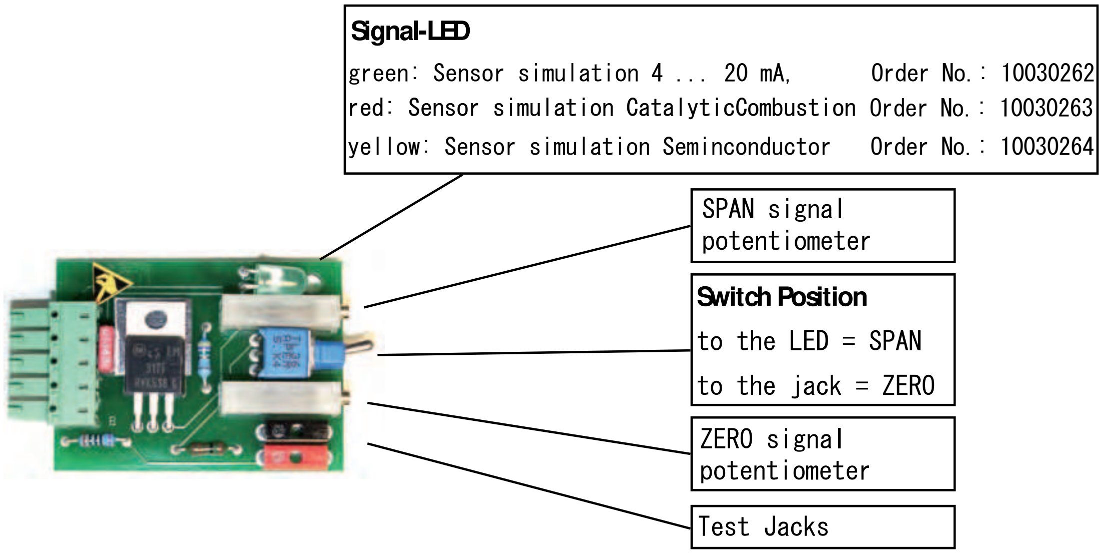


Fig. 49 Sensor simulation Module with rocker switch

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

for MCI – Check 4 ... 20 mA

Sensor type:	PrimaX
Measuring gas:	Carbon monoxide
Zero gas:	Air
Reference gas:	Carbon monoxide
Ua at open switch [Normal operation]:	400 mV
Ua 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:	Series 47k
Measuring gas:	Methane
Zero gas:	Air
Reference gas:	Methane
Ux at open switch [Normal operation]:	0 mV
Ux at closed switch [Alarm] :	100 mV

for MPI – Check Semiconductor Sensors

Sensor type:	DF-8101
Measuring gas:	Acetone
Zero gas:	Air
Reference gas:	Acetone
Ux at open switch [Normal operation]:	1.6 V
Ux at closed switch [Alarm] :	1.1 V

6.3 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.
- 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 first calibration as described in Chapter 6.1 , under consideration of the required sensor recovery time.
- Check the configuration of the sensors in the “Setup/Measure Points” menu.
- Unlock the measure point.

6.4 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 has to be replaced.

> **Attention!**
>
> Generally, all plug-in modules must only be replaced after the voltage to the SUPREMATouch system has been shut off. Also pull out and plug in the plug-in modules only after having disconnected the supply voltage connections.

In the following, the procedure for replacing individual modules is described.

Plug-In Modules

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 as follows:

- 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].

> **Attention!**
>
> 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 [Chapter 10.7]

- Replace the MCP20, or MDC20 and MDO20 modules [be careful with the ribbon cable connection between the MDC20 and the MDO20 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 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 [Chapter 10.7] must be inhibited.

If the MPI or MCI module is also to be replaced along with the MAI module, be careful to ensure that the correct assignment to the connected sensors is preserved [Chapter 10.7].

When MPI modules are being replaced, the following points must be kept in mind:

- The presetting of the MAI module [Chapter 11.3] must be performed again.
- The type of MPI must correspond to the type of connected sensor [→ Installation and Start-Up Guide].

> **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 [→ Installation and Start-Up Guide].

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 [→ Installation and Start-Up Guide].

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 [MRO-8 module] or on the MRC TS module [MRO 8 TS module] [→ Installation and Start-Up Guide].

Replacement of the MBC Module

It is necessary to turn off the system to replace the MBC module. To prevent alarms and malfunction messages, the relays must be inhibited directly on the MRC TS module [→ Installation and Start-Up Guide].

Connection Modules

Replacement of MAT/MAT TS, MUT, and MGT 40 TS Modules

These modules can be replaced without turning off the system, although the function in question [sensor input, relay driver or analogue 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 [→ Installation and Start-Up Guide].

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 LOCR connection on the MRC TS module, provided that the MRC TS module has a voltage supply separate from the system [→ Installation and Start-Up Guide]

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].

6.5 Changing the Password

If a currently valid password is to be changed, a new password can be entered in the following way:

- Select the corresponding password field in the “Setup/System” menu.
- You will be asked to enter the current password or to actuate the key switch.

> **Attention!**
>
> If you have forgotten the current password, a higher-value password can also be entered. If the current parameterisation password is also lost, 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 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 actuating the OK button.
- You can now enter the new password in the “Password” and “Confirmation” fields of the “Setup/System” menu.
- After actuating the OK button, the new password will be applied.

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 nothing. Authorization can then be granted only by the use of the key switch. 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.

6.6 Plug-In Modules– Status LED

In the case of the modules designed as plug-in modules, status LEDs are located in the upper left corner. The position and function of these LEDs are described in the following.

MCP, MDC, MBC, MDA, MGO, MAO Modules

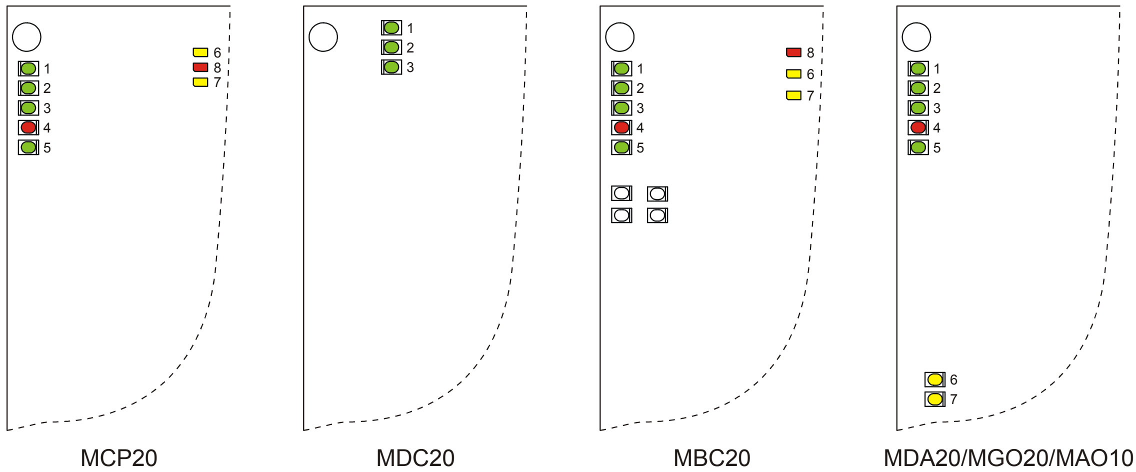


Fig. 50 MCP, MDC, MBC, MDA, MGO, MAO Modules, Status LEDs

LED-No.	Colour	Function	
1	green	ON:	The external voltage supply is selected by the module.
2	green	ON:	The internal voltage supply is selected by the module.
3	green	ON:	The battery voltage supply is selected by 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 failure
7	yellow	ON:	Voltage failure
8	red	ON:	Module is in reset state

Fig. 51 MCP, MDC, MBC, MDA, MGO, MAO Modules, Function Status LEDs

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 [→ Installation and Start-Up Guide]. The failure which occurred is stored in the SUPREMATouch logbook and can be found in the "Diagnosis/Logbook/System events" menu.

MAI Module

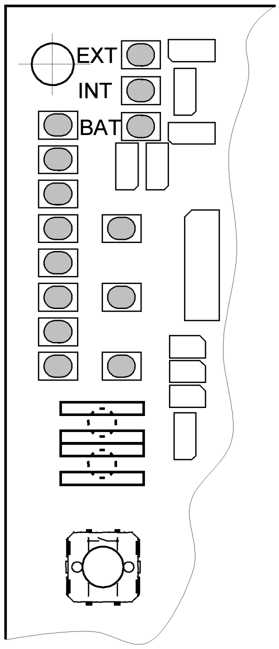


Fig. 52 MAI Module, Function Status LEDs

LED	Colour	Function	
EXT	green	ON:	The external voltage supply is selected by the module.
INT	green	ON:	The internal voltage supply is selected by the module.
BAT	green	ON:	The battery voltage supply is selected by the module.

Fig. 53 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.

6.7 Diagnostic Functions

The structure and operation of the “Diagnosis” menu are described in detail in the Instruction Manual. 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.

Logbook Functions

The logbook is divided into seven history menus:

- Calibration
- System Events
- Alarm Events
- Signal Events
- Changes
- Supply Voltage
- Processor Temperature

The History entries are shown as list view in chronological order.

> **Attention!**
>
> You can scroll vertically and horizontally through the lists by dragging and dropping it to the desired position.

Calibration History

The date/time of the last four calibrations and last presettings are stored here for each measure point. If there are more than 4 calibration entries, the oldest calibration entry is overwritten. Exception: the first calibration is always kept.

The presetting entries are overwritten with the next similar presetting. Basically, every presetting deletes all calibration entries of the corresponding measuring point.

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.

> **Attention!**
>
> The signal voltage values [preamplified signal UA and difference voltage Ux] and the unit are visible on the MDO module display only after scrolling.

System Events History

Here, system events are recorded for service purposes. These serve as a source of information for the MSA service personal.

Alarm Events History

Crossings of the alarm threshold, confirmations and resets of alarms 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.

Signal Events History

Signal failures, confirmations and resets of signal failures as well as primary power system changes are stored in this history. The date/time of the incident, if applicable, the measure point involved and a short description are given.

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.

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 number;
- 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 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:

- the date and time when the temperature exceeded or fell below the limit;
- the serial no. of MDA module;
- the temperature value and
- information on whether the incident involved a departure from the allowed range or a return to the allowed range.

Measure Points

This menu displays the current data of the measure points present in the system.

Modules

This menu displays the current data of the modules present in the system.

6.8 System Failure Messages

No.	Failure Message Text	Module	Appears in case of	Disappears in case of	Error LED	Fail LED	Info 1 [BYTE]	Info 2 [DWORD]	Remarks/ Remedial action
1	dynamic memory overflow	All	Stack overflow or stack underflow detected	Restart	X	X	Task ID	Memory address	Generally software problems [e.g. wrong stack dimensions] Perhaps sequence error to No. 2,3 or 6
2	error in work memory	All	RAM failure detected [Self-test]	Whole RAM tested failure-free [after approx. 24 h]	X	X	Bit pattern fault bits	Memory address	Hardware defect: exchange module
3	error in program memory	All	ROM failure detected [Self-test]	Whole ROM tested failure-free [after approx. 24 h]	X	X	1 → found during system start; 0 → otherwise	loWord → CRC found; hiWord → CRC should be	Hardware defect: exchange module
4	internal timeout	All	Life sign of at least one task is missing	All tasks gave life sign in time	X	X	Nominal value of task flags [8 lowest Bits]	loWord → task flags is; hiWord → task flags should be	Perhaps sequence error of CAN bus failure. Check bus.
5	data lost on bus	MDA, MGO, MAO	CAN controller detects overflow	CAN Controller in normal mode	X	X	Always 0	Always 0	Perhaps not correctly terminated bus or modules with wrong bitrate at the bus. [Green CAN-LED indicates the status of the bus.] May also be defect hardware.
6	fatal internal error	All	Exception Interrupt [e.g. write access to ROM, invalid memory address...]	Restart	X	X	Exception number	Memory address	Hardware defect: exchange module Perhaps sequence error to No. 1, 2 or 3
7	buffer overflow	MCP, MDO, MDA, MBC	Overflow of the internal processing queues.	Restart	X	X	Queue number	Queue Status	Perhaps in combination with No. 4 at system overload or sequence error to CAN bus failures
8	communication error on bus	MCP, MDO	Error during SDO transfer [transfer of configuration and parameter data]	SDO transfer successfully ended	X	X	CAN-I/O error code	Additional data [error code depended]	Perhaps CAN-bus failure: check Bus. Check MCP and MDO for incompatible software status. May occur when hot plugging modules.
9	system error of configuration memory	MCP, MDO, MBC	Error on accessing flash memory which contains parameter and configuration data	Restart	X	X	Flash error code	Additional data [error code depended]	Hardware defect: exchange module Perhaps in combination with No. 10 or 15.

No.	Failure Message Text	Mod-ule	Appears in case of	Disap-pears in case of	Error LED	Fail LED	Info 1 [BYTE]	Info 2 [DWORD]	Remarks/ Remedial ac-tion
10	error in con-figuration memory	MCP, MDO, MBC	Flash error detected [Self-test of the configu-ration and parameter memory]	Whole flash test-ed error-free [after approx. 24 h]	X	X	Always 0	Always 0	Hardware defect: ex-change module
11	data lost at serial com-munication	MDO	Error at serial communica-tion	Restart	X	X	Interface number	loWord → number of charac-ters; hiWord → status	Data lost at PC or printer interface: Check cables Perhaps hardware de-fect: exchange MDO module
12	node guard-ing error de-tected	MCP, MDO	Module does not respond to node-guarding, or does not send any heartbeat	All nodes respond again	X	X	ID of node that doesn't re-spond	If the node in info 1 is an MDA and info 2 is not 0, this is the MAI number	CAN-Bus failure, module defect or missing: Check bus and modules
		MGO, MAO			X	X	Always 0	Time in system-ticks	no output data was re-ceived for a certain time: check bus and MCP/ MDO modules
13	program er-ror	MCP, MDO	Application program er-ror	Restart	X	X	Applica-tion error code	Additional data [error code de-pended]	Normally software prob-lems [not plausible inter-nal software status]
14	data error	MCP, MDO	Application program er-ror	Restart	X	X	Applica-tion error code	Additional data [error code de-pended]	Normally software prob-lems [not plausible inter-nal software data] Often sequence error of No. 9 or 10
15	system con-figuration error	MCP	The system configuration detected does not cor-respond to the configu-ration stored or is not con-sistent	Restart	X	X	Configu-ration er-ror code	Additional data [error code de-pended]	Modules on wrong plug position? Several racks of the same ID [switch] in the system?
		MDA	Module in invalid slot	Restart	X	X	Slot number	Always 0	The module is in an invalid slot
		MAO, MGO	Module in invalid slot	Restart	X	X	Always 0	Always 0	The module is in an invalid slot
16	data acqui-sition error	MDA	SPI commu-nication error between MDA and MAI	SPI com-munica-tion all right again	X	X	SPI error code	Additional data [error code de-pended]	MAI or MDA defect. Can also be caused by defect rack. Always appears if a MDA but not a MAI, is be-ing plugged in a rack.
		MGO	SPI commu-nication error between MDA and MAI or at dig-ital outputs [MGO]	SPI com-munica-tion respec-tively out-puts all right again	X	X	1-5 → number of errone-ous output block FF → hardware defect	MGO: diagnosis code	Outputs short circuited or open or module defect.

6.9 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	

Fig. 54 ID Rack Assignment in decimal and hexadecimal figures

Slot No. 16 of a rack is reserved for the MDO only. Only one MDO can be contacted in one system.

6.10 Display of Digital Messages

Message	Priority	Display [List]	LEDs/Relays
Alarm 1	9	Measure points status 1st Alarm	Signal AL 1 at
Alarm 2	8	Measure points status 2nd Alarm	Signal AL 2 at
Alarm 3	7	Measure points status 3rd Alarm	Signal AL 3 at
Alarm 4	6	Measure points 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		
Free	1	Measure point status free	
Measuring	10	Measure point status measuring	
Inhibit	2	Measure point status inhibited	Inhibit at
DO [Disable Output]	2	Measure point point status	Inhibit flashing
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

Fig. 55 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.

6.11 LED and Sounder Test

An LED and sounder test is provided for the MDO which enables a visual functional test of the front panel LEDs and an acoustical test of the sounder. This test can be carried out independently from the active operating state of the SUPREMATouch and does not affect the mode of operation of the SUPREMATouch. To carry out this test, press the button 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.

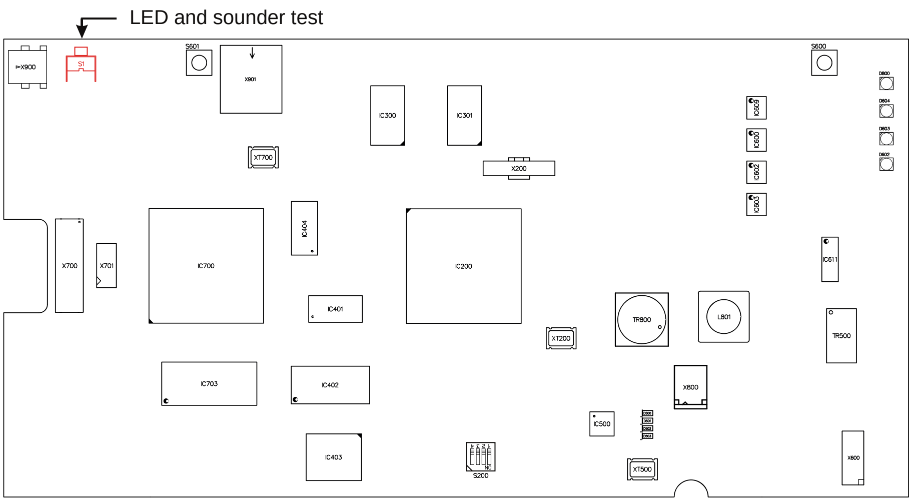


Fig. 56 MDO Module, Switch for LED Test

6.12 Instructions for system configuration

Configuration during initial installation

If there is no configuration in the SUPREMATouch during transfer of the configuration and the first MCP is not plugged into Slot1 of the rack, the PC program "SUPREMA Manager" displays an error message "transmission failed". This can be ignored.

Varying or manual selection of a configuration

If there are different configurations in the SUPREMATouch modules, e.g. because of replacement of an MCP, a system configuration message appears when the system is switched on for the first time after the modification. The module from which the [effective] configuration is to be taken must be specified.

If the configuration is to be taken manually from a particular module, press the RESET button for approx. 1 second directly after switch-on. The system configuration message appears after the system starts so that the configuration of a module can be selected.

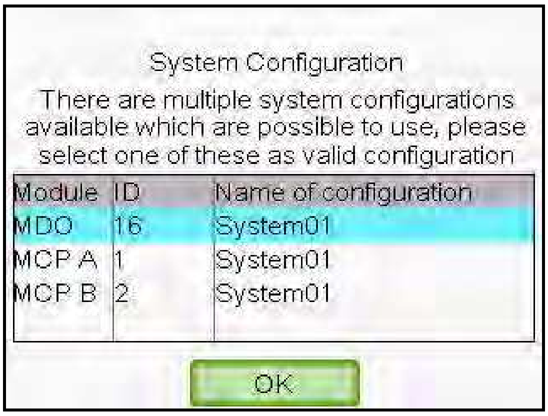


Fig. 57 System Configuration Message

Selection of the Configuration

Touch the desired configuration to select it. Press OK to copy the selected configuration to other MDO and/or MCP modules.

> **Attention!**
>
> If a configuration is transferred to the SUPREMATouch with the "SUPREMA Manager", this configuration is always saved in the MDO. If you are not sure that the configuration was distributed to the system, the configuration of MDO is to be selected.

Removal of entries from a configuration

If removing measuring points from a configuration, care should be taken to ensure that all parameters of these measuring points [settings, connections, etc.] are deleted in the SUPREMATouch before the new configuration is transferred to the SUPREMATouch.

If the system still contains parameters from measuring points that are no longer configured after re-starting with reduced configuration, the SUPREMATouch stops with a SYSTEM FAILURE with the status message "system start in progress…".

Corrective measure: Delete the invalid parameter with the PC program "SUPREMA Manager". Communication with the SUPREMATouch is possible in this system status

7 System Expansions

Up to 256 inputs can be connected to a SUPREMATouch system. Up to 512 digital outputs 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 installed in addition must be registered in the system using the SUPREMA Manager.

7.1 Connection of Additional Sensors

Up to 256 sensors can be connected to a SUPREMATouch 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 MGT 40 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 [→ Installation and Start-Up Guide].

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 equals 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. To avoid alarm or error messages, the inputs belonging to the MAI module [→ Installation and Start-Up Guide] or the relays belonging to the inputs [→ Installation and Start-Up Guide] 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 the Installation and Start-Up Guide.

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 the Installation and Start-Up Guide.

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/MGT 40 TS modules will also be needed. To avoid alarm and error messages, the connected relays [→ Installation and Start-Up Guide] 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 the Installation and Start-Up Guide.

3. All of the existing MAI modules are assigned, or the number of free inputs is smaller than 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/MCI modules are required, depending on the number of new sensors to be connected. Additional MAT/MAT TS/MUT/MGT 40 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 the Installation and Start-Up Guide. Be sure to choose the correct CAN bus Bit rate and CAN node number.

Attention!

Whenever you connect additional sensors, always make sure that the voltage supply to the system is still adequate [→ Installation and Start-Up Guide]. If necessary, install a voltage supply which meets the new requirements.

7.2 Connection of Additional Relay Driver Outputs

Additional Relay Connections

One SUPREMATouch 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 [→ Installation and Start-Up Guide]. 5 MRO 8 TS modules, each with 8 relays, can be connected per MRC TS module. The connection procedure is described in detail [→ Installation and Start-Up Guide].

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.

Attention!

In both cases, the relay outputs must be configured as instructed [→ Installation and Start-Up Guide].

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 [→ Installation and Start-Up Guide]. 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 10.7 Connection of the 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 the Installation and Start-Up Guide. Take special care to choose the correct CAN bus baudrate and CAN node no.

Additional relay modules are to be connected as described under Point 2a].

Attention!

In both cases, the relay outputs must be configured as instructed [→ Installation and Start-Up Guide].

Attention!

Whenever you connect additional outputs, always make sure that the voltage supply to the system is still adequate [→ Installation and Start-Up Guide]. If necessary, install a voltage supply which meets the new requirements.

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 10.7 Connection of the Relay Outputs]. Instead of the MRO and MRC TS modules, however, MGT 40 TS modules are required, which are connected via ribbon cable and an MUT module to the MGO module plugged into the rack [→ Installation and Start-Up Guide].

7.3 Connection of Additional Analogue Outputs

A maximum of 256 analogue outputs are provided by the SUPREMATouch, corresponding to the maximum number of sensors that can be connected.

One MAO module makes 8 analogue 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 carried out, depending on the extent to which the system has already been expanded:

1. Not all of the 8 possible analogue outputs on an existing MAO module have been assigned. The number of free analogue outputs is equal to the number of new analogue outputs to be connected.

No additional modules are required. The additional analogue outputs can be connected to the existing MAT or MAT TS module.

2. All existing MAO modules are assigned, or the number of free analogue outputs is smaller than the number of new analogue 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 analogue outputs to be connected.

Additional MAT/MAT TS/MUT modules are also required.

3. All of the existing MAO modules are full, or the number of free analogue outputs is smaller than the number of new analogue outputs 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 analogue outputs to be connected.

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 the Installation and Start-Up Guide. Take special care to choose the correct CAN bus baudrate and CAN node number.

Attention!

Whenever you connect additional sensors, always make sure that the voltage supply to the system is still adequate [→ Installation and Start-Up Guide]. If necessary, install a voltage supply which meets the new requirements.

8 Ordering Information

8.1 Modules and Accessories

Order No.	Name
10101581	SUPREMA MCP 20
10015759	SUPREMA MAT analogue Terminals
10022311	SUPREMA MAT TS analogue Terminals [rail]
10050713	SUPREMA MAI 20 analogue Input
10050714	SUPREMA MAR 10 analogue 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
10080011	SUPREMA MDA 20 Data Acquisition
10083804	SUPREMA MGO 20, General Output Board
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]
10112807	SUPREMA MRO 20-8-TS
10112805	SUPREMA MRO 20-16-TS
10105281	SUPREMA MRO 10-16-TS-SSR
10115115	SUPREMA MRO20-8-TS SSR
10021050	SUPREMA MAO analogue 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
10109638	SUPREMA MDO 20
10105306	SUPREMATouch Rack [w/o pw sup,w MDO]
10097135	SUPREMATouch Rack 150 W [w pw sup,w/o MDO]
10097147	SUPREMATouch Rack [w/o pw sup,w/o MDO]
10105307	SUPREMATouch Rack [150 W] [w pw sup,w MDO]
10069677	SUPREMA MSO Status Output
10030078	SUPREMA CAN-Bus Terminator, D-SUB, female
10030079	SUPREMA CAN-Bus Terminator, D-SUB, male
10030080	SUPREMA CAN-Bus T-Piece
10030083	SUPREMA CAN-Bus Cable, 5 m, D-SUB, female/male
10030084	SUPREMA CAN-Bus Cable, 0,5 m, D-SUB, female/male
10030087	SUPREMA Flat Ribbon Cable, D-SUB
10029644	SUPREMA RS 232 Cable, 2 m

10121866	SUPREMA Manual, German
10121863	SUPREMA Manual, English
10121868	SUPREMA Touch CD ROM - SUPREMA Manager
10035191	Printer EPSON LX-300+
10031949	SUPREMA Gateway CAN/MODBUS RTU
10121146	SUPREMA Gateway CAN/PROFIBUS DP II
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
10052880	SUPREMA Dummy Relay
10060041	SUPREMA Gateway CAN/MODBUS TCP
10110482	SUPREMA MDC 20
10105277	SUPREMA MBC 20-AdvEl
10105279	SUPREMA MBT 20
10088569	Touch pen

Fig. 58 Order No., Modules and Accessories

Installation and Start-Up Manual

SUPREMATouch

Fire and Gas Warning Unit

MSA AUER GmbH
Thiemannstrasse 1
D-12059 Berlin

Germany

9 Description of the System

9.1 Structure of the System (module descriptions)

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 and multitasking:

- MDA Module — DATA ACQUISITION Module (measurement signal input + preliminary processing)
- MGO Module — GENERAL OUTPUT Module (driver outputs for system messages)
- MAO Module — ANALOG OUTPUT Module (0 ... 20 mA outputs)
- MBC20-AdvEI Module — BUS COMMUNICATION Module (for use only with Advanced Electronics Fire Panel)
- MRO Module — RELAY OUTPUT Module (different models, 8/16 relays)

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

- MDC — DISPLAY CONNECTION Module (connection between MDO and MIB)
- MAI Module — ANALOG INPUT Module (signal processing + digitisation for 8 measuring sites)
- MCI Module — CURRENT INPUT Module MCI (signal processing for 0 ... 20 mA) MCI BFE (BFE = Smoldering Fire Detection) (Signal processing for 0 ... 20 mA especially for DF 8501, DF 8502, DF 8510 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.

9.2 Expansion Stages

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

• MDA Module	Data Acquisition Module.
• MAI Module	Analog Input Module.
• MCI and/or MPI Module	(maximum of 8 on one MAI module).
• MCP Module	Central Processing Module.
• MGO Module	General Output Module.
• MRO 8 Module	Relay Output Module (Common Alarms).
• MDO&MDC Module	Display + Operation Module.
• MFI Module	Fire Input Module.
• MSI Module	Switch Input Module.
• Rack	
• Power supply and external wiring/modules	

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 one more CENTRAL PROCESSING unit (MCP module), 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. (→ Chapter 13).

9.3 System Design Variants

- 19” racks for up to 64 sensors.
- System modules installed in racks.

9.4 Bus Protocol

The SUPREMATouch uses the CAN bus protocol. 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.

9.5 Descriptions of the Modules

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

The measurement values are acquired by means of the following units

• MAI Module	ANALOG INPUT Module (signal processing + digitisation for 8 inputs).
• MAR Module	ANALOG 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 (signal processing for 0 ... 20 mA) MCI BFE (BFE = Smoldering Fire Detection) (Signal processing for 0 ... 20 mA especially for DF 8501, DF 8502, DF 8510 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: Analog 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 (Attention: required only when a sensor is replaced and with manual presetting).

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

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.

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. (Chapter 10.3)

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.

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 4, 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. (Chapter 10.3)

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 (Analog 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 analog 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 Analog 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.
- Automatic presetting of the bridge current, zero point and sensitivity in passive sensors with MPI module through the SPI-Bus (possible only in connection with MDA20)
- 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) and sent to the MCP for evaluation.
- System Failure relay is activated when a processor error occurs.
- Euro card with a 96-way connector.

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 [via MDO], MAO module 4 ... 20 mA [via MDO], MGO module, relays, printer [via MDO], 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

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 a touch panel in conjunction with a Windows like user interface (configuration, performance of calibrations, etc.).

- Graphic display (320x240 pixels) with backlit LCD screen.
- System operated via touch screen, ACKN and RESET.
- 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.
- 1 x USB/RS232, electrically isolated (laptop/PC).
- 1 x RS 232, electrically isolated (printer interface).
- System Failure Relay is activated when a system malfunction occurs.
- Flash memory log book, divided into Calibration (4 calibration entries as well as 3 presettings per measuring point), system events (10000 entries), alarm events (50000 entries), signal events (50000 entries), Changes (400 entries), Supply voltage (200 entries) and Processor temperature (200 entries) for diagnostic purposes.

Display Connection/MDC Module

The Display Connection Unit (MDC module) is used to connect the MDO module to the system. It's only functions are the physical connection and the selection of the power supply.

Digital + Analog Output: MGO/MRC TS/MRO/MRO TS/MAO Modules

•	MGO Module	GENERAL OUTPUT UNIT (40 switching outputs, 24 V/0.5 A)
•	MRO 10-8 Module	RELAY OUTPUT UNIT (rack relay module, 8 relays, 230 VAC/3 A contacts)
•	MRC TS Module	RELAY CONNECTION Module (5 x MRO, 2 x 40 channels, ribbon cable)
•	MRO 10-8 TS Module	RELAY OUTPUT Module (rail-mount relay module, 8 relays, 230 VAC/3 A contacts)
•	MRO 10-16 TS Module	RELAY OUTPUT Module (rail-mount relay module, redundant, 16 relays, 230 VAC/3 A
•	MAO Module	ANALOG OUTPUT Module (source 0 ... 20 mA/500 Ohms load/electrically isolated from system power supply)
•	MRO 20-8-TS	RELAY OUTPUT Module (rail-mount relay module, 8 relays, 230VAC/5A contacts)
•	MRO 20-16-TS	RELAY OUTPUT Module (rail-mount relay module, 16 relays, 230VAC/5A contacts)
•	MRO 10-16-TS-SSR	SOLID STATE RELAY OUTPUT Module (rail-mount solid state relay module, 16 relays, 24 VAC/100 mA)
•	MRO20-8-TS SSR	SOLID STATE RELAY OUTPUT Module(rail-mount solid state relay module, 8 relays, 24 VAC/100 mA)

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 relay modules.

MAO Module (Analog Output)

This module is used when analog outputs (max. 256) are installed in the system. Each MAO module has 8 analog signal outputs for 0(4) ... 20 mA current loops. The assignment between the outputs and the signal inputs can be configured.

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

Measurement signal output: Measuring range over flow:	4 ... 20 mA22 mA (Values between 20 and 22mA are still valid measuring values, but out of range)3.0 mA 3.2 mA(see chapter 10)
INHIBIT: Signal failure: Fail dependent of Free A/Free B	

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

Power Supply, Bus Connections, Connecting Technique

• MSP Module	System Power Unit (power supply unit, 85 ... 265 VAC/24 VDC)
• MIB Module	Interconnection Board (rack, bus circuit board)
• MST Module	System Terminals (RS 232, RES, ACK, LOCK, CAN)
• MAT Module	Analog Terminal Unit (terminals for sensors on the rack)
• MAT TS Module	ANALOG TERMINAL UNIT (terminals for sensors on mounting rail)
• 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 reserved 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. Each rack clearly indicates which module can be used in each slot.

- Rack rear-panel wiring for 2 x MCP modules, 2 x MDA modules, 8 x MAI/MGO/MBC modules, and additional 2 x MGO/MBC 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
- 2 System Failure Relays, 1 changeover contact, 3 connection terminals
- DIL switch for CAN rack ID, CAN bus termination, system behaviour (FreeA/B) and Baudrate
- 5 dedicated slots for 2 x MCP, 1 x MDC+MDO, 2 x MDA modules
- 10 undedicated slots for MAI (only 8), MAO, MGO, or MBC 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 MST10: 2x CAN A, 2x CAN B, RS 232-A (PC operation), RS 232-B (serial printer, output from messages), RS 232-C (unused), alarm reset (RES), horn reset (HACK), relay inhibit (LOCR), password key switch (PSW).

MAT Module (Analog 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 (Analog 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 modules (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 SSR TS	optional 8 solid state relays, installed on mounting rail (for very low current switching applications)
•	MRO 16 SSR TS	optional 16 solid state relays, redundant layout, installed on mounting rail (for very low current switching applications)

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 safety relevant 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 2 MGO modules are used and 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 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:	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

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

9.6 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.

Attention!

During the operation of SUPREMA Systems with UPS or battery back-up, care should be taken to ensure that no undefined low voltage operation (U < 19V DC) can arise or else it can have adverse effects on the System Functions.

If, for example, a battery is connected directly to the SUPREMA and the normal 24 VDC supply unit fails, then the battery become the power supply of the system. If the 24 VDC supply unit is not restored promptly and no external action is taken, there is the danger of:

- deep discharge of the battery
- permanent damage and destruction of the battery.

In order to protect the battery and the SUPREMA against damage, an additional deep discharge contactor component is required in the corresponding 24V feeder (e.g. deep discharge contactor C1900-TLS, Mentzer or similar).

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.

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.

BAT Terminals (Backup Battery Power Supply)

- Backup battery power supply for all units of a rack (21 ...28 VDC).
- If the internal and/or the external power supply fails, the system receives its power here.
- Maximum supply current of 20 A.

Features of the System Power Supply

- The customer is responsible for providing a safety cut-out (maximum rack power, 480 W/ 20 A).
- 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.

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.

Functions:

- 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.

10 Installation

10.1 General Information

Installation Instructions for Following the EMC Directives

The devices of MSA have been developed and tested in accordance with the EMC Directives 2004/108/EG 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 clean ground or clean potential ground 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.

Instruction 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 2060 (Schaffner) or equivalent
- For the external 24-volt supply, a line filter of type FN 660 (Schaffner); 20 A 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 potential ground.
- 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 potential ground.
- 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.).

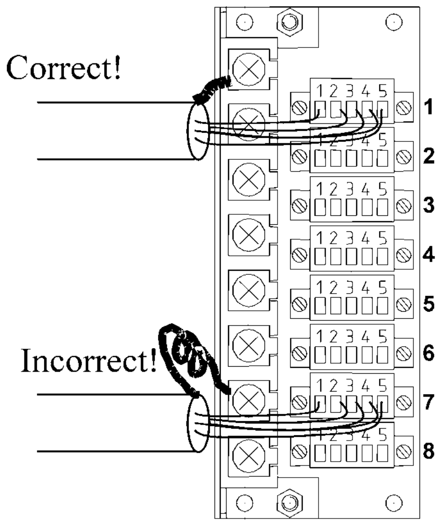


Fig. 59 MAT Module, connection of the screening

Connection of the Sensors:

(3) 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.

(4) 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.

MUT Module connected to MAT TS Module

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

MUT Module connected to MRC TS Module

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.

MRC TS Module connected to MRO 16 (8) TS Module

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

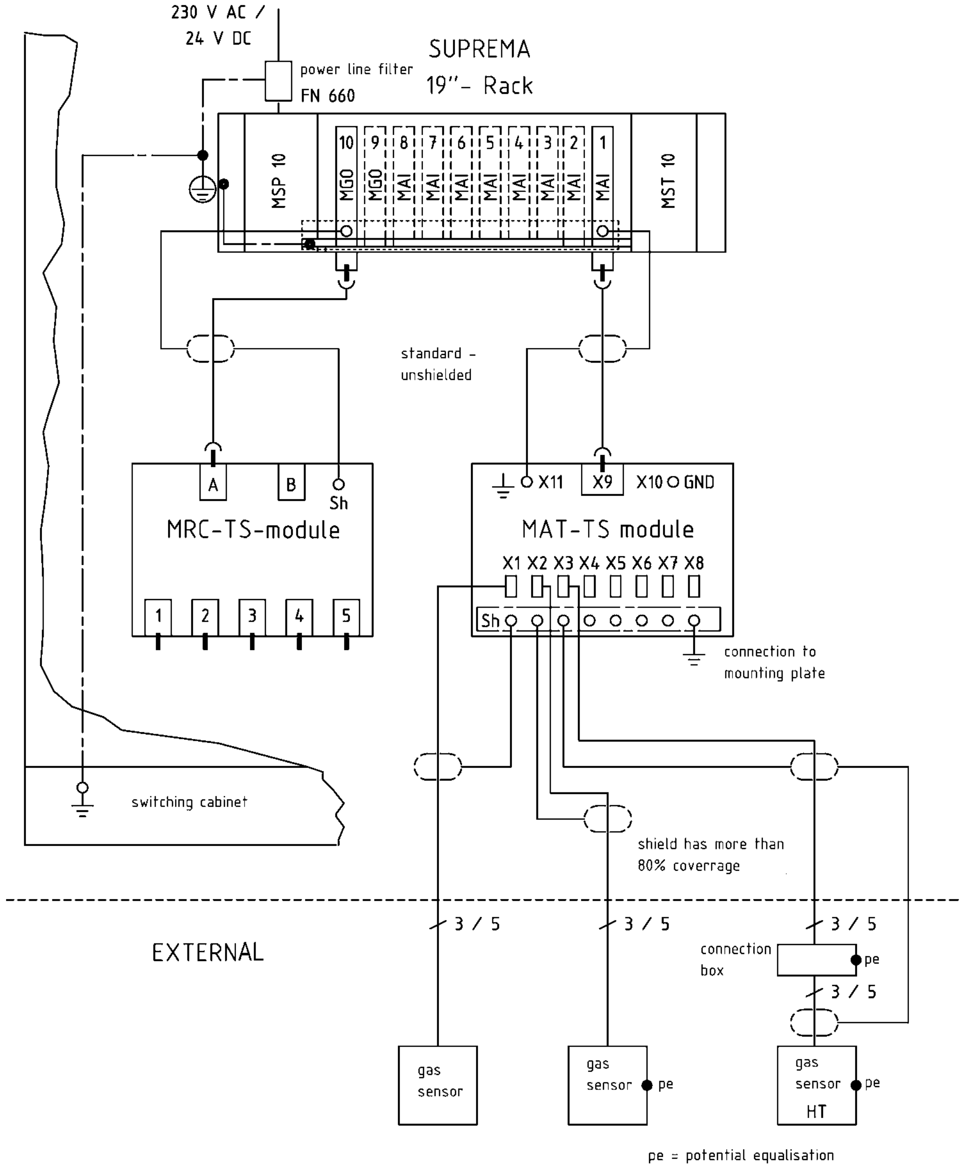


Fig. 60 SUPREMA shielding and grounding concept

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.

General:

EN 60079-29-2	Gas detectors - Selection, installation, use and maintenance of detectors for flammable gases and oxygen.
IEC 61508	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 61000-6-3	Electromagnetic Compatibility. Generic emission standard. Residential, commercial and light industry.
EN 60079-29-1	Gas detectors - Performance requirements of detectors for flammable gases
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.
EN 45544	Electrical apparatus used for the direct detection and direct concentration measurement of toxic gases and vapours
EN 50402	Electrical apparatus for the detection and measurement of combustible or toxic gases or vapours or of oxygen - Requirements on the functional safety of fixed gas detection systems

Warning!

The area where the modules are installed must be outside of a hazardous 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.

10.2 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 Chapter 11.

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.

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.

Cabling

The terminal posts on the **Analog 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 0.14 ... 1.5 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 RS 232 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)	0.14 mm^2 - 1.5 mm^2
MSP Module (rack power supply, 150W)	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

Fig. 61 Allowed Conductor Cross Sections

Type of Sensor	Number of Wires	Cable Type	Max. cable loop resistance in ohms	Maximum Length	Remarks
D-7100 Series 47K	5 x 0.75 mm^2 5 x 1.5 mm^2	Y(C)Y Y(C)Y	36 ohms 36 ohms	750 m 1500 m	Screened cable is required.
D-7010	5 x 0.75 mm^2 5 x 1.5 mm^2	Y(C)Y Y(C)Y	28 ohms 28 ohms	500 m 1000 m	Screened cable is required.
D-7100 Series 47K	3 x 0.75 mm^2	Y(C)Y	36 ohms (3.4 ohms for ATEX)	750 m (70 m for ATEX	Screened cable is required.
	3 x 1.5 mm^2	Y(C)Y	36 ohms (3.4 ohms for ATEX)	1500 m (140 m for ATEX)	
D-7010	3 x 0.75 mm^2	Y(C)Y	28 ohms (3.4 ohms for ATEX)	500 m (70 m for ATEX)	Screened cable is required.
	3 x 1.5 mm^2	Y(C)Y	28 ohms (3.4 ohms for ATEX)	1000 m (140 m for ATEX)	
DF-9500 DF-9200	2 x 1.5 mm^2	NYSLYCYÖ (CY(Ex)i)	500 ohms (100 ohms for EX zone)	20000 m (4000 m for EX zone)	Screened cable is required. The values in parentheses apply only to the DF-9500 in association with zener barriers (operation in explosive area, cable colour 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 mm^2	Y(C)Y	20	1000 m	Screened cable is required
DF-8201 DF-8250	3 x 1.5 mm^2	Y(C)Y			Screened cable is required
DF-8502	3 x 1.5 mm^2	Y(C)Y	20	1000 m	Screened cable is required
DF-8510	3 x 1.5 mm^2	Y(C)Y	200 ohms	1000 m	Screened cable is required
GD10	3 x 1.5 mm^2	Y(C)Y	20	840 m	Screened cable is required
SafEye FlameGard	4 x 1.5 mm^2	Y(C)Y	10	420 m	Screened cable is required
Ultima X 2 wire	2 x 0.5 mm^2	Y(C)Y		2000 m	Screened cable is required
Ultima X 3 wire	3 x 0.5 mm^2 3 x 1.0 mm^2 3 x 1.5 mm^2	Y(C)Y		300 m 750 m 1250 m	Screened cable is required
PrimaX					See transmitter specific manual.

Type of Sensor	Number of Wires	Cable Type	Max. cable loop resistance in ohms	Maximum Length	Remarks
PrimaX IR					See transmitter specific manual.
FlameGard 5 MSIR	3 x 1.5 mm^2	Y(C)Y	20 Ohm loop	1000 m	See transmitter specific manual.
FlameGard 5 UV/IR	3 x 1.5 mm^2	Y(C)Y	20 Ohm loop	700 m	See transmitter specific manual.
FlameGard 5 UV/IR-E	3 x 1.5 mm^2	Y(C)Y	20 Ohm loop	700 m	See transmitter specific manual.
Ultima MOS-5	3 x 1.5 mm^2	Y(C)Y	20 Ohm loop	500 m	See transmitter specific manual.
Ultima MOS-5E	3 x 1.5 mm^2	Y(C)Y	20 Ohm loop	500 m	See transmitter specific manual.
Ultima OPIR-5	3 x 1.5 mm^2	Y(C)Y	20 Ohm loop	200 m	Receiver w/o relay and heater. See transmitter specific manual.
UltraSonic EX-5	3 x 1.5 mm^2	Y(C)Y	20 Ohm loop	1000 m	See transmitter specific manual.
UltraSonic IS-5	3 x 1.5 mm^2	Y(C)Y	40 Ohm loop	1800 m	See transmitter specific manual.

Fig. 62 Cable Specifications

The maximum length of a cable is calculated as follows

$$l = \frac{R * K * A}{2}$$

, where R is the maximum load in ohms,

$$k = 56 \frac{m}{Ohm * mm^2}$$

(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 figure 63. It is possible to enlarge the distances by the use of a CAN bridge.

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

Fig. 63 Maximum Allowable CAN Bus Length

Attention!

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

10.3 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.

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.

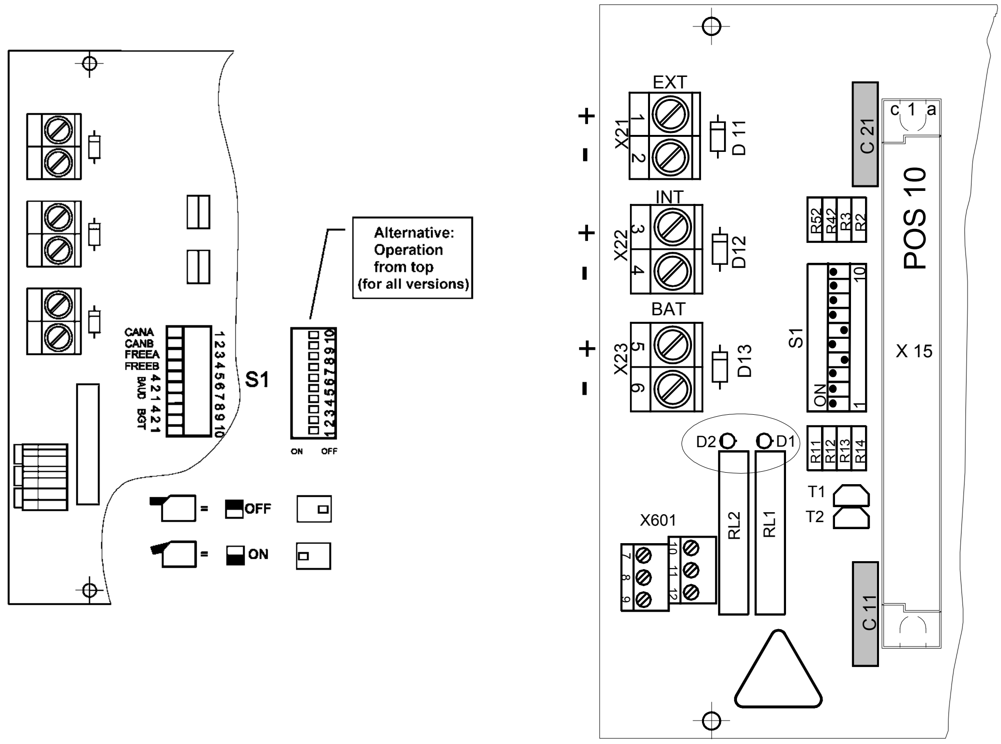


Fig. 64 MIB Module, DIL Switch (BGT = Rack No.)

MIB 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					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			

Fig. 65 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

Fig. 66 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 modules 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 (Standard)	ON	ON								
Terminating Resistor Open	OFF	OFF								

Fig. 67 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. (Standard)			ON	ON						
All relays remain de-energised	After 72 h, all relays are de-energised (according SIL 3)			OFF	ON						
All relays are energised	All relays keep their last state			ON	OFF						
All relays are energised	After 72 h, all relays are energised.			OFF	OFF						

Fig. 68 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 analog 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 analog outputs are 0 mA.	All analog outputs keep there last state. (Standard)			ON	ON						
All analog outputs are 2 mA.	All analog outputs keep there last state.			OFF	ON						
All analog outputs are 0 mA.	After ca. 2 min all along outputs are 0 mA.			ON	OFF						
All analog outputs are 2 mA.	After ca. 2 min all along outputs are 0 mA.			OFF	OFF						

Fig. 69 MAO Module, Configuration of turn-on behaviour and failure behaviour

Explanation of the symbols

= Any switch

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.

The terminal posts on the (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.

Attention!

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 (Chapter 10.3)

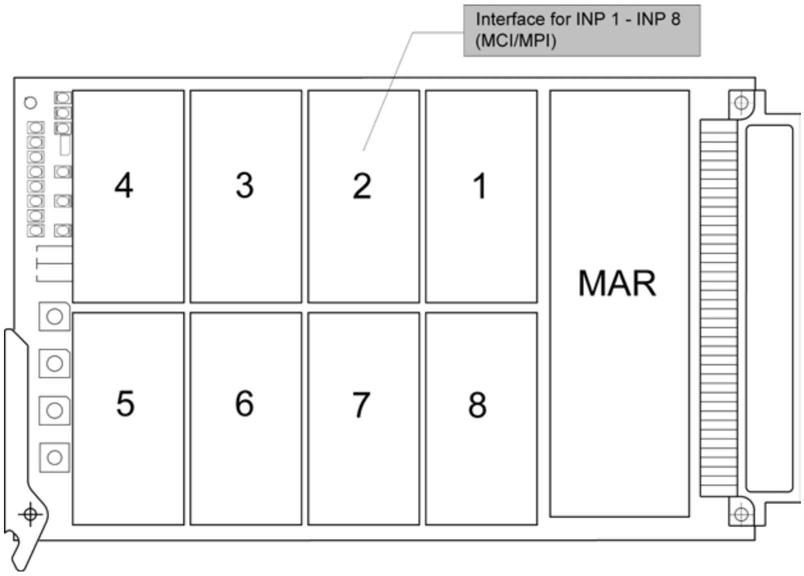


Fig. 70 MAI Module, position of adapter modules 1-8

MAR = Analog Redundant	only with redundant systems
MCI = Current Input	depending on type of sensor (active/passive)
MPI = Passive Input	
MFI = Fire Input	
MSI = Switch Input	

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

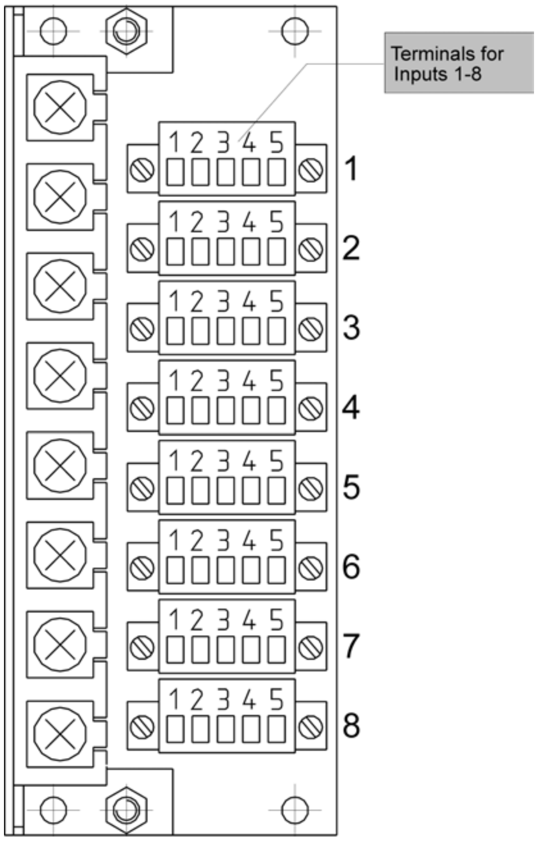


Fig. 71 MAT Module, position of the terminals for input 1-8

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.

Attention!

MPI modules 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

Fig. 72 2-10 Types of MPI Modules

The type of sensors must be matched to the type of module, otherwise the sensor or the module will be destroyed.

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

Attention!

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

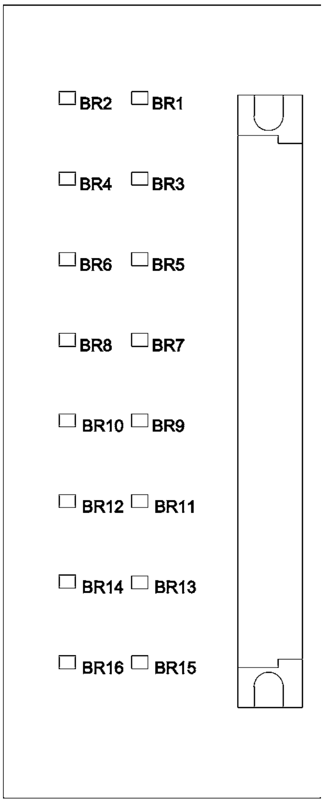


Fig. 73 Configuration of MAT Module

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

> **Attention!**
> 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

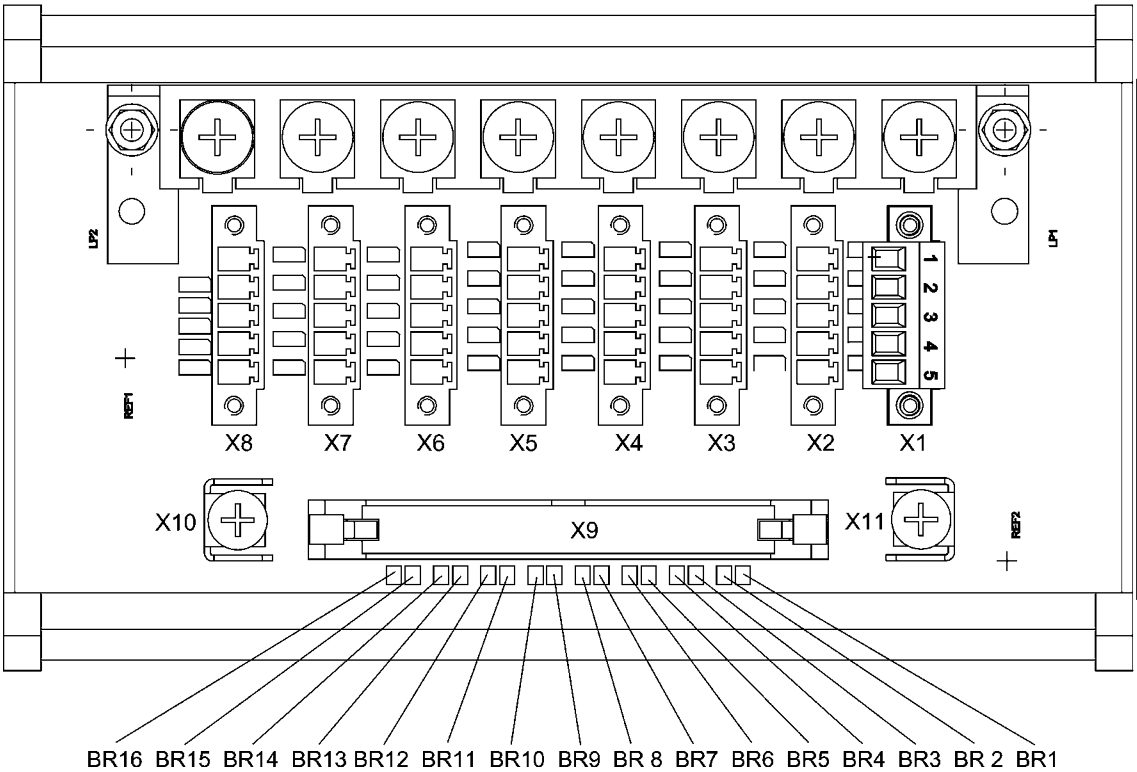


Fig. 74 Configuration of the MAT TS Module

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 (Chapter 10.10) 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

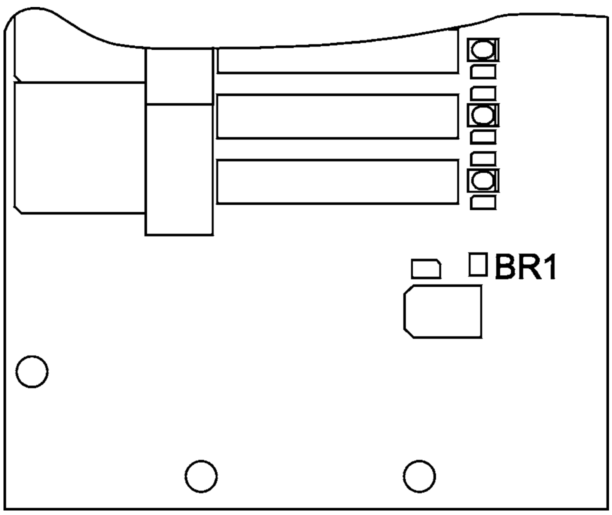


Fig. 75 Configuration of the MRO 8 Module

> **Attention!**
>
> Because the common alarms are normally energised 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).

Configuration of the MRC TS Module

A solder bridge (BR1), which is used to determine the function of the relay inhibit (Chapter 10.7) 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

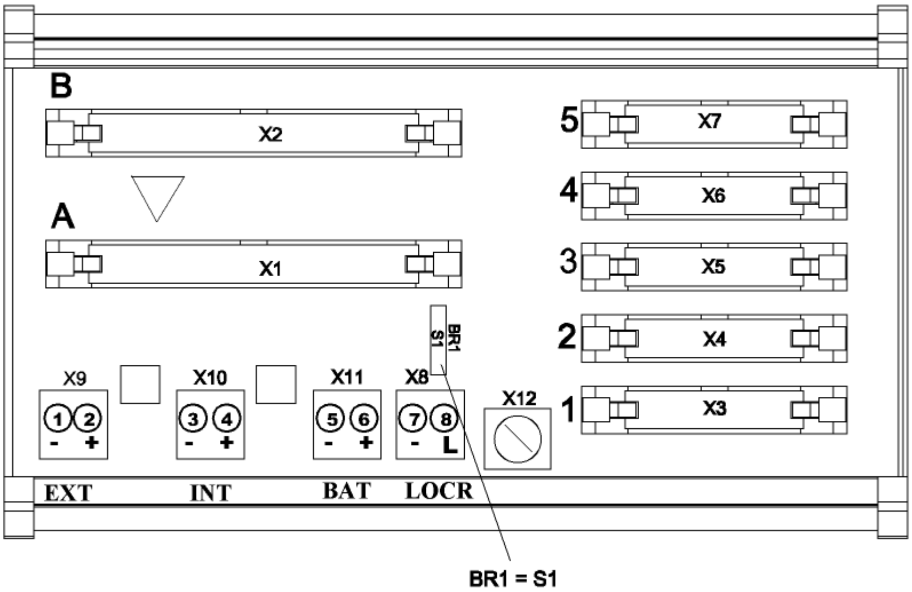


Fig. 76 Configuration of the MRC TS Module

> **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.

Configuration of the MRO 8 TS Module

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

Configuration of the MRO 16 TS Module

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

Configuration of the MUT Module

No configuration

Configuration of the MAR Module

No configuration

Configuration of the MST Module

No configuration

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 module 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

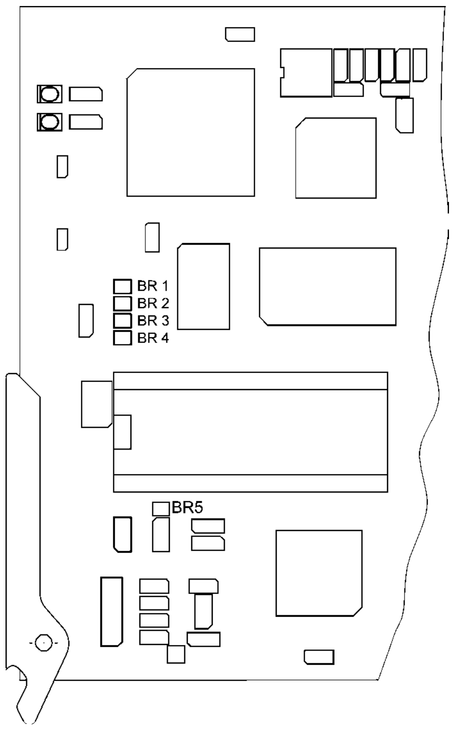


Fig. 77 Configuration of the MAO Module

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 module	
				Turn-on behaviour	**Behaviour at CAN failure**
OFF	OFF	OFF	OFF	All analog outputs at 2 mA.	All analog outputs at 2 mA.
X	ON	OFF	OFF		Last state is kept
ON	X	OFF	OFF	All analog outputs at 0 mA.	

X: Any switch

CAN-A-/B settings

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

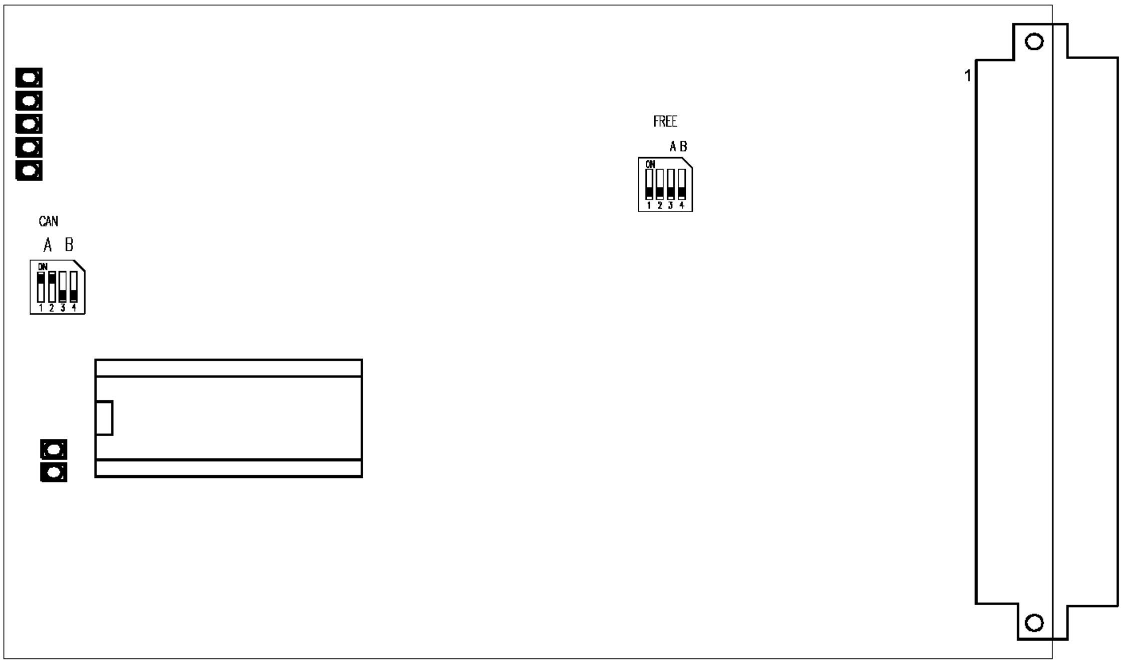


Fig. 78 Configuration MAO Module, Layout version 6

> **Attention!**
>
> The MAO module is always controlled by the CAN-A bus and is always outputting the measuring values of the MDO module.

Configuration of the MGO-20 Module

The operating mode for the input signal through the CAN-A or CAN-B bus as well as the switch-on and configuration properties are to be set with DIL switches S3 and S4. Switch S1 is omitted. Figures 79 show the switch positions on the printed circuit board.

The module MGO-20 is furnished with a bootloader for installing new firmware. The switch S2-1 = OFF activates the bootloader mode.

> **Attention!**
>
> The normal function of the module is deactivated in the bootloader mode. This mode should therefore be used only by the MSA service personnel!

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

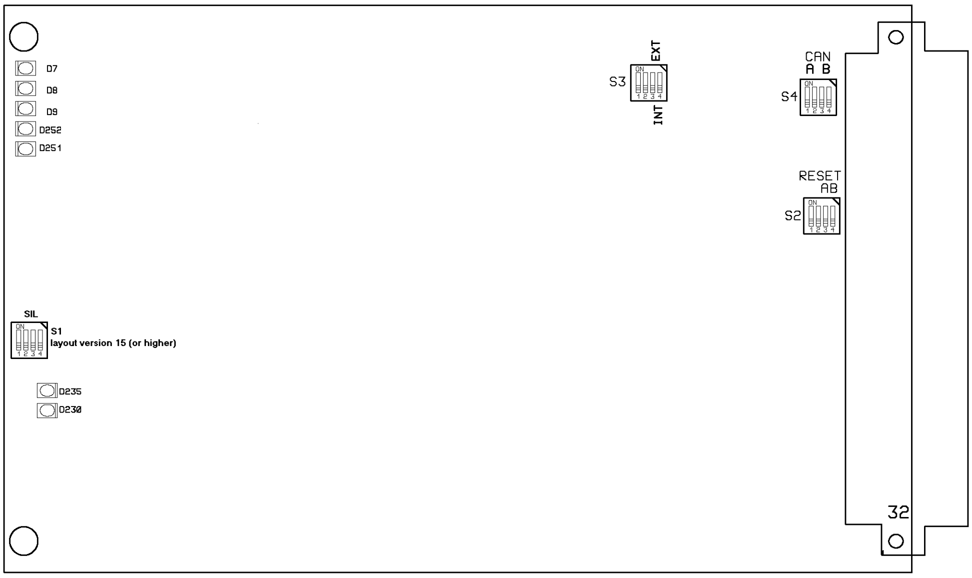


Fig. 79 MGO Module, as from layout version 15

Switch S2				Function
1	2	3	4	
ON	ON	OFF	OFF	Factory setting/Do not change
OFF	X	X	X	Bootloader active (only MGO-20)

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 (Standard)	
X	X	OFF	OFF	Function by switch FREE-A/B 1+2 on the MGO module	
				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 settings

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

Configuration of the MCP-20 Module

The MCP-20 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-20 module, however, the switch setting (S700 set to all OFF) illustrated in Figure 80, MCP-20 module, standard configuration, must be checked and corrected if necessary.

Switch S700

1	2	3	4	
OFF	OFF	OFF	OFF	Factory setting / Do not change
ON	OFF	OFF	OFF	Bootloader active
*	ON	ON	ON	Reserved

The module MCP-20 is furnished with a bootloader for installing new firmware.

The switch S700-1 = ON activates the bootloader mode.

Attention!

The normal function of the module is deactivated in the bootloader mode. This mode should therefore be used only by the MSA service personnel!

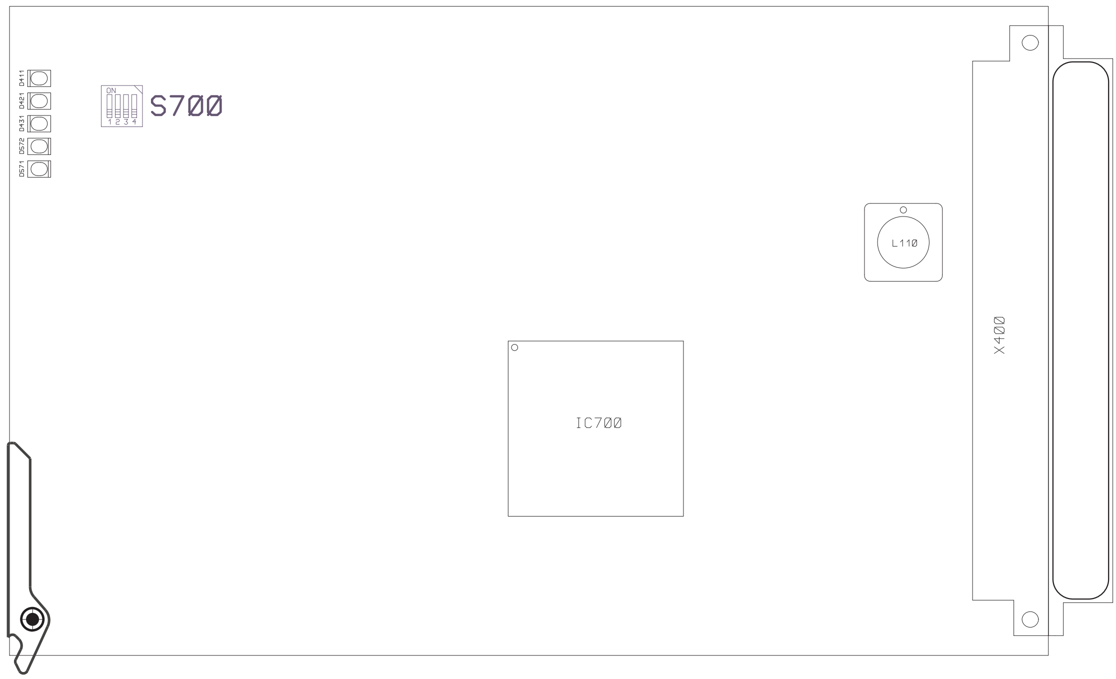


Fig. 80 MCP Module, standard configuration

Configuration of the MDO-20 Module

The MDO-20 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 MDO-20 module, however, the switch setting (S200 set to all OFF) shown in Figure 81, MDO-20 module, standard configuration, must be checked and corrected if necessary.

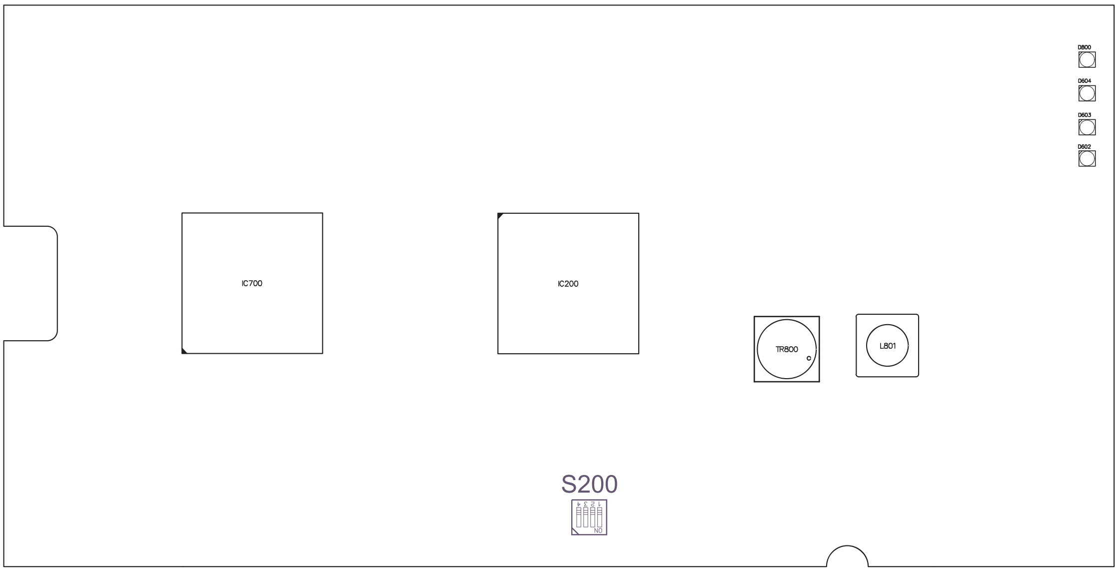


Fig. 81 MDO Module, standard configuration

Switch S200

1	2	3	4	
OFF	OFF	OFF	OFF	Factory setting / serial baud rate 19200 baud
OFF	OFF	OFF	ON	serial baud rate 115200 baud
ON	OFF	OFF	OFF	Bootloader active
*	ON	ON	ON	Reserved

The module MDO-20 is furnished with a bootloader for installing new firmware.

The switch S200-1 = ON activates the bootloader mode.

Attention!

The normal function of the module is deactivated in the bootloader mode. This mode should therefore be used only by the MSA service personnel!

Configuration of the MDC20 Module

No configuration.

Configuration of the MDA20 Module

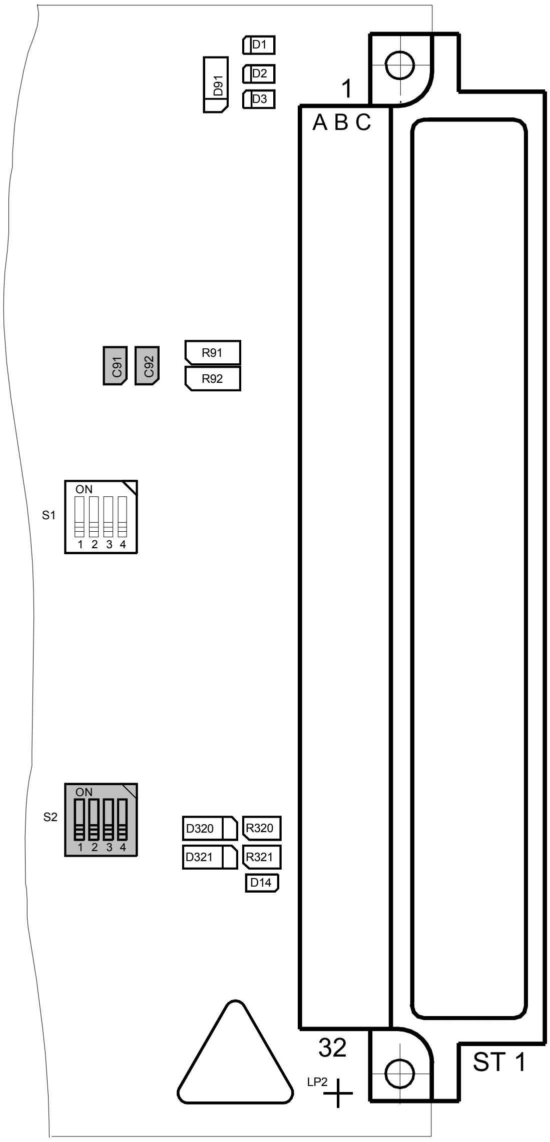


Fig. 82 Configuration of the MDA Module

Switch S1

1	2	3	4	
ON	ON	ON	ON	Factory setting / Do not change
OFF	X	X	X	Bootloader active

The module MDA 20 is furnished with a bootloader for installing new firmware.

The switch S1-1 = OFF activates the bootloader mode.

Attention!

The normal function of the module is deactivated in the bootloader mode. This mode should therefore be used only by the MSA service personnel!

The switch S2 is not used.

Configuration of the MBC-20 Module

The MBC-20 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 MBC-20 module, however, the switch setting (S500 set to all OFF) illustrated in Figure 83 must be checked and corrected if necessary.

Switch S500

1	2	3	4	
OFF	OFF	OFF	OFF	Factory setting / operation on CAN A
OFF	OFF	OFF	ON	operation on CAN B
ON	OFF	OFF	OFF	Bootloader active (only MDA-20)
*	ON	ON	ON	Reserved

The module MBC-20 is furnished with a bootloader for installing new firmware.

The switch S500-1 = ON activates the bootloader mode.

Attention!

The normal function of the module is deactivated in the bootloader mode. This mode should therefore be used only by the MSA service personnel!

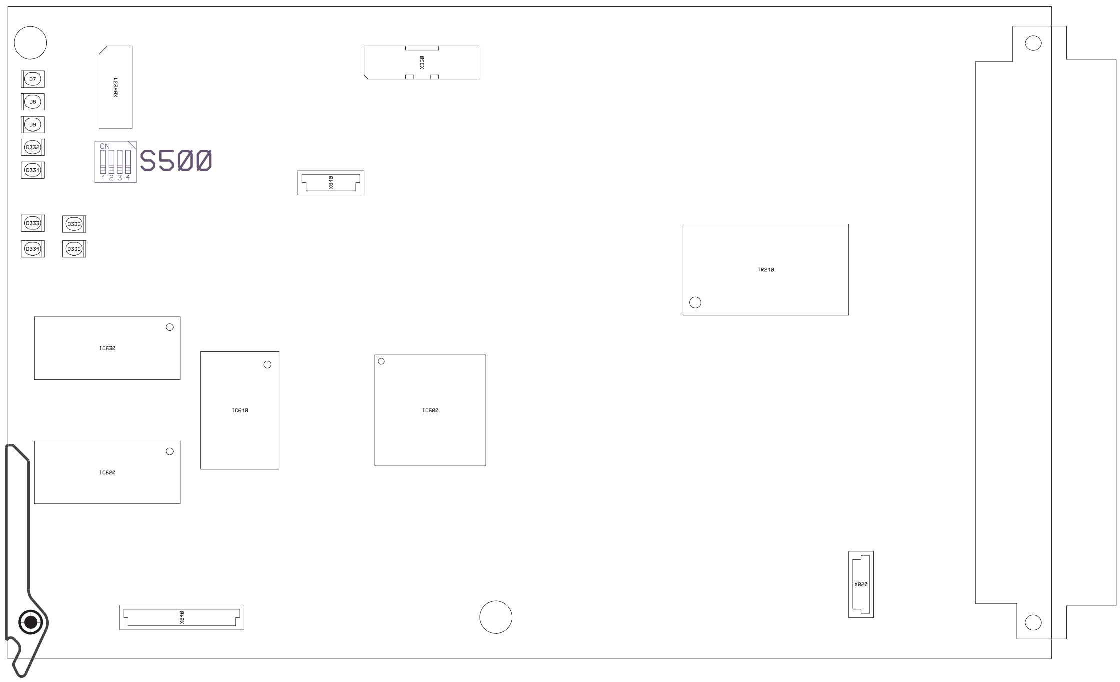


Fig. 83 Configuration of the MBC20 Module

Configuration of the MBT20 Module

No configuration.

Configuration of the MFI Module

S101 Code Switch

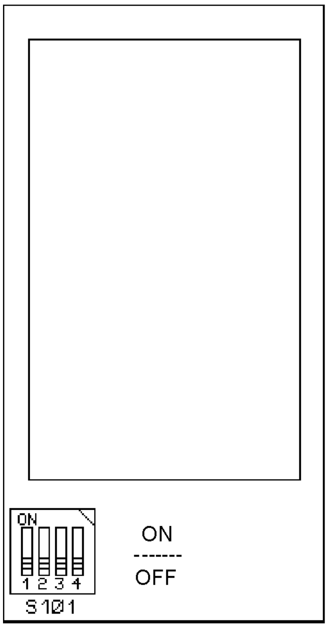


Fig. 84 View of the MFI Module

Functions S101

1 = ON, 2 = ON, 3 = OFF

The fire detectors are powered from the SUPREMA power supply (dc coupling between signal and SUPREMA power supply).

1 = OFF, 2 = OFF, 3 = ON

The fire detectors are powered from a separate power supply. Signal line and SUPREMA power supply are electrically isolated.

4 = ON

The module is configured for applications with a zener barrier.

4 = OFF

The module is configured for applications without a zener barrier.

Configuration in the SUPREMA menu

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 4th level	de-activated

Configuration of the MSI Module

S101 Code Switch

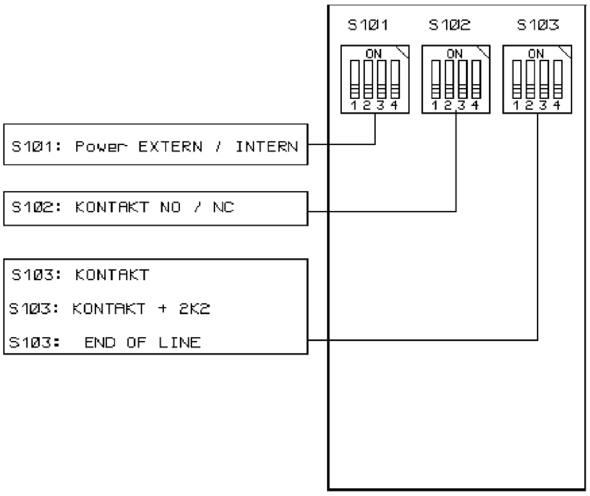


Fig. 85 View of the MSI Module

Configuration in the SUPREMA menu

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 s hut
Below alarm level	Alarm contact open
Latching	Alarm latching
2nd to 4th alarm	de-activated
2nd 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 module requires his 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 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 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 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 no alarm. An open circuit of the connecting wires will cause a 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 or interrupt of the connecting wires 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. A serial connection of that type of contact can not monitored.

MRD Dummy Relay

Module application/function

Up to 5 relay modules can be connected (MRO 8/MRO 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 MGO modules are monitored. Output failures (open/short circuit) are identified and are reported as a system failure.

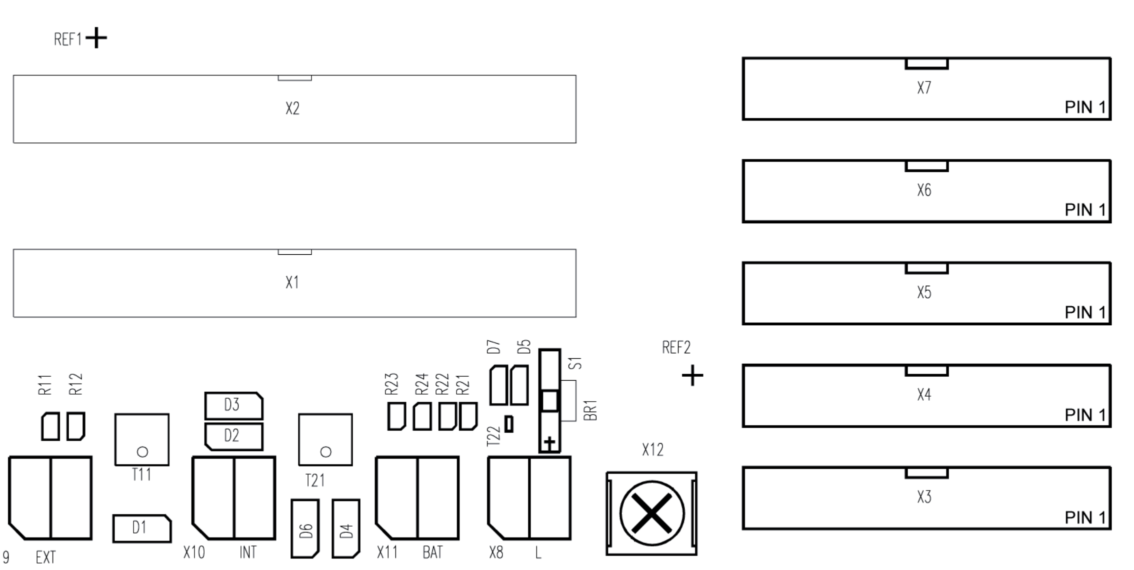


Fig. 86 View of the MRC Module

MRC

X3 -X7 = 20-pin connection for relay modules MRO 8/MRO 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

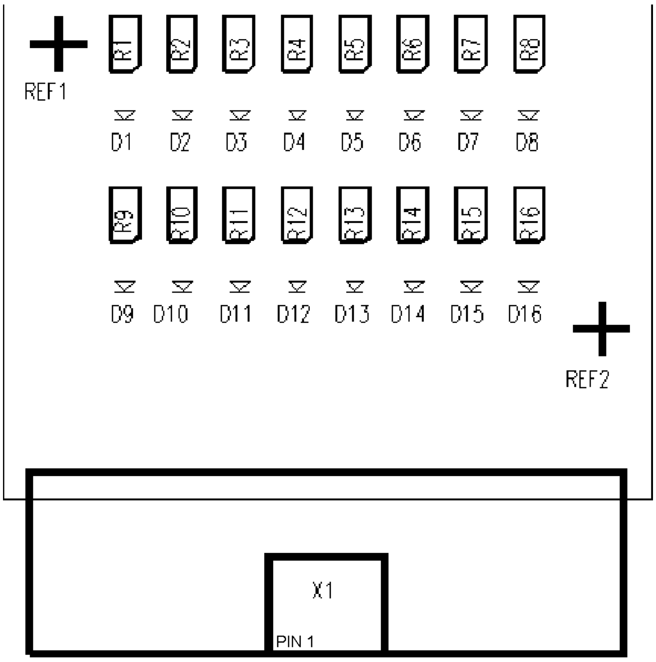


Fig. 87 View of MRD Module

LED 1 - 8	= Driver outputs channel A
LED 9 - 16	= Driver outputs channel B

Attention!

Note the correct polarity of the modules, see illustration 86.

10.4 System Configuration (Hardware)

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 2-5	➪	free
	Slot 6-15	➪	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 (i. e. 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 and/or MDC module. In systems without redundancy, slot 2 is the standard slot for the MCP module (Chapter 13).

Slots 4-5:

Slots 4 and 5 are reserved exclusively for the MDA module. In systems without redundancy, the 4th slot must be used for the MDA module (Chapter 13).

Slots 6-13:

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

Slots 14-15:

Slots 14 and 15 may be filled only with MAO, MBC 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.

Position 1-10:

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

Attention!

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
Front:	MCP MDC	MCP MDC	MCP MDC	MDA	MDA	MAI MGO MAO MBC	MAI MGO MAO MBC	MAI MGO MAO MBC	MAI MGO MAO MBC	MAI MGO MAO MBC	MAI MGO MAO MBC	MAI MGO MAO MBC	MAI MGO MAO MBC	MGO MAO MBC	MGO MAO MBC

Fig. 88 Slots and Positions on the rack

Slots in the Rack

Slots 1-3:	slots for MCP and/or MDC modules only
Slots 4-5:	slots for MDA modules only
Slots 6-13:	slots for INPUT/OUTPUT modules
Slots 14-15:	slots for INPUT/OUTPUT (but no MAI) modules only
INPUT:	MAI modules (with MPI/MCI modules) MBC modules
OUTPUT:	MGO module MAO module MBC module

Connection sites on the rear of the rack:

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

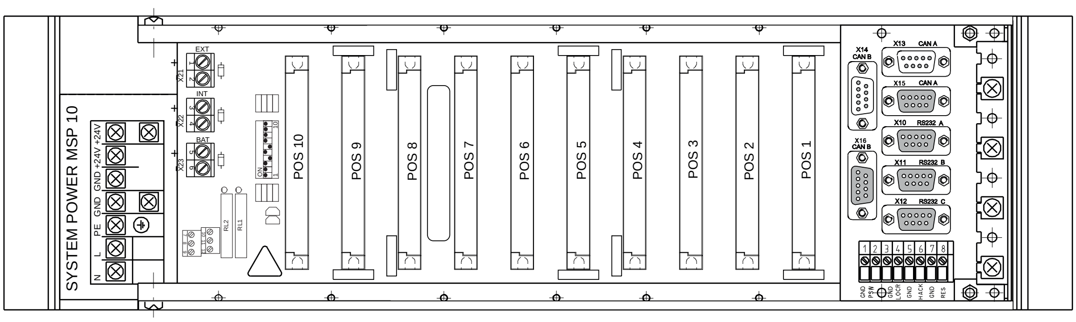


Fig. 89 Rear of the Rack

System Requirements

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

Exactly one MCP module, one MDC module and one MDO module are required for a system (up to 8 racks) (non-redundant design). The MDC 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.

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 fig. 90)].

The modules plugged into the rear must be located at the same slots as the modules with the associated functions plugged into the front.

Attention!

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 TS module for remote connection of the 4 ... 20 mA outputs)
MBC module	MBT module

Fig. 90 Assignment of the Connection Modules

Attention!

Further information on the functions of the individual modules can be found in Chapter 9.5

Maximum Loads

Attention!

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 of 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 module	400 W
Maximum input power for a MIB module (for a track)	480 W
Maximum current load for a MIB module	20A
Maximum current load MIB module/GND terminal (MAI module and MGO module current)	32A
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

Fig. 91 System Configuration/Maximum Loads

Normal 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 currents loads of a MGO module (one MGO module is disposing of 40 driver outputs)	12 A (40 x 0.3 A)

Fig. 92 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 Fig. 149 Power Requirements of the System Modules).
- The power available from the supply voltage.

For further details, see the tables in Chapter 10.11 and Chapter 14 and the operation and maintenance manuals of the sensors to be connected.

> **Attention!**
> A cooling fan must be installed and operated to prevent overheating in the installation framework if more than 64 measuring points are fitted with MPI modules.

Configuration Examples

Standard System with 8 Inputs/8 Common Alarm Relays

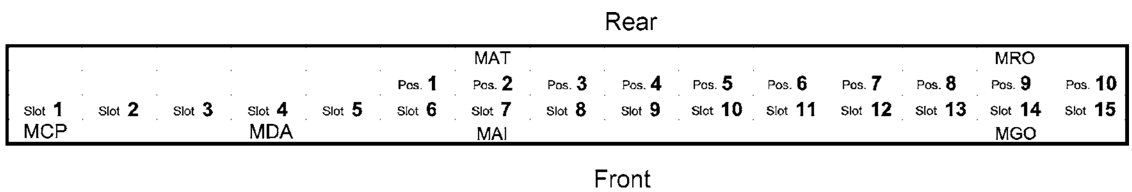


Fig. 93 Configuration example 1

Standard System with 32 Inputs/8 Common Alarm Relays

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

Fig. 94 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

Fig. 95 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

Fig. 96 Configuration example 4

10.5 Systems Consisting of Several Racks

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 and the system fail relay must be connected on each rack.
- The racks are connected by way of the MST modules 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 racks in between must be open (Chapter 10.3).
- 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 (Chapter 10.3).
- Each rack must have it own CAN node number. The standard setting for the first rack is 111 (Chapter 10.3).
- 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 (Chapter 13).
- A cooling fan must be installed and operated for the warmth removal in the installation framework if more than 64 measuring points are fitted with MPI modules.

Connection Notes

The MST 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.

> **Attention!**
>
> 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 Chapter 10.10.

> **Attention!**
>
> The system fault relay must be wired up for all racks!

MST Module G Status A:

Connection of 2 racks:

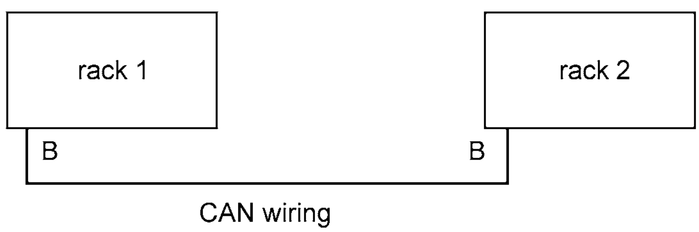


Fig. 97

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

Connection of 3 racks:

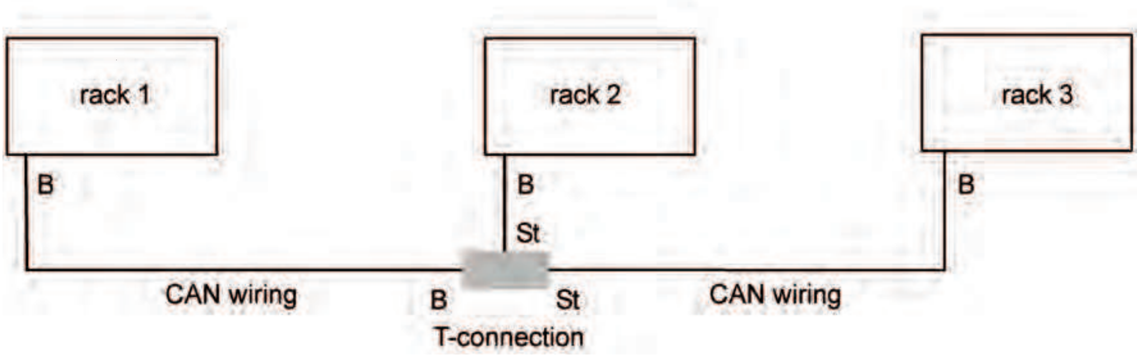


Fig. 98

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

Connection of 4 racks:

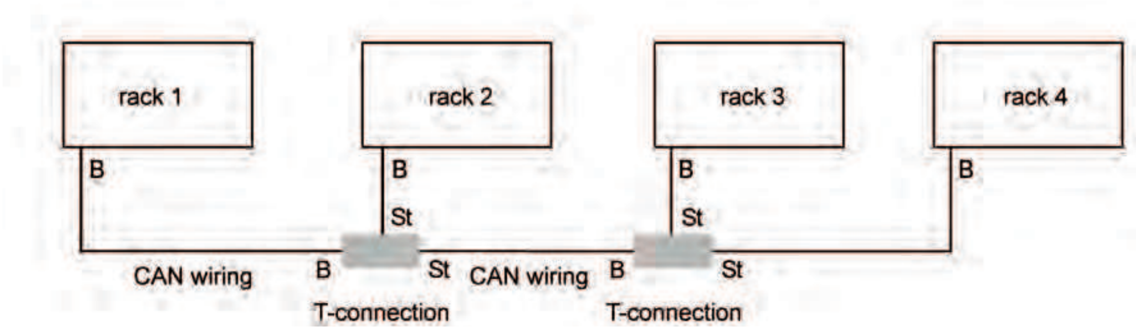


Fig. 99

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:

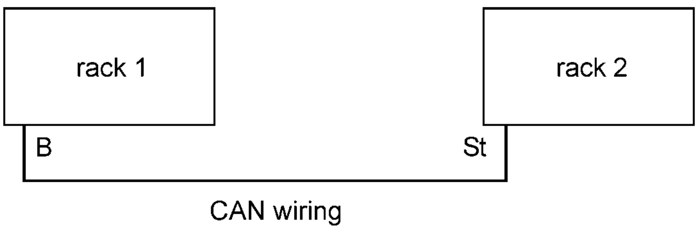


Fig. 100

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

Connection of 3 racks:

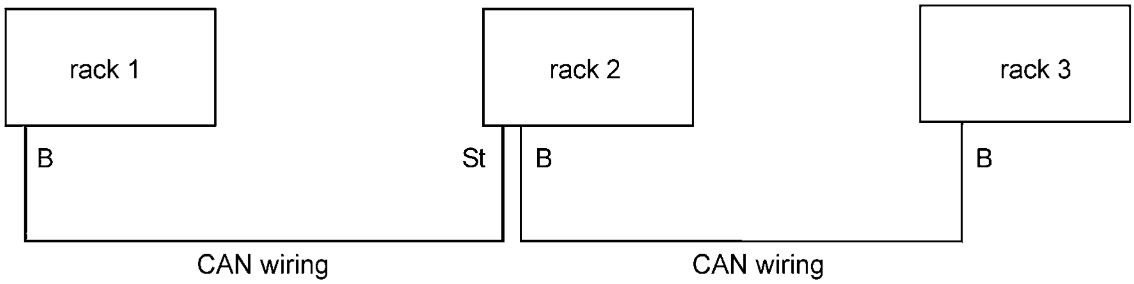


Fig. 101

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

Connection of 4 racks:

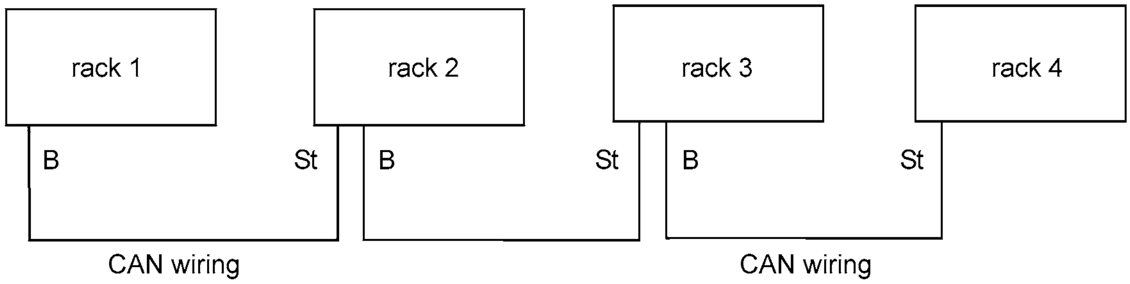


Fig. 102

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.

Listing CAN Bus Connection Elements:

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

Fig. 103 CAN Bus Connection Elements

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 without MDO), equipped only with measuring points and/or outputs, installed in the field. Both racks communicate with one another via the CAN Bus.

> ⚠ **Attention!**
>
> This means that instead of up to 64 sensor cables, only one CAN bus cable has to be connected and the system fail relays on all racks has to be connected.

> **Attention!**
>
> At distances >20 m, a CAN bridge has to be interposed.

Examples of Satellite Applications:

With one satellite

Fig. 104 System with one satellite and CAN bridge

With two or n satellite:

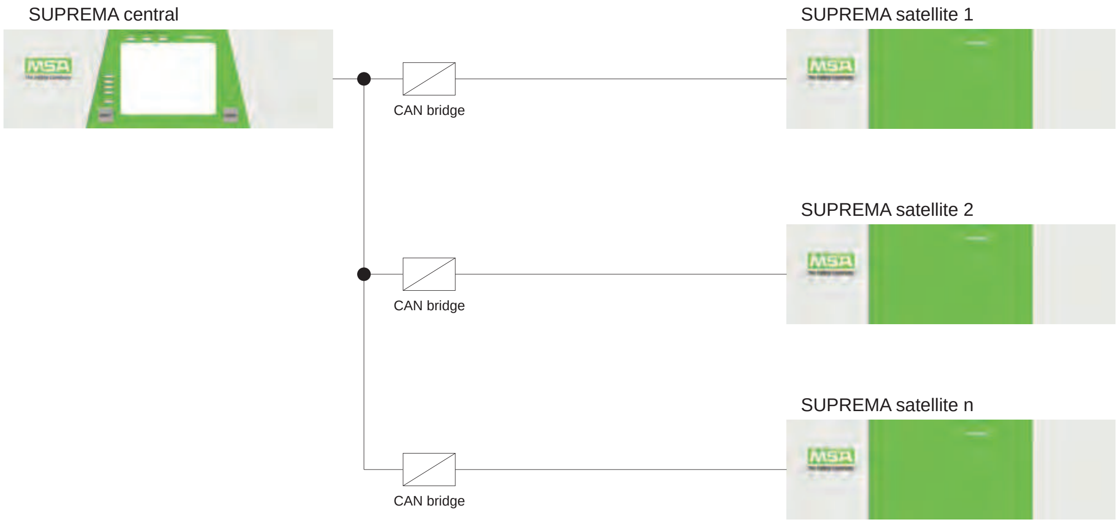


Fig. 105 System with multiple satellites and CAN bridges

Connection Note:

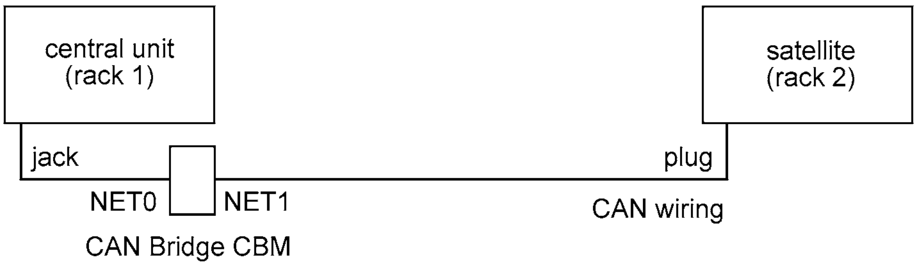


Fig. 106 Connection CAN-Bridge CBM

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. The CAN terminating resistor at Rack 2 has to be set.

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).

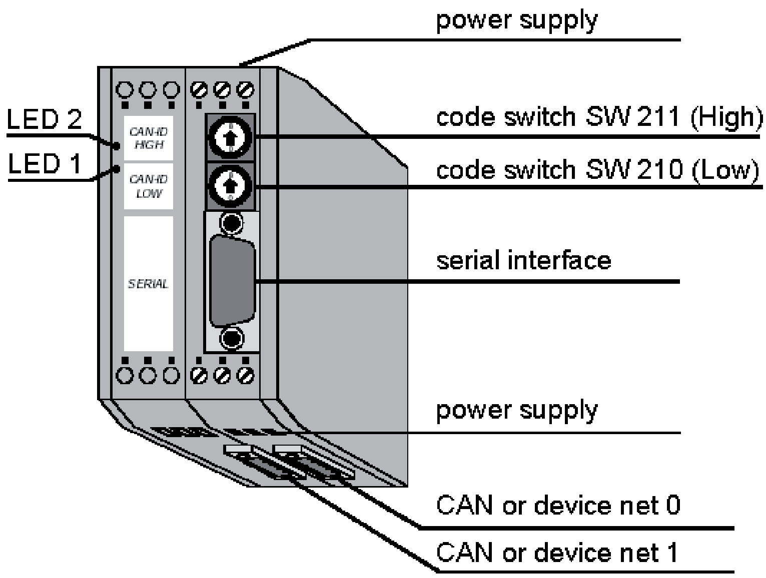


Fig. 107 SUPREMA CAN-Bridge CBM

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 manual).

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) Baudrate setting at the Central Rack (depends on the number of measuring points)
b) Baudrate 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)

> **Attention!**
>
> 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	**Bit rate setting in kB/s** Simplex/Duplex	**Bridge Command**
1 - 256	250	B0:4

Fig. 108 Baudrate 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

Fig. 109 Baudrate 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 (fig. 56)
$COBID_{(Module)}$	= CAN Identifier for COBID of the Module

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

Fig. 110 Calculation of the Node ID

Message	COB-ID (Module) (dec)	COB-ID (module) (hex)	Purpose	COD-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	Analog Input (640+Node-ID)	281-2FF
PDO2(tx)	768+NID	300+NID	Analog Output (768+Node-ID)	301-37F
SDO(rx)	1408+NID	580+NID	Reading from object directory (1408+Node-ID)	581-5FF

Message	COB-ID (Module) (dec)	COB-ID (module) (hex)	Purpose	COD-ID (hex) Range
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

Fig. 111 CAN-ID Assignment

> **Attention!**
>
> 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 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 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 module in slot 13 of rack 3:

ID calculation for:

Digital 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

Calculation example:

Components of the individual racks:

Central rack

Module	Slot	Remark	Number
MDO	16		1
MCP	2		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: 250 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 (Chapter 10.3).

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

Parameter Setting for CAN Bus A

Net 0 in 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:

B0:4	{Bit rate = 250kB}
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

Fiter for NET1 to NET0:

B1:9	{Bit rate = 50kB}
M1:0:0xxxxxxxxxxxxxxxxxxxxxx xx	{Mask for NET1 to NET0}

With help of a text editor, a *.txt file is generated, which only contains the data required:

```
B0:4
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
M1:0:0xxxxxxxxxxxxxxxxxxxxxx
```

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*	Baudrate 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,	
M1:0:0xxxxxxxxxxx	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:

Baudrate:	9600 Bits per second
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.

```
> > > RTOS - UH < < <
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=4.3        Setup=3.3e       SysRes=15c     EX=2.2-M         Check=1.5
CBM-DP=1.8g     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 cars 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
B0:4
B1:6
```

This is the contents for a reset CAN bridge; both baudrates 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 : 4
>IO : 0 I1:0
>IO : 80 I1 : 80
>IO : 100 I1 : 100
>IO : 614 I1 : 614
>IO : 714 I1 : 714
>IO : 21E I1 : 21E
>IO : 61E I1 : 61E
>IO : 71E I1 : 71E
>B1 : 9
>M1 : 0 :0xxxxxxxxxxxxxxxxx
```

Press E and >Enter<, to write the parameters into the memory, and then check them by pressing R and >Enter<.

```
e
>r
B0 : 4
IO : 0 I1:0
IO : 80 I1 : 80
IO : 100 I1 : 100
IO : 614 I1 : 614
IO : 714 I1 : 714
IO : 21e I1 : 21e
IO : 61eI1 : 61e
IO : 71e I1 : 71e
B1 : 9
M1 : 0 :0xxxxxxxxxxxxxxxxx
```

The parameters have now been successfully set.

Attention!

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)
Temperature 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 protruding connector DSUB9, without CANDeviceNet plug)
Weight	approx. 200 g

Systems with peripheral data logging (satellites) and LWL converters

In the case of great distances or electromagnetic disturbances to be expected, the optical fibre (LWL) transfer can be used. In this case, no potential equalization between base station and the satellite will occur either. The LWL converter changes electrical signals to optical signals, which are no more disturbed by other electrical signals. A star-shaped network topology is compulsory, to avoid critical values of the CAN bus capacity.

Examples of Satellite applications

With one satellite and a LWL converter:

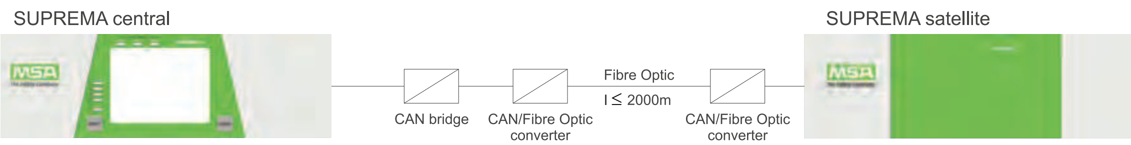


Fig. 112 System with one satellite and LWL converter

With 2 or n satellites and a LWL converters:

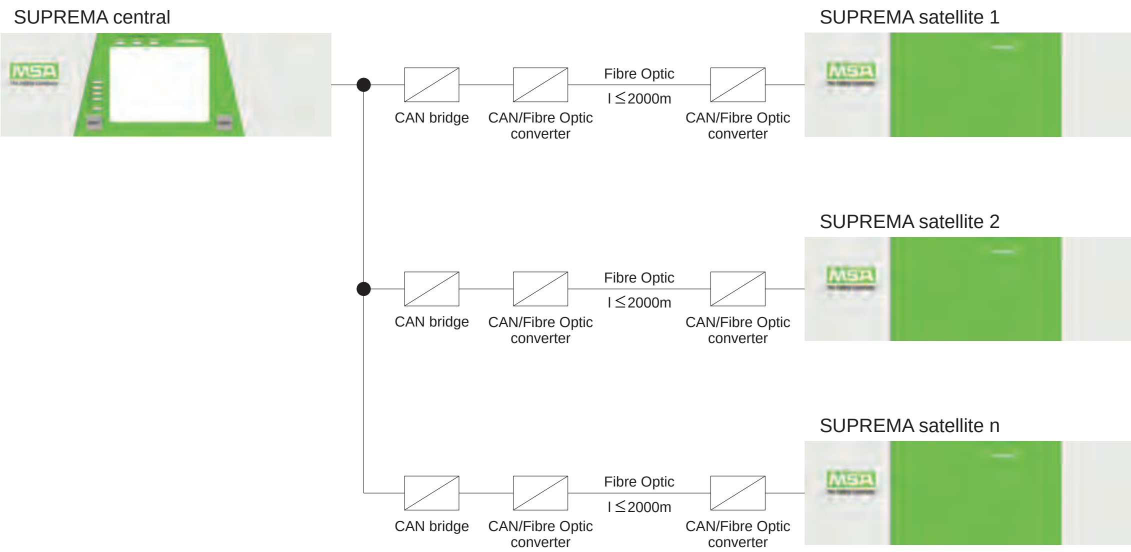


Fig. 113 System with multiple satellites and LWL converters

Here, only CAN A is displayed, CAN B is assembled in the same way.

Connection advice:

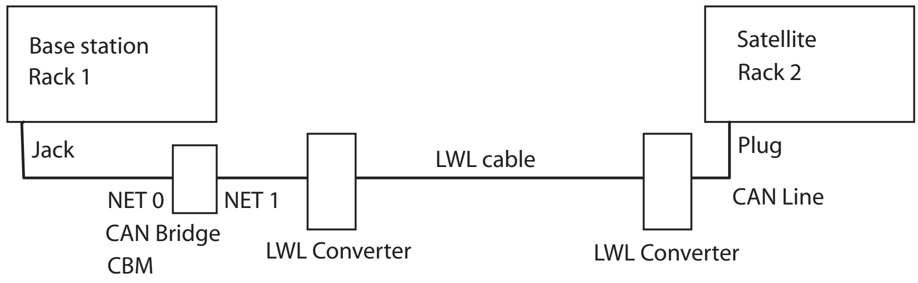


Fig. 114 LWL converter connection scheme

The terminator at rack 1 must be de-activated, and a 120 ohms resistor has additionally to be clamped under the terminal (2 to 4) NET 0 of the CAN connection.

For Net 1 a 120 ohms resistor has additionally to be clamped under the terminal (2 to 4) NET 1 of the CAN connection. The terminators of both LWL converters must be activated (S5) as well as the satellite terminator.

SUPREMA CAN LWL Converter

The voltage supply (24 V) of the CAN LWL converter is effected via a COMBICON connector, which is also equipped with a relay contact for failure output. The CAN bus is equally connected via a 4-pin COMBICON connector. The LW line is connected via an ST connector. The baudrate of the converter can be set by means of DIP switches. Additionally, there is an extra switch for the CAN terminator in the converter.

The LWL converters dispose of a very good diagnosis function which enables them to locate errors very quickly. A bar graph displays the signal quality at the optical fibre side, and a LED indicates possible errors at the „copper“ side.

To guarantee the function of the SUPREMA LWL converters, some points must be taken into consideration in the rup-up. These are:

a) The CAN baudrate must match with that of the SUPREMA (or CAN bridge).

b) The line length must align with the baudrate (max. 2000 m).

c) Take notice of optical fibre line crossing between TD and RD.

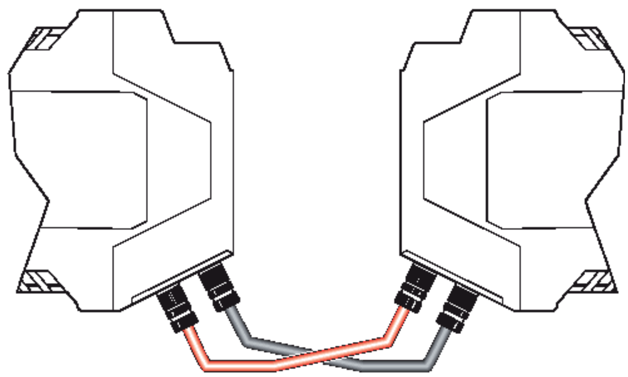


Fig. 115 LWL converter connector allocation

View of the terminals/LEDs:

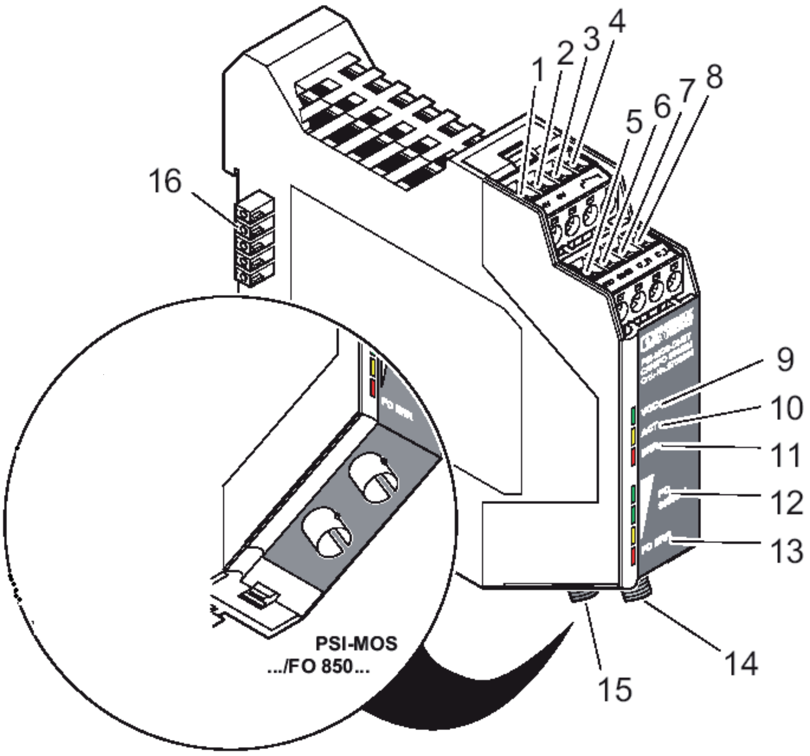


Fig. 116 LWL converter terminals/LEDs

1. Voltage supply: 24 VDC
2. Voltage supply: 0 VDC
3. Connection switching contact (onlybase module)
4. Connection switching contact (onlybase module)
5. CAN connection: Shield (onlybase module)
6. CAN connection: GND (onlybase module)
7. CAN connection: C_High (onlybase module)
8. CAN connection: C_Low (onlybase module)
9. LED: Ready for operation/Redundancy-Standby operation
10. LED: Bus activity
11. LED: Bus error
12. LED field: Qualitiy of LWL Signal
13. LED: LWL error
14. LWL connection: Sending path
15. LWL connection: Receive path
16. Backplane

Technical data:

Voltage supply	10 V ... 48 VDC
Current compumption	max. 100 mA
Connection of bus interface	CANopen, 4-pin COMBICON
Bus terminator	120 Ohm connectable
Data rate	10, 20, 50, 125, 250, 500, 800 kBit/s adjustable
Connection LWL interface	ST (B-FOC)
Wave length	850 nm
Operating temperature	-20 °C to +60 °C
Function text EX AM	+5 °C to +55 °C
Storage temperature	-40 °C to +85 °C
Dimensions (W x H x D)	22.5 mm x 105 mm x 115 mm
Weight	approx.120 g
Humidity	10 % ... 95 %, non-condensing

LWL Line Specification:

Line type	Wave length	Connector	Damping	Maximum length
F-S200/230	850 nm	ST® (B-FOC)	8 dB/Km	1500
F-G 62.5/125	850 nm	ST® (B-FOC)	3 dB/Km	2000*
F-G 50/125	850 nm	ST® (B-FOC)	2.5 dB/Km	2000*

* Other line lengths after consultation with MSA AUER.

For use with the SUPREMATouch, multi mode firbes are required. For further technical data and operating conditions, see the LWL Converter Manual.

10.6 Connection of the Sensors

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 (Chapter 10.3).
- 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 (Chapter 11). 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 Chapter 10.1).

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 chapter 15). The operating and maintenance instructions of the sensor to be connected should also be noted.

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 is only possible at an O2 concentration of above 10 Vol.%. At O2 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 60079-29-1 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.

Note for Operation with Active Sensors (0/4 ... 20 mA)

At use of MCI modules Order No 10021029 and 10041567: The requirements of line control according to EN 61779-1 are not met with 3-wire 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 modules Order No 10043997 and 10044020. This modules are without any qualification operative.

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	Semi-conductor/ active 4-wire	+M (white)	+H (green)	-M (brown)	-H (yellow)	

Fig. 117 MAT/MAT TS Module, Terminal Assignment, Sensor Connections

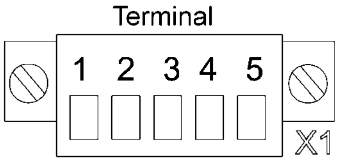


Fig. 118 MAT Module/MAT TS Module, Connector Plug

For the 3-wire operation of the passive WT sensors, bridges are to be provided:

Terminal 1-2: BR K-K'
Terminal 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). (Chapter 10.3)

MGT 40 TS Module/Sensor Connections

		MAI Module with MPI Module (WT)	**MAI Module with MPI Module (WT)**	**MAI Module with MCI Module (WT)**	**MAI Module with MCI Module (WT)**	**MAI Module with MPI Module (WT)**
Measurem. Point No.	**MGT 40 TS Module Terminal No.**	**Catalytic/ passive 5-wire**	**Catalytic/ passive 3-wire**	**active/ 2-wire**	**active/ 3-wire**	**Semicon-ductor/ 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)				

		MAI Module with MPI Module (WT)	MAI Module with MPI Module (WT)	MAI Module with MCI Module (WT)	MAI Module with MCI Module (WT)	MAI Module with MPI Module (WT)
Measurem. Point No.	**MGT 40 TS Module Terminal No.**	**Catalytic/ passive 5-wire**	**Catalytic/ passive 3-wire**	**active/ 2-wire**	**active/ 3-wire**	**Semicon-ductor/ 4-wire**
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)				

Fig. 119 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

Fig. 120 MGT 40 TS Module/Allocation MAT - MGT connections

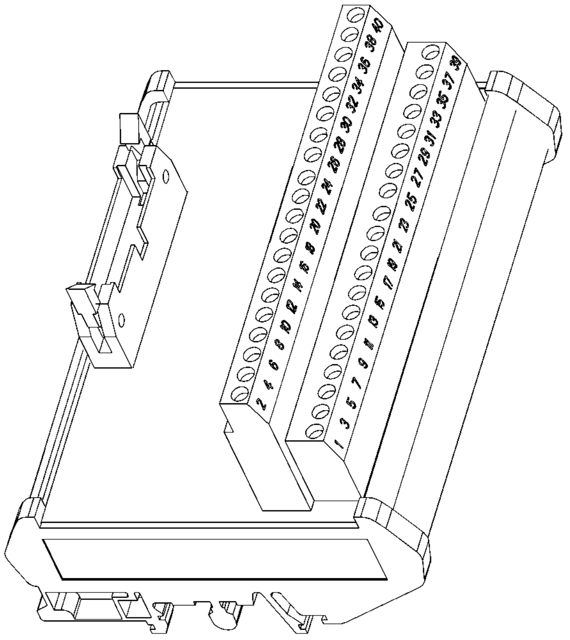


Fig. 121 MGT 40 TS Module

10.7 Connection of the Relay Outputs

The function of the individual relay modules is described in detail in Chapter 9.5 Descriptions of the Modules. Depending on the application, the following relay modules can be used:

MRO 8 module	8 common alarm relays on the racks
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 (Chapter 13), installed on mounting rail.
MRO 8 TS SSR module	8 solid state relays, installed on mounting rail
MRO 16 TS SSR module	16 solid state relays, redundant design, 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, two system failure relays are available on the MIB module, which are 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

Fig. 122 MRO Module, Contact Load Capacity

Attention!

For the safety related use of each relay, the alarm and failure relays of the SUPREMA system has to be used in the following condition:

1.Relay under power

2.Alarm or fault contact is closed

Thereby it will be assured that the relay contacts will give a failsafe signal at power fail or line disconnection

Attention!

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.

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 2.10.7). 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.).

Attention!

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.

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

Fig. 123 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

Fig. 124 MRO 8 Module, Terminal Assignment

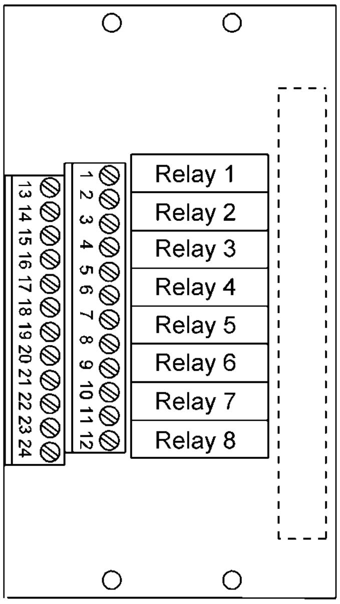


Fig. 125 MRO 8 Module, Terminal Assignment

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 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 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 Chapter 13.

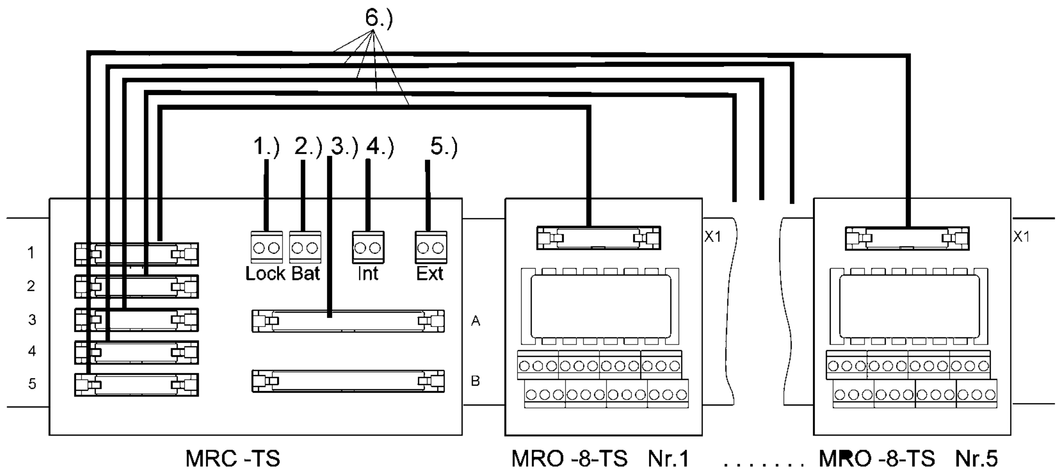


Fig. 126 Connection diagram of the MRC TS and MRO 8 TS Modules

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 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 (Chapter 10.4). 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, Int, and/or Ext.
As an option, a switch can be connected to the Inhibit (Lock) terminal for the purpose of inhibiting the relays. (Chapter 10.3).

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 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.

Relay Inhibit

- By connecting a switch to the LOCR 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 (Chapter 10.3).
- By means of the bridge (BR1), the type of inhibiting (normally energised or normally de-energised) can be specified (Chapter 10.3).

normally de-energised	**=**	**relay energised**	**=**	**alarm**
normally 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 (Chapter 10.4)

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.

Attention!

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).

Attention!

If service is finished the inhibit status of the relays must be cancelled. During the time the relays are inhibited, the system fail is set.

MRO 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, 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).

MRO10 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

Fig. 127 MRO 8 TS Modules, Common Alarm Relay Assignment

MRO10 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

Fig. 128 MRO 8 TS Module, Terminal Assignment

MRO20 8 TS Module

The terminals are assigned as follows:

Relay Number	Terminal	Contact
1	1	NC
	2	M
	3	NO
	25	NC
	26	M
	27	NO
2	4	NC
	5	M
	6	NO
	28	NC
	29	M
	30	NO
3	7	NC
	8	M
	9	NO
	31	NC
	32	M
	33	NO
4	10	NC
	11	M
	12	NO
	34	NC
	35	M
	36	NO
5	13	NC
	14	M
	15	NO
	37	NC
	38	M
	39	NO
6	16	NC
	17	M
	18	NO
	40	NC
	41	M
	42	NO
7	19	NC
	20	M
	21	NO
	43	NC
	44	M
	45	NO

Relay Number	Terminal	Contact
	22	NC
	23	M
	24	NO
	46	NC
	47	M
8	48	NO

Fig. 129 Terminal assignment MRO 20-8-TS

MRO10/MRO20 16 TS Module

The terminals are assigned as follows:

Relay Number	Terminal	Contact
1	1	NO 1
	2	
2	3	NO 2
	4	
3	5	NO 3
	6	
4	7	NO 4
	8	
5	9	NO 5
	10	
6	11	NO 6
	12	
7	13	NO 7
	14	
8	15	NO 8
	16	
9	17	NO 9
	18	
10	19	NO 10
	20	
11	21	NO 11
	22	
12	23	NO 12
	24	
13	25	NO 13
	26	
14	27	NO 14
	28	
15	29	NO 15
	30	
16	31	NO 16
	32	

Fig. 130 Terminal assignment MRO 10/20-16-TS

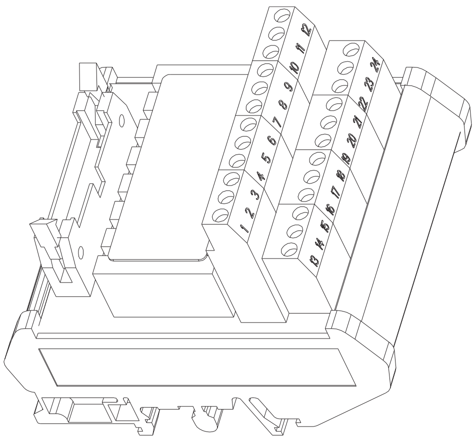


Fig. 131 MRO 8 TS Module

Relay monitoring

Starting from the version 2.02.06 of the MGO module all relay outputs are supervised on the presence of all relays. Therefore all 40 outputs of a respective module in the configuration must be always announced. If at the MRC module not all relay modules are attached, then must be used an MRD module for each missing modules, so that the relay monitoring does not announce an error.

The MRD module can be attached directly to the MRC module. The MRD module has LED displays for the relay condition. Missing ones or defective relay modules are indicated with a red LED on the MDO module, registered at the same time in the log an error message with „data acquisition error".

> **Attention!**
>
> Thus forbids itself for this version the use of the MRO 8 of modules (without mounting rail assembly).

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.

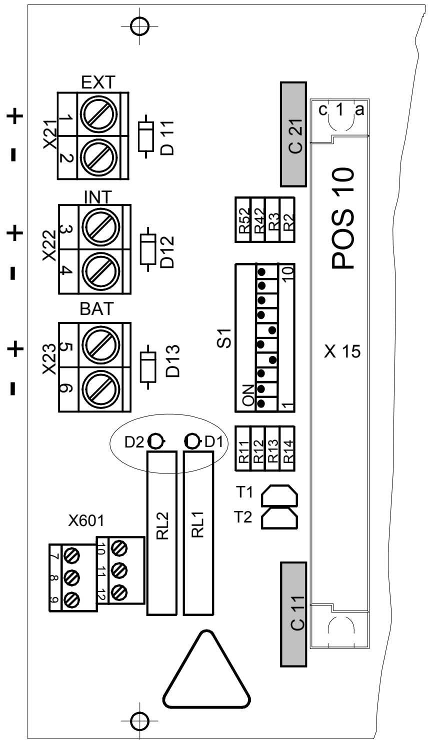


Fig. 132 MIB Module, connection terminals for the system failure relay

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

Fig. 133 MIB Module, System Fail Relay and Terminal Assignment

Attention!

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.

10.8 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 (Chapter 10.4). 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 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!

Attention!

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).

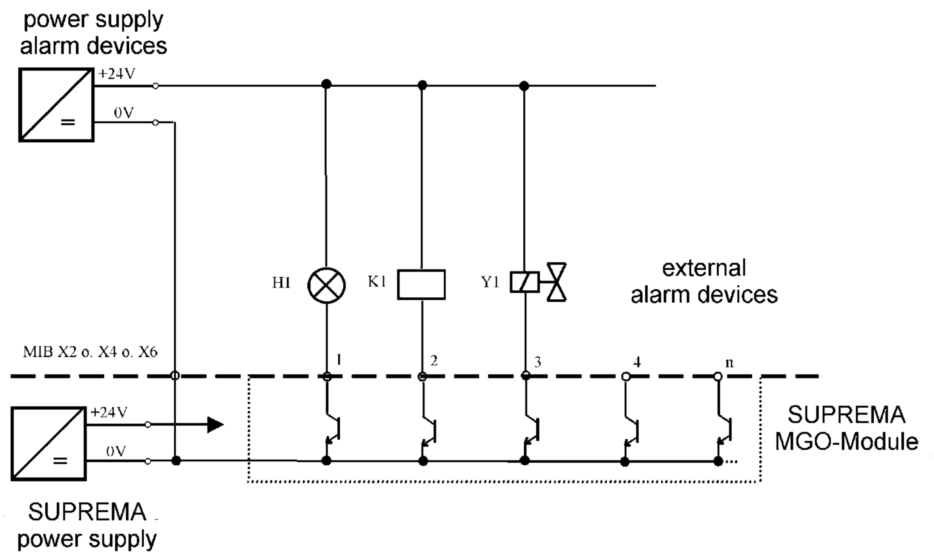


Fig. 134 Principle circuit diagram, connection of the switching outputs

Attention!

The load limits, described at chapter must be meet! (Chapter10.4)

Switching outputs are run as "open-collector" outputs, that is, an internal transistor of SUPREMA switches the negative connection of the demand while the positive connection of the load is to be connected directly to the 24V supply.

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

Fig. 135 MGT 40 TS Module, Terminal Assignments of the Switching Outputs

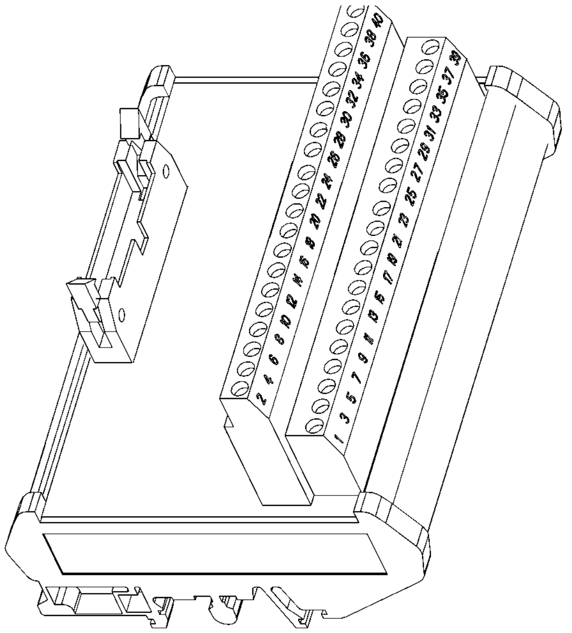


Fig. 136 MGT 40 TS Module

The cables are to be screened if excessive electromagnetic loads are possible (Chapter 10).

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 (of MGO).

- 24 V supply and load connections (20 A maximum)
- Mounting on C or standard rail
- Outputs short-circuit-proof

Redundant supply must be realised externally.

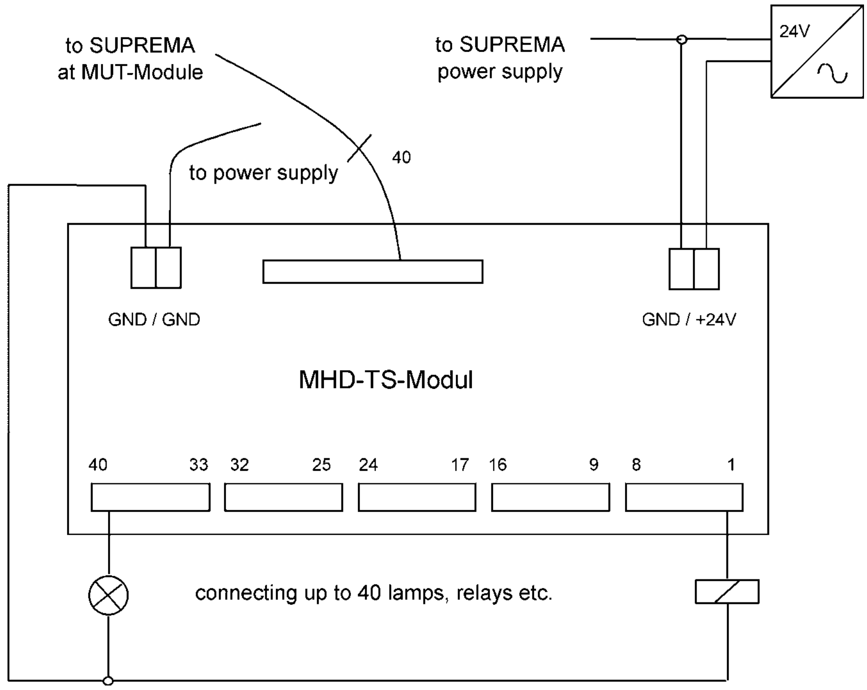


Fig. 137 MHD TS Module Connection (Switching outputs inverted)

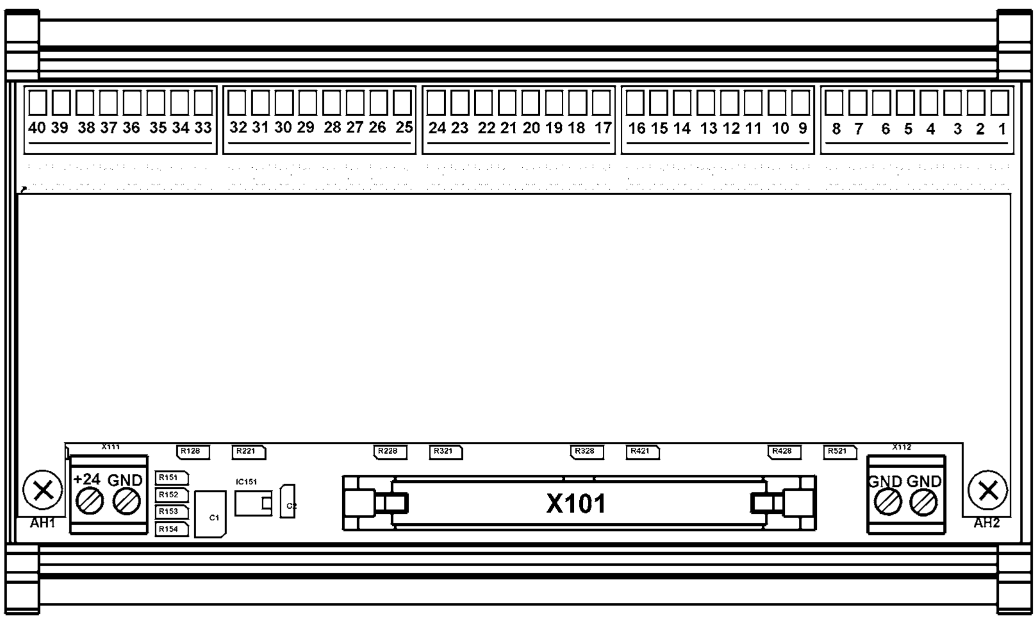


Fig. 138 MHD TS Module

10.9 Connection of the Analog Outputs

Analog 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 analog outputs that follow the level of the sensor signal. The assignment between signal inputs and analog outputs is freely configurable. 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 etc.).

The analog signals can be accepted directly on the rack at the terminals of a MAT module plugged into the rear of the rack.

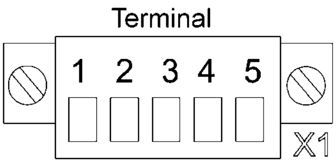


Fig. 139 MAT Module/MAT TS Module, connector plug

Terminal No. 1	Terminal No. 2	Terminal No. 3	Terminal No. 4	Terminal No. 5
			+ Ia	+Ia

Fig. 140 MAT/MAT TS Module Terminal Assignment, Analog 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 by a 40-way ribbon cable and the MUT module.

Analog output	Terminal no. (MGT-40-TS)	Function
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

Fig. 141 MGT 40 TS Module Terminal Assignment, Analog Outputs

The cables must be screened (Chapter 10.1).

An external device with voltage input (e.g. recorder, PC with a DAQ card) can be connected to the analog 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.

10.10 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.

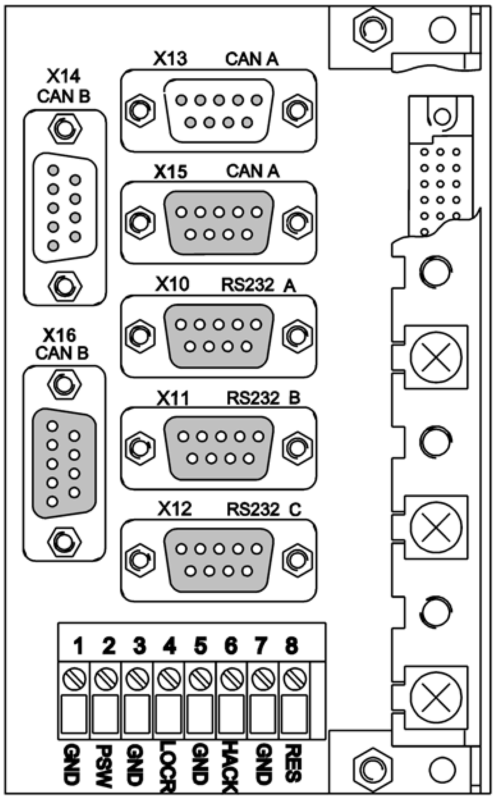


Fig. 142 MST Module Connections as from Module version 8

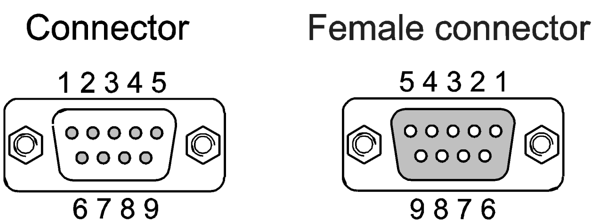


Fig. 143 SUB-D pin assignment

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 (Chapter 10.5).

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 (Chapter 10.4).

Plug Assignment:

Plug	Name	Terminal No.	Assignment
X13, X15	CAN A	2	CAN_L
		3	GND
		6	GND
		7	CAN_H
X14, X16	CAN B	2	CAN_L
		3	GND
		6	GND
		7	CAN_H

Fig. 144 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.

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 (Chapter 12.1), 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 IV, 2GHz, 2 GB of RAM
- Windows XP SP 3
- Connecting cable USB: miniUSB / RS232: RS 232 extensions, SUB-D connector 9-way, plug and socket (do not use a null-modem cable!)
- RS 232 configuration: 19200/115200 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 143). 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	

Fig. 145 RS 232A Terminal Assignment

Printer Port (Printer, RS 232 B)

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 143). Connect the screening to the pin housing.

Socket No.	Assignment
1	
2	R x D
3	T x D
4	
5	GND
6	
7	
8	
9	

Fig. 146 RS 232B, Pin Assignment

When a signal event occurs (alarm, failure), the following information is transmitted by default in a single line through this port to a printer:

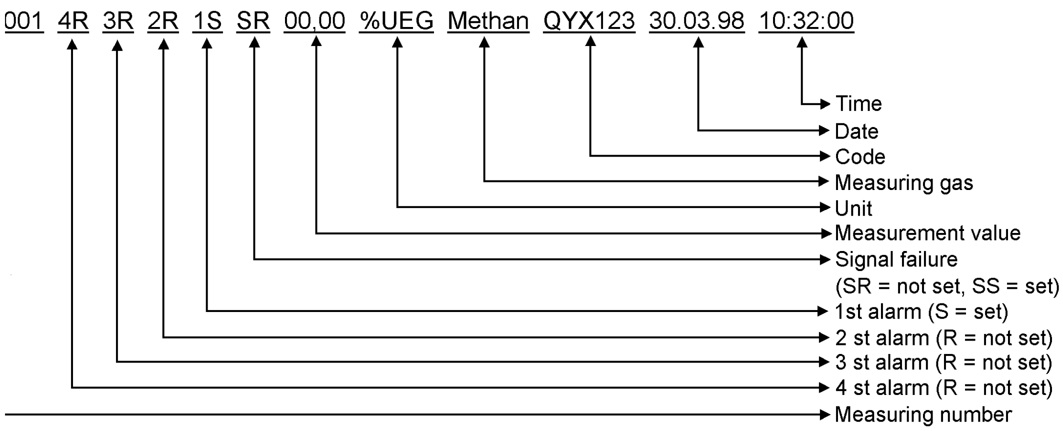


Fig. 147 Protocol Printer, Data Structure

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 147.

> **Attention!**
>
> This formatting can be changed by the user! See the section Operation -> Menu -> Settings -> Printer

Diagnostics / Service (RS 232C)

This port is intended only for internal system testing. (Output of failure messages when the system configuration is transferred.)

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

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

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 (Chapter 10.7).

MST Terminal 4: LOCR
MST Terminal 3: GND

Attention!

If the voltage supply for the MIB module is interrupted, the inhibiting function of the MRO 8 modules is no longer active.

Password Terminal

The input of the configuration password 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 (Chapter 10.5).

MST Terminal 2: PSW
MST Terminal 1: GND

10.11 Connection for the System Power Supply

Before beginning installation, make sure that chapter 10.7, 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.

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-7100	1,5 W	0.1 W*
Series 47 K	1,5 W	0.1 W*
D-7010	2,5 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-8502	5 W	0.1 W
DF-9500	1 W	not applicable
DF-9200	1 W	not applicable
SafEye	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
DF-8510	2 W	0.65 W, max.
FlameGard	5 W	0.1 W
PrimaX I	1 W	not applicable
PrimaX P	2,5 W	0.05 W
PrimaX IR	5 W	0.1 W
FlameGard 5 MSIR	3,6 W	0.1 W
FlameGard 5 UV/IR	3,6 W	0.1 W
FlameGard 5 UV/IR-E	3,6 W	0.1 W
Ultima MOS-5	5 W	0.1 W
Ultima MOS-5E	5 W	0.1 W
Ultima OPIR-5	10 W	0.1 W
UltraSonic EX-5	5 W	0.1 W
UltraSonic IS-5	2,5 W	0.05 W

Fig. 148 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.

After adding the power consumption for the sensors, the following power values can be given for the individual modules:

Type of Module	Power (VA) Module
MCP module	5
MDO module	10
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
MBC module	2,5

Fig. 149 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 (Chapter 11).

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!

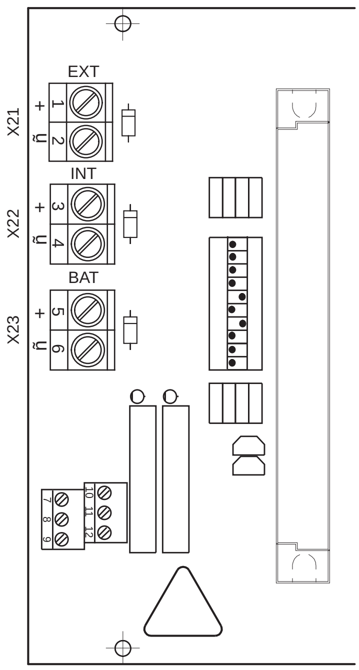


Fig. 150 MIB Module, supply voltage terminals

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.

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 VA)

- 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, modules 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 (21 ... 28 VDC).
- If the internal and/or the external power supply unit fails, the system is supplied from here
- Maximum supply current, 20 A.

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	Sense Connection
+ 24 V		Output: +24 VDC	
GND		Output: GND	
GND	- S	Output: GND	Sense Connection
PE		Ground Wire Connection	
L		Line	
N		Neutral	

Fig. 151 MSP Module, Terminal Assignment

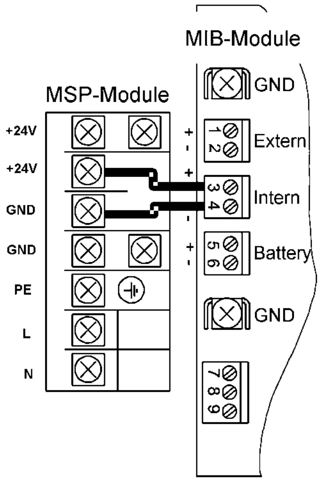


Fig. 152 Connection diagram of the MSP Module

> **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 152, 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.

> **Attention!**
>
> Do not supply line power to the MIB module. This will damage the SUPREMA system.

The ground wire is connected to the PE terminal of the MSP module.

> **Attention!**
>
> 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.

10.12 Labelling Concept

Labelling fields are provided on the various modules for the numbering of the plug-in modules, 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.

Plug-In Modules

The labelling field for the plug-in modules (MCP, MDA, MAI, MGO and MAO modules) is located on the front, on the release lever for the module. 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.

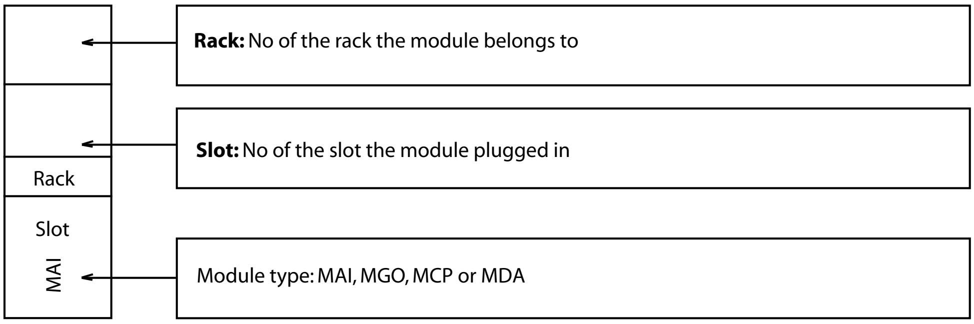


Fig. 153 Labelling field, plug-in Modules

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 numbers 41–80, etc.

MAO Modules/Analog Outputs:

The analog output numbers are permanently assigned; 8 analog outputs are available per MAO module. The assignement between the analog output numbers and the input numbers can be parameterized.

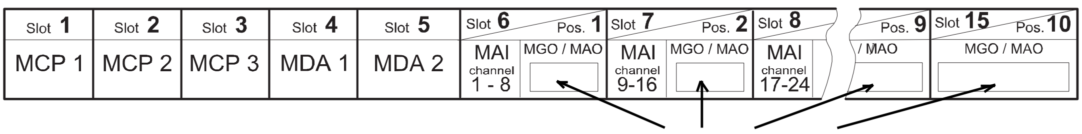


Fig. 154 Labelling of the slots in the 1st rack

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**

Fig. 155 Shows a possible labelling system

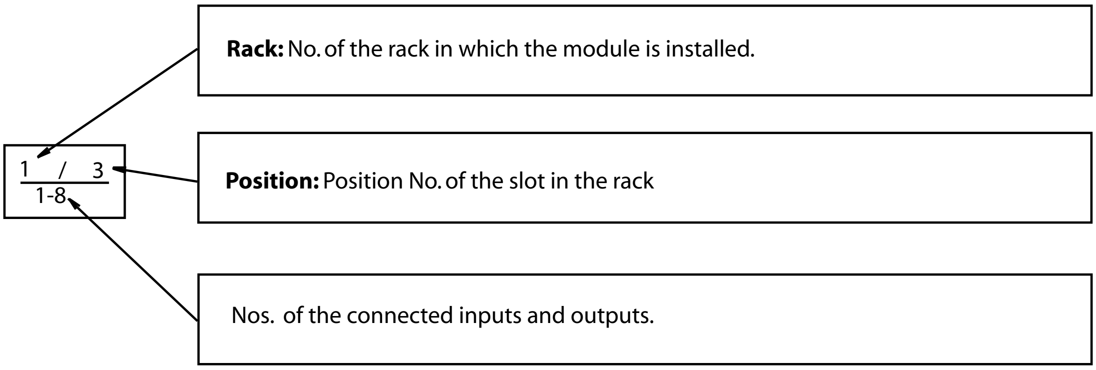


Fig. 156 Labelling of the connection and terminal Modules in the rack

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 157 shows a possible labelling system.

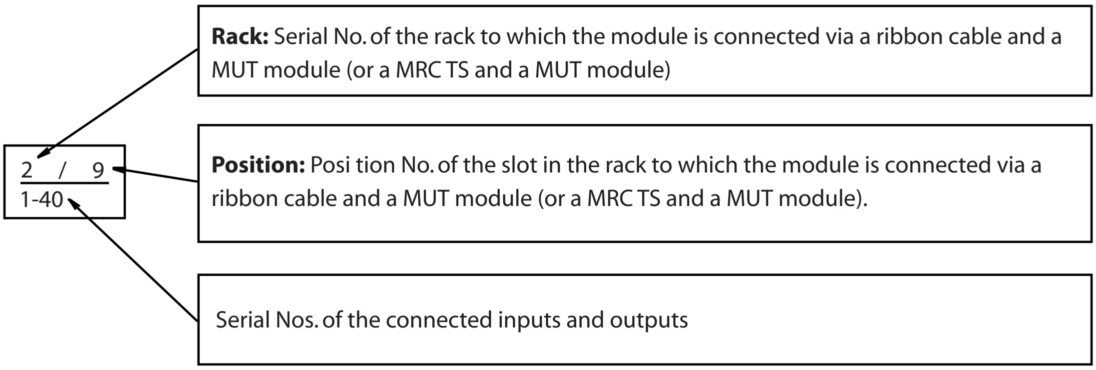


Fig. 157 Labelling of the rail-mounted connection and terminal Modules

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 158 shows a possible labelling system.

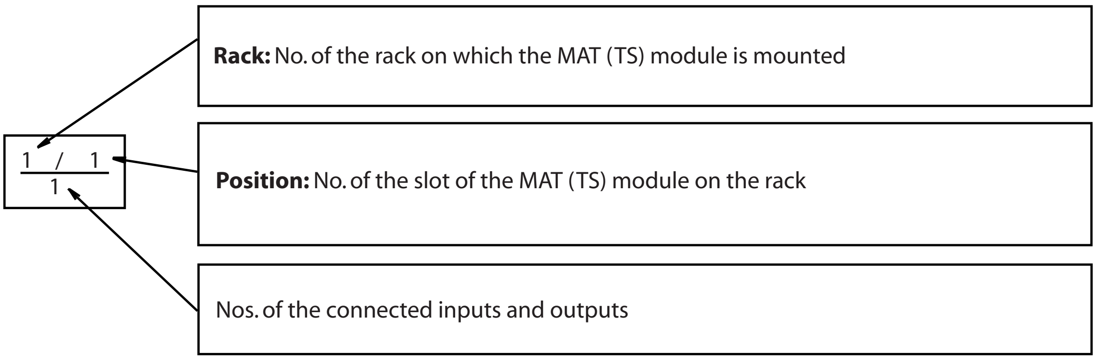


Fig. 158 Labelling of the MAT (TS) connector plug

11 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, baudrate, CAN node no., terminating resistor).
- Turn on the supply voltage.
- System Configuration (SUPREMA Manager)
- Connect and configure the sensors.
- Connect and configure the relay or switching outputs.
- Give the sensors a first calibration.
- Subject the overall system to a function test with gas.

11.1 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 “SUPREMA - MDO-20” appears on the display of the front panel (MDO module) along with the current software and hardware revision. During the start-up, a self-test is performed. The progress of this self-test is indicated by a successive activation of all LEDs as an binary counter. When a communication between the MDO and the MCP(s) is established, all alarm LEDs will be switched off. 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.

> **Attention!**
>
> If this process is not completed in 5 minutes, the installation should be checked again. If necessary, an MSA service technician should be called in to correct the problem.

11.2 System Configuration

The SUPREMA requires accurate data about the system structure for system control and error detection. This includes information such as the used modules and their locations in the system, connected power supplies as well as the number and location of the measuring points and Alarm outputs. During commissioning, these data must be entered once into the system.

The required configuration file can be created with the PC program "SUPREMA Manager". This program can then be used to transfer the configuration to the SUPREMA. (See Section 8 for version and order number).

If the current system structure does not match the stored configuration, a SYSTEM FAILURE is displayed and entries are recorded in the logbook of SUPREMA after it has started and also during operation.

Attention!

The SUPREMA must always be restarted by switching off and on after configuration to activate the new configuration.

PC program SUPREMA Manager

The program SUPREMA Manager allows you to create and manage the data of multiple SUPREMA systems. The database can include the following information:

- System configuration
- Measuring point data
- Digital output Data
- System logs

The operating instructions include a CD-ROM where you can find the SUPREMA Manager program. This program runs on Windows 7, Vista and XP (SP3).

Installation

- Insert the CD-ROM into your computer.
- The installation wizard starts automatically. Follow the instructions of the installation wizard.
- Start the SUPREMA Manager program on your system.

Creating a system configuration

Upon starting the program for the first time, the window for selecting the database path will be opened automatically. Choose there the place your database will be located on your PC.

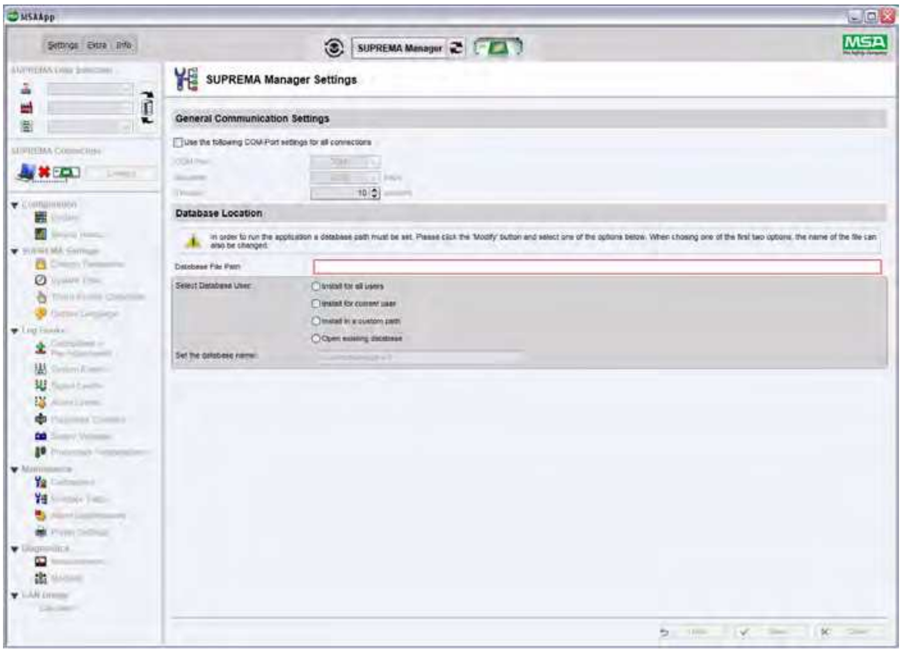


Fig. 159 Database location

After starting the program, you must select your working SUPREMA dataset in the "SUPREMA Data Selection" area. If your database is empty or if you want to create a new SUPREMA dataset, open the "Data Management" page by pressing the button in the "SUPREMA Data Selection" area. After storing the new data, close the "Data Management" page and select your new working dataset in the "SUPREMA Data Selection" area.

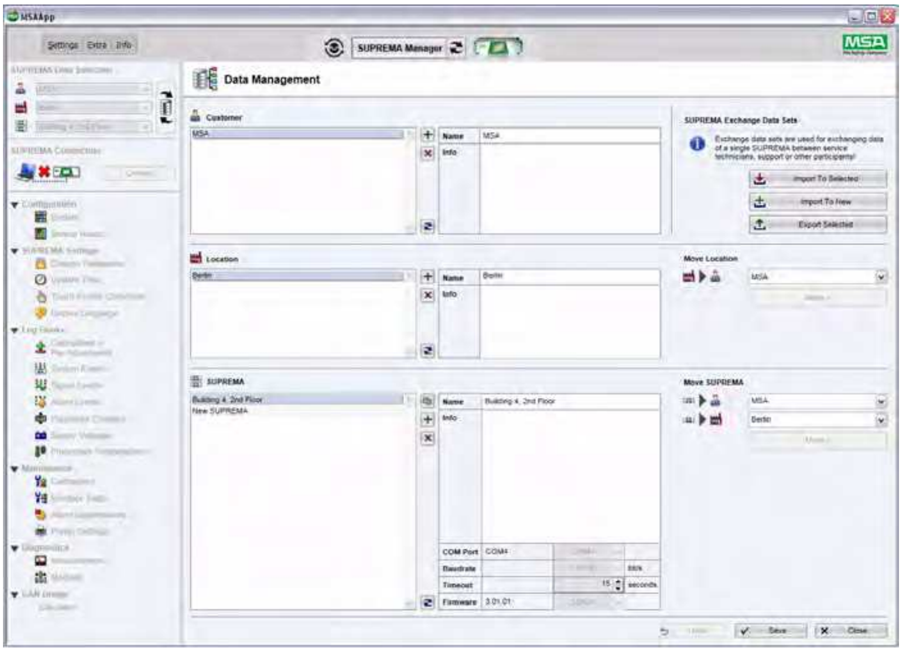


Fig. 160 Data management

Select the "Configuration > System" node in the tree view. The "Configuration > System > Overview" page will be opened.

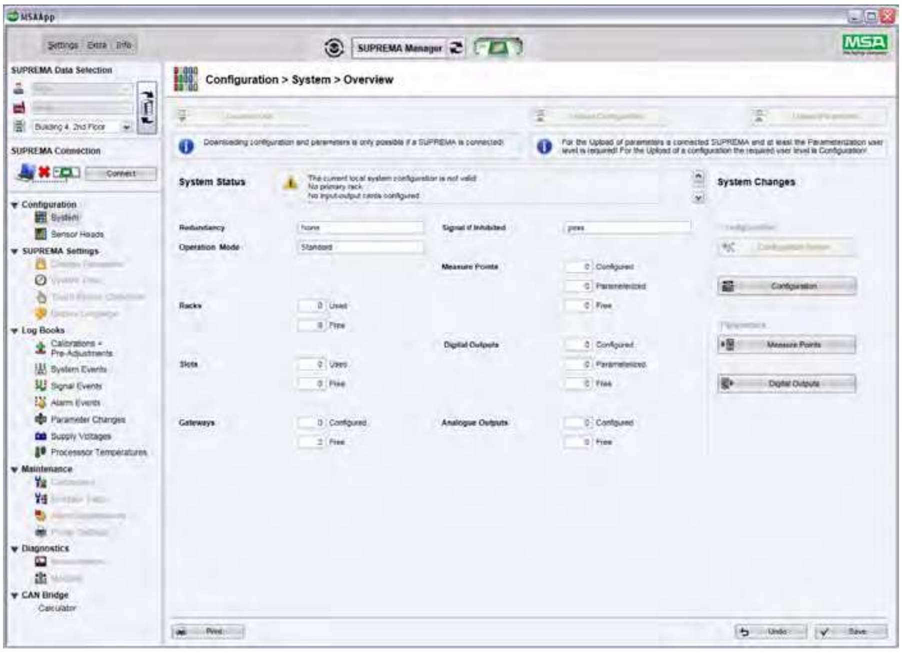


Fig. 161 System overview

Select here the "Configuration" button to open the configuration page.

Fig. 162 Configuration overview

Here you have the following options:

Adding a rack:	Select the "Add rack" button. You can choose the rack number within the button control.
Adding/deleting modules:	Right click at the target slot and choose the desired module in the context menu.
Editing mappings:	Select a module to open the detail view. For Input/Output modules you can edit the mapping here.

To complete your configuration go back to the "System overview" page by clicking the "Ready" button. Store the changes by clicking the "Save" button.

Sending a system configuration

To send a system configuration you must select a working dataset in the "SUPREMA Data Selection" area. Open the connection to your already physically connected SUPREMA with the "Connect" button in the "SUPREMA connection" area. When connected change the user level to "Configuration" in case no keyswitch is set. (Attention: The "Configuration" password is required here!) Open the "Configuration > System > Overview" page by pressing the "Configuration > System" node in the tree view.

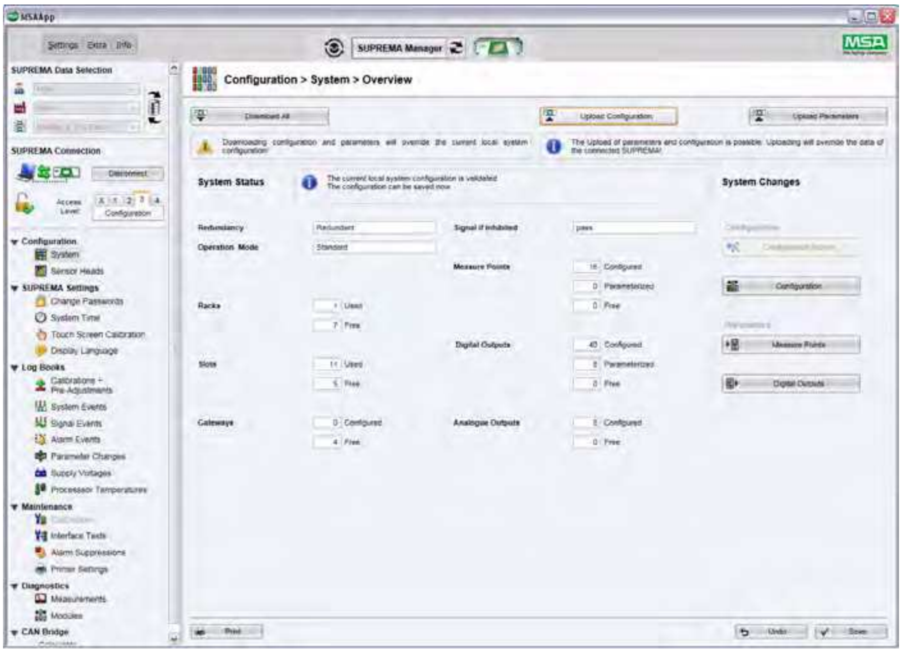


Fig. 163 System overview

Press the "Upload Configuration" button to send the configuration to the SUPREMA. After upload completion the connection is closed automatically.

To activate the uploaded configuration the SUPREMA must be restarted by shutting the SUPREMA OFF and ON again.

11.3 Start the Sensors

The system differentiates between passive and active sensors.

As a general rule, passive sensors are simply made up of a highly sensitive (half) measuring bridge while active sensors possess their own electronics and have a standardised signal output (4..20 mA).

As a result of the spread of passive sensors, some sensor type-dependent presettings, described in subsequent sections, are necessary in the first commissioning and, later, also when a sensor is replaced. Not only the instructions given here but also the operating and maintenance instructions that came with the sensor to be connected must be followed.

Attention!

If errors occur during startup which cannot be corrected with the help of the troubleshooting guide in the Maintenance and Service manual contact an MSA service technician.

In order to avoid false alarms during the commissioning of sensors, we recommend locking all affected SUPREMA measuring points before starting.

Presetting of passive sensors

Automatic presetting of passive sensors

An automatic presetting of the hardware for passive sensors is possible only by using modules MDA 20 and MAI 20 (MAIEA03). Therefore, please check the corresponding hardware and software states of your SUPREMATouch before the presetting.

The operation takes place exclusively via the MDO or the PC software. The opening of the front panel is not necessary for this. External measuring instruments are not needed too.

Method:

In order to avoid accidental damage and destruction of the sensors by an excessive bridge current, the automatic presetting is to be carried out unconditionally using a corresponding sensor equivalent network (see section 6.2 Sensor simulation module):

1. Set sensor parameter on the SUPREMA
2. Connect sensor simulation module. Set sensor current for this
3. Set sensor type dependent bridge current through MDO or PC.
4. Remove sensor simulation module
5. Connect desired sensor
6. Ensure a sufficient running-in period of the sensor
7. Carry out the first calibration of the measuring point.

These steps are to be repeated for all passive sensors to be connected.

Manual presetting of Passive Sensors

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. Therefore in the following sections the presetting for the different instrument status is described one by one..

Method:

In order to avoid accidental damage and destruction of the sensors by a too high bridge current, the manual presetting is to be carried out unconditionally using a corresponding sensor equivalent network:

1. Set sensor parameter on the SUPREMA
2. Connect sensor simulation module
3. Set sensor type dependent bridge current using UP/DOWN key MAI and external multimeter
4. Remove sensor simulation module
5. Connect desired sensor
6. Ensure a sufficient running-in period of the sensor
7. Carry out the presetting Zero point (in zero gas feeding) using the UP/DOWN key MAI and external multimeter
8. Carry out the presetting Sensitivity (in calibration gas feeding) using UP/DOWN key MAI and external multimeter
9. Carry out the first calibration of the measuring point.

These steps are to be repeated for all passive sensors to be connected. A precise description of the steps follow in subsequent sections.

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:

MAI Module Status “A” and “B”

Adjust the Sensor Current

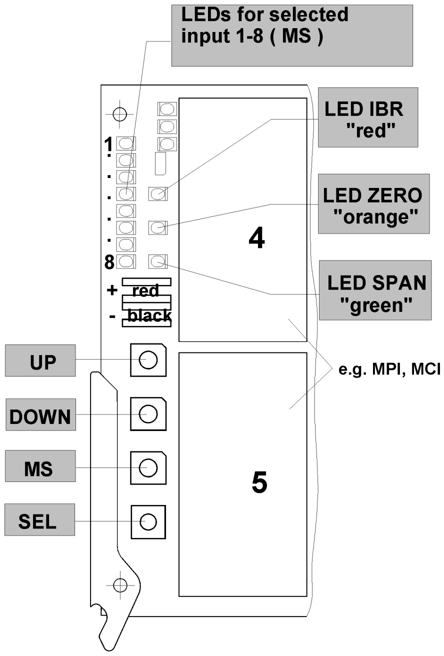


Fig. 164 Display and operating elements of the MAI Module Status “A” and “B”

> **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 165/166.

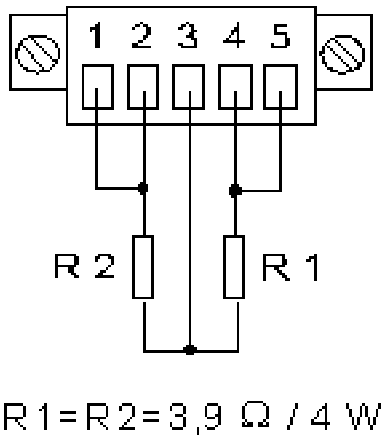


Fig. 165 Equivalent sensor circuit for the MPI WT100/MPI WT10 Module

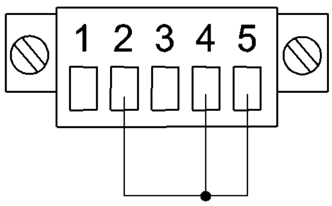


Fig. 166 Equivalent sensor circuit for the MPI HL8101/MPI HL8113 Module

- **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 goes out.

Then remove the equivalent sensor circuit 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.

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.

> **Attention!**
>
> 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:

- **Connec**t 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 WT10:	**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 è the SPAN value is within the tolerance).

Attention!

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 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 goes out.

MAI Module "C" and Order No 10050713

Setting the Sensor Current

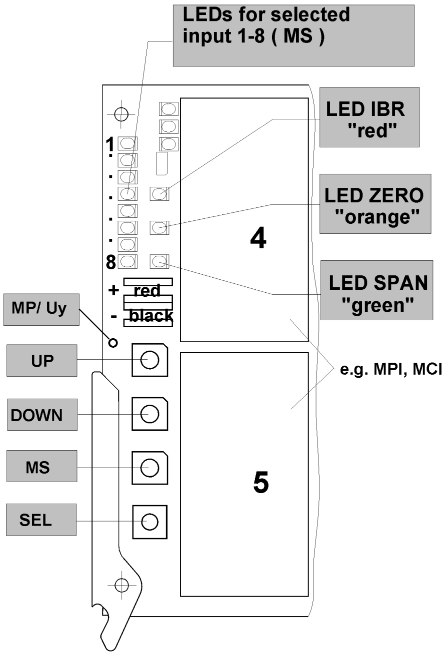


Fig. 167 Display and Operation Elements of the MAI Module Status "C"

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 connect the sensor yet!

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 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 165: Equivalent sensor circuit for the MPI WT100/MPI WT10 Module or figure 166: 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 equivalent sensor circuit 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.

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.

Attention!

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:

- **Connec**t **digital multimeter** to the **test sockets** on 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. according 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** corresponding 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 and 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).

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.

Configure the Sensors

Note: The basic operation, the menu design, and the menu structure are described in detail in the user instruction manual. Operation of the System for both the integrated operating unit, i.e., the MDO module, and also for the PC operating software "SUPREMA Manager". 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 "SUPREMA Manager" are almost completely identical to those of the display on the MDO front panel module. Differences with respect to operation are explained in the user instruction manual. The “SUPREMA Manager” 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.

> ⚠ **Attention!**
>
> 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 connection has to be re-established..

Set the System Parameters

> ⚠ **Attention!**
>
> The names of the menu and option fields refer to the display on the MDO front panel module. The corresponding names in the "SUPREMA Manager" 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:* English, German, or Chinese can be selected as the system language.
- *Set the Date and Time:* The system time can be set in the menu "Setup/Time".
- *New Password (Most Recent Password):* A customer-specific password can be entered.
- *Confirmation (Password Confirmation):* Re-enter the new password to confirm.

> ⚠ **Attention!**
>
> 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. The only behaviour that complies with EN 50271 is the function *“maintain”*.

Attention!

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.

Attention!

Make sure that the displayed operation mode is "Standard". Otherwise the system behaviour differs from the description in this manual.

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 behaviour (latching/crossing) in the *“Alarms”* menu.

Option field: *“Measure Point No.”:* Use this to select the input to be configured.

Attention!

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).

Attention!

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”)

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.

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.

Attention!

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.

Attention!

Care must be taken to ensure that the selected values are correct and valid.

Option field *“Measure Gas”*: Select the measurement gas (gas or vapour 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).

> **Attention!**
>
> If the measurement gas (the gas or vapour 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.)

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.

> **Attention!**
>
> This property has an effect on the behaviour 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.

> **Attention!**
>
> Alarms which are not required can be deactivated in this field. To do this, enter the field, press "CLEAR" and confirm the setting with "OK".

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.

> **Attention!**
>
> After the entries have been made, the settings are not accepted until the OK button has been pressed.

11.4 Configure the Relay Driver Outputs (Switching Outputs)

> **Attention!**
>
> 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.

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.

> **Attention!**
>
> If this procedure is not over in 5 minutes, check the installation again and, if necessary, call in an MSA service technician to correct the problem.

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.

The relay driver outputs are configured in the "Setup/Relay Outputs" menu. The individual options are described below.

> **Attention!**
>
> 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)

> **Attention!**
>
> When the relays are inhibited by using the LOCR connection on the MRC TS module, the switching direction selected in the “open circuit/closed circuit” 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 LOCR 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 10.3)

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.”)*. ("SUPREMA Manager": 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. ("SUPREMA Manager": 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 first 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.

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".

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.

Latching alarm:

The signal is within the alarm limits:

- The output is at *"normal"* status.

The signal is outside the 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" (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.

11.5 First Calibration

> **Attention!**
>
> 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.

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 first calibration for passive sensors must be performed on the SUPREMA system.

> **Attention!**
>
> At least 2 people are required to perform the first 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 first 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 first calibration may not be performed until after the preliminary adjustment of the MAI module in accordance with Section Presetting of Passive Sensors, has been properly completed for all connected passive sensors.

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)

Presetting of Passive Sensors

For the first 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.

> **Attention!**
>
> 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.
- Activate the field First calibration.
- Start calibration with the “Start” button.

> **Attention!**
>
> 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 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 button has been actuated “[Store]”. In a first calibration, the line “OLD” is blank.
- 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 "Store" button 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 "Store" button. The value is now shown in the “CAL-SPAN/mV” field.
- Conclude the calibration of the selected input by actuating the "End" button.

Attention!

Signals UA above 600 mV are not valid for the zero point calibration. During the sensitivity calibration the value in test gas feed must be 200 mV greater than the current value in zero gas feed.

- 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.

Attention!

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 "Cancel" button. 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.

Active Sensors

A first calibration on the SUPREMA system is not required for active sensors (sensors with a 4 ... 20 mA output). The first 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 first calibration.

Attention!

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 chapter 11.5.

11.6 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.

12 Connection of Peripherals

To simplify the operation (especially the configuration) of the SUPREMA, a PC or laptop with operating software can be connected using different connectors.

A protocol printer can be connected via the RS 232-B interface on the MST.

12.1 Connection of a PC/Laptop

For this connection, you can use either the RS 232-A port on the MST10 module or the RS 232/USB port on the MDO-20 module.

Attention!

No more than one PC/laptop may be connected to the SUPREMA system at one time, even if more than one USB/RS232 port is available.

Connecting cable: RS 232 extension, 9-pin SUB-D connector, plug/jack (**do not use a null modem cable!**) or miniUSB.

To connect a PC/laptop to the MDO-20 module, the front panel screwing has to be loosened, and the front panel must be dropped.

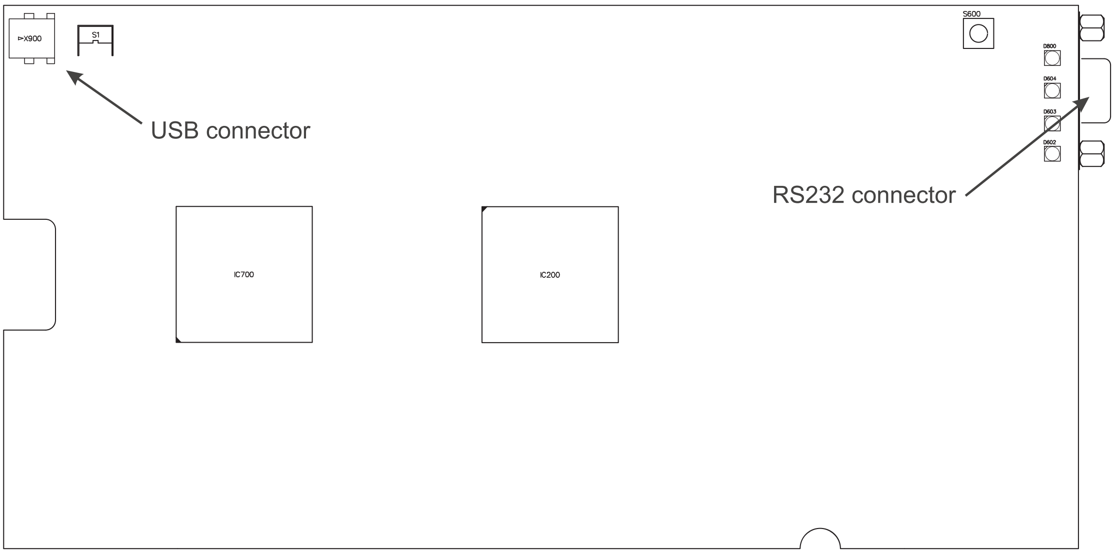


Fig. 168 MDO Module, RS 232 port

The terminal assignment of the RS 232/USB port on the MDO-20 module is the same as that used for the RS 232-A port on the MST10 module (Chapter 10.10).

The MST module is mounted on the rear of the rack, behind Slot 1–3.

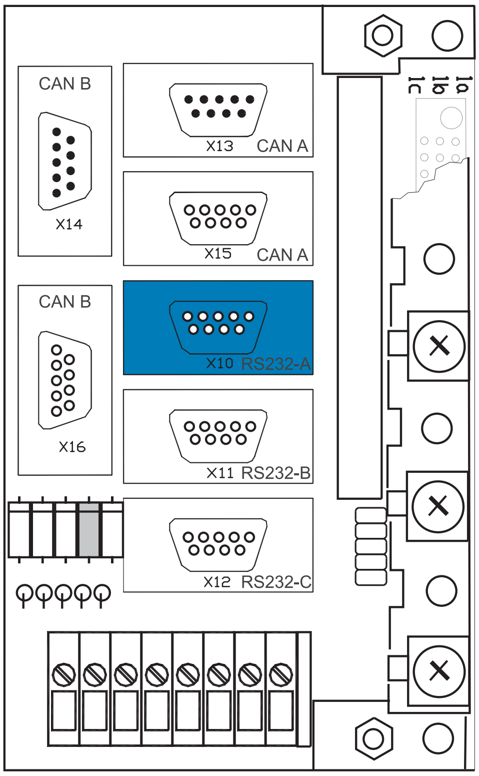


Fig. 169 MST Module, RS 232-port

The PC/laptop is connected via the serial interface (RS 232). The necessary settings for the interface are described in the following sections.

Operating Software

PC operating software "SUPREMA Manager" 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:

- Minimum Pentium IV, 2GHz, 2 GB of RAM

The operating software runs under the following operating systems:

- Windows 7, Vista and XP (SP3)

For the connection of the PC/laptop, an USB and alternatively an serial interface (RS232) is provided. The serial interface of the PC/laptop must be configured in accordance with the following specifications:

- RS 232 configuration (COM1): 19200 baud (by setting DIP switch S200-4 on the MDO, the baud rate can be changed to 115200 baud), 8 data bits, 1 stop bit, parity none

> **Attention!**
>
> The operating software can be connected to any USB or RS232 interface of the PC!

Section3.4 PC Operation describes in detail how to use the software.

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.

12.2 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, behind Slot 1–3.

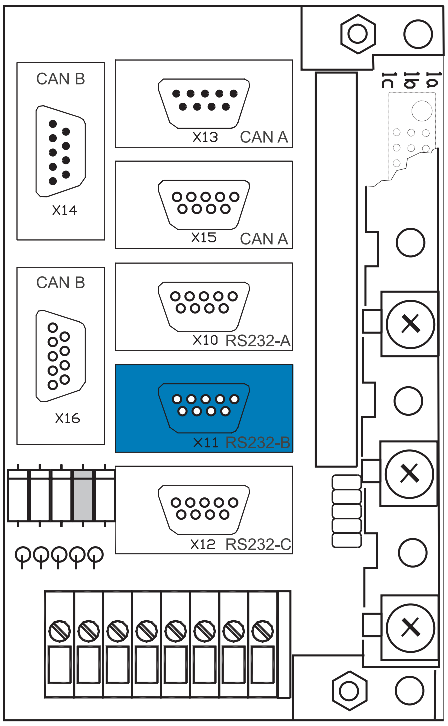


Fig. 170 MST Module, RS 232-B port

The terminal assignment of the RS 232-B connection is described in chapter 10.10.

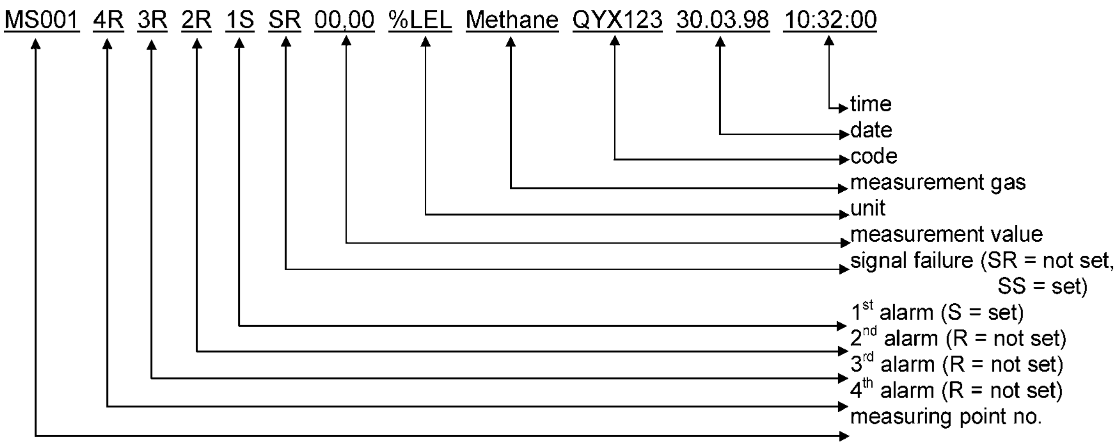


Fig. 171 Protocol printer, Data Structure

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 166: Protocol printer, Data Structure is printed out along with the date and time of the most recent change of status.

Attention!

This formatting can be changed by the user!

12.3 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 conversion necessary is realised by SUPREMA gateways.

> **Attention!**
>
> 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:

- Modbus RTU Standard
- Modbus TCP, Description of function - see Software Manual "SUPREMA Gateway CAN/ Modbus TCP with SUPREMA-CANopen Firmware"
- Profibus DP

Further data bus systems on request.

SUPREMA Gateway CAN/Modbus RTU (PKV30)

(Not contained in EC-type examination certificate DMT 03 ATEX G 003 X)

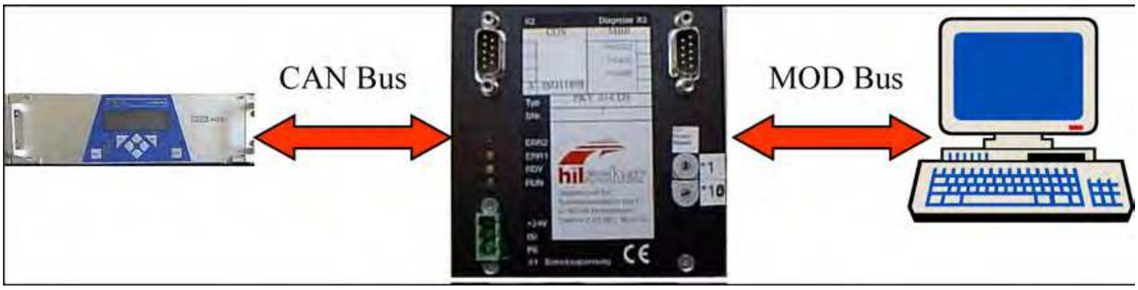


Fig. 172 Connection the SUPREMA to external systems using a Modbus RTU gateway

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 Modbus, 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 Modbus. 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 Modbus 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.

Attention!

For operating the gateway PKV30 via RS485 the jumper J5 inside the device has to be set to position 3-4 and the parameter RTS-Control has to be switched to YES with the COMPRO tool. See also the "device manual protocol converter for CANopen Slave" and the "Operation manual COMPRO".

Data format Modbus 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 (at version 1.02.07 and PKV Firmware 1.101).

					Event				
Memory address	Data value	1st alarm	2nd alarm	3rd alarm	4th alarm	Calibration	Signal failure	Inhibitet	Measure range exceeded
10001	1st alarm	1	0	0	0	0	0	0	1
10002	2nd alarm	0	1	0	0	0	0	0	1
10003	3rd alarm	0	0	1	0	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	0	1	0	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 = HEX 7C, switch 1 to C, switch 16 to 7

125 = HEX 7D, switch 1 to D, switch 16 to 7

provided on the PKV 30 (see also fig. 169).

Connection to the SUPREMA:

Fig. 173 Connection Suprema Gateway CAN/Modbus 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, 458 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

Fig. 174 Technical Data Suprema Gateway CAN/Modbus RTU

SUPREMA-Gateway CAN/Profibus DP

(Not contained in EC-type examination certificate DMT 03 ATEX G 003 X)

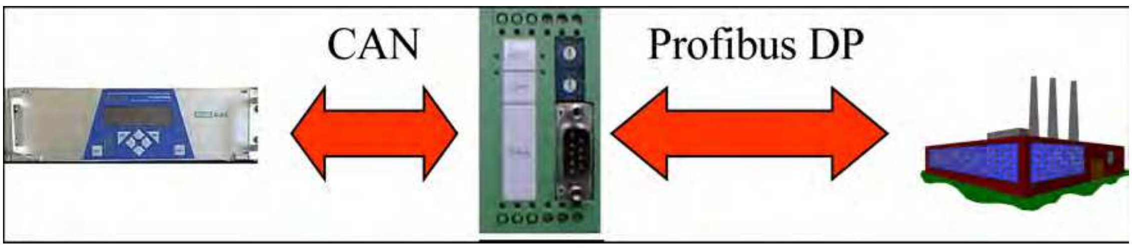


Fig. 175 Connection the SUPREMA to external systems using a Profibus gateway

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, parameterisation 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:

Fig. 176 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 MSTB2.5/5.08) - CAN or DeviceNet
Temperature range	0 ... 50 °C environmental temperature
Humidity	max. 90%, noncondensing
Dimensions of the cabinet (L x W x H)	Width: 40 mm, Height: 85 mm, Depth: 83 mm (including mounting rail and protruding connector DSUB9, without CAN/DeviceNet plug
Weight	Approx. 200 g

Fig. 177 Technical Data Suprema Gateway CAN/Profibus DP

13 Redundant Systems

13.1 Application/Function Safety

For the safety functions of gas warning measuring instruments, the European standards EN 60 079-29-1, EN 50 104, EN 50 271 , and EN 50 402 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 Acquisition
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 acquisition and alarming, the non-redundant system can be converted to a redundant system.

13.2 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 “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)
MRA Module	= Analog Redundant (ADW 2)

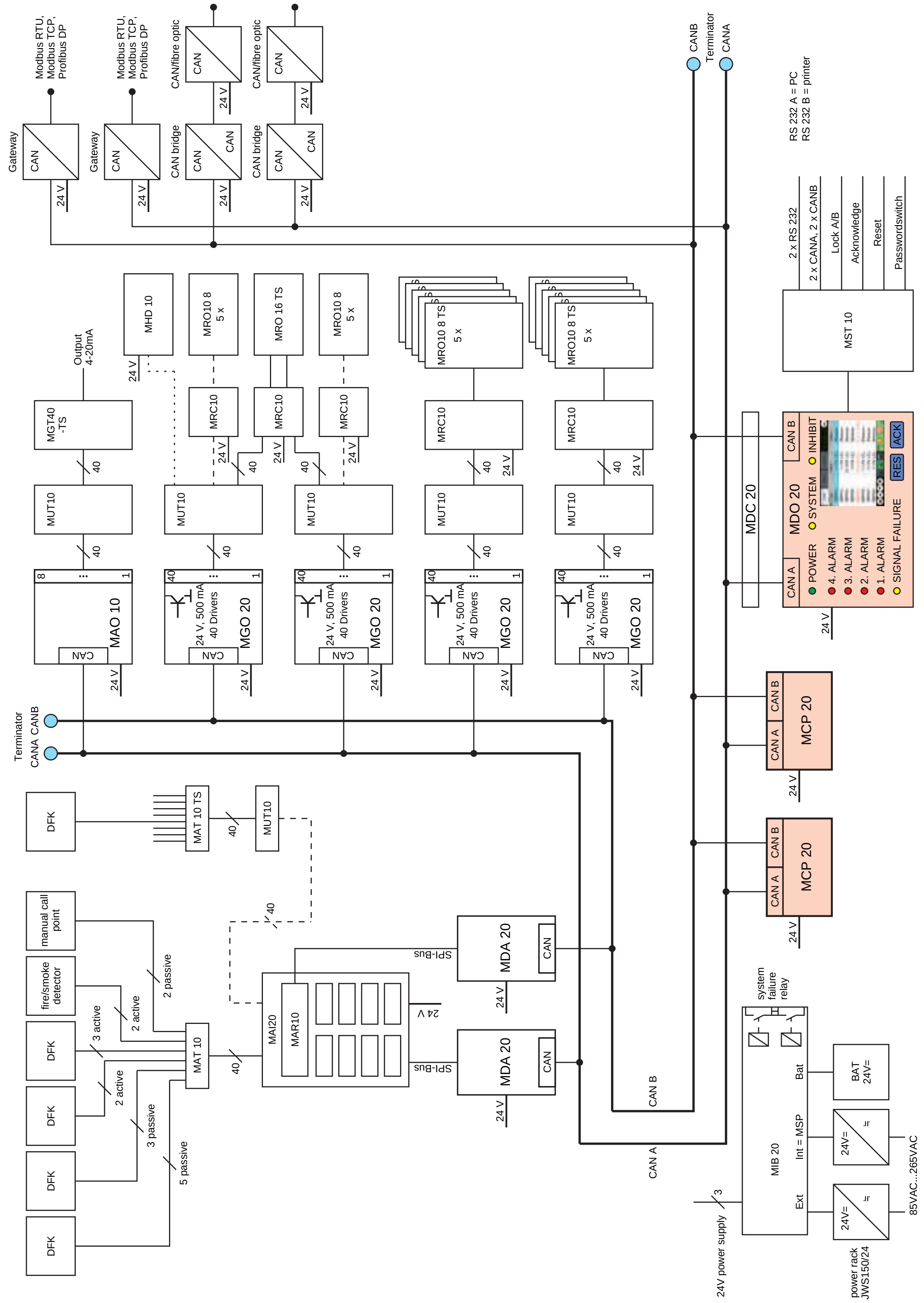


Fig. 178 Circuit Diagram Rack System (redundant)

13.3 Design of the Redundant System

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.

Attention!

When retrofitting, the Regulations for Handling Electrostatic Sensitive Components must be followed!

Slot	Name	Non redundant (Channel A)	Redundant (Channel B)
1	Slot 1	MCP	MCP
2	Slot 2		MCP
3	Slot 3	MDC + MDO	MDC + MDO
4	Slot 4 / MDA 1	MDA	MDA
5	Slot 5 / MDA 2		MDA
6	Slot 6/POS 1		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

Fig. 179 Modules of 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 (Modbus, Profibus)

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 output 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.

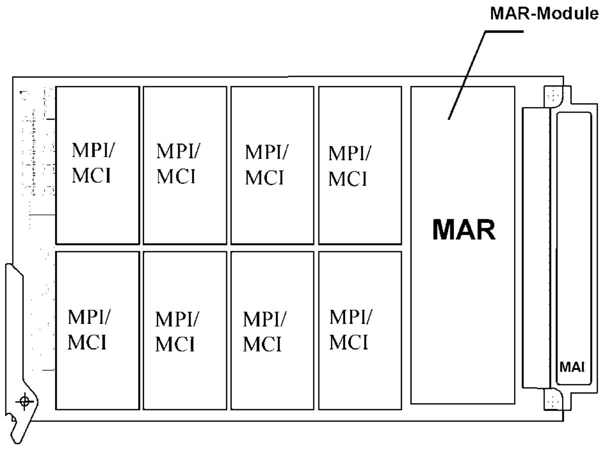


Fig. 180 MAI Module with MAR Module

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.

Output Drivers/Relay Outputs

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 outputs 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 layout 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 users responsibility to observe the valid standards and guidelines.

Attention!

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.

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**

Connection MRO 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.

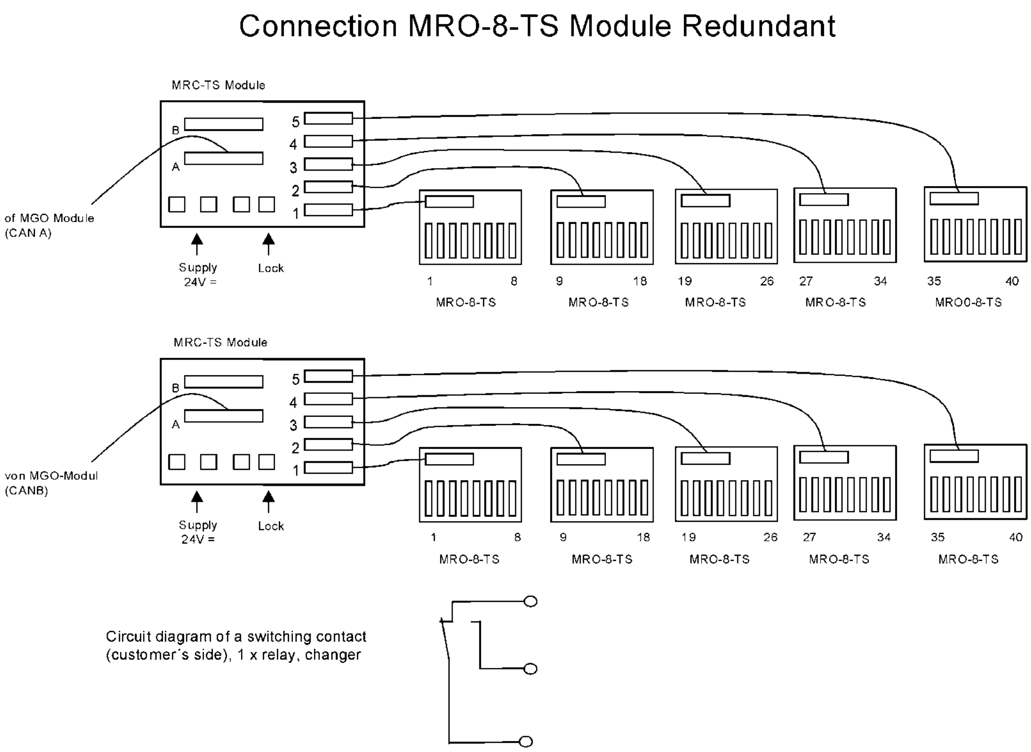


Fig. 181 Connection MRO 8 TS Redundant Module

The terminal connections and the relay assignment of the MRO 8 TS module are described in detail in chapter 10.7.

If for non ATEX or SIL-3 relevant purposes (e.g. indicator tablet) only 1 set of output relays or drivers (usually only of CAN A) are needed, then a MSO module can be attached to the not occupied outputs (usually CAN B) directly to the MIB without use of a MUT module. The MSO module has LED displays for the relay condition.

Attention!

In case of failure of the bus system A the external outputs are frozen to the last value.

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

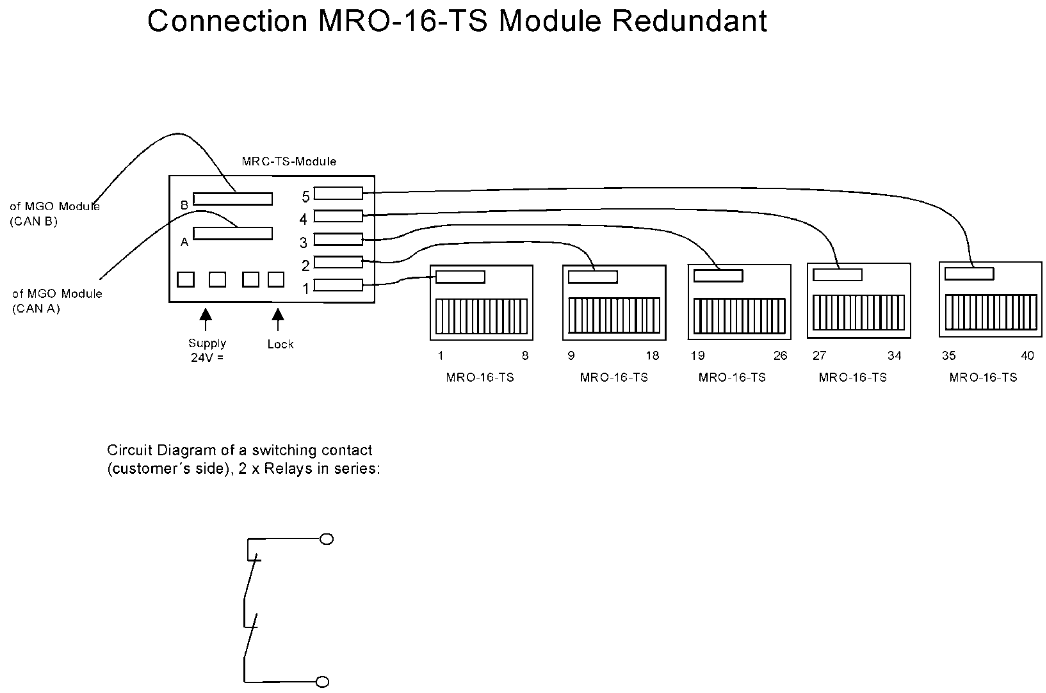


Fig. 182 Connection MRO 16 TS Redundant Module

Connection Terminals	Relays	Function at Position 1, (first relay block)
1-2	1, 9	1st Alarm
3-4	2, 10	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	Power Failure

Fig. 183 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 9–16 by CAN B (MCP B).

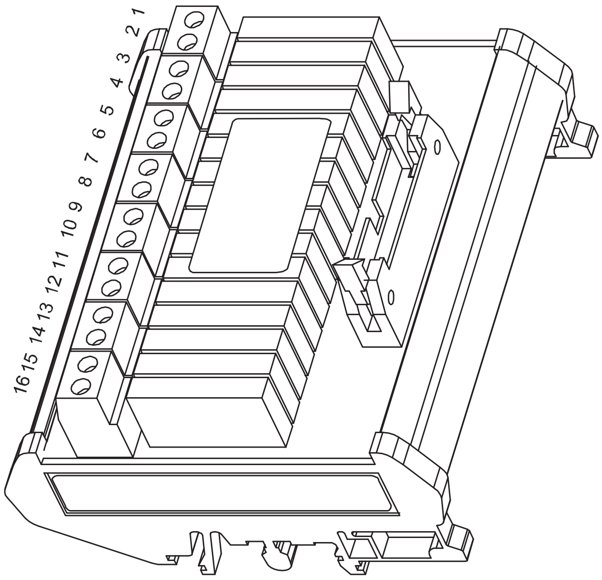


Fig. 184 MRO 16 TS Module

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.

Logic extension MLE10 (with SIL-3 Approvals)

This module can be inserted into redundant systems to implement special logic functions, switching delays, etc. for the 40 switching outputs of a MGO module. Logic extension MLE10 is connected between MGO and MRC / MGT. It is connected with the 40-pole ribbon cable.

This module is checked for safety-related applications up to and including SIL3.

For detailed information with regard to the use, operation and Technical Data, see the operating and maintenance instructions for logic extension MLE10, material number 10056386.

13.4 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.

If the configuration listing does not correspond to the system status, “SYSTEM FAILURE“ will be issued after startup.

After connecting the modules, the configuration stored in the SUPREMA memory has to be updated according to the system status. For detailed information, see section 10.

Configuration Tool

All configuration has to be done, and all paraterization can be done with the PC operating program called SUPREMA Manager. Version and Article Number see chapter 8.

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. LED Display	Display Listing

Displays of the Modules

All CAN-BUS modules 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.

14 Technical Data

14.1 System Data

Racks per system:		1-8
Number of inputs	- per system:	1-256
	- per rack;	up to 64
Switching output/relay outputs:		0-512
Analog outputs 0 - 20 mA:		0-256
Operation and Display:		320 x 240 pixel colour display
		resistive touch panel
		function keys
Interfaces:		3 x RS232:
		- PS operation
		- printer
		- free
		2 x CAN-Bus
System operating voltage		19.2 V ... 32 VDC
System power supply (3x redundancy):		3 x 24 VDC
Rack power supply, 150 W:		85 ... 265 VAC
- 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 modules (+24 V): 10 A
- maximum rack load current of all MGO modules (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)
	- switches	
	- fire	
Housing:	19“ rack, 3HE	

Storage temperature for all parts of the system: -25 °C ... +55 °C

14.2 Module Data

MCP Module: Central Processing Unit
Order No.: 10087413
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 ... 55 °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:	125 g

MDA Module: Data Acquisition Unit
Order No.: 10080011
Function

- reads in the measurement values from the MAI 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:	40 mA
Temperature range:	5 °C ... 55 °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:	87 g

MDO Module: Display + Operating Unit

Order No.: 10087412

Function

- 320 x 240 pixel backlit graphics display
- system operation via touch screen
- 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
- RS 232 (RS 485 optional) and USB, electrically isolated PC interface
- RS 232 (RS 485 optional), electrically isolated printer interface

Technical Data

Operating voltage feed (3 x 24 VDC):	14 ... 32 VDC
Operating current:	350 mA
Temperature range:	5 °C ... 55 °C
Humidity:	0 ... 90 % relative humidity noncondensing
RTC backup battery type:	BR2325
RTC backup battery life time:	10 years
Plug connector:	50-channel ribbon cable
Dimensions:	213 x 108 mm
Weight:	470 g

MDC Module: Display Connection

Order No.: 10110482

Function

- connection between MDO and MIB

Technical Data

Operating voltage feed (3 x 24 VDC):	14 ... 32 VDC
Operating current:	40 mA
Temperature range:	5 °C ... 55 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Plug connector:	50-channel ribbon cable
Dimensions:	100 x 160 mm
Weight:	100 g

MBC Module: Bus Communication

Order No.: Software dependent

Function

- connection to external busses (function is software dependent)

Technical Data

Operating voltage feed (3 x 24 VDC):	14 ... 32 VDC
Operating current:	100 mA
Temperature range:	5 °C ... 55 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	100 x 160 mm
Weight:	115 g

MGO Module: General Output Unit

Order No.: 10083804

Function

40 driver outputs for relays + LEDs (24 VDC/0.3 A)

Technical Data

Operating voltage feed (3 x 24 VDC):	14 ... 32 VDC
Operating current logic:	40 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 outputs ON)	1 A
- total current of all outputs of one driver IC:	4 A
Temperature range:	5 °C ... 55 °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:	100 g

MHD TS Module: Modular High Driver

Order No.: 10038420

The MHD 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 (24 V 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
Temperature range:	5 °C ... 55 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	150 x 90 x 60 mm
Weight:	approx. 165 g

MAI Module: 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 MAT module (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 module)	3 A, maximum
Temperature range:	5 °C ... 55 °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

MPI WT 100 Module: Passive 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 (3 x 24 VDC):	19.2 ... 32 VDC
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 ... 55 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	46 x 24 mm
Weight:	12 g

MPI WT 10 Module: Passive 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 VDC
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 ... 55 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	46 x 24 mm
Weight:	12 g

MPI HL 8101 Module: Passive 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 VDC
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:	44 ... 1100 mV (Ux)
Temperature range:	5 °C ... 55 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	46 x 24 mm
Weight:	12 g

MPI HL 8113 Module: Passive 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 VDC
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 kOhm
Setting range, sensitivity:	24 ... 1100 mV (Ux)
Temperature range:	5 °C ... 55 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	46 x 24 mm
Weight:	12 g

MCI/MCI BFE Module: Current Input Unit

Order No.: 10043997 / 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 ... 2 A)
- 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: 4 ... 20 mA

Technical Data

Operating voltage feed:	18.5 ... 32 VDC
Operating current:	1 mA
Current input (current limitation):	0 ... 30 mA
Contact input:	0 ... 27.5 V
Temperature range:	5 °C ... 55 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	46 x 24 mm
Weight:	7 g

MRO 10-8 Module: Relais Output Unit

Order No.: 10018946

Function

- relay module, installed on rear of rack
- 8 relays for common alarms, 1^{st}-4^{th} 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 ... 55 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	125 x 69 mm
Weight:	142 g

MRC TS Module: Relais Connector

Order No.: 10021676

Function

- connection module for 5 MRO 8 TS/MRO 16 TS modules on MUT module
- divides 2 x 40-channel FRC 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 MRO 8 TS:	280 mA
Relay operating current 5 x MRO 16 TS:	560 mA
Temperature range:	5 °C ... 55 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	90 x 153 x 65 mm
Weight:	180 g

MRO 10-8 TS Module: 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 ... 55 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	90 x 71 x 68 mm
Weight:	160 g

MRO 10-16-TS Module: 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 ... 55 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	90 x 103 x 65 mm
Weight:	201 g

Relay Contact Data (MRO10)

Maximum switching voltage:	250 VAC
	250 VDC
Nominal current:	3 A
Maximum switching power:	
- AC voltage	1500 VA
- DC voltage (from load limit curve)	24 VDC/3 A
	50 VDC/0.3 A
	100 VDC/0.1 A
Minimum switching power:	6 VDC/1 A
	12 VDC/100 mA
	24 VDC/1 mA

MRO 20-8-TS

Order No.: 10112807

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)
- 2 change over contact per relay

Technical Data

Relay operating voltage:	19 ... 32 VDC
Relay operating current:	16 mA
Contact type:	2 x change-over contact
Contact load capacity:	see relay contact data
Temperature range:	5 °C ... 55 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	132x 68 x 90 mm
Weight:	348 g

MRO 20-16-TS

Order No.: 10112805

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:	16 mA
Contact type:	2 x normally open
Contact load capacity:	see relay contact data
Temperature range:	5 °C ... 55 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	252 x 68 x 90 mm
Weight:	514 g

Relay Contact Data (MRO 20-8(16)-TS)

Maximum switching voltage	AC 250 / 400 VAC
Nominal current:	5 A
Maximum switching power	
- AC voltage	2000 VA
- DC voltage	24 VDC/5 A
(from load limit curve)	50 VDC/5 A
	100 VDC/0.4 A
Minimum switching power:	24 VDC/100 mA

MRO 20-8-TS SSR

Order No.: 10115115

- 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)
- galvanic isolated

Technical Data

Relay operating voltage:	19 ... 32 VDC
Relay operating current:	10 mA
Contact type:	1 x NO contact
Contact load capacity:	see relay contact data
Temperature range:	5 °C ... 55 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	103 x 60 x 90 mm
Weight:	140 g

MRO 10-16-TS SSR
Order No.: 10105281

- relay module, installed on mounting rail
- actuated by 2 MGO modules
- relays locked via the MRC module (LOCK)
- Series connection of 2 contacts
- Connection across 2 terminals
- galvanic isolated

Technical Data

Relay operating voltage:	19 ... 32 VDC
Relay operating current:	10 mA
Contact type:	1 x NO contact
Contact load capacity:	see relay contact data
Temperature range:	5 °C ... 55 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	103 x 60 x 90 mm
Weight:	150 g

Relay Contact Data (MRO 20-8-TS SSR/MRO 10-16-TS SSR)

Maximum switching voltage	max 32 V DC
Nominal current:	0.3 A (1 A peak / 80ms)
On resistance	max. 3.2 ohms
I/O isolation voltage	2,000 V AC

MAO Module: 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 ... 32 VDC
Operating current:	150 mA (maximum)
Temperature range:	5 °C ... 55 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Maximum load:	500 ohms
Output current 4 ... 50 mA:	0 ... 24 mA
Dimensions:	100 x 160 mm
Weight:	127 g

MIB Module: Interconnection Board

Order No.: 10032525

Function

- rack rear-panel wiring for 2 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
- DIL switch for CAN rack ID, CAN bit rate, CAN bus terminating resistor
- 5 “dedicated” slots for 2 x MCP, 1 x reserved for MDC + MDO, 2 x MDA
- 8 undedicated slots for MAI, MGO, MAO modules etc.
- 2 undedicated slots for MAO, or MGO modules etc.
- electric connection for the inserted modules
- connection modules (MST, MUT etc.) are plugged into the rear of the MIB

Technical Data

Operating voltage feed:	19.2 ... 32 VDC
Maximum allowable operating current:	
feed (+24 v):	20 A
(GND):	32 A
Feed connector cross section:	4 mm^2, flexible
	6 mm^2, rigid
Power supply terminals:	EXT, INT, BAT
Setting elements (rack no., CAN bit rate)	10-channel DIL switch
System error relay	3 A
Temperature range:	5 °C ... 55 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	377 x 128 mm
Weight:	650 g

MAT Module: 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 ... 55 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	125 x 50 mm
Weight:	155 g

MSP Module: System Power Unit

Order No.: 10020340

Function

- rack power supply, 150 VA

Technical Data

Operating voltage, feed:	85 ... 265 VAC
Maximum operating current:	2 $A_{(100VAC\ Input)}$; 1 $A_{(200\ VAC\ Input)}$
Maximum switch on current:	50 A at 230 V (cold start)
Power connection factor:	according 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 ... 55 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	65 x 92 x 198 mm
Weight:	850 g

MST Module: 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 ... 55 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	125 x 76 mm
Weight:	102 g

MFI Module: Fire Input Unit

Order No.: 10046262

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 VDC
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 ... 55 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	46 x 24 mm
Weight:	10 g

MSI Module: Switch Input Unit

Order No.: 10048284

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 VDC
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 ... 55 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	46 x 24 mm
Weight:	8 g

MRD Module: Dummy Relay

Order No.: 10052880

Function

A Dummy Relay Module simulates the load provided by a Relay Output Module (MRO).

A system fail will be triggered if each Relay Connection Module (MRC) output connector (X3 to X7) is not connected to either an MRO or a MRD.

Technical Data

Temperature range:	5 °C ... 55 °C
Operating voltage	18 ... 32 VDC
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	approx. 29 x 30 x 8 mm
Weight:	approx. 5 g

MAR Module: 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.

Technical Data

Temperature range:	5 °C ... 55 °C
Humidity:	0 ... 90 % relative humidity noncondensing
Dimensions:	95 x 24 mm
Weight:	15 g

15 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 60079-29-1 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 module with part no. 10043997 and 10044020 meets the requirements according to EN 60079-29-1 for active sensors at 3-wire operation..

15.1 SUPREMA Sensor Data Sheet D-7010 (3-wire)

Order No.: D0791601

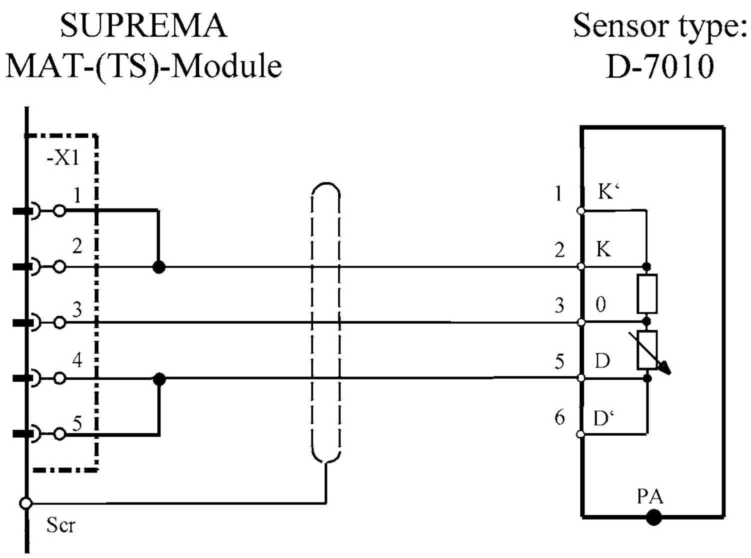


Fig. 185 Connection scheme D-7010 (3-wire)

The cable screen is only connected to the SUPREMA. 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 MAT and MAT TS module.

Connection module:	MPI/WT 10/passive/3-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	3-core, 80 % screened
	Maximum loop resistance	28 ohms (3.4 ohms for ATEX applications)
	Maximum cable lenght	850 m (at 1.5 mm^2 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 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 - +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 the digital multimeter to the test sockets on the MAI module. Bridge current setting —> 270 mA or 300 mA (for CH4) 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 LED's, 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			

15.2 SUPREMA Sensor Data Sheet D-7010 (5-wire)

Order No.: D0791601

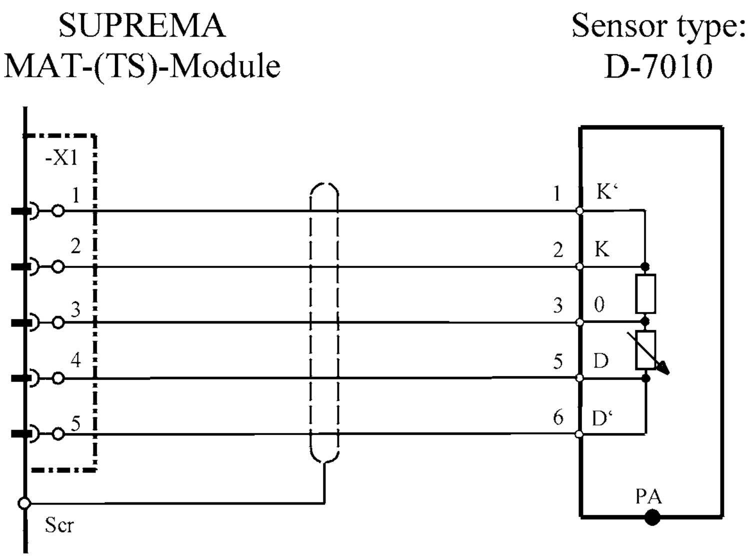


Fig. 186 Connection scheme D-7010 (5-wire)

The cable screen is only connected to the SUPREMA.

Connection module: MPI/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 mm^2 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 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 - +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 the digital multimeter to the test sockets on the MAI module. Bridge current setting —> 270 mA or 300 mA (for CH4) 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 LED‘s, 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	XX	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	XX	X	X	X	XXXX

15.3 SUPREMA Sensor Data Sheet D-7100 (3-wire)

Order No.: D0791610

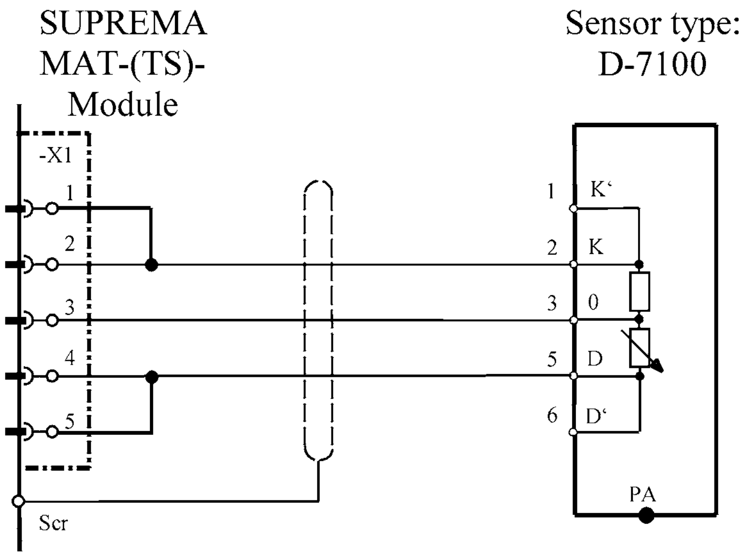


Fig. 187 Connection scheme D-7100 (3-wire)

The cable screen is only connected to the SUPREMA. 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 and MAT TS module.

Connection module: MPI/WT 100/passive/3-wire/Constant current/Presetting required

Sensor simulation module: WT 100 = catalytic combustion (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 (3.4 ohms for ATEX applications)
Maximum cable length	1200 m (at 1.5 mm^2 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 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 - +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**
Presetting:	Connect the digital multimeter to the test sockets on the MAI module. Bridge current setting —> 270 mA or 300 mA (for CH4) Zero adjustment by zero gas —> Zero setting to **Ua = 400 ... 450 mV**Sensitivity adjustment with measuring gas —> Measuring range level **Ua = 1900 ... 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 LED‘s, 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			

15.4 SUPREMA Sensor Data Sheet D-7100 (5-wire)

Order No.: D0791610

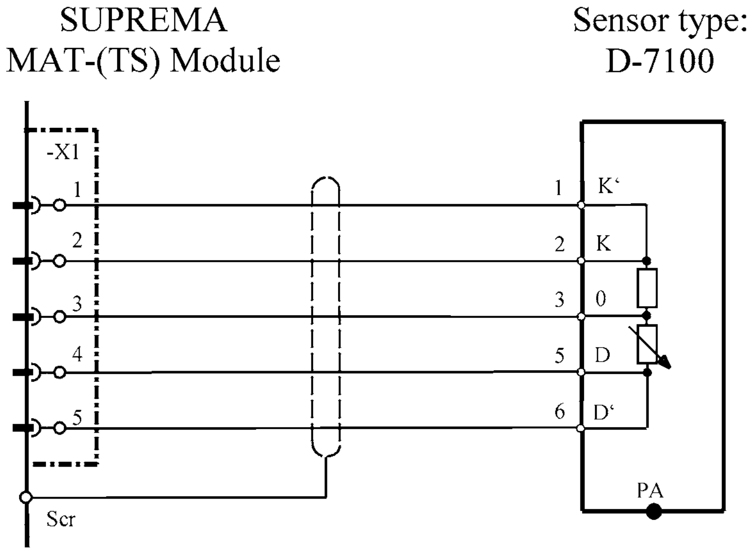


Fig. 188 Connection scheme D-7100 (5-wire)

The cable screen is only connected to the SUPREMA.

Connection module:	MPI/WT 100/passive/5-wire/Constant current/Presetting required
Sensor simulation module:	WT 100 = catalytic combustion (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 mm^2 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 mm^2
Cable inlet	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**
Presetting:	Connect the digital multimeter to the test sockets on the MAI module. Bridge current setting —> 270 mA or 300 mA (for CH4) Zero adjustment by zero gas —> Zero setting to **Ua = 400 ... 450 mV**Sensitivity adjustment with measuring gas —> Measuring range level **Ua = 1900 ... 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 LED‘s, 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	XX	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	XX	X	X	X	XXXX

15.5 SUPREMA Sensor Data Sheet Series 47K-ST, -PRP (3-wire)

Order No.: according to ordering information

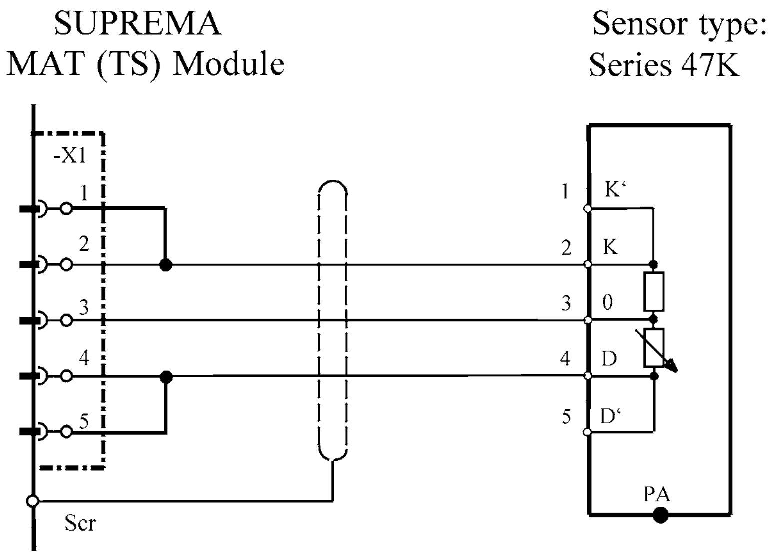


Fig. 189 Connection scheme Series 47K (3-wire)

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 module resp. 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 (3.4 ohms for ATEX applications)
Maximum cable length	1000 m (at 1.5 mm^2 cross section per wire
Cable diameter	7 ... 12 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	CESI 012 ATEX 091
Dimensions W x D x H	100 mm x 100 mm x 100 mm
Weight	400 g
Temperature	-40 °C ... +55 °C (T5) / -40 °C ... +40 °C (T6)
Terminal box EEx d 2 x M25 x 1.5 mm	KEMA 99 ATEX 3853
Dimensions W x D x H	90 mm x 90 mm x 75 mm
Weight	490 g
Temperature	-40 °C ... +60 °C (T5) / -40 °C ... +40 °C (T6)
Humidity	5 ... 95 % rel. humidity; noncondensing
Pressure 47 K-ST/47 K-PRP	800 ... 1200 hPa
For further details see operation manual. (Order no.: 10052472)	

Startup:	**Presetting required —> before first calibration and when changing sensor**
Presetting:	Connect the digital multimeter to the test sockets on the MAI module. 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 / 100 * 1600 + 400** **C = Span gas concentration in % of measuring range**
Warm-up period:	15 min 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 LED‘s, 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			

15.6 SUPREMA Sensor Data Sheet Series 47K-ST, -PRP (5-wire)

Order No.: according to ordering information

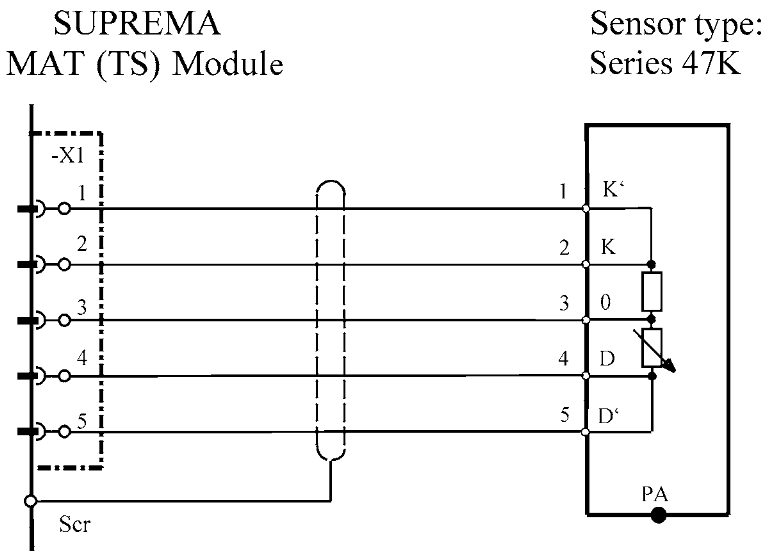


Fig. 190 Connection scheme Series 47K (5-wire)

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/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	1500 m (at 1.5 mm^2 cross section per wire
Cable diameter	7 ... 12 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	CESI 012 ATEX 105
Dimensions W x D x H	100 mm x 100 mm x 100 mm
Weight	400 g
Temperature	-40 °C ... +60 °C (T5) / -40 °C ... +40 °C (T6)
Terminal box EEx d 2 x M25 x 1.5 mm	KEMA 99 ATEX 3853
Dimensions W x D x H	90 mm x 90 mm x 75 mm
Weight	490 g
Temperature	-40 °C ... +55 °C (T5) / -40 °C ... +40 °C (T6)
Humidity	5 ... 95 % rel. humidity; noncondensing
Pressure 47 K-ST/47 K-PRP	800 ... 1200 hPa
For further details see operation manual. (Order no.: 10052472)	

Startup:	**Presetting required —> before first calibration and when changing sensor**
Presetting:	Connect the digital multimeter to the test sockets on the MAI module. 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 / 100 * 1600 + 400** **C = Span gas concentration in % of measuring range**
Warm-up period:	15 min 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 LED‘s, 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. ca-ble 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-cir-cuit 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	XX	X	X	X	XX
Short-cir-cuit 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	XX	X	X	X	XXXX

15.7 SUPREMA Sensor Data Sheet Contact

Connection.: potential-free contact

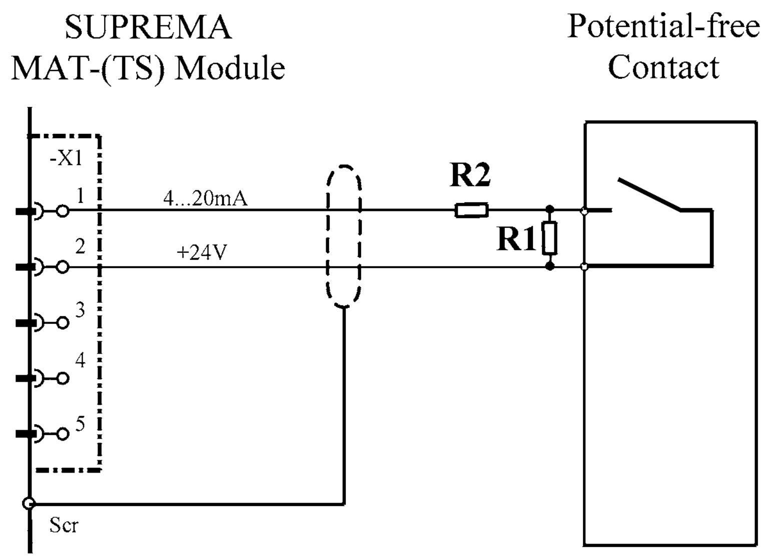


Fig. 191 Connection scheme Contact

Connection module:	MCI (BR101 and BR102 open) Standard configuration (passive/2-wire/4 ... 20 mA/current supply)
Sensor simulation module:	4 ... 20mA (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 signal	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

Confuguration data:

Settings/Measuring points/ Sensor data

Sensor	Pressure button
Measuring range	0 ... 100
Unity	Units any
1st 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/level	deactivated

It is recommended to delete the 2nd to 4th alarm. To do so, enter the associated alarm limit value fields, press "CLEAR" and commit with "OK".

All other inputs in the *Settings/Measuring Points* menu may be chosen freely.

> **Attention!**
>
> 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.

15.8 SUPREMA Sensor Data Sheet Fire Detector Apollo Series 65 (not explosion-proof) Internal Power Supply (without safety barrier)

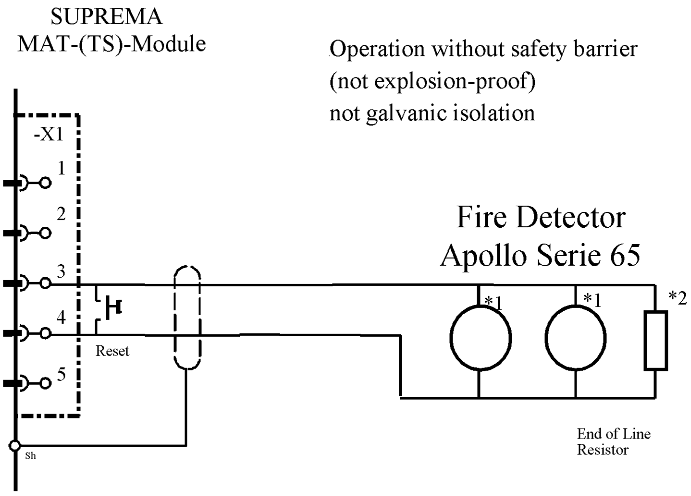


Fig. 192

The cable screen is only connected to the SUPREMA.

*1 Apollo Fire Detector Series 65
Connect according to Apollo Mounting support 45681-200 Series 60/65 connection diagram
Max. 20 Fire Detector

*2 End of Line Resistor 2K2/0,5 W according to Apollo connection diagram 45681-200

Connection module:

MFI (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	Ø 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:

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

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.

15.9 SUPREMA Sensor Data Sheet Fire Detector Apollo Series 65 (not explosion-proof) External Power Supply (without safety barrier)

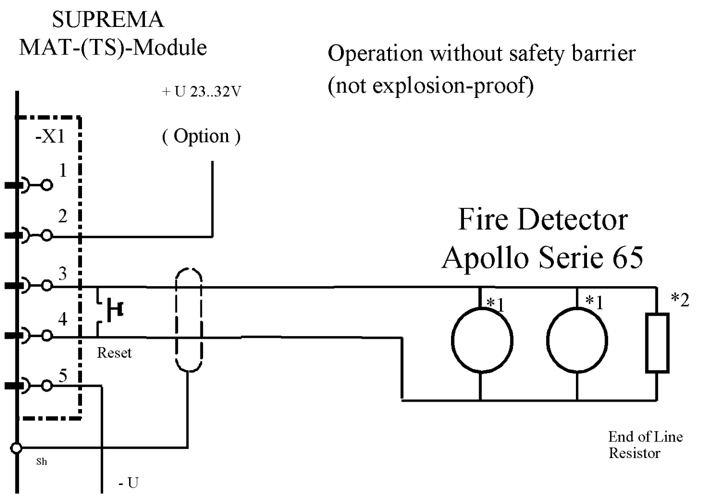


Fig. 193

The cable screen is only connected to the SUPREMA.

*1 Apollo Fire Detector Series 65
Connect according to Apollo Mounting support 45681-200 Series 60/65 connection diagram
Max. 20 Fire Detector

*2 End of Line Resistor 2K2/0,5 W according to Apollo connection diagram 45681-200

Connection module:

MFI (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	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 END OF LINE resistor 2K2 connected according to circuit diagram	Normal operation
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 after 45 s maximum.
Interruption of the supply voltage External power supply 23 ... 32 V not connected END OF LINE resistor 2K2 connected according to circuit diagram	Failure message

15.10 SUPREMA Sensor Data Sheet for Push-Button Detector (not explosion-proof) Internal Power Supply (without safety barrier)

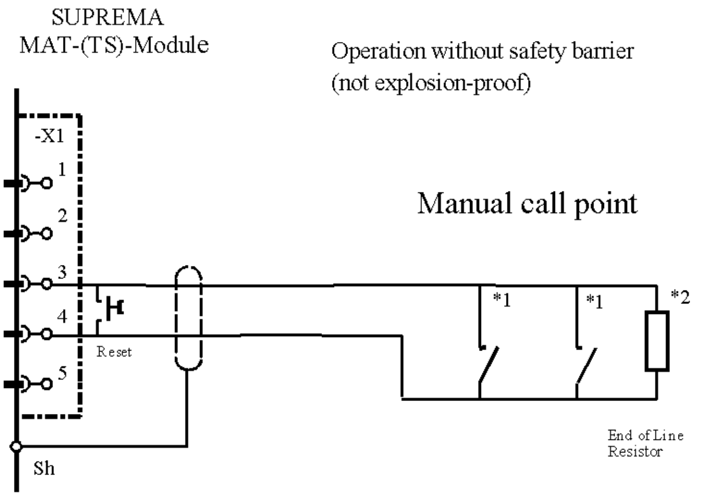


Fig. 194

The cable screen is only connected to the SUPREMA.

*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 (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	-
Humidity	-
Pressure	-
Weight	-
Dimensions	125 x 125 x 36 mm
Housing material	Plastic

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 max. 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

15.11 SUPREMA Sensor Data Sheet for Push-Button Detector (not explosion-proof) External Power Supply (without safety barrier)

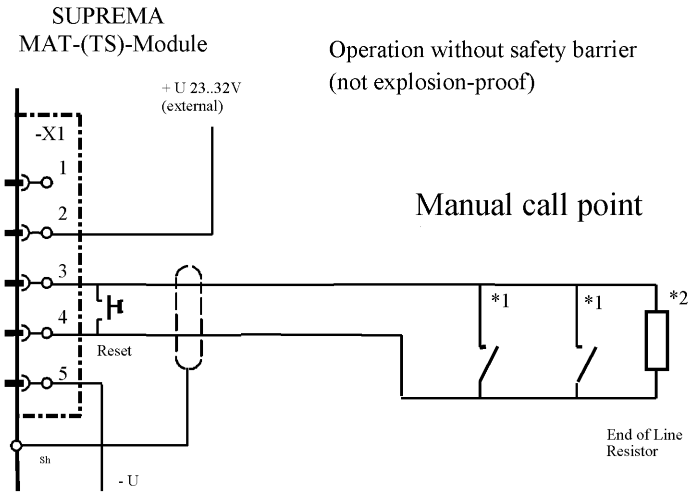


Fig. 195

The cable screen is only connected to the SUPREMA.

*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 (Fire Input Module) Configuration: Internal 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

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 max. 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

15.12 SUPREMA Sensor Data Sheet Explosion-proof Push-Button Detector with Barrier Z 787

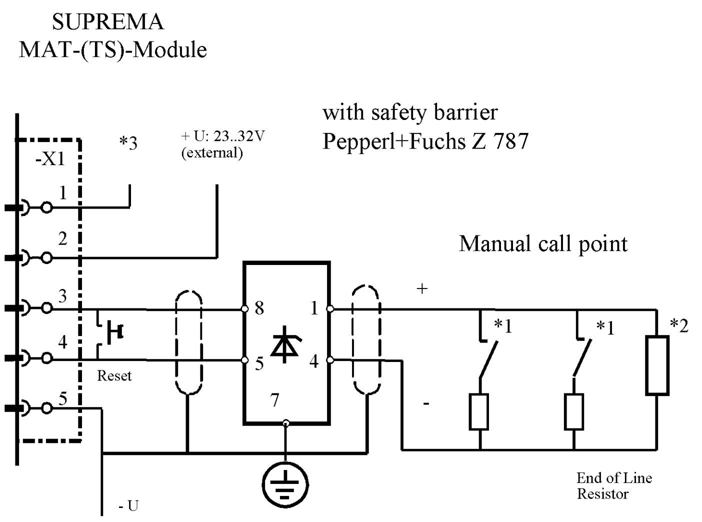


Fig. 196

The cable screen is only connected to the SUPREMA.

*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 (Fire Input Module) Configuration: Internal power supply, without 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 °Cv
	Humidity	-
	Pressure	-
	Weight	approx. 1100 g
	Dimensions	120 x 125 x 75 mm
	Housing material	Aluminium, pressure-resistant

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 END OF LINE resistor 2K2 connected according to circuit diagram	Normal operation
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 44	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 END OF LINE resistor 2K2 connected according to circuit diagram	Failure message after max. 45 s
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

15.13 SUPREMA Sensor Data Sheet Ex-Fire Detector Apollo Series 60 with Barrier Z 787

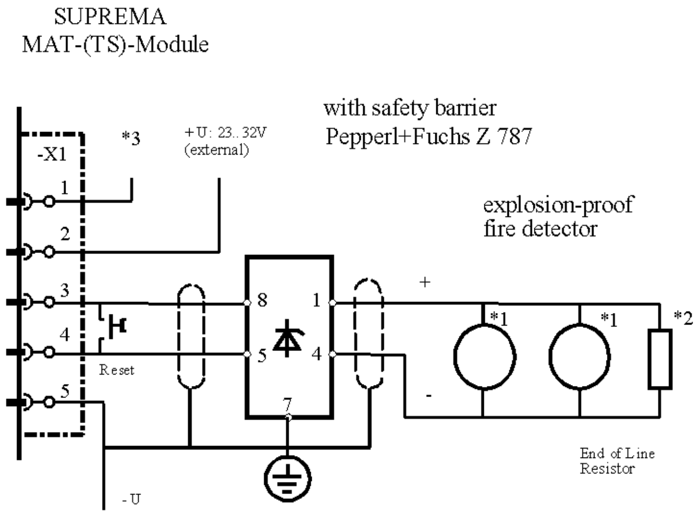


Fig. 197

The cable screen is only connected to the SUPREMA.

*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 (Fire Input Module) Configuration: External power supply, without 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 END OF LINE resistor 2K2 connected according to circuit diagram	Normal operation
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 END OF LINE resistor 2K2 connected according to circuit diagram	Failure message after max. 45 s
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

15.14 SUPREMA Sensor Data Sheet Explosions-Proof Fire Detector CERBERUS DO1101EX/DT1101EX with Barrier Z 787

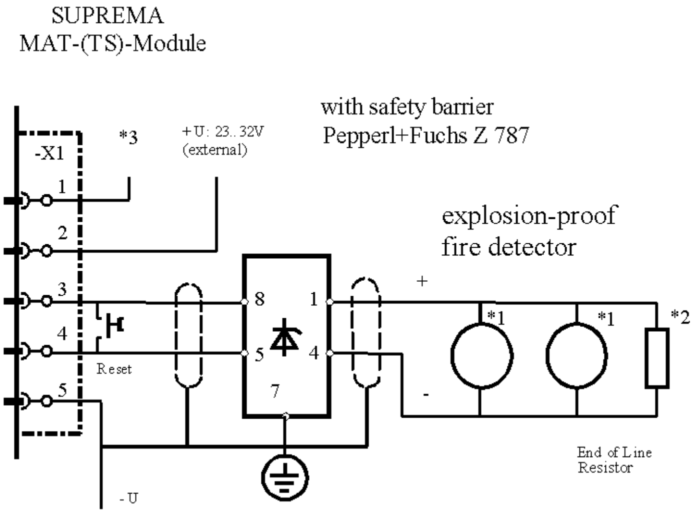


Fig. 198

The cable screen is only connected to the SUPREMA.

*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 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 (Fire Input Module) Configuration: External power supply, without 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 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 END OF LINE resistor 2K2 connected according to circuit diagram	Normal operation
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 END OF LINE resistor 2K2 connected according to circuit diagram	Failure message after max. 45 s
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 terminals 1-2 must be 23 ... 32 V

15.15 SUPREMA Sensor Data Sheet Explosion-Proof Push-Button Detector with Barriers MTL 728 and MTL 710

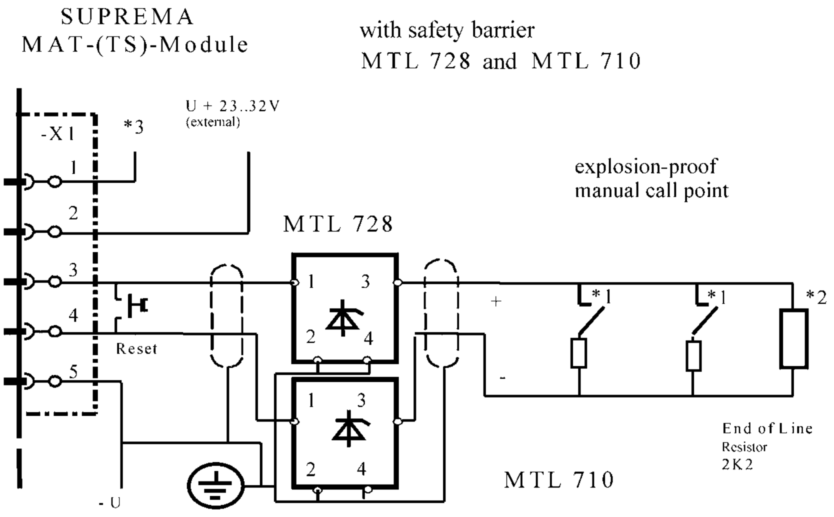


Fig. 199

The cable screen is only connected to the SUPREMA.

*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 KW / 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 has 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 (Fire Input Module) Configuration: External power supply, without 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

Simulation of normal operation / Alarm / RESET / Open or short-circuit fault indication:

Simulation	Effect
Normal operation	Normal operation
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	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	Normal operation
Connect wire jumper between terminals 3 and 4	After max. 45 s failure message appears.
Open-circuit of line	Failure message
External power supply 23 ... 32 V connected according to circuit diagram	
END OF LINE resistor 2K2 not connected	
Line short-circuit	Failure message
External power supply 23 ... 32 V connected according to circuit diagram	
END OF LINE resistor short-circuited	
Interruption of the supply voltage	Failure message after max. 45 s
External power supply 23 ... 32 V not connected	
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 terminals 1-2 must be 23 ... 32 V

15.16 SUPREMA Sensor Data Sheet Explosion-Proof Fire Detector Apollo Series 60 with Barriers MTL 728 and MTL 710pressure-resistant

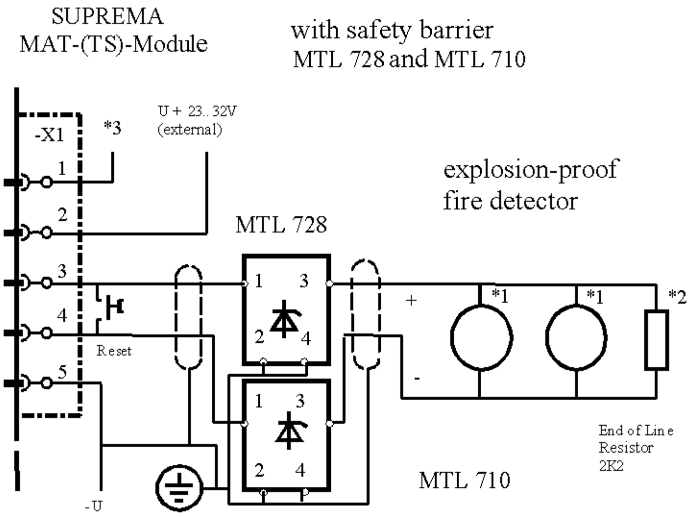


Fig. 200

The cable screen is only connected to the SUPREMA.

*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 has 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 (Fire Input Module) Configuration: External power supply, without 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 END OF LINE resistor 2K2 connected according to circuit diagram	Normal operation
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 END OF LINE resistor 2K2 connected according to circuit diagram	Failure message after max. 45 s
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 terminals 1-2 must be 23 ... 32 V

15.17 SUPREMA Sensor Data Sheet Explosion-Proof Fire Detector CERBERUS DO1101EX/DT1101EX with Barriers MTL 728 and MTL 710

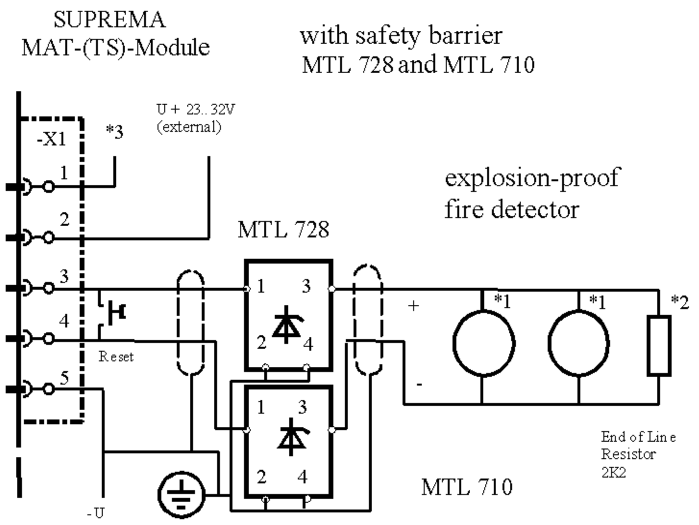


Fig. 201

The cable screen is only connected to the SUPREMA.

*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 has 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 (Fire Input Module) Configuration: External power supply, without 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	Normal operation
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	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	Normal operation
Connect wire jumper between terminals 3 and 4	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 terminals 1-2 must be 23 ... 32 V

15.18 SUPREMA Sensor Data Sheet Contact

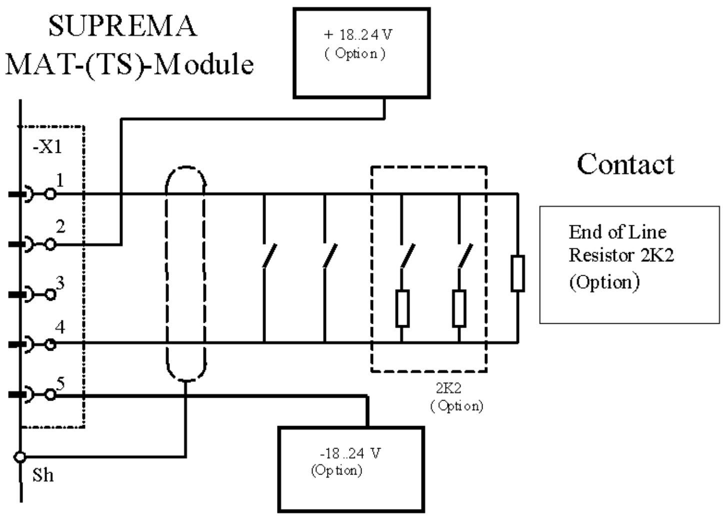


Fig. 202

The cable screen is only connected to the SUPREMA.

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
Maximum cable length	2000 m (at 1.5 mm^2 cross section per wire
Cross section per wire allowed	0.5 ... 2.5 mm^2

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 W x D x H	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 X1/2	Wire -X1/1/ with X1/2	Wire -X2/4	Wire -X2/5	Wire -X4/5
Failure indication	X	X	N	X	X	X
Short-circuit at max. cable length	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

15.19 SUPREMA Sensor Data Sheet Series 47K-HT (3-wire)

Order No.: according to order sheet

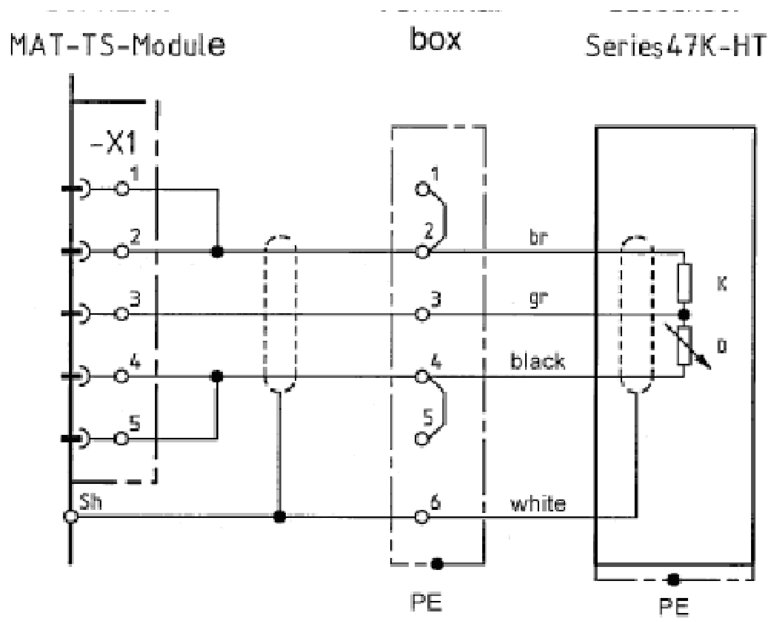


Fig. 203

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	280 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 (3.4 ohms for ATEX applications)
Maximum cable length	1000 m (at 1.5 mm^2 cross section per wire
Cable diameter	6 ... 12 mm
Cross section per wire allowed	1.0 ... 2.5 mm^2
Connection box II 2 G EEx e II/PTB 00 ATEX 1063	Order No.: 10062674
Wall angle bracket with connection of potential equalization	Order No.: 10048829
Constant cable length of sensor	2.0 m

Conditions for use:

Mounting	Wall mounting

Explosion protection/Sensor	II 2 G EEx d IIC T3 (-40 °C ... +160 °C) – HT
Certificate/Sensor	INERIS 03 ATEX 0208
Dimensions W x D x H Weight Temperature	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	5 ... 95 % rel. humidity; noncondensing
Pressure	800 ... 1200 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 min 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 LED‘s, 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 -X1/2	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 output resistance 0 ... 1.7 Ohm per wire	XX	X	X

15.20 SUPREMA Sensor Data Sheet Series 47K-HT (5-wire)

Order No.: according to ordering information

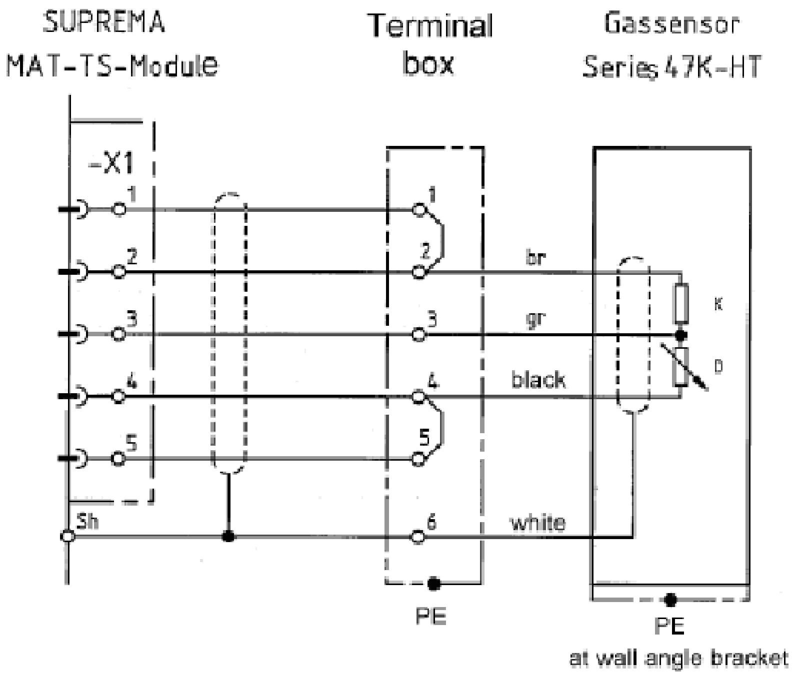


Fig. 204

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	280 mA
Maximum nominal current	350 mA
Power consumption	1.0 W typical (without cable length)
Cable type	35 -core, 80 % screened
Maximum loop resistance	36 ohms
Maximum cable length	1500 m (at 1.5 mm^2 cross section per wire
Cable diameter	6 ... 12 mm
Cross section per wire allowed	1.0 ... 2.5 mm^2
Connection box II 2 G EEx e II/PTB 00 ATEX 1063 with cable inlet EEx e II KEMA 99	Order No.: 10062674
Wall angle bracket with connection of potential equalization	Order No.: 10048829
Constant cable length of sensor	2.0 m

Conditions for use:		
	Mounting	Wall mounting
	Explosion protection/HT Sensor	II 2G EEx d IIC T3 (-40 °C ... +160 °C) – HT
	Certificate/Sensor	INERIS 03 ATEX 0208
	EG Type Approval	DMT 03 ATEX G 003 x (SUPREMA)
	Air velocity	0 ... 6 m/s
	Humidity	5 ... 95 % rel. humidity; noncondensing
	Pressure	800 ... 1200 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 —> 280 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 min 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 LED‘s, 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	XX	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	XX	X	X	X	XXXX

15.21 SUPREMA Sensor Data Sheet 4-20 mA [2-wire]

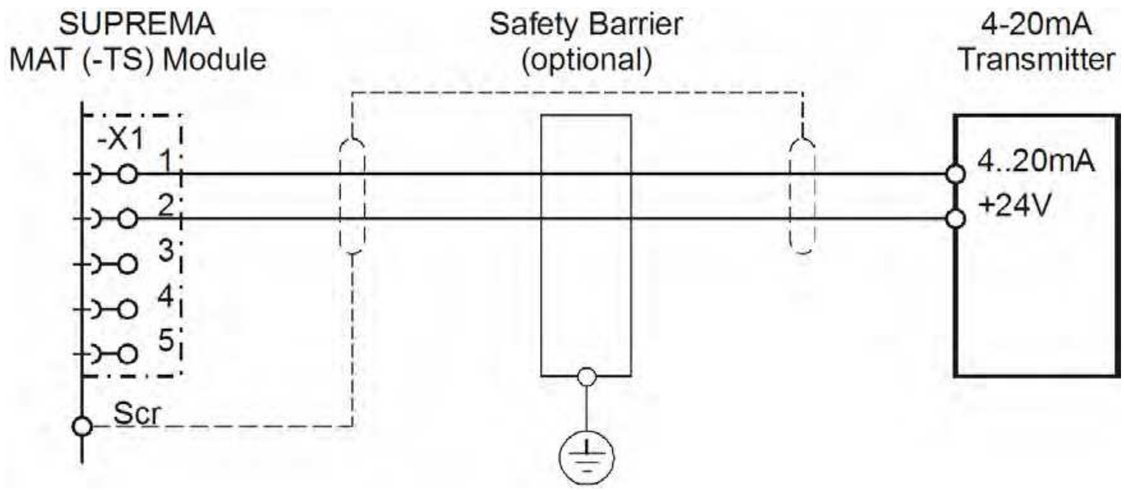


Fig. 205

The cable screen is only connected to the SUPREMA.

Connection module:	MCI (active; 2-wire; 4 ... 20 mA; current sink)
Sensor simulation module:	4 ... 20 mA (Order No.: 10030262)

Connection data:

Supply current	max. 400 mA
Maximum power consumption	40 mA
Cable type	2-core, 80 % screened
Maximum load	Transmitter dependent
Maximum cable length	Transmitter dependent
Cable diameter	9 ... 17 mm
Cross section per wire allowed	0.75 ... 2.5 mm^2

Conditions for use:	For further details see operation manual of the transmitter.

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		

15.22 SUPREMA Sensor Data Sheet 4-20 mA [3-wire]

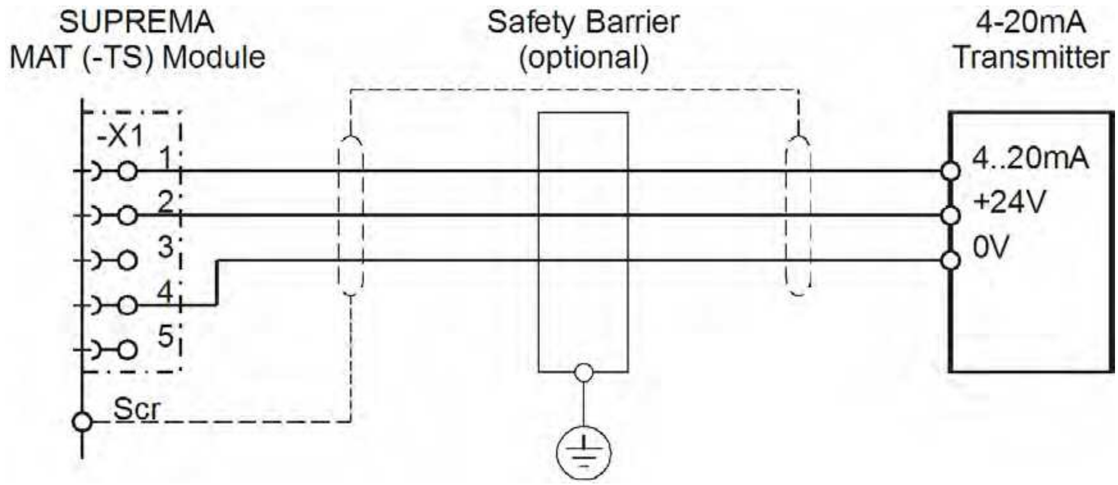


Fig. 206

The cable screen is only connected to the SUPREMA.

Connection module:	MCI (active; 3-wire; 4 ... 20 mA; current source)
Sensor simulation module:	4 ... 20 mA (Order No.: 10030262)

Connection data:

Supply voltage	19 ... 30 VDC
Supply current	max. 400 mA
Cable type	3-core, 80 % screened
Maximum load	Transmitter dependent
Maximum cable length	Transmitter dependent
Cable diameter	9 ... 17 mm
Cross section per wire allowed	0.75 ... 2.5 mm^2

Conditions for use:	For further details see operation manual of the transmitter.

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	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 at max. cable length	Wire -X1/1/ -X1/2	Wire -X1/1/ -X1/4	Wire -X1/2/ -X1/4	
Failure indication	XX	X	X	

15.23 SUPREMA Sensor Data Sheet 4-20 mA with ext. power supply

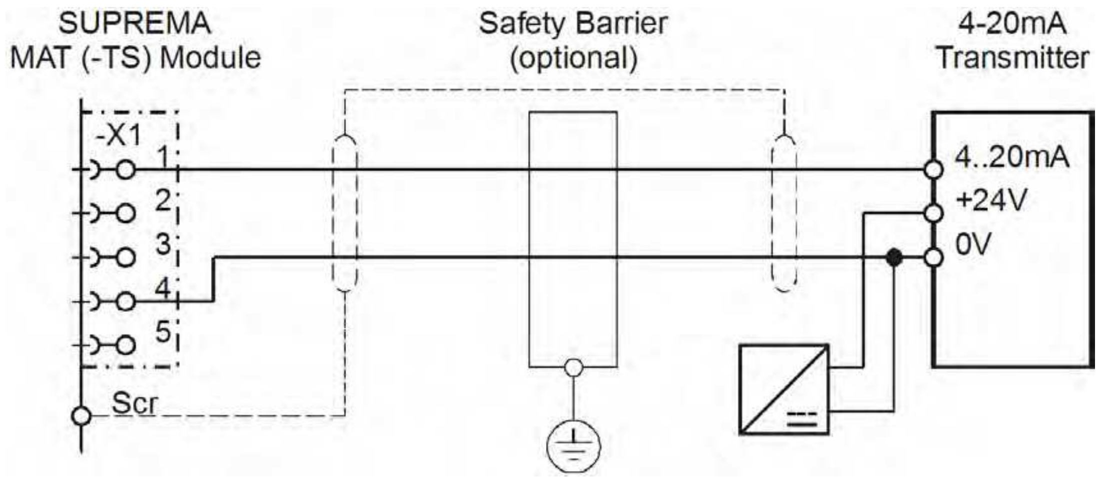


Fig. 207

The cable screen is only connected to the SUPREMA.

Connection module:	MCI (active; 2-wire; 4 ... 20 mA; current supply)
Sensor simulation module:	4 ... 20 mA (Order No.: 10030262)

Connection data:

Supply voltage	See operation manual
Cable type	2-core, 80 % screened
Maximum load	Transmitter dependent
Maximum cable length	Transmitter dependent
Cable diameter	9 ... 17 mm
Cross section per wire allowed	0.75 ... 2.5 mm^2

Conditions for use:	For further details see operation manual of the transmitter.

Open or Short Circuit Fault Indication:

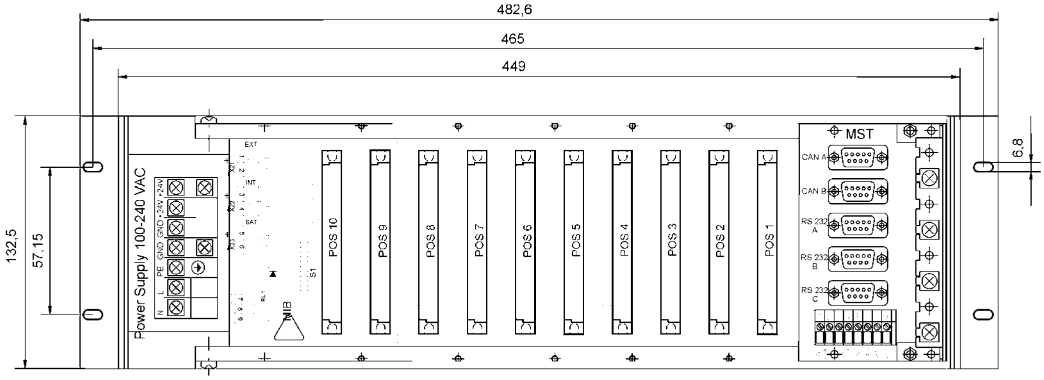
X= Signal failure (FAIL-LED)

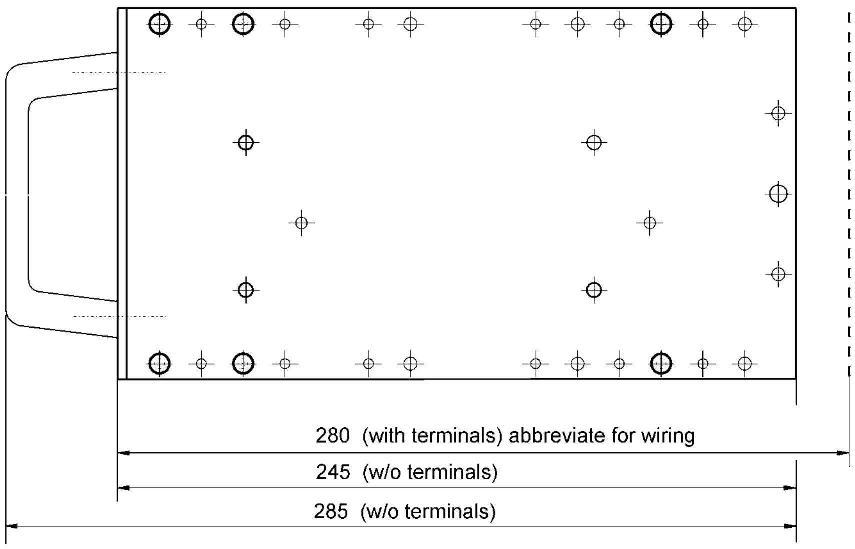
XX= Alarm LEDs, Signal exceeded, Signal failure (FAIL-LED)

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		

16 Dimensions

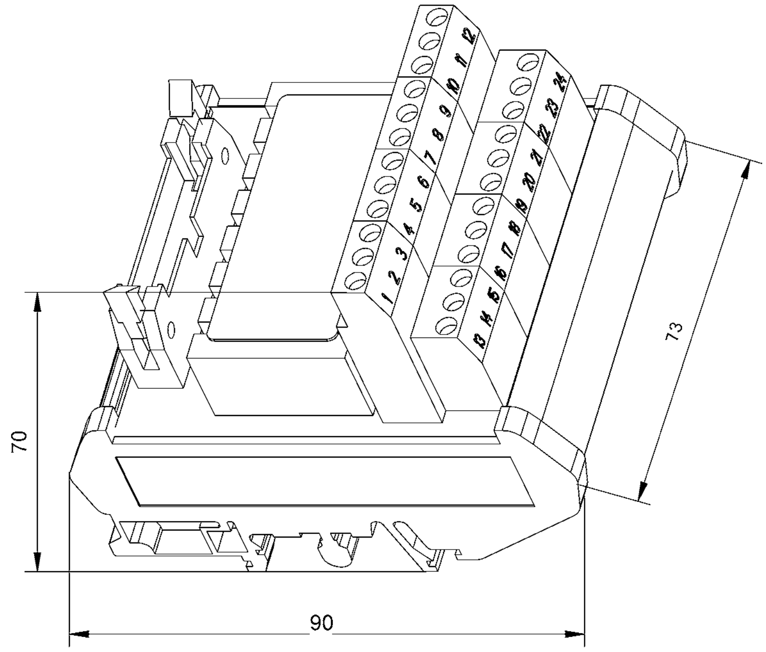
16.1 Rack



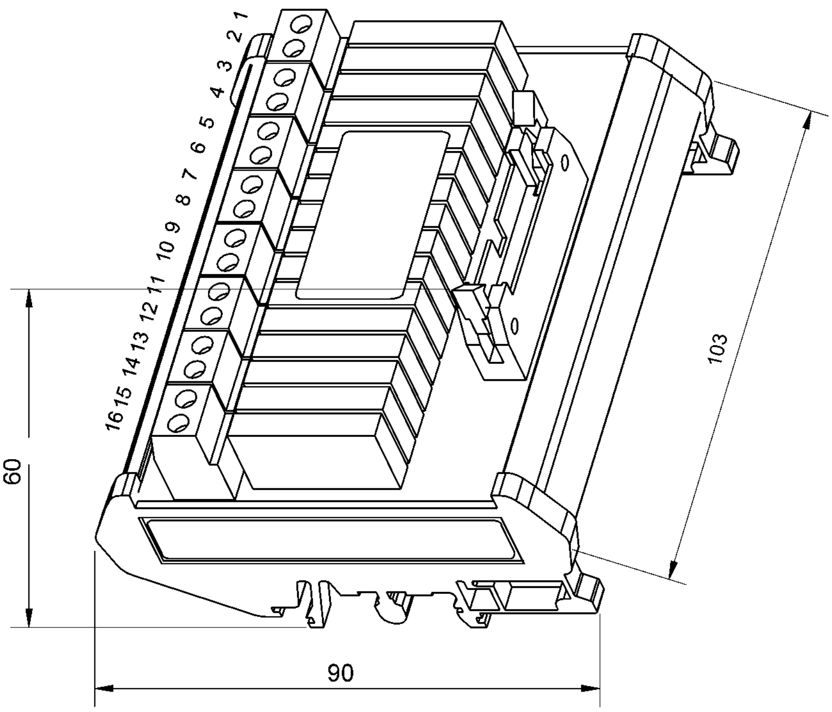


16.2 Rail-mounted Modules

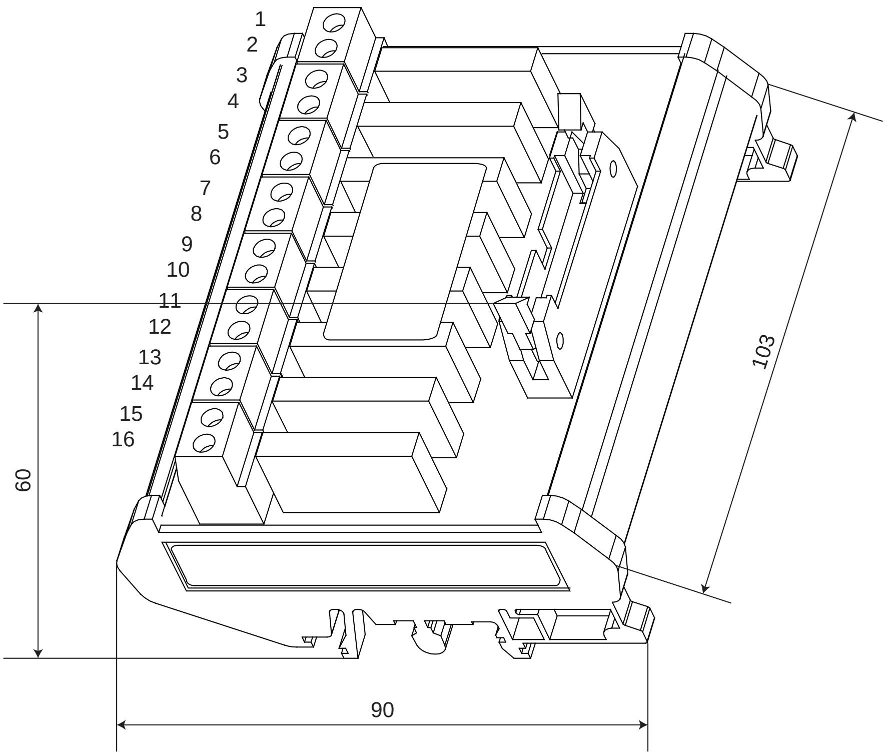
MRO 8 TS Module



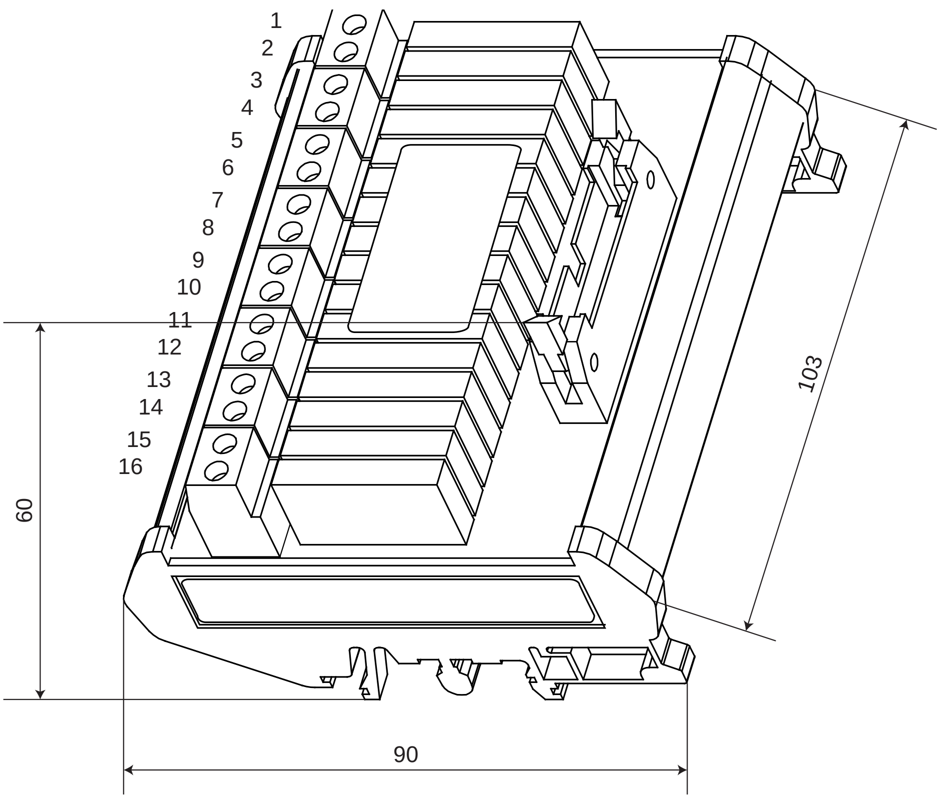
MRO 16 TS Module



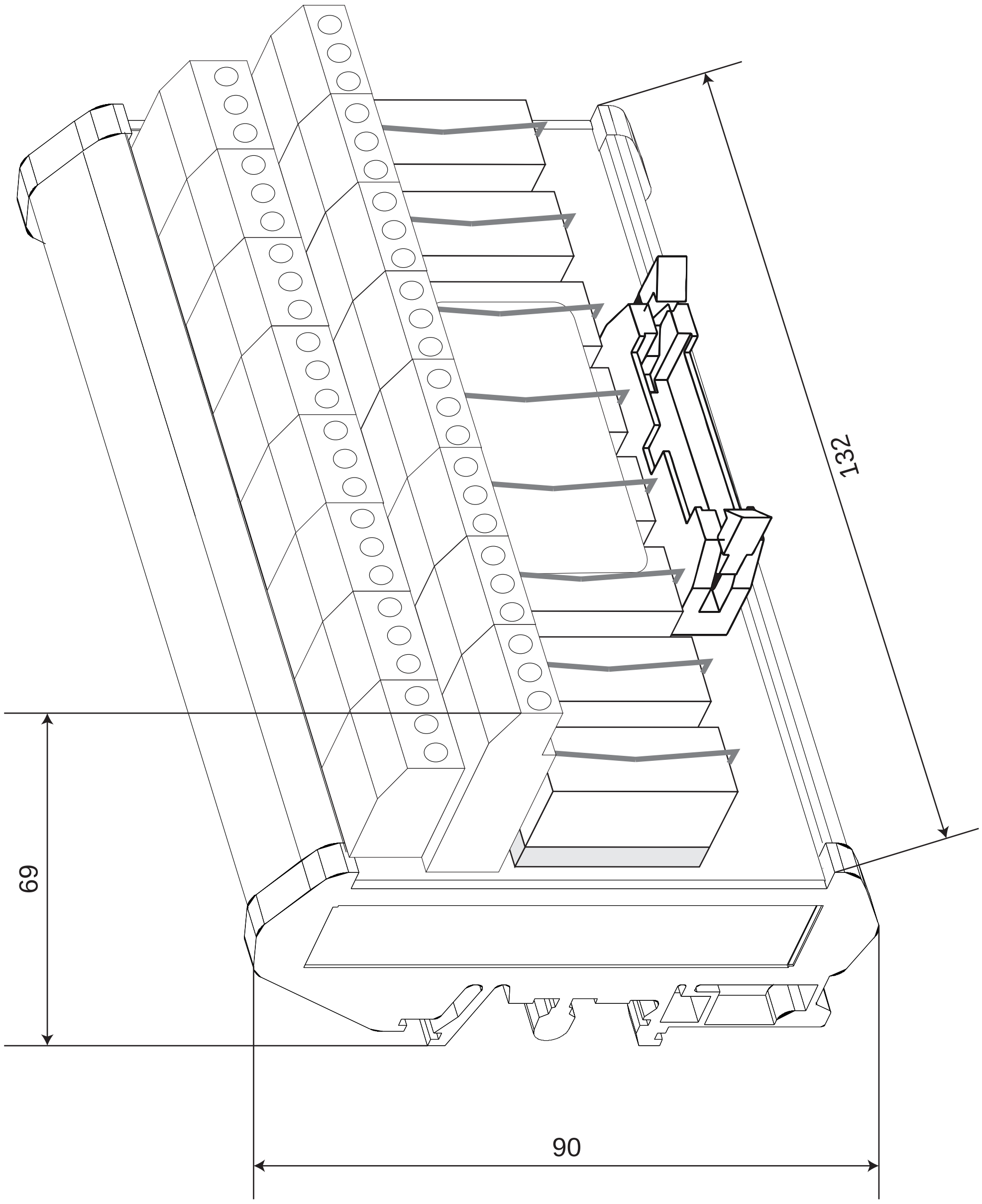
MRO20-8-TS SSR Module



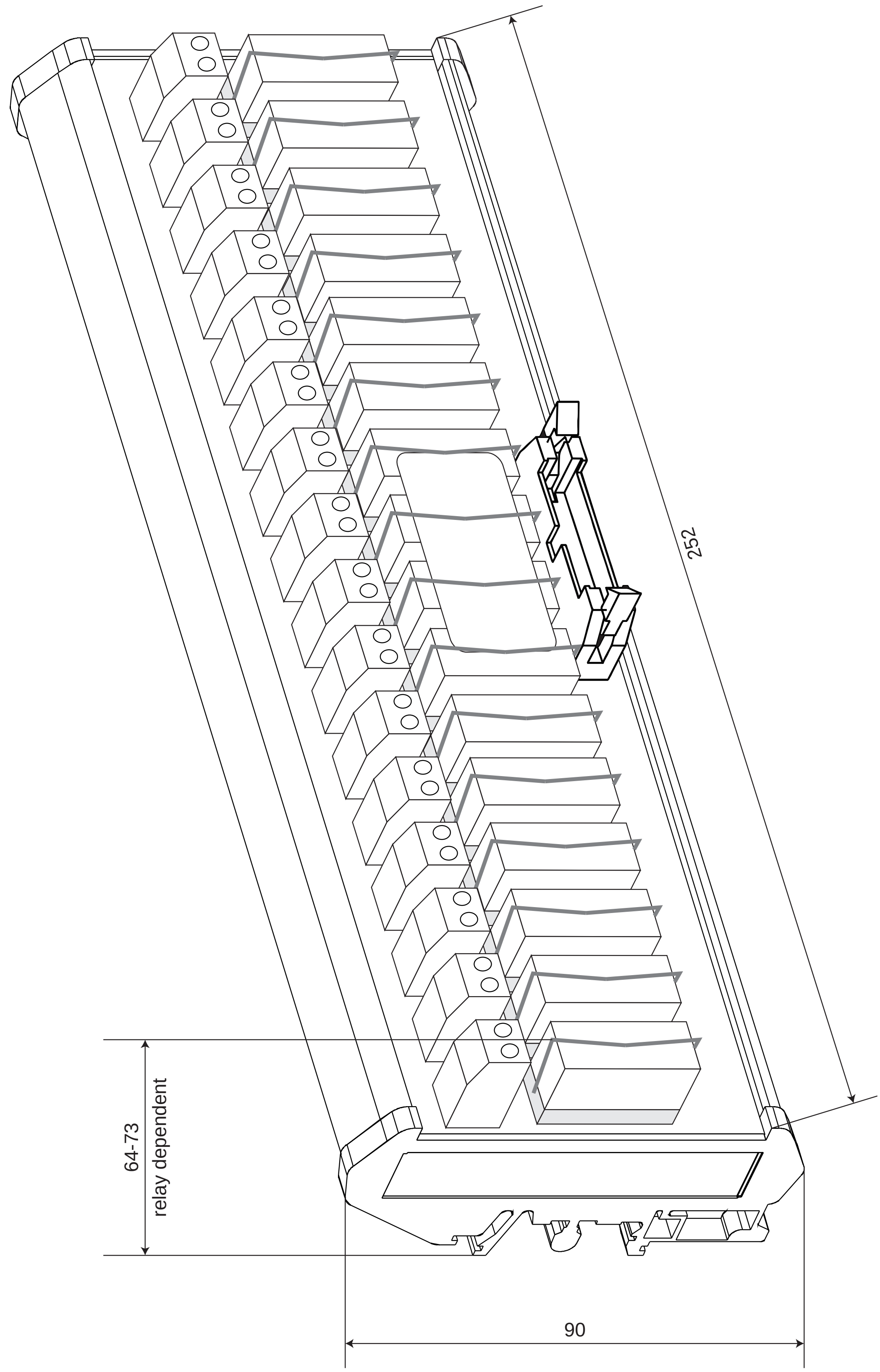
MRO10-16-TS SSR Module



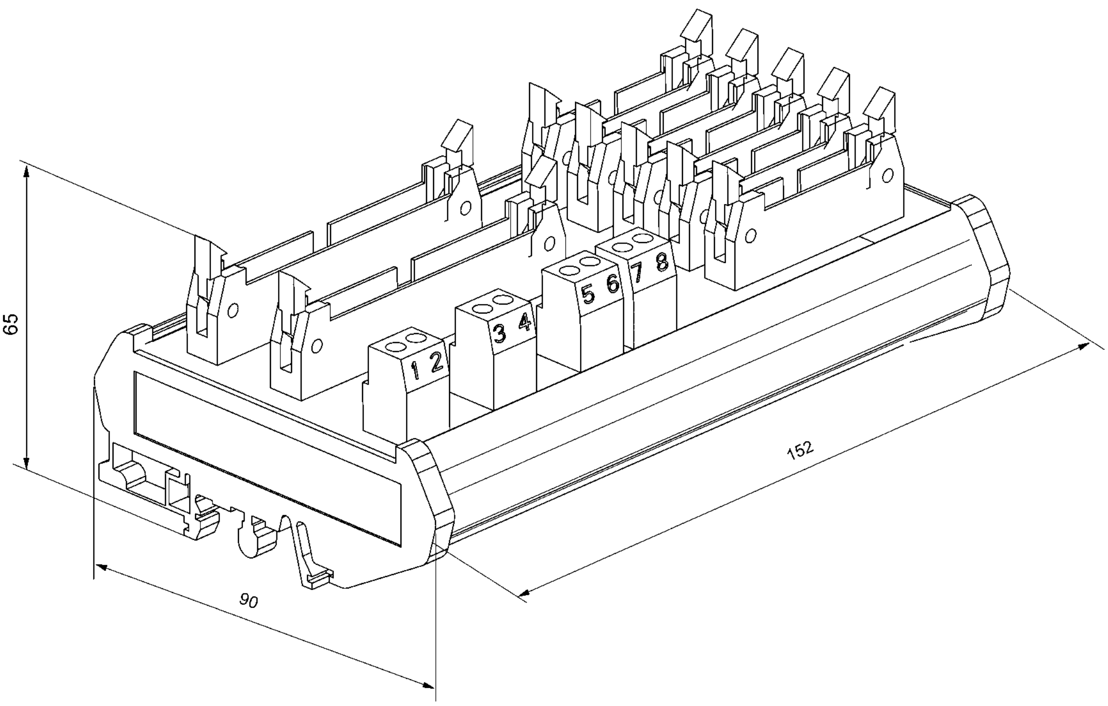
MRO20-8-TS Module



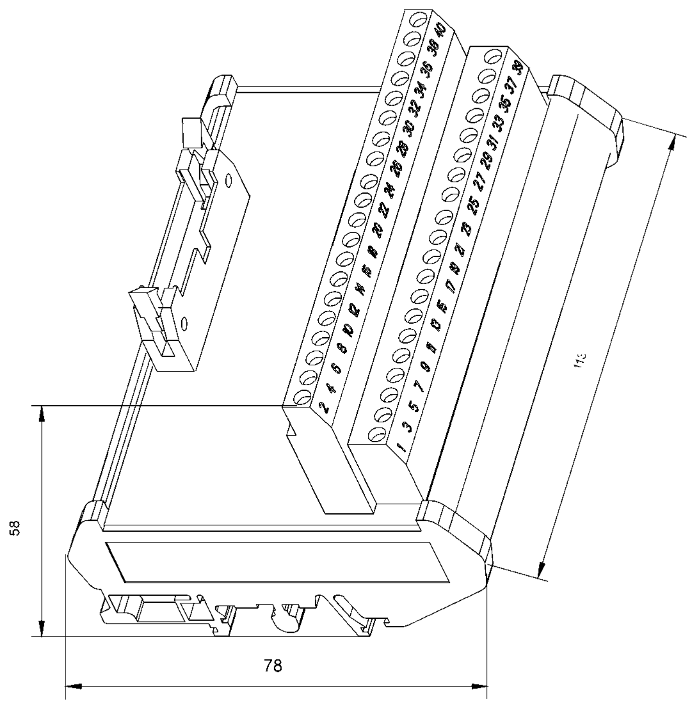
MRO20-16-TS Module



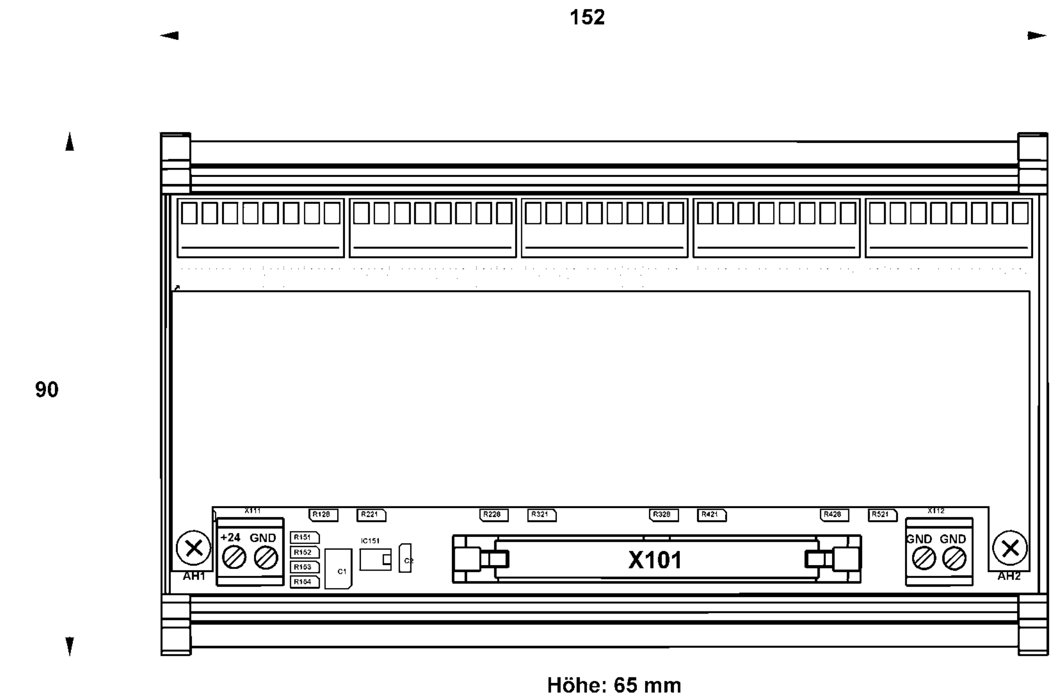
MRC TS Module



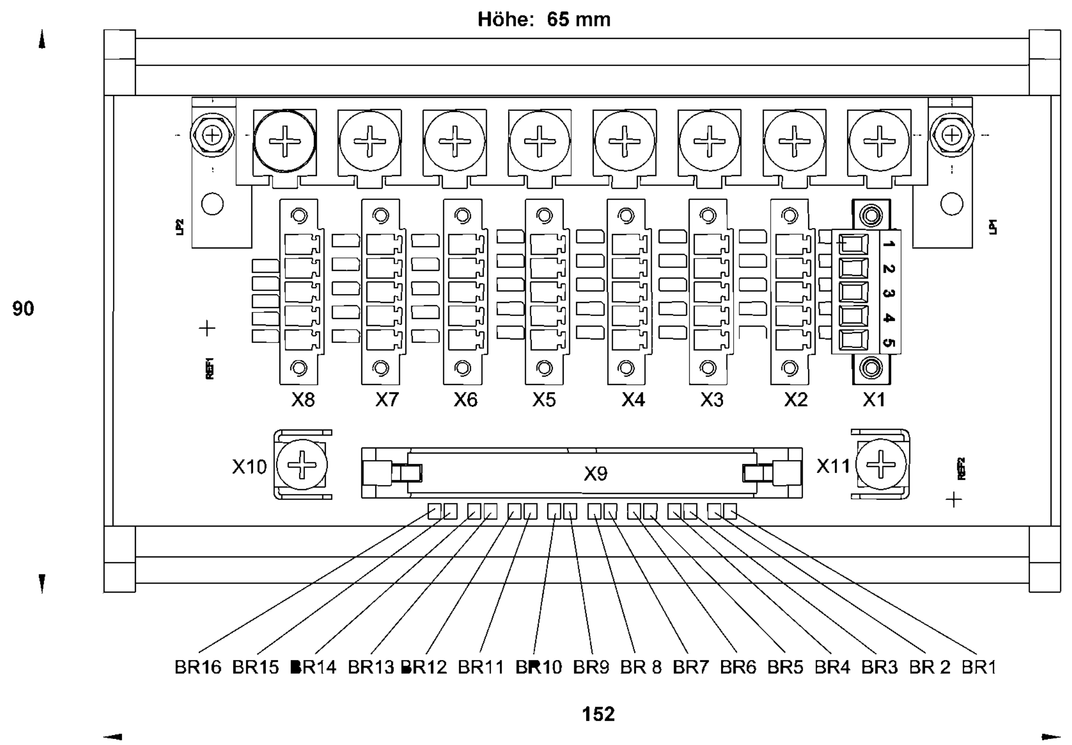
MGT 40 TS Module



MHD TS Module



MAT TS Module



MSA in Europe

[www.MSASafety.com]

Northern Europe

Netherlands
MSA Nederland
Kernweg 20
1627 LH Hoorn
Phone +31 [229] 25 03 03
Fax +31 [229] 21 13 40
info@msaned.nl

Belgium
MSA Belgium
Duwijckstraat 17
2500 Lier
Phone +32 [3] 491 91 50
Fax +32 [3] 491 91 51
msabelgium@msa.be

Great Britain
MSA Britain
Lochard House
Linnet Way
Strathclyde Business Park
BELLSHILL ML4 3RA
Scotland
Phone +44 [16 98] 57 33 57
Fax +44 [16 98] 74 0141
info@msabritain.co.uk

Sweden
MSA NORDIC
Kopparbergsgatan 29
214 44 Malmö
Phone +46 [40] 699 07 70
Fax +46 [40] 699 07 77
info@msanordic.se

MSA SORDIN
Rörläggarvägen 8
33153 Värnamo
Phone +46 [370] 69 35 50
Fax +46 [370] 69 35 55
info@sordin.se

Southern Europe

France
MSA GALLET
Zone Industrielle Sud
01400 Châtillon sur Chalaronne
Phone +33 [474] 55 01 55
Fax +33 [474] 55 47 99
message@msa-gallet.fr

Italy
MSA Italiana
Via Po 13/17
20089 Rozzano [MI]
Phone +39 [02] 89 217 1
Fax +39 [02] 82 59 228
info-italy@msa-europe.com

Spain
MSA Española
Narcís Monturiol, 7
Pol. Ind. del Sudoeste
08960 Sant-Just Desvern [Barcelona]
Phone +34 [93] 372 51 62
Fax +34 [93] 372 66 57
info@msa.es

Eastern Europe

Poland
MSA Safety Poland
ul. Wschodnia 5A
05-090 Raszyn k/Warszawy
Phone +48 [22] 711 50 33
Fax +48 [22] 711 50 19
eer@msa-europe.com

Czech republic
MSA Safety Czech s.r.o.
Dolnojircanska 270/22b
142 00 Praha 4 - Kamyk
Phone +420 [59] 6 232222
Fax +420 [59] 6 232675
info@msa-auer.cz

Hungary
MSA Safety Hungaria
Francia út 10
1143 Budapest
Phone +36 [1] 251 34 88
Fax +36 [1] 251 46 51
info@msa.hu

Romania
MSA Safety Romania
Str. Virgil Madgearu, Nr. 5
Ap. 2, Sector 1
014135 Bucuresti
Phone +40 [21] 232 62 45
Fax +40 [21] 232 87 23
office@msanet.ro

Russia
MSA Safety Russia
Pokhodny Proezd, 14
125373 Moscow
Phone +7 [495] 921 1370/74
Fax +7 [495] 921 1368
msa-moscow@msa-europe.com

Central Europe

Germany
MSA AUER GmbH
Thiemannstrasse 1
12059 Berlin
Phone +49 [30] 68 86 0
Fax +49 [30] 68 86 15 17
info@msa-auer.de

Austria
MSA AUER Austria Vertriebs GmbH
Modecenterstrasse 22
MGC Office 4, Top 601
A-1030 Wien
Phone +43 [0] 1 / 796 04 96
Fax +43 [0] 1 / 796 04 96 - 20
info@msa-auer.at

Switzerland
MSA Schweiz
Eichweg 6
8154 Oberglatt
Phone +41 [43] 255 89 00
Fax +41 [43] 255 99 90
info@msa.ch

European International Sales
[Africa, Asia, Australia, Latin America, Middle East]

MSA EUROPE
Thiemannstrasse 1
12059 Berlin
Phone +49 [30] 68 86 0
Fax +49 [30] 68 86 15 58
contact@msa-europe.com

The Safety Company