Technical Manual

Digital Communication- PROFIBUS® PA

Dräger Polytron® 8000 Series

This page has been left blank intentionally.

Contents

1 Introduction

This document supplements the instructions for use for gas detectors:

– Dräger Polytron® 8100 EC
– Dräger Polytron® 8200 CAT
– Dräger Polytron® 8310 IR
– Dräger Polytron® 8700 IR
– Dräger Polytron® 8720 IR

This document contains additional information about the PROFIBUS® PA interface.

1.1 Target group

This document is intended for technicians with training in PLC programming, trained electricians or persons who have received instruction from a trained electrician. These persons must also be familiar with the applicable standards.

1.2 General safety statements

Before using this product, carefully read the associated instructions for use. This document does not replace the instructions for use.

1.3 Meaning of the warning notes

The following warning notes are used in this document to notify users of possible dangers. The meanings of the warning notes are defined as follows:

Alert icon	Signal word	Consequences in case of nonobservance
	WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
	CAUTION	Indicates a potentially hazardous situation which, if not avoided, could result in injury. It may also be used to alert against unsafe practices.
	NOTICE	Indicates a potentially hazardous situation which, if not avoided, could result in damage to the product or environment.

1.4 Trade marks

Trademark	Trademark owner
Polytron®	Dräger
PROFIBUS®	PROFIBUS Nutzerorganisation e. V.

The following website lists the countries in which Dräger trademarks are registered: www.draeger.com/trademarks.

2 Basic principles of PROFIBUS® technology

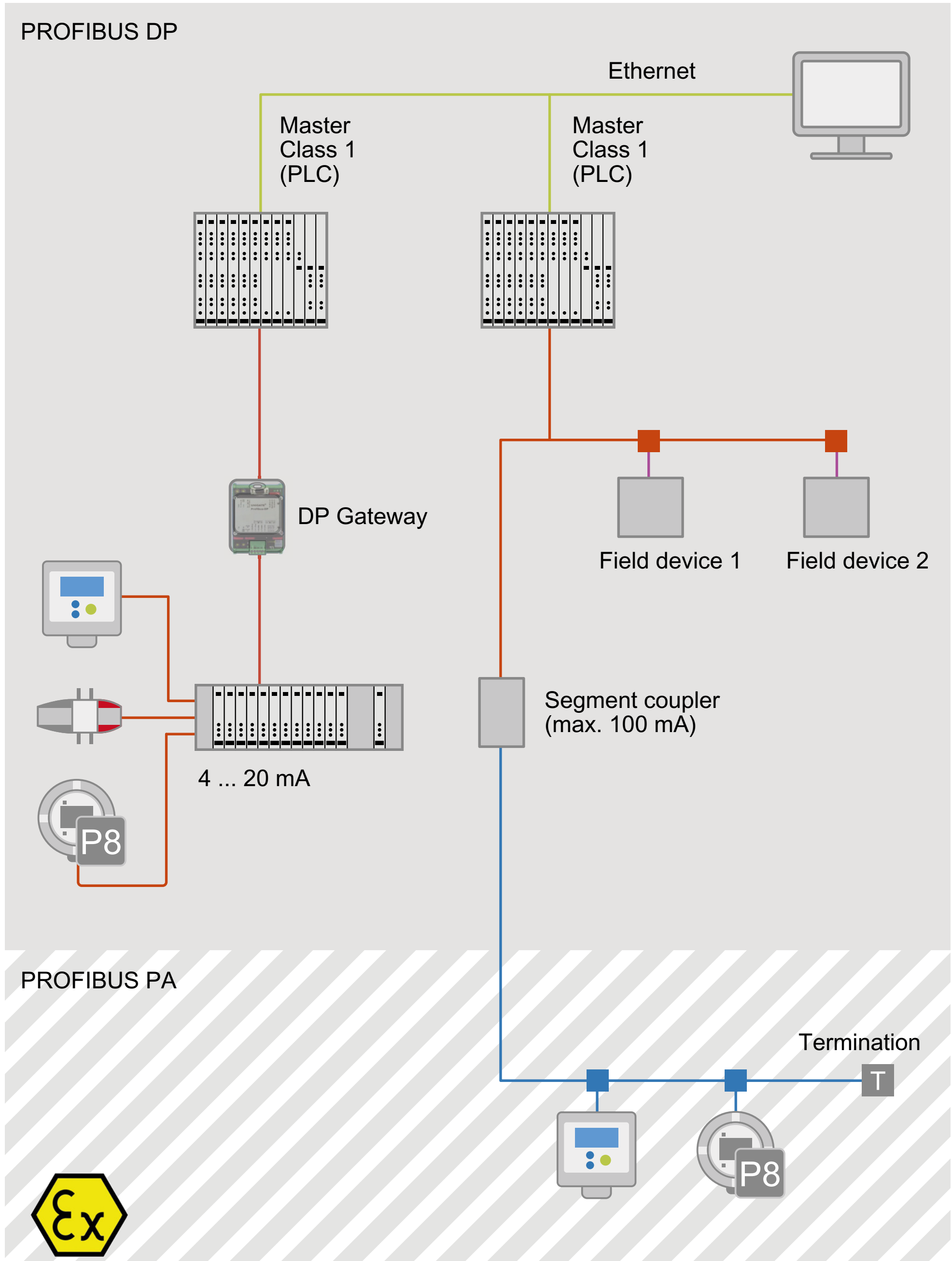
2.1 PROFIBUS® PA main features

PROFIBUS® is an internationally standardized digital communication system. In many areas, it is replacing analog signal transmission using a 4-20-mA interface, which is costly in terms of time and resources. Digital communication offers the following benefits over analog data transmission:

– Significantly less wiring is required. Digital signals and supply voltage are transmitted via one cable.
– Adding new field devices and putting them into operation, as well as removing them, is easier. Due to standardization, field devices can be replaced manufacturer-independently.
– Parameterization, diagnostics and maintenance of field devices can be performed centrally.
– Data transmission is bi-directional and delivers more information, e.g. status and error messages.

The PROFIBUS® technology is used in many industrial sectors. The great variety of applications is made possible by modularly combinable variation options, e.g. different protocol configurations levels, methods of transmission and device management tools.

For Dräger applications, the PROFIBUS® DP and PROFIBUS® PA variants need to be considered. In each case, PROFIBUS® PA is a sub-segment of a PROFIBUS® DP network. Such a DP network is also referred to as a control level and offers higher transmission speeds than PROFIBUS® PA. Sometimes, the PROFIBUS® MBP designation is also used as a synonym for PROFIBUS® PA. Strictly speaking, however, MBP (Manchester Bus Powered) is merely the transmission technology utilized by the PROFIBUS® PA segment. Provided that certain parameters are met, PROFIBUS® PA can also be used in explosion-hazard areas.



2.2 Basic principles of PROFIBUS® DP

2.2.1 Overview

PROFIBUS® DP (Decentralized Periphery) is the fastest variant of PROFIBUS® technology.

Standard	IEC 61158
Data transmission (physical layer)	RS-485 and/or fiber optic cable (FOC)

Max. length	– Max. 1200 m without repeater with RS-485 – several kilometers with FOC
Number of participants	– Max. 32 participants as master – Without repeater: 32 participants per segment – With repeater: 126 participants per segment – Max. 31 bus participants in last and 1st segment – In segments between repeaters, a maximum of 30 bus participants can be connected.
Number of repeaters	max. 9 repeaters
Remote power supply	possible via additional wires
Types of protection	none
Topology	Line topology, at low transmission rates also tree structure. Topology depends on the number of repeaters and on the transmission technology used
Bus termination	Termination at the end of a segment using ohmic resistors connected in series (390 Ω - 220 Ω - 390 Ω)
Transmission rate	9.6 kbit/s up to 12 Mbit/s, depending on the line length
Bus access method	Token passing with master-slave
Protocol	DP-V0, DP-V1, DP-V2

2.2.2 Transmission rate

The PROFIBUS® DP transmission rates depend on the line length. The following values apply to type A RS-485 cables:

Transmission rate (kbit/s)	9.6; 19.2;45.45; 93.75	187.5	500	1500	3000; 6000; 12000
Line length (m)	1200	1000	400	200	100

Repeaters can be used to extend line length and transmission rates.

The following formula applies with regard to the maximum distance between 2 bus participants: (ANZ_REP +1) * segment length, with ANZ_REP = max. number of repeaters that may be connected in series (depending on the repeater).

2.2.3 Cable type

Cable type A may be used for all transmission rates up to 12 Mbit/s. Fiber optic cables are also permitted.

Characteristic impedance	135 Ω to 165 Ω at a measuring frequency of 3 MHz to 20 MHz
Cable capacitance	< 30 pF per meter
Wire cross section	> 0.34 mm² (AWG 22)
Cable type	twisted pair, 1x 2, 2x 2 oder 1x 4 wires
Loop resistance	110 Ω per km
Signal line loss	max. 9 dB over the entire length of the line section
Screening	copper braided shield or braided shield and foil screen

2.2.4 Stubs

The line between a connection box and a field device is called a stub. The following must be observed:

– Stub length < 6.0 m (at 1.5 Mbit/s max.).
– Stubs must not be used for transmission rates > 1.5 Mbit/s.
– Stubs must not have bus termination.

2.3 Segment couplers and links

Segment couplers and links form the interface between PROFIBUS® DP and PROFIBUS® PA. Both components essentially perform the following tasks:

– Conversion from the asynchronous RS-485 DP protocol to the synchronous MBP PA protocol.
– Provision of the supply voltage for the PA segment and limitation of the supply current.
– De-coupling of the transmission speed.
– Alternatively: Ex-relevant separation and energy limitation.

2.3.1 Segment couplers

Segment couplers consist of a signal coupler and a bus power supply unit. They convert incoming signals and feed the PROFIBUS® PA segment. Depending on the model, multiple transmission speeds are supported on the PROFIBUS® DP side. When a PROFIBUS® PA segment is operated in intrinsically safe mode, the segment coupler reduces the electric current. As a result, a maximum of 10 bus participants is permitted per segment.

2.3.2 Links

Links consist of multiple segment couplers and an intelligent interface. The installed segment couplers can have different degrees of protection. Different baud rates are supported on the DP side. Links store the data from the connected field devices in the corresponding PA segment in a buffer until the data are retrieved by a master.

2.4 Basic principles of PROFIBUS® PA

2.4.1 Overview

PROFIBUS® PA differs from PROFIBUS® DP in the following respects:

– Use in potentially explosive atmospheres is possible with PROFIBUS® PA.
– The bus line can serve as an intrinsically safe power supply.
– A maximum of 32 bus participants may be connected for applications outside potentially explosive atmospheres.

Standard	IEC 61158
Data transmission (physical layer)	Manchester Coding Bus Powered (MBP)

Max. length from segment coupler	– 1900 m: standard and intrinsically safe category ib applications – 1000 m: intrinsically safe category ia applications
Number of participants in the segment (max. 126 per network)	– Non-ex: max. 32 participants per segment – Ex ia: max. 10 participants – Ex ib: max. 24 participants
Number of repeaters	max. 4 repeaters
Remote power supply	alternatively via the signal wires
Types of protection	intrinsic safety (Ex ia/ib)
Transmission rate	31.25 kbit/s
Bus access method	master-Slave
Protocol	DP-V1

2.4.2 Topology

The network topology of a PROFIBUS PA segment can be designed in different ways. Almost all configurations are permitted. Tree structure, line structure or combinations of these are possible.

In the case of a line structure, the participants are either directly connected to the bus cable or connected to the bus cable via connection boxes and stubs. In the case of the connection type using a connection box and stub it is rather easy to add field devices to the bus and to remove them.

In the case of a tree structure, all field devices are connected in parallel by means of field distributors.

Each fieldbus segment must be terminated at the beginning and at the end by a bus terminator. In the case of branched bus segments, the participant that is the most distant from the segment coupler forms the end of the bus.

2.4.3 Cable type

Field devices and fieldbus network are connected by means of twisted pair cables. It is not permitted to have multiple electric circuits connected to one cable. The electrical characteristics of the fieldbus cables determine essential properties such as the number of participants or distances. Cable type B and cable type A can be used. If cable type B is used, it is possible to connect multiple fieldbuses of the same type of protection to one cable. The shielded cable type A must be used for Dräger gas detectors. If cable type B is used, it is possible to connect multiple fieldbuses of the same type of protection to one cable.

	Type A	Type B
Cable structure	Twisted wire pair, shielded	One or more twisted wire pairs, overall shielding
Core cross-section	0.8 mm² (AWG 18)	0.32 mm² (AWG 22)
Loop resistance (DC)	44 Ω/km	112 Ω/km
Characteristic impedance at 31.25 kHz	100 Ω ± 20 %	100 Ω ± 30 %
Wave attenuation at 39 kHz	3 dB/km	5 dB/km
Capacitive asymmetry	2 nF/km	2 nF/km

	Type A	Type B
Group delay distortion	1.7 µs/km	-
Shielding coverage rate	90 %	-
Recommended maximum network size (including stubs) 1)	1900 m	1200 m
Recommended maximum network size (including stubs) with repeaters 2)	1900 *2	1200 *2

1) Depends on the type of protection and the cable specifications.

2) A maximum of 4 repeaters is permitted between participant and master.

2.4.4 Stubs

The line between a connection box and a field device is called a stub. The following must be observed:

- In explosion-hazard areas, stubs must not be more than 30 m in length.
- Short stubs (< 1 m) count as linking devices and are not considered in the calculation of the total bus cable length. However, this does not apply if the sum of all short stubs amounts to 2 % of the total length of a bus.
- In non explosion-hazard areas, the maximum stub length depends on the number of field devices.

Number of field devices	25-32	19-24	15-18	13-14	1-12
Stub length	≤ 1 m	30 m	60 m	90 m	120 m

2.4.5 Explosion-hazard area application

If networks are designed to be intrinsically safe, the “Ex i” type of protection applies. This type of protection does not only require intrinsic safety of the connected equipment but also relates to the entire electric circuit. The intrinsic safety of a network depends on the connected electric circuits. The circuit with the lowest intrinsic safety determines the intrinsic safety of the entire network. If a connected circuit is designed to comply with Ex ib type of protection, this type of protection applies to the entire network.

Intrinsic safety is verified using the FISCO model.

2.4.6 FISCO model

The FISCO model (Fieldbus Intrinsically Safe Concept) was developed by the PTB (Physikalisch-Technische Bundesanstalt, the National Metrology Institute of Germany) in order to facilitate planning, extending and installing of networks in explosion-hazard areas. Network design in accordance with FISCO makes it possible, for example, to exchange field devices or to extend the system without the need for recalculation. Field devices can be exchanged by plug-and-play.

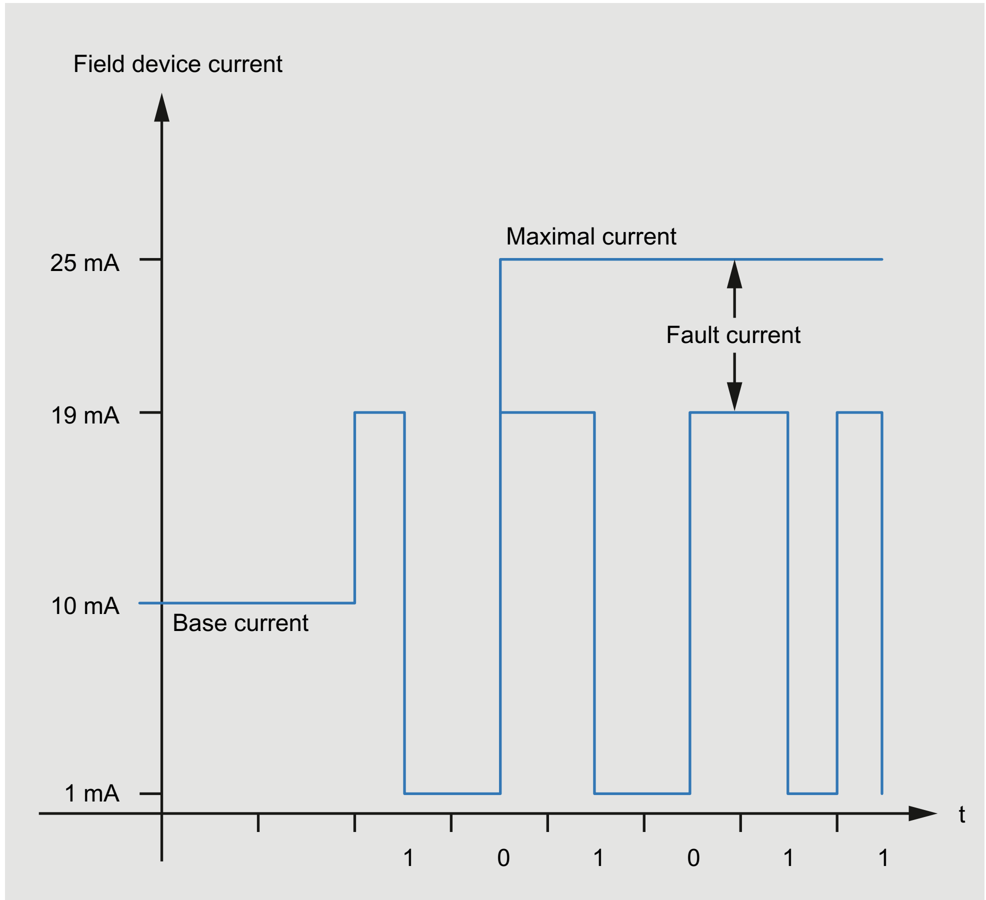
Certain constraints need to be observed in order to ensure these and other advantages. All bus participants must comply with the FISCO model. Only one device may feed energy into the network. Field devices may only take out energy. When a field device is transmitting, no additional energy is fed into the bus. Field devices that require additional auxiliary energy must be at least one type of protection higher than the fieldbus circuit. For installation in accordance with FISCO, corresponding control drawings are included in the instructions for use for the respective gas detector.

Properties according to the FISCO model

	Ex ia/ib IIC	**Ex ib IIB**
Cables		
Loop resistance (DC)	15...150 Ω/km	15...150 Ω/km
Specific inductance	0.4...1 mH/km	0.4...1 mH/km
Specific capacitance	45...200 nF/km	45...200 nF/km
Stub length	≤ 60 m	≤ 60 m
Line length	≤ 1000 m	≤ 5000 m
Feed units	Type A	Type B
Max. current requirement	≤ 110 mA	≤ 110 mA

2.4.7 Power supply and communication

The field devices of the PA area are supplied with energy by segment couplers. The type of segment coupler determines whether a PROFIBUS® PA branch can be used in explosion-hazard areas. The field devices connected to the PA segment derive the current required for their operation from the bus cable. Field devices thus are current sinks. As can be seen in the figure below, field devices draw a base current of at least 10 mA. Transmitting of data is then performed by modulating the current consumption in the range of +/- 9 mA. During transmission, field devices act as variable ohmic resistors. In the event of a field device fault, FDE (Fault Disconnection Electronics) is employed. FDE detects the increase of the base current above a manufacturer specific value. The maximum consumption of current is limited, and the field device is disconnected from the network. This prevents blocking of the entire bus. The increase of the base current in the event of a fault is referred to as fault current.



2.5 Functional principle of master-slave communication

2.5.1 Communication protocols

DP-V0

DP-V0 designates the basic form of the DP communication protocol. This basic form comprises cyclic data exchange and system diagnostics. Bus master and integrated devices communicate according to the master-slave principle. Class 1 masters can be control systems or PCs.

DP-V1

Designates the extension by acyclic data exchange with an IEC-61158-2 interface. This configuration level has 2 Classes of masters:

– Class 1 masters are control systems (PCS) or programmable logic controllers (PLC). Class 1 masters cyclically exchange their data with their decentralized slaves. A slave may only be allocated to a Class 1 master.
– Class 2 masters are, for example, PCs with special software (DTMs). Class 2 masters are responsible for commissioning and for parameterizing the slave during the ongoing cyclic traffic. The exchange with the allocated slaves is conducted acyclically, i.e. upon request. These slaves are also allocated to a Class 1 master.

In PROFIBUS® DP networks, it is also possible to operate more than one master. Networks of this type are referred to as multi-master systems. This constellation enables the use of cyclic and acyclic traffic. Systems that have only one master are referred to as mono-master systems.

The data exchange is carried out using standard telegrams, the maximum length of which depends on the respective master. The PROFIBUS® standard specifies an upper limit of 244 bytes. The cyclic data transmission of the process parameters always has priority.

DP-V2

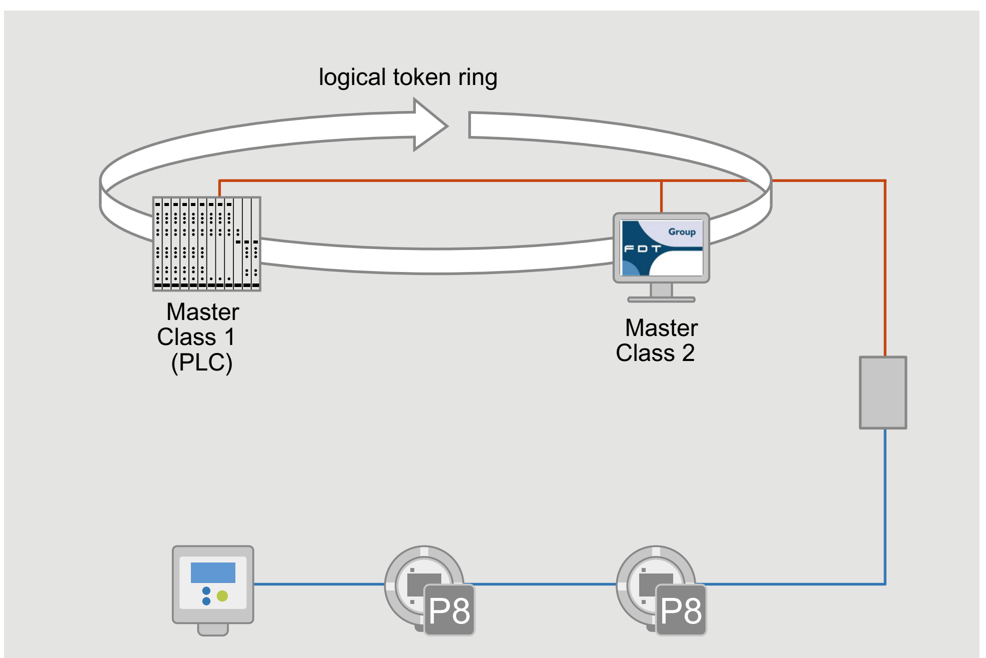
Designates the extension by an upwardly compatible direct data exchange between slaves and their isochronous operation.

2.5.2 DP bus access method

The bus access method of the DP architecture is a mixture of decentralized token passing and centralized master-slave communication. The masters form a logical token ring. The master with the token may transmit. The exchange with its slaves is conducted in accordance with the master-slave principle. This exchange takes place during a specified access time. When the time elapses, the token passes to the next master.

When the Class 1 master has the right to transmit, cyclic data exchange with the field devices takes place. Measured values and status of the field devices are transmitted.

When the Class 2 master has the right to transmit, acyclic data exchange with one of the field devices takes place. Settings can be made by the Class 2 master.

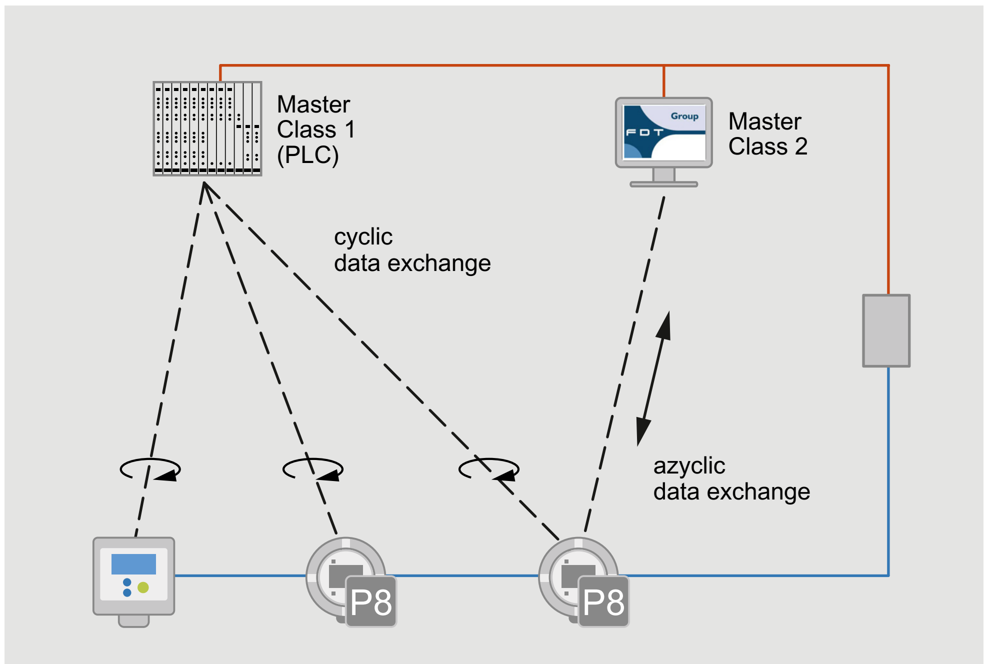


2.5.3 PA bus access method

The bus access method used is the master-slave principle. The communication protocol is DP-V1.

2.5.4 Master-slave communication with a segment coupler

Segment couplers do not need to be set or addressed since they are considered by the PROFIBUS® DP master to be transparent. Thus the field devices in the PA segment are regarded as DP slaves, they are given a DP address and are only allocated to one Class 1 master.



2.5.5 Master-slave communication with a link

Unlike segment couplers, links are recognized as participants by the DP master and also addressed. Links keep the data from the connected field devices in the respective PA segment in a buffer, which is cyclically read out by the DP master (Class 1).

In acyclic traffic with a Class 2 master, links are transparent. PA field devices can be directly addressed by Class 2 DP masters. This requires that the DP address of the link and the PA address of the field devices are specified. Towards the PA participants, the link behaves as a PA master with cyclic traffic. The PA participants receive PA addresses that may be assigned only once within their own link but can occur in other link segments.

2.5.6 Data transmission

In order to ensure functionality across manufacturers, device parameters and device functions are standardized for data transmission. This standardization is realized by way of device profiles. The device profiles contain rough definitions of functions and properties of the different field devices. This includes, for example, variables such as alarm thresholds, measured values and alarm types.

Device profiles are subdivided into 2 classes:

- Class A of the device profile is limited by the scope of the basic functions of a field device. The class contains measured values, the date and the name of the field device.
- Class B extends Class A by application functions such as maintenance, diagnostics and commissioning.

Parameters are assigned to either class. These can be classified as follows:

Dynamic parameters

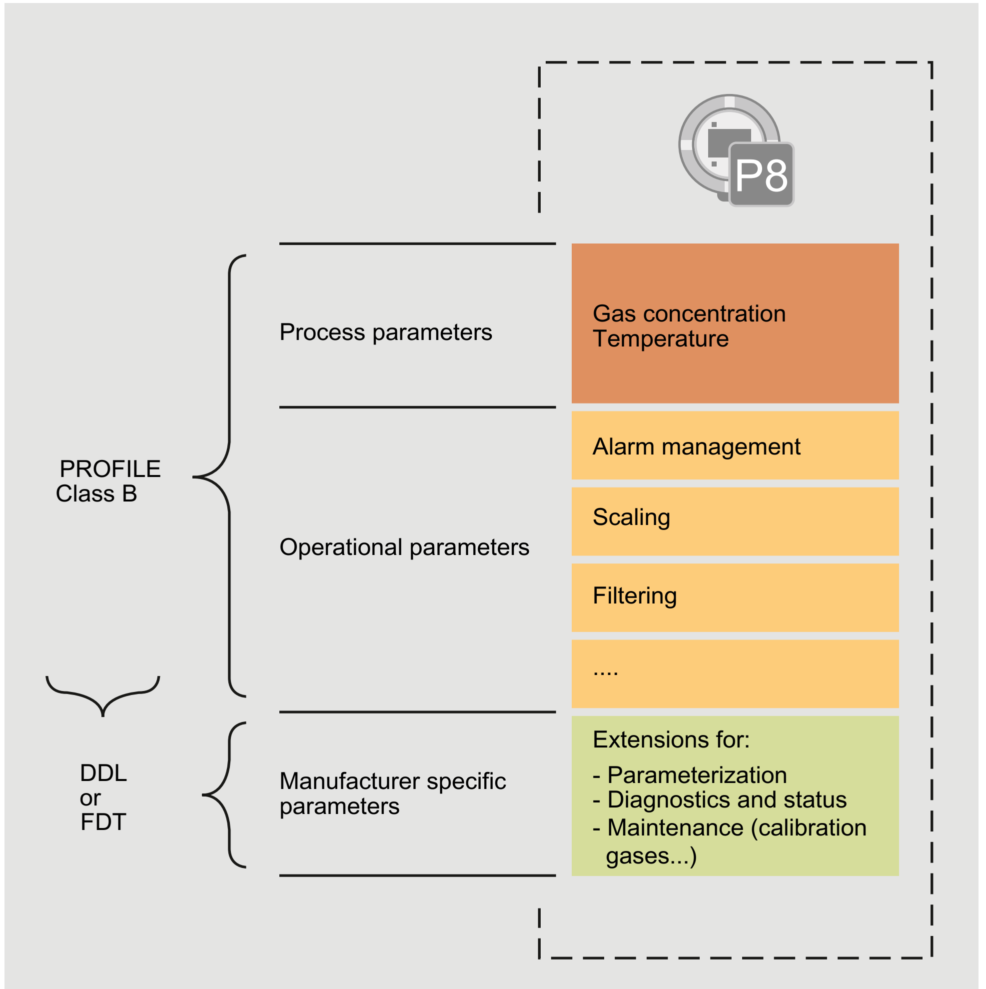
These parameters describe all dynamic status values and measured values. They are cyclically retrieved via the GSD. Acyclic access is also possible.

Application and standard parameters

These parameters are device type dependent. Among other things, they describe the type of the sensor, input/output etc. All parameters that are required by the respective device profile must be present. These parameters are read out and described only acyclically.

Manufacturer specific parameters

These parameters go beyond the application and standard parameters. They contain manufacturer specific setup variants and device functions. Manufacturer specific parameters are read out and described only acyclically.



2.5.7 Function block model

The general structure of the data transmission is assigned to 3 different function blocks. Within these blocks, parameters are further indexed. The blocks are represented in the software of the respective field device and define the functionality of the field device. The following 3 block types are defined:

Physical block (PB)

Each field device has only one PB. It contains the characteristic data of the field device, such as manufacturer, serial number of each assembly, software version, command for re-setting to factory settings, the status of the field device etc.

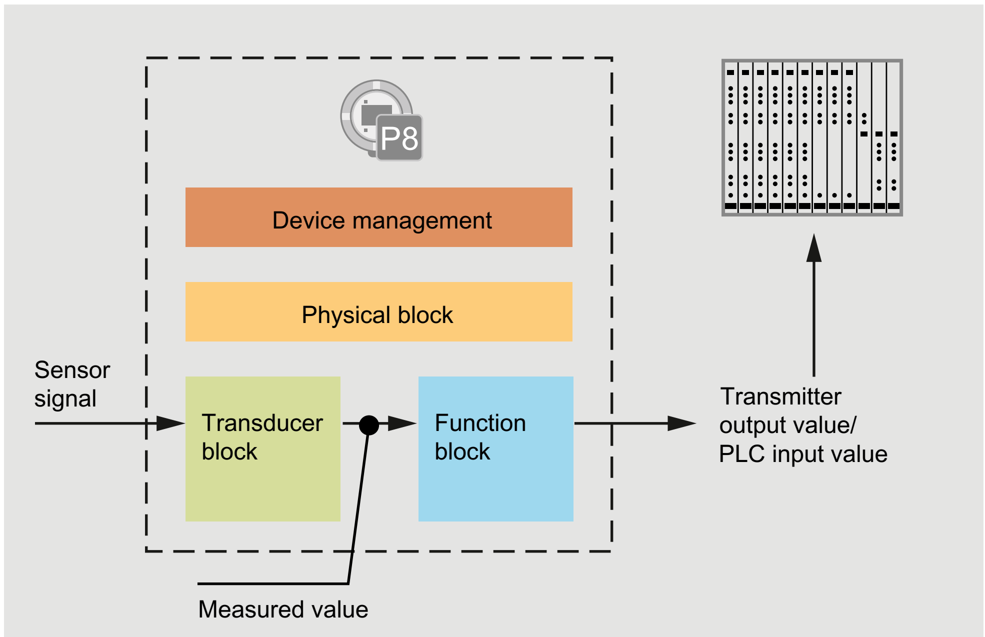
Transducer block (TB)

The TB bundles parameters that describe or influence the sensor type. In addition, parameters for calibrating, for target gas adjustment, for alarm configuration (alarm thresholds A1 A2), maintenance and self-testing function, etc., are integrated. Nearly the entire menu functionality is contained. With the help of these parameters, the raw data of the sensor are converted in the TB into a measured value. The measured value is then processed in the function block.

Function block (FB)

In the FB, limit values are added to the measured value coming from the TB. If required, the measured value is scaled. The resulting data are passed, via the cyclic traffic, to a Class 1 master (process control system). These data contain the current measured value and the field device status.

The device management is located upstream of the 3 main blocks PB, TB and FB.



2.5.8 Transmission of measured values and status

The data blocks for the transmission of measured values and status are 5 bytes in length. The first 4 bytes contain the measured value as a floating point number in accordance with the IEEE standard. The 5th byte is used for device specific status information. The device specific status information is given in accordance with the NAMUR standard NE 107. If an error is present, it can be read out using the DTM.

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
Measured value as a floating-point number in acc. with IEEE 754				Status

2.6 Device management in cyclic traffic

The device management in cyclic traffic is controlled by the process control system. Here, the measured value and the status of a field device are queried.

2.6.1 Device master data file (Geräte-Stammdaten-Datei, GSD)

The device master data file (Gerätestammdatei, GSD) of a field device is required to integrate a field device into the process control system. The GSD is written in a standardized file format and is included in the scope of supply of a field device. It contains device specific parameters that are needed to integrate the field devices with the fieldbus, including: input data, output data, data format, amount of information and, if required, device icons that are represented in the network tree of the control system. For the cyclic exchange of measured values the GSD suffices.

Profile GSD and manufacturer specific GSD

There are manufacturer specific GSDs and profile GSDs. The profile specific GSD differs with regard to the number of the individual function blocks. Thus it does not offer the full functional scope of a manufacturer specific GSD. Profile GSDs are made available by the PROFIBUS® user organization. Devices can be exchanged independent of manufacturers if the order of the cyclic process values and the profile ID number match.

ℹ Dräger recommends the use of the manufacturer-specific GSD.

2.7 Device management in acyclic traffic

The communication between a field device and a Class 2 master is conducted acyclically. The Class 2 master is connected to the DP network via an interface.

2 interface descriptions were specified in order to enable the Class 2 master to capture the device properties and operating functions of the field devices across manufacturers:

– FDT and DTM
– EED

2.7.1 FDT and DTM

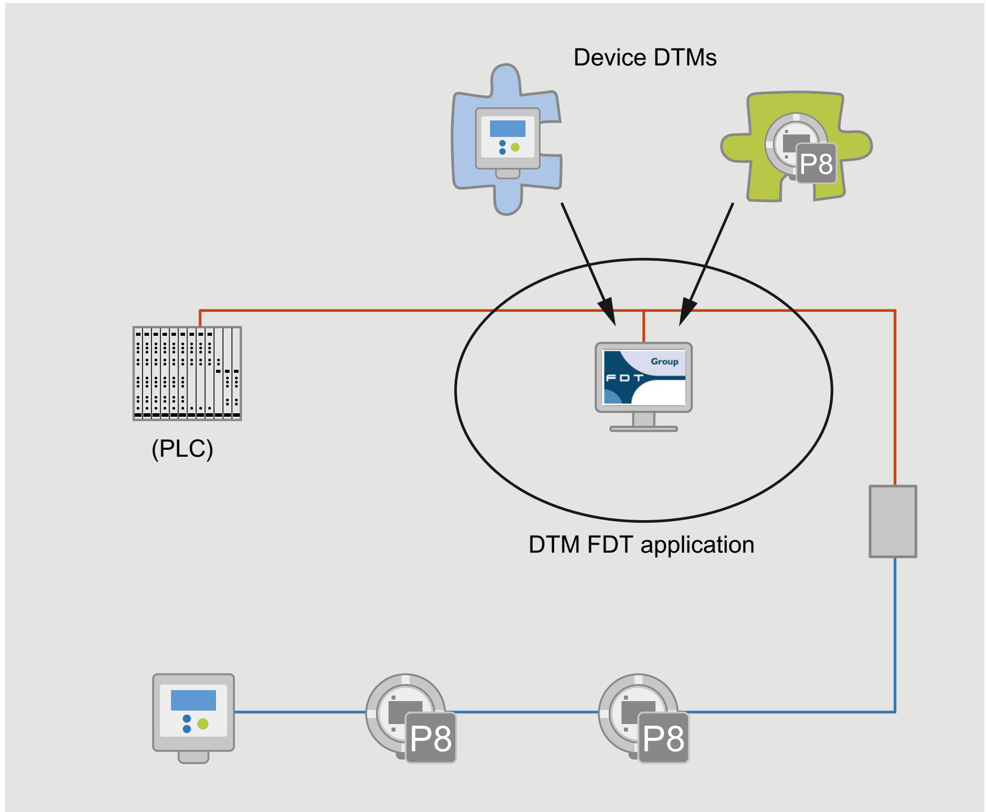
The FDT/DTM concept serves the purposes of integration and management of intelligent field devices. The concept makes it possible to configure field devices centrally, to document their measured values and their behavior and to perform device diagnostics.

DTMs (Device Type Managers) are software components that can be used to implement all functions, properties and parameters of the gas detector. Manufacturer specific DTMs also contain the complete control panel and the menu structure of the field device.

The FDT (Field Device Tool) is a cross-manufacturer concept enabling parameterization of different field devices using just one software. This software is a framework application into which the required DTMs can be loaded. This concept can be compared with the way printer drivers are loaded into an operating system.

Communication DTM (COM_DTM)

The Communication DTM is a driver that sets up the interface between fieldbus cable and the Class 2 master. This interface can for example be a USB-PROFIBUS converter. The Communication DTM is installed within the FDT framework application. After installation, the data of the segment coupler or link must be entered in the Communication DTM. During the project planning phase, be sure to observe the segment coupler data sheet. Segment couplers from different manufacturers have different communication parameters.



2.7.2 Electronic Device Description (EDD)

The EDD is a file and not a software component. The file contains all application features of the field device and works on interpreter basis. EDDs have proven their worth for applications up to medium complexity.

Profile EDDs

The Profile EDD is manufacturer independent. It maps the basic functionality of the field devices belonging to one class (e.g. analyzers).

ℹ Dräger recommends the use of the manufacturer specific EED.

2.8 Current and voltage in the PROFIBUS® PA segment

2.8.1 Current calculation

The following values need to be known for the calculation:

– I_S = Feed current of the segment coupler
– I_B = Base current of each field device
– I_{FDE}= Fault current of each field device

The maximum number of field devices at the PA segment is a function of the feed current of the segment coupler used and the current consumption of the field devices.

The current requirement of the segment I_{SEG} is calculated as follows: $I_{SEG} = \sum I_B + \max. I_{FDE}$

A segment is permissible if $I_S \geq I_{SEG}$.

2.8.2 Voltage at the last field device

The minimum operational voltage (9 V) must be verified at the field device that is the most distant from the feed unit, since the cable resistance causes a voltage drop.

The voltage is calculated using Ohm's law:

$U_B = U_S – (I_{SEG} * R_{SEG})$

Where: U_B = Voltage at the last device

U_S = Feed voltage of the feed unit (manufacturer's data)

I_{SEG} = Current requirement of the segment

R_{SEG} = Cable resistance = bus length * specific resistance

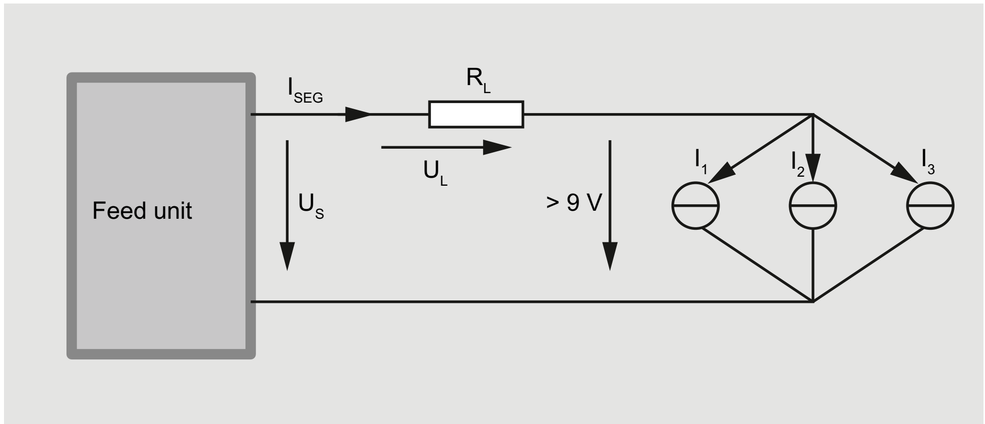
2.8.3 Voltage calculation and line length

The following formula is used to calculate the maximum cable length for a specific cable resistance.

$$\text{max. cable length [km]} = \frac{\text{max. loop resistance of feed unit}}{\text{resistance of the cable [Ohm/km]}}$$

2.8.4 Example of worst case calculation

In certain cases, the maximum line length can be negatively affected by the distribution of the bus participants in the segment.



R_L = Line resistance of line segment χ

I_n = Current consumption of the nth field device

Given values (from current calculation and data sheet of the cable type):

I_{SEG} = max. direct current (incl. I_{FDE}) = 100 mA

R_L = Specific resistance of cable type A = 44 Ω/km.

To ensure proper functioning of a field device, the input voltage at the bus line must not be lower than 9 V.

Thus the following obtains for the maximum voltage drop over the line: U_{Lmax} = U_S - 9 V.

Example: Feed unit with Ex interface

Feed units with Ex interface supply a voltage of 12.8 V.... 13.4 V.

Thus we obtain the maximum voltage drop over the line
U_{Lmax} = US - 9 V = 12.8 V - 9 V = 3.8 V

The max. line resistance R_{Lmax}[Ω] = (U_{Lmax}/ I_{SEG}) = 3.8 V / 0.1 A = 38 Ω.

Thus we obtain the maximum line length
[km] = (R_{Lmax}/ R_L) = 38 Ω/ 44 [Ω/km] = 0.863 km

3 Installation in the PROFIBUS® PA segment - field devices in general

3.1 Grounding and shielding

Intrinsically safe fieldbus circuits are operated in floating mode, although individual measuring current circuits may be grounded. In some cases, overvoltage protection needs to be placed upstream. The decision as to whether overvoltage protection is to be used and the responsibility for proper integration into equipotential bonding lies with the customer.

Sufficient equipotential bonding must be in place for the grounding of the conductive shielding. The grounding of the shielding protects the digital signals on the fieldbus against high-frequency electromagnetic interference.

ℹ Dräger gas detection equipment is only approved for capacitive grounding. The legal EMC requirements are only met if the shielding is grounded at the control unit at one end.

There are 3 methods for the grounding of the shielding.

– Isolated installation
– Installation with multiple grounding
– Capacitive installation

3.1.1 Isolated installation (IEC 61158-2)

The grounding of the cable shielding is separate from the device grounding and is only applied at the feed unit. The disadvantage of this method is that the bus signals are not optimally protected against interference. The degree of interference depends on the length and topology of the bus.

3.1.2 Installation with multiple grounding (IEC 79-13)

All cable shields and devices are grounded locally. The grounding lugs are connected to an equipotential bonding conductor that is grounded in the safe area. This grounding method achieves increased protection of the signals against interference and may be used, subject to conditions, in explosion-hazard areas.

3.1.3 Capacitive installation

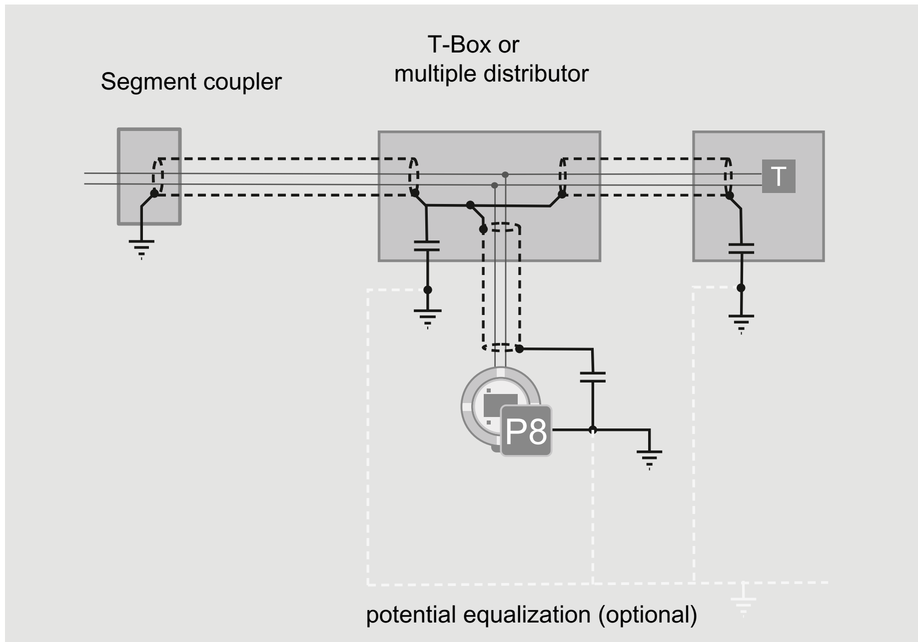
The cable shields are grounded via a capacitor. The capacitors have an electric strength of 1 nF/1500 V. The overall capacity connected to the shielding must not exceed 10 nF. A shielded and twisted cable must be used.

Capacitive grounding in non-explosion-hazard areas:

– Field devices and connection boxes are capacitively grounded between cable shielding and earth. The capacitors are installed inside the connection boxes.
– The feed unit is grounded using the normal method.

Capacitive grounding in explosion-hazard areas:

- The connection box is grounded using the conventional method.
- The feed unit is capacitively grounded. The bus shield must be grounded directly at the feed unit.
- At the Dräger gas detector, the shield is inserted into the PIN provided for that purpose.



3.2 Termination

Passive termination is required at the beginning and end of each segment. The termination suppresses signal reflections on the bus line. Termination is achieved by means of a combination of a resistor and a capacitor (RC element).

3.2.1 Termination of an RS-485 interface (on the DP side)

Termination resistors are already present in most available plugs and only need to be activated by means of a switch.

3.2.2 Termination of an MBP interface (on the PA side)

- The segment coupler at the beginning of the segment has an in-built bus terminator.
- In the case of a branched bus segment, the field device that is the most distant from the segment coupler forms the end of the bus and needs to be terminated.
- If the connected stubs are longer than 30 m, termination must be installed directly at the field device.
- If the bus is extended using a repeater, the extension also needs to be terminated at both ends.

Termination in non-explosion-hazard areas

In most connection boxes, bus termination can be activated by means of a switch. Where this is not the case, a separate bus terminator needs to be installed.

Termination in explosion-hazard areas

Connection boxes with switchable termination resistors are not permitted. The termination resistor must have appropriate approval (in accordance with FISCO) and is installed separately.

3.3 Addressing

Each Bus participant needs to have a unique bus address. Addressing depends on whether the transition to the DP network is formed by a link or by a segment coupler. Bus addresses can be in the range between 0 and 125.

The address of a Class 2 master is always 0. The address of a Class 1 master can be in the range between 1 and n (where $n \leq 4$). The addresses of the connected participants are then between n+1 and 125. If extensions to the network are known in advance, it is also useful to assign addresses to the devices that are not yet connected. This makes it possible at a later stage to connect devices by plug-and-play.

The address setting can be made directly at the gas detector via the menu or the DIP switch. It is also possible to make the settings centrally by means of a software via a Class 2 master.

ℹ Addressing via a DIP switch overwrites changes made on the software side.
If the address is set via a DIP switch, the address can be changed by a Class 2 master or via the menu on the gas detector. When the field device is restarted, however, the address set on the DIP switch is used (e.g. following a power failure).

3.3.1 Dressing of field devices when a segment coupler is used

Segment couplers are not addressed since they are considered by the DP master to be transparent. Field devices in the PROFIBUS® PAsegment are assigned a DP address between 2 and 126.

3.3.2 Dressing of field devices when a link is used

Unlike segment couplers, links are recognized as participants by the DP master and also addressed. Links receive DP addresses. The PA participants receive PA addresses that may be assigned only once within their own link but can occur in other link segments. The DP address of the link and the PA address of the field devices must be specified at the DP Master.

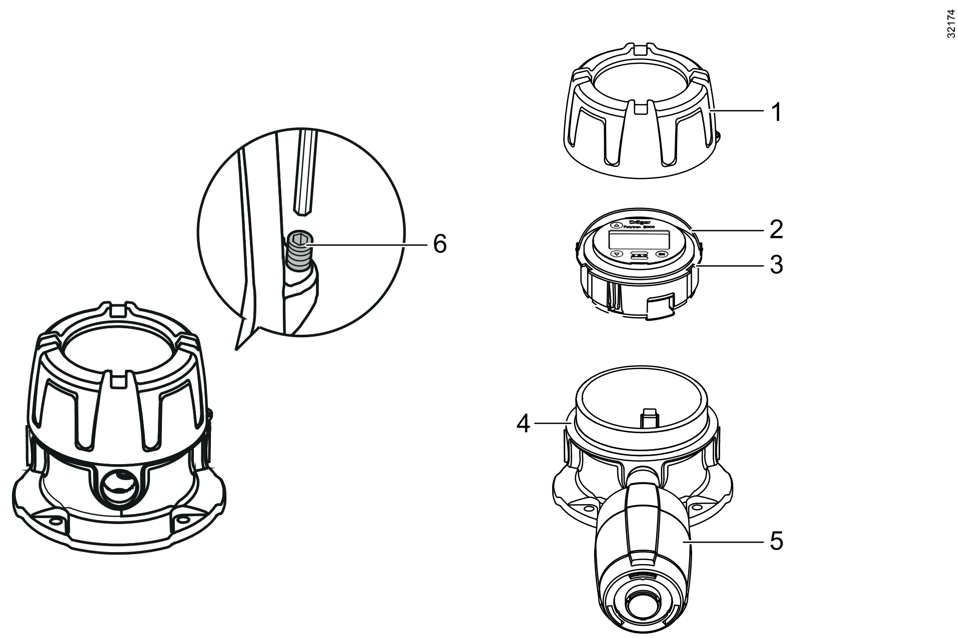
4 Installation in the PROFIBUS® PA segment - Polytron® 8000

The installation must be carried out in accordance with the specifications of the FISCO model, the instructions for use and the included control drawings for the respective gas detector. When a Dräger Docking Station FB is used, the associated instructions for use must be observed.

ℹ Only use suitable cable types (see 2.4.3 Cable type). Dräger recommends cable type A.

ℹ The legal EMC requirements are only met if the shielding is grounded at the control unit at one end.

4.1 Opening the gas detector



1. Loosen the set screw (6).
2. Unscrew the lid (1) and take it off the gas detector.
3. Turn the handle (2) upward and pull out the PCB unit (3) containing the main electronics.

4.2 Connecting the gas detector

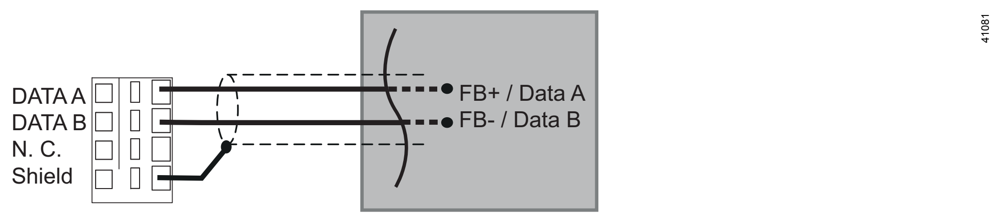
Preconditions:

– Cable bushings are installed at the gas detector as described in the respective instructions for use.

1. Insert the fieldbus cable and the power supply cable into the cable bushing.
2. Strip the cores of the cables.
3. Twist the shielding of the fieldbus cable.
4. If required, add ferrules and crimp them.

4.3 Signal lines for explosion protection type Ex d

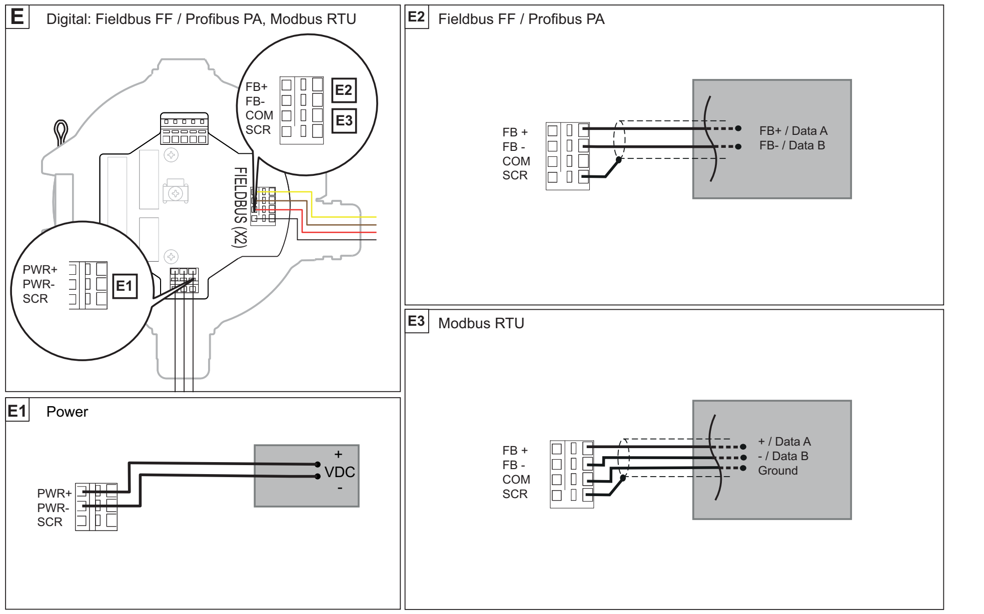
The terminal of the PCB unit within the Ex d housing is assigned as follows.



4-pin connector				
Assignment	Data-A	Data-B	N.C.	Shield
Function	Signal A	Signal B	Not Connected	Cable shield

4.4 Signal lines for explosion protection type Ex e

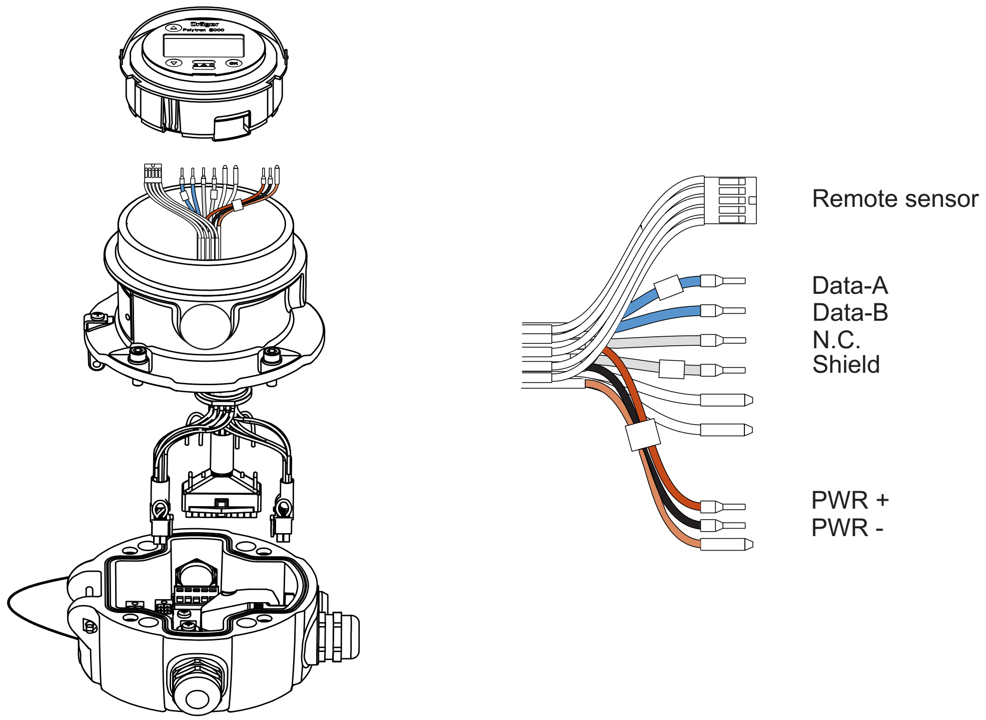
The terminal of the PCB within the docking station for explosion protection type Ex e is assigned as follows (Fig. E2).



4-pin terminal X2				
Assignment	FB +	FB -	COM	SCR
Function	Signal A	Signal B	Not con-nected	Cable shield

4.4.1 Rewiring of the PCB unit in the Ex d housing

The following information is only required if the Ex d housing has to be rewired (e.g. when replacing the PCB unit in the Ex d housing).



Only the cable cores with ferrules are required for gas detectors with a PROFIBUS® interface. The other cable cores are inoperative. To be able to distinguish between the cable cores with the same color, they were marked with heat-shrink tubes. The "Remote sensor" connector is not present in every version.

4-pin connector of the PCB unit in the Ex d housing				
Assignment	Data-A	Data-B	N.C.	Shield
Cables	Blue with marking	Blue without marking	Gray without marking	Gray with marking

4.5 Checking grounding and shielding

ℹ The legal EMC requirements are only met if the shielding is grounded at the control unit at one end.

ℹ Polytron® 8000 meets FISCO specifications only with capacitive grounding.

1. Check if the shielding of the fieldbus cable is connected to pin 4 (Shield) at the gas detector.
2. Check the grounding and shielding at the other end of the fieldbus cable.
   – The segment coupler must be capacitively grounded.
   – The bus shield must be grounded directly at the segment coupler unit.
   – The bus cable or the connection box must be grounded directly.

4.6 Applying the termination

Use an RC element for termination.

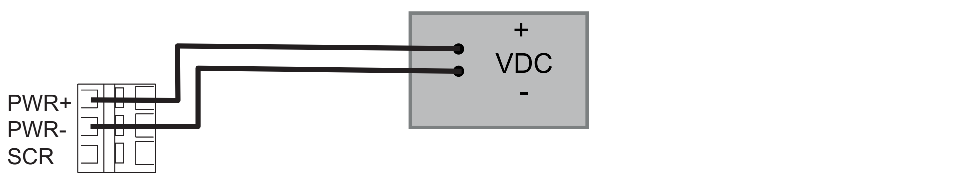
Properties of the RC element:

Parameters	Nom. Value	Tolerance	Unit
Termination resistor	100	+/- 2 %	Ω
Termination capacitor	1-2	+/- 20 %	µF

1. Apply the termination depending on the location of the gas detector in the PROFIBUS® PA segment.

Terminate the feed unit	if the gas detector is located at the beginning of the bus.
Terminate the connection box	if the gas detector is located at the end of the bus.
Terminate the gas detector	if the gas detector is located at the end of the bus and termination at the connection box is not possible.

4.7 Connecting the power supply



1. Connect the 2 cores of the power supply cable to the 2-pin connector.

2-pin connector		
Pin	1	2
Assignment	PWR+	PWR-
Function	V+	V-

2. Insert the 2-pin connector into the power supply socket and tighten the connector screws.

4.8 Closing the instrument

1. Ensure the following connections are properly made:
   a. Wiring screws are tightened to the correct torque.
   b. All cable connectors are secured with screws.
   c. The sensor connector is plugged.
   d. The grounding cable coming from the enclosure is connected to the lug on the PCB unit,
2. Place PCB unit back into the enclosure.
3. Screw the lid back on, until it is seated with correct torque, and tighten set-screw.

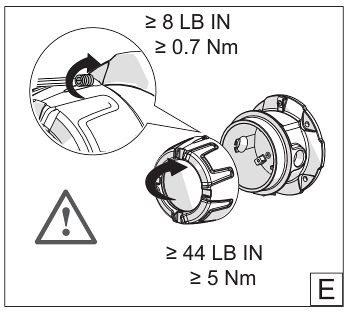


Fig. 1 Closing the Ex d enclosure with correct torques

5 Commissioning - Polytron® 8000

5.1 Checking the installation

1. Check for correct connection of the cables (see 4.3 Signal lines for explosion protection type Ex d)
2. Check the voltage at the gas detector.
   The minimum operational voltage is 10-32 V.

5.2 Setting the address of the PROFIBUS®-PA interface on the Polytron® 8000

There are 3 methods for setting the address of the gas detector:

– At the gas detector by means of the DIP switch
– At the gas detector by means of the menu
– At a Class 2 master with FDT and DTM

Addressing via a DIP switch overwrites changes made on the software side.
If the address is set via a DIP switch, the address can be changed by a Class 2 master or via the menu on the gas detector. When the field device is restarted, however, the address set on the DIP switch is used (e.g. following a power failure).

5.2.1 Setting the address of the PROFIBUS®-PA interface

	Factory default setting	Selection
Address of the gas detector	126	2 ... 126

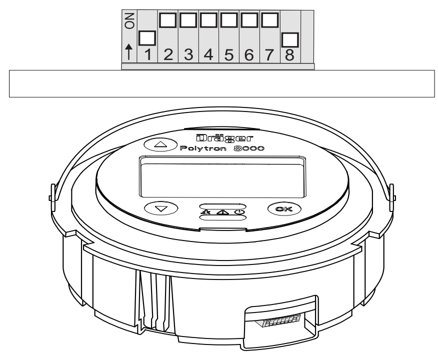
5.2.2 Address setting with DIP switch

DIP switch no. 8 activates or disables the address assignment via the DIP switch.

On	Address assignment via the DIP switch is disabled.
Off	Address assignment via the DIP switch is activated.

Setting the address with the DIP switch

1. Open the gas detector (see 4.1 Opening the gas detector).
2. Set the address using the DIP switch.



   a. Set DIP switch no. 8 to Off.
   b. Set the address as defined in the table with DIP switches no. 1 to 7.

Switch number	1	2	3	4	5	6	7
Value in "On" position	0	0	0	0	0	0	0
Value in "Off" position	1	2	4	8	16	32	64

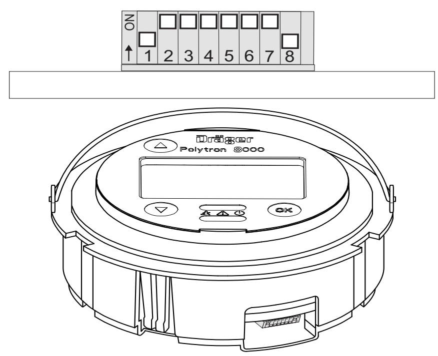
3. Close the gas detector (see 4.8 Closing the instrument).
4. Open the menu of the gas detector.
   a. In measuring mode, press and hold down for approx. 3 seconds.
   b. Choose ***Kenn. eingeben***.
   c. Enter the calibration password.
      The factory setting for the calibration password is _ _ _ 2.
5. Choose ***Einstellungen > Gerät > Gerät zurücksetzen*** and confirm.
6. Choose ***Bestätigen*** and confirm with [***OK***].

i If the address assignment is selected using the DIP switch, the address set on the DIP switch is used when restarting the field device.

5.2.3 Setting the address using the menu function

Disabling the DIP switch

1. Open the gas detector (see 4.1 Opening the gas detector).
2. Set DIP switch no. 8 to On.



3. Close the gas detector (see 4.8 Closing the instrument).

Setting the address using the menu function

1. Open the menu of the gas detector.
   a. In measuring mode, press and hold down ▼ for approx. 3 seconds.
   b. Choose ***Kennw. eingeben***.
   c. Enter the calibration password.
      The factory setting for the calibration password is _ _ _ 2.
2. ***Einstellungen > Kommunikation > Profibus***.
3. ***Profibus Adresse***.
4. Using the arrow symbol, navigate down to ***Adresse***.
5. Set the address using the arrow symbols.
6. ***OK***.

ℹ If the address assignment is selected using the DIP switch, the address set on the DIP switch is used when restarting the field device.

5.3 Configuring the gas detector via DTM

Gas detectors can be configured using the DrägerServicetool or a PC on which the FDT frame application and DTM are installed.

5.3.1 Preparing for configuration using FDT and DTM

1. Procure the required software.
   Software is available free of charge or linked at www.draeger.com. Required are:
   – FDT frame application (e.g. PactWare)
   – Communication DTM (e.g. ProfiTrace)
   – Polytron® 8000 DTM
   – Manufacturer specific GSD (not an installation file)
2. Save and unzip the software locally.
3. Install the software, following the respective installation wizard.
4. Using a PROFIBUS® interface (e.g. USB-PROFIBUS converter), connect the PC to the fieldbus cable.

5.3.2 Establishing the connection to the fieldbus

To establish the connection to the fieldbus, the Profibus interface must be added to the FDT frame application and the Communication DTM must be set up.

Preconditions:

– FDT frame application installed
– Communication DTM installed
– PROFIBUS® interface connected

1. Start the FDT frame application
2. Add the PROFIBUS® interface.
   If PactWare is used:
   a. Right-click on HOST PC (2) and choose ***Gerät hinzufügen***.
   b. Highlight the driver for the connected PROFIBUS® interface.
   c. Choose ***OK***.
3. Enter the data from the data sheet for the segment coupler or link.
   If PactWare is used:
   a. Right-click on the connected PROFIBUS® interface (3).
   b. Choose ***Parameter*** and enter the data for the segment coupler.
   c. Choose ***OK***.
   ⇒ The connection to the fieldbus is established.

5.3.3 Establishing the connection to the gas detector

To establish the connection to the gas detector, the GSD must be assigned to the Communication DTM and the device address must be selected in the Polytron 8000® DTM.

Preconditions:

– FDT frame application opened
– Manufacturer-specific GSD available
– Communication DTM set up
– Gas detector connected to the fieldbus
– Polytron 8000® DTM installed

1. Assign the GSD to the Communication DTM.

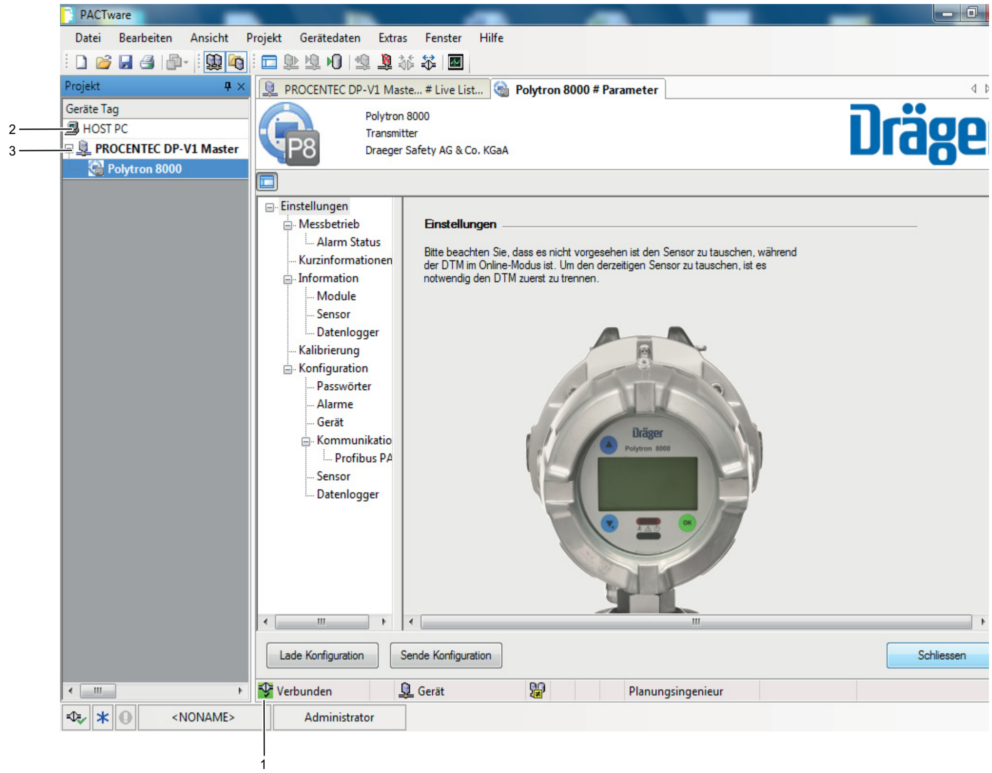
If ProfiTrace is used:

a. Open ProfiTrace.
b. Choose ***Settings***.
c. Choose Add/Copy GSD to Catalog.
d. Select GSD and confirm with OK.
e. Minimize ProfiTrace.

2. Start the FDT frame application.
3. Find the address of the field device.
   If PactWare is used:
   a. Right-click on the connected PROFIBUS® interface (3).
   b. Choose ***Weitere Funktionen***.
   c. Choose Live Liste... .
   d. Choose Scan starten.
   e. Identify the gas detector by the serial number and make a note of the device address.
   f. Choose Schließen.
4. Add the gas detector, observing the address settings.
   If PactWare is used:
   a. Right-click on the connected PROFIBUS® interface (3).
   b. Choose Verbindung aufbauen.
   c. Right-click on the connected PROFIBUS® interface (3).
   d. Choose ***Weitere Funktionen***.
   e. Choose Geräteadresse bearbeiten.
   f. In the drop-down menu, select the address of the gas detector.
   g. Choose ***Übernehmen***.
   h. Right-click on the connected PROFIBUS® interface (3).
   i. Choose ***Gerät hinzufügen***.
   j. Select the gas detector and double-click.

✓ The connection is established.

If all settings are correct, the connection status (1) changes to verbunden/connected



6 Troubleshooting

6.1 Fault analysis

If communication with the gas detector cannot be established, check the following items:

– Verify that the address of the field device is the same as the address specified in the DTM.
– Check if the USB-PROFIBUS converter is correctly connected to the Class 2 master and to the fieldbus cable.
– Check if the values of the segment coupler are correctly entered into the Communication DTM.
– Check the termination at both ends and, if applicable, at the transitions of the fieldbus cable (segment coupler, connection box).
– Verify that the manufacturer specific GSD is integrated.

ℹ In order to be able to establish a connection, all parameters in the gas detector and in the Communication DTM must match.

6.2 Fault prior to commissioning

Question/fault	Solution
The PA segment fails when a new field device is connected.	Diagnostics: Measure the current consumption of the field devices in non-communication state.Remedy: Reduce the load on the affected segment, e.g. by removing field devices.
PA field device with address 2 does not respond	Diagnostics: Check if another field device or a master has address 2. When a link is used, no PA field device can have address 2. Remedy: Assign a different address to the PA field device.

6.3 Fault during PLC project planning

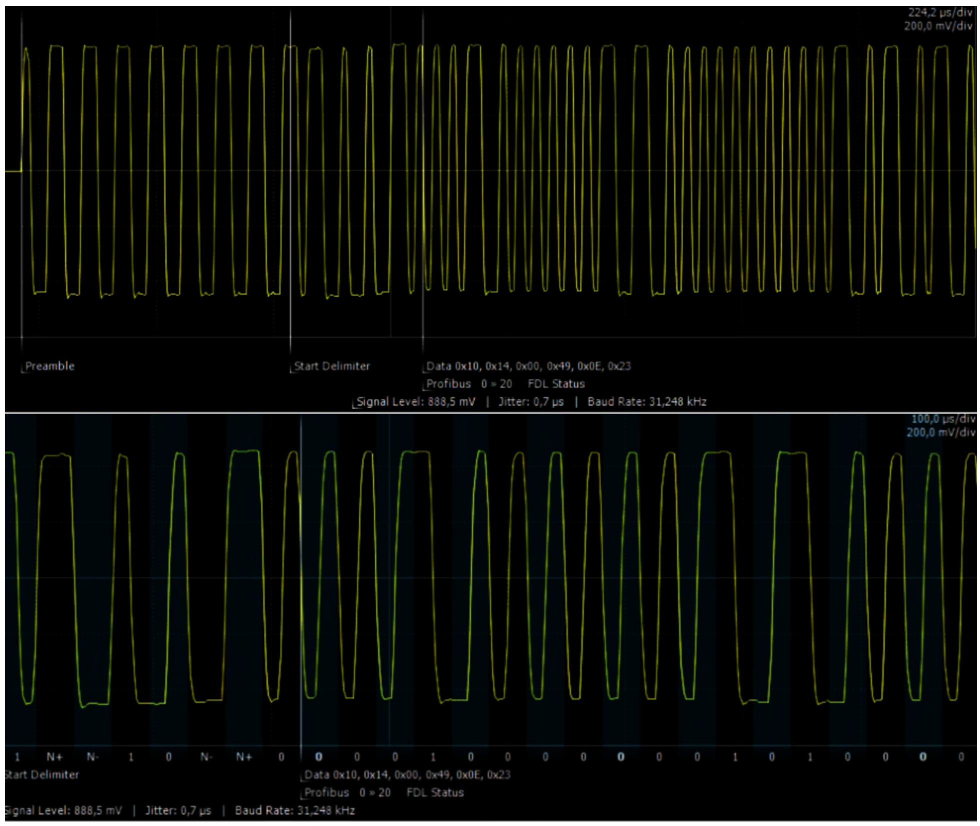
<table>
<tr><th>Question/fault</th><th>Solution</th></tr>
<tr><td>The Siemens S5 control displays an incorrect measured value.</td><td>The IEEE number format must be converted to Siemens KG format. This requires the use of a conversion module, which can be obtained via Siemens. (It only runs on 135 U and 155 U, and not on 115 U or 95 U.)</td></tr>
<tr><td>The Siemens S7 control displays the measured value 0 for all field devices.</td><td>Use the SFC 14 function module.
It is for example used to consistently load 5 bytes into the PLC. Without SFC 14, the Siemens S7 can only read 4 bytes consistently.</td></tr>
<tr><td>The PLC displays a different value than the display of the field device.</td><td>PV-Scale and Out-Scale may be adjusted incorrectly. Adjust the parameters in the function block.
OUT_SCALE_Min. = PV-Min
OUT_SCALE_Max. = PV-Max.</td></tr>
<tr><td>The PLC has no connection to the PA segment</td><td>Check baud rates and bus parameters. They can be found in the Data Sheet for the segment coupler or the link.
Siemens: 45.45 kbit/s
PA link (Siemens): freely definable
Pepperl+Fuchs SK1: 93.75 kbit/s
Pepperl+Fuchs SK2: freely definable
Ensure that the polarity of the DP line (A and B) is not reversed.
Check termination (DP bus).</td></tr>
</table>

6.4 Fault analysis with an oscilloscope

Some FDT frame applications can analyze bus segments with an oscilloscope function. Bus segment errors can be determined more precisely using the signal shape on the oscilloscope image.

Oscilloscope image, correct signal shape

The following oscilloscope image shows the signal shape of a functioning bus segment, i.e. typically rectangular.



43422

Fig. 2 Oscilloscope image of a functioning bus segment

Oscilloscope image, too many bus terminations

Having too many bus terminations causes excessive capacitive loading in the bus segment. In the following oscilloscope image, excessive capacitive loading is indicated by the rounded edges and peaks in signal.

Remedy: Ensure that the bus segment only has two bus terminations.

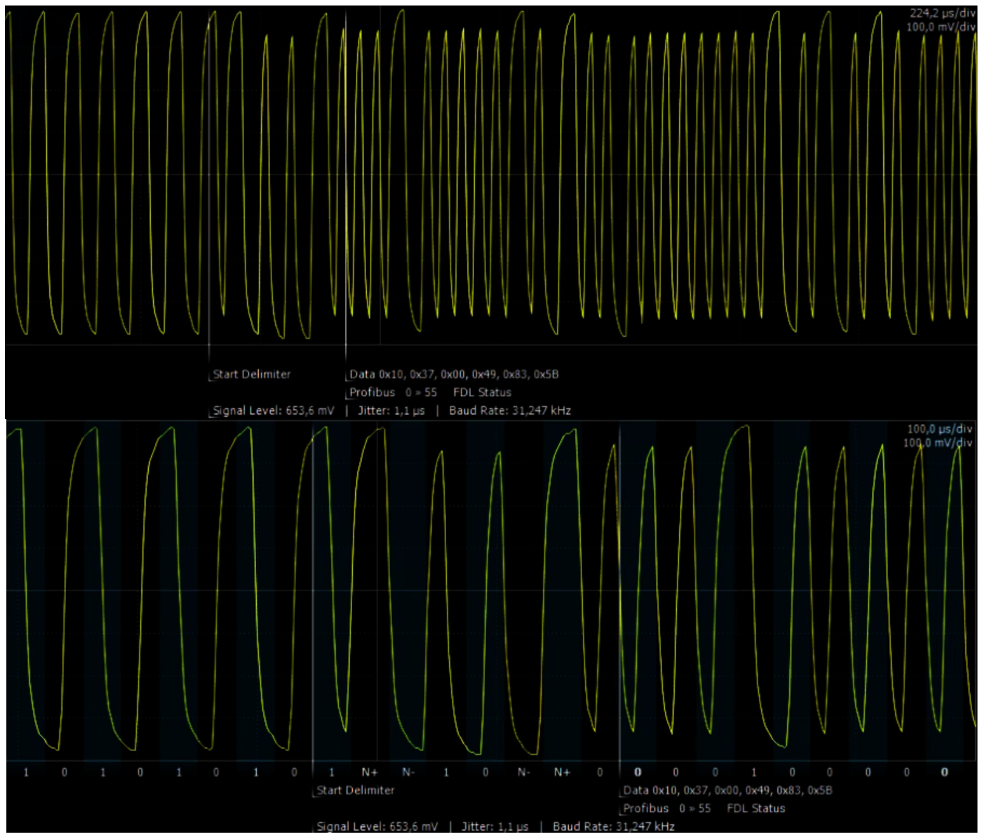


Fig. 3 Oscilloscope image of a bus segment with too many bus terminations

Oscilloscope image, not enough bus terminations

Not having enough bus terminations causes reflections in the bus signals. This oscilloscope image shows peaks in signal. Peaks in the signals also indicate that the voltage in the segment is too high. Not having enough bus terminations can make the voltage high.

Remedy: Ensure that the bus segment has two bus terminations.

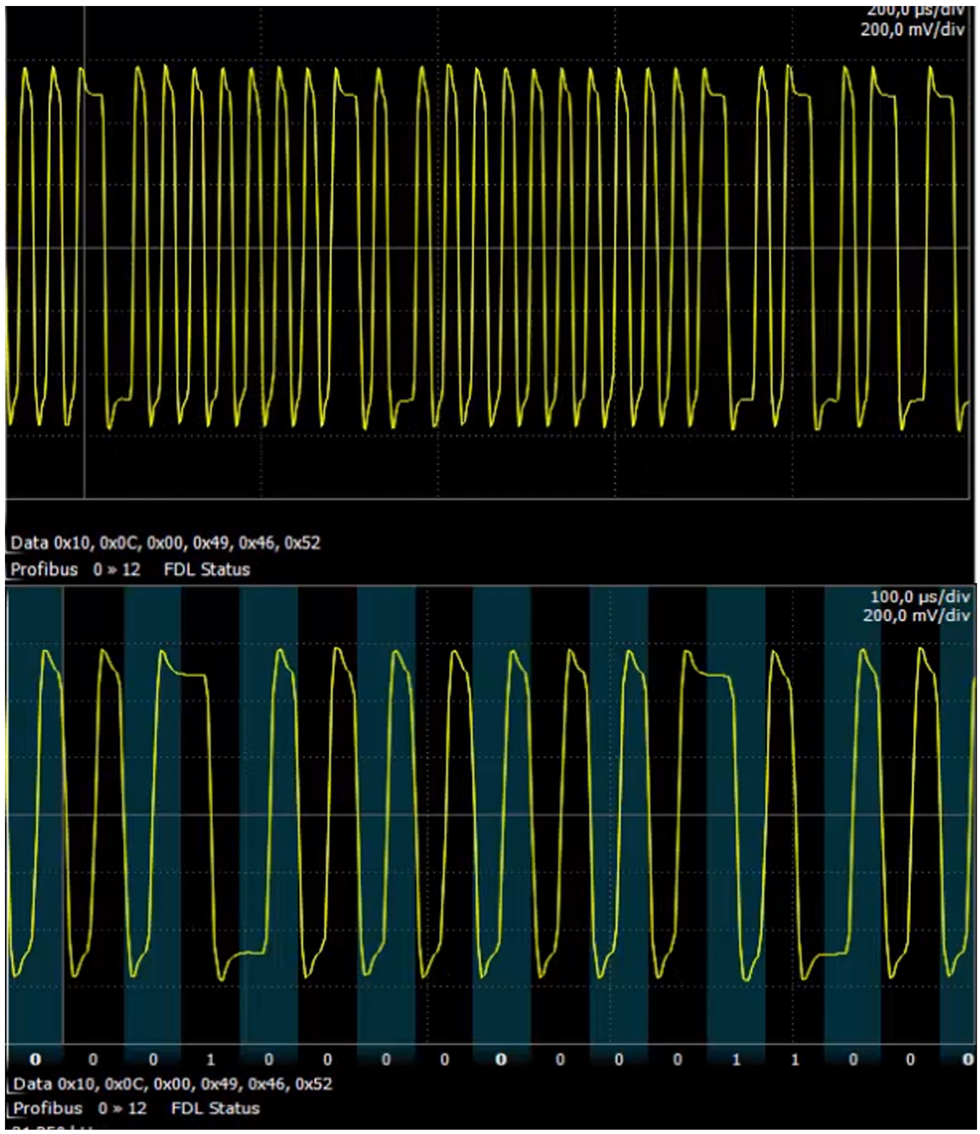


Fig. 4 Oscilloscope image of a bus segment with not enough bus terminations/where the voltage is too high

Oscilloscope image, short circuit between cable shield and Data B wire

The following oscilloscope image shows the signal shape of a bus segment with a short circuit between the cable shield and the Data B wire.

Remedy: Ensure that the cable shield has been correctly stripped and is connected to the terminal.

Fig. 5 Oscilloscope image of a short circuit between the cable shield and Data B wire

Oscilloscope image, Data A and Data B wrong way round

The following oscilloscope image shows the signal shape of a bus segment where Data A and Data B are the wrong way round.

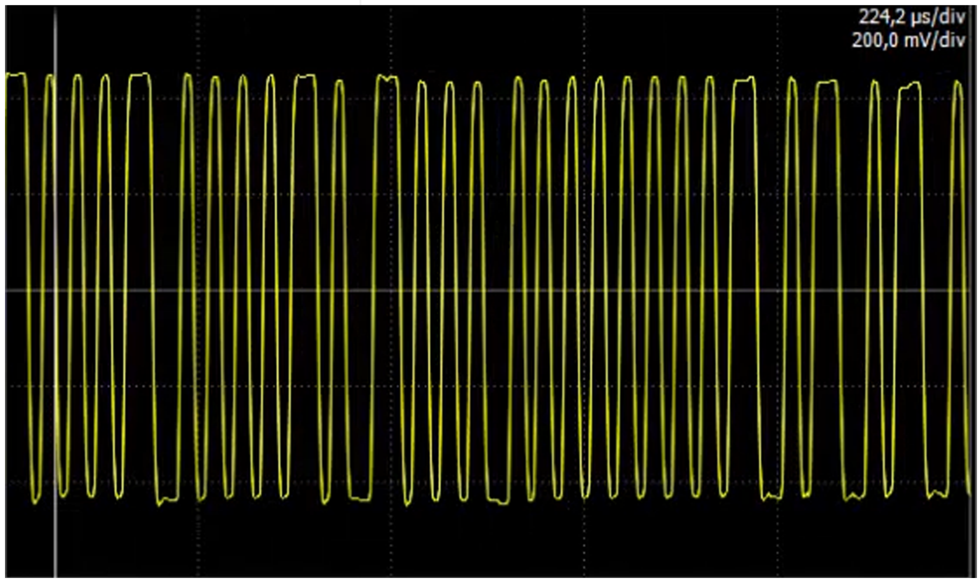
Remedy: Ensure that the terminals are connected correctly.

Fig. 6 Oscilloscope image of a bus segment with the connections the wrong way round

Oscilloscope image, loose cable cores

The following oscilloscope image shows the signal shape of a bus segment with loose cable cores.

Remedy: Ensure that the terminals are connected correctly.



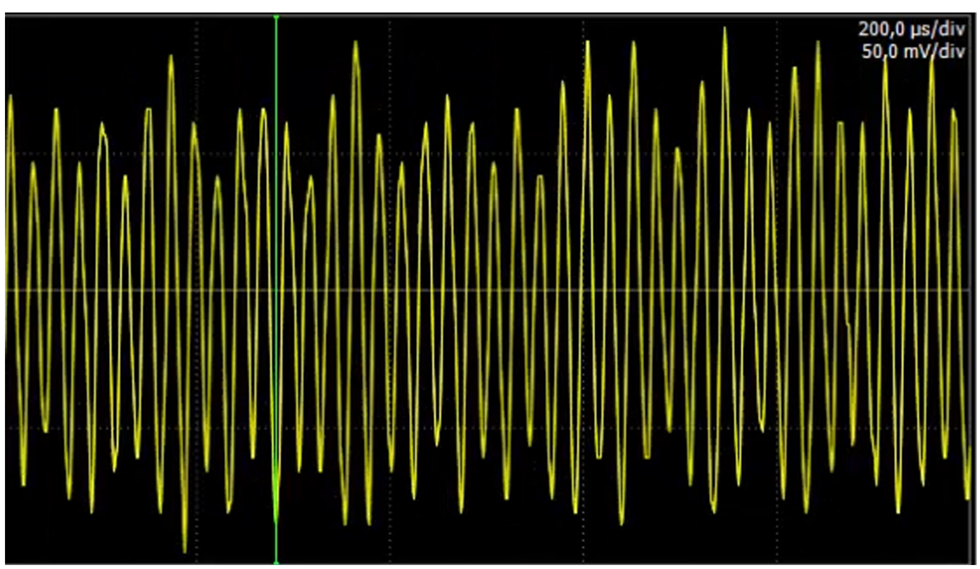
43449

Fig. 7 Oscilloscope image of a bus segment with loose cable cores

Oscilloscope image, separated cable cores

The following oscilloscope image shows the signal shape of a bus segment with separated cable cores.

Remedy: Ensure that the terminals are connected correctly.



43448

Fig. 8 Oscilloscope image of a bus segment with separated cable cores

7 Annex

7.1 Overview of registers and parameters of the function blocks

The following pages provide an overview of the registers and parameters and a description of their functions.

7.2 Appendix 1: List of parameters for Polytron® 8000

Legend

Register		Number of the register
Parameter		Name of the parameter
Data type		Data type of the parameter
Memory	D	Dynamic – values change
	S	Static – values remain unchanged
	N	Non-volatile – permanent parameter that remains in the memory for the duration of a session but is not updated automatically.
	C	Complex – complex data type
Access	R – **R**ead	Read access
	W – **W**rite	Write access
	RO – **R**ead **O**nly	Read-only access
	RW – **R**ead and **W**rite	Read and write access
Size		Word size
Value range **(default value)**		Valid range
		Factory-set default value. The default value is formatted in **bold** in the table
Description		Description of the respective parameters
	Sensor variant	The parameters are only valid for the specified sensor variants.
	EC	Modbus for communication between gas detector and EC sensor
	IR	Modbus for communication between gas detector and IR sensor
	CAT	Modbus for communication between gas detector and catalytic sensor

Glossary

Index	Attribute of the PROFIBUS-DPV1 Read and Write service for addressing variables and parameters in a device. The index subdivides the slots of a device into 0 to 254 units and is defined in IEC 61158-5.
Slot	Attribute of the PROFIBUS-DPV1 Read and Write service for addressing variables and parameters in a DP Slave device. The slot subdivides the address space of a device into 0 to 254 units and is defined in IEC 61158-5.

Physical Block

Index	Parameter	Data type	Memory/ access	Size	Value range **(default value)**	Description
1	ST_REV	Unsigned16	N / RO	2	0	Valid for sensor variant: EC, IR, CAT
2	TAG_DESC	Octet String	S / RW	32	“ “	Valid for sensor variant: EC, IR, CAT
3	STRATEGY	Unsigned16	S / RW	2	0	Valid for sensor variant: EC, IR, CAT
4	ALERT_KEY	Unsigned8	S / RW	1	0	Valid for sensor variant: EC, IR, CAT
5	TARGET_MODE	Unsigned8	S / RW	1	0x08	Valid for sensor variant: EC, IR, CAT
6	MODE_BLK	DS-37	D / RO	3	0x08;0x08;0x08	Valid for sensor variant: EC, IR, CAT
7	ALARM_SUM	DS-42	D / RO	8	0;0;0;0	Valid for sensor variant: EC, IR, CAT
8	SOFTWARE_REVISION	Visible String	C / RO	16	“ 1.0”	Valid for sensor variant: EC, IR, CAT
9	HARDWARE_REVISION	Visible String	C / RO	16	“ 1.0”	Valid for sensor variant: EC, IR, CAT
10	DEVICE_MAN_ID	Unsigned16	C / RO	2	0x0052	Valid for sensor variant: EC, IR, CAT
11	DEVICE_ID	Visible String	C / RO	16	“ P8xxx”	Valid for sensor variant: EC, IR, CAT
12	DEVICE_SER_NUM	Visible String	C / RO	16	**1**	Valid for sensor variant: EC, IR, CAT Serial number of the gas detector. The parameter can be written into if a valid password is entered in the "WRITE_LOCKING" parameter. Otherwise, the parameter is read-only.
13	DIAGNOSIS	Octet String	D / RO	4	0x00000000	Valid for sensor variant: EC, IR, CAT
14	DIAGNOSIS_EXTENSION	Octet String	D / RO	6	0x000000000000	Valid for sensor variant: EC, IR, CAT
15	DIAGNOSIS_MASK	Octet String	C / RO	4	0x8000B831	Valid for sensor variant: EC, IR, CAT
16	DIAGNOSIS_MASK_EXTENSION	Octet String	C / RO	6	0x00000000000F	Valid for sensor variant: EC, IR, CAT
19	FACTORY_RESET	Unsigned16	S / RW	2	0	Valid for sensor variant: EC, IR, CAT
24	IDENT_NUMBER_SELECTOR	Unsigned8	S / RW	1	127	Valid for sensor variant: EC, IR, CAT
26	FEATURE	DS-68	N / RO	8	0x01;0x01	Valid for sensor variant: EC, IR, CAT
27	COND_STATUS_DIAG	Unsigned8	S / RW	1	1	Valid for sensor variant: EC, IR, CAT
36	DEVICE_CONFIGURATION	Visible String	D / RO	32	-	Valid for sensor variant: EC, IR, CAT
37	INIT_STATE	Unsigned8	S / RW	1	2	Valid for sensor variant: EC, IR, CAT
38	DEVICE_STATE	Unsigned8	D / RO	1	**2** 5	Valid for sensor variant: EC, IR, CAT RUN: In **RUN** state, all elements required for the execution of a process are active. MAINTENANCE: The behavior of the gas detector in MAINTENANCE state is device-specific. This state can be set automatically by the gas detector.
39	GLOBAL_STATUS	Unsigned16	D / RO	2	0	Valid for sensor variant: EC, IR, CAT
48	FIELDBUS_MODULE_SW_VERSION	Visible String	S / RO	4	0.01	Valid for sensor variant: EC, IR, CAT
49	FIELDBUS_MODULE_HW_VERSION	Visible String	S / RO	4	0.01	Valid for sensor variant: EC, IR, CAT
50	FIELDBUS_MODULE_STATUS	Unsigned8	D / RO	1	0x01	Valid for sensor variant: EC, IR, CAT
51	DEVICE_STATUS_INDICATION	Unsigned8	D / RO	1	0x01 0x02 0x04	Valid for sensor variant: EC, IR, CAT Contains information on the current status of the gas detector. Warnings and/or errors are displayed as group warnings and group errors. The DEVICE_STATUS_VALUE parameter contains a detailed description of the warnings or errors and possible remedies. No errors and warnings. Error exists. Warning exists.

54	DEVICE_STATUS_VALUE	Bit String	D / RO	20		Valid for sensor variant: EC, IR, CAT The parameter contains detailed information on the current status of the gas detector as a warning and error matrix.
55	TRANSMITTER_SPECIFIC_OPTIONS	Unsigned32	D / RO	4	 0x0004 0x0008 0x0010 0x0080 0x0400 0x0800 0x4000	Valid for sensor variant: EC, IR, CAT List of installed hardware modules (e.g., pump, relay module) DATALOGGER DONGLE PRESENT SENSOR DIAGNOSTICS DONGLE PRESENT SENSOR TEST DONGLE PRESENT FIELDBUS PB-PA FFB PRESENT DOUBLE REMOTE PRESENT REMOTE PRESENT ALARM MODULE PRESENT
56	POLYTRON_SW_VERSION	Visible String	C / RO	4	0.00	Valid for sensor variant: EC, IR, CAT
57	FIELDBUS_MODULE_ERROR_CODE	Unsigned8	D / RO	1	0	Valid for sensor variant: EC, IR, CAT
58	SENSOR_LOCK_PART_NUMBER	Visible String	N / RO	7	-	Valid for sensor variant: EC, IR Contains the part number (Dräger order number) of the sensor that can be replaced while SENSOR_LOCK_INFO is active.
59	SENSOR_PART_NUMBER	Visible String	D / RO	7	-	Valid for sensor variant: EC, IR Part number of the connected sensor
60	SENSOR_SERIAL_NUMBER	Visible String	D / RO	8	-	Valid for sensor variant: EC, IR Serial number of the connected sensor
61	SW_SUBVERSION	Unsigned8	D / RO	1	**0**	Valid for sensor variant: EC, IR, CAT Software subversion
62	MODULE_PART_NUMBER	Visible String	D / RO	7	**“-----“**	Valid for sensor variant: EC, IR, CAT Part number of the gas detector
63	EEPROM_TYPE EEPROM_VERSION	Unsigned8 Unsigned8	D / RO D / RO	2	**0**	Valid for sensor variant: EC, IR Software version of the gas detector
64	SENSOR_ID	Unsigned8	D / RO	1	 0x01 0x02 0x03 0x04 0x07	Valid for sensor variant: EC, IR, CAT Type of sensor connected. DSIR SENSOR DD SENSOR LC SENSOR EC SENSOR PIR7X00 SENSOR
65	WAVELENGTH_IR	Unsigned16	D / RO	2	0	Valid for sensor variant: IR

Dräger

Function block

Index	Parameter	Data type	Memory/ access	Size	Value range **(default value)**	Description
1	ST_REV	Unsigned16	N / RO	2	0	Valid for sensor variant: EC, IR, CAT
2	TAG_DESC	Octet String	S / RW	32	" "	Valid for sensor variant: EC, IR, CAT
3	STRATEGY	Unsigned16	S / RW	2	0	Valid for sensor variant: EC, IR, CAT
4	ALERT_KEY	Unsigned8	S / RW	1	0	Valid for sensor variant: EC, IR, CAT
5	TARGET_MODE	Unsigned8	S / RW	1	0x08	Valid for sensor variant: EC, IR, CAT
6	MODE_BLK	DS-37	D / RO	3	0x08;0x98;0x08	Valid for sensor variant: EC, IR, CAT
7	ALARM_SUM	DS-42	D / RO	8	0;0;0;0	Valid for sensor variant: EC, IR, CAT
8	BATCH	DS-67	S / RW	10	0;0;0;0	Valid for sensor variant: EC, IR, CAT
10	OUT	DS-101	D / RO	5	0.0;0x4F	Valid for sensor variant: EC, IR, CAT
11	PV_SCALE	Float	S / RW	8	-	Valid for sensor variant: EC, IR, CAT
12	OUT_SCALE	DS-36	S / RW	11	100.0;0.0;32768;4	Valid for sensor variant: EC, IR, CAT
13	LIN_TYPE	Unsigned8	S / RW	1	0	Valid for sensor variant: EC, IR, CAT
14	CHANNEL	Unsigned16	S / RW	2	0x0109	Valid for sensor variant: EC, IR, CAT
16	PV_FTIME	Float	S / RW	4	0.0	Valid for sensor variant: EC, IR, CAT
19	ALARM_HYS	Float	S / RW	4	0.5	Valid for sensor variant: EC, IR, CAT
21	HI_HI_LIM	Float	S / RW	4	FLT_MAX	Valid for sensor variant: EC, IR, CAT
23	HI_LIM	Float	S / RW	4	FLT_MAX	Valid for sensor variant: EC, IR, CAT
25	LO_LIM	Float	S / RW	4	FLT_MIN	Valid for sensor variant: EC, IR, CAT
27	LO_LO_LIM	Float	S / RW	4	FLT_MIN	Valid for sensor variant: EC, IR, CAT
30	HI_HI_ALM	DS-39	D / RO	16	0	Valid for sensor variant: EC, IR, CAT

Transducer block

Index	Parameter	Data type	Memory/ access	Size	Value range **(default value)**	Description
27	GAS_NAME	Visible String	D / RO	10		Valid for sensor variant: EC, IR, CAT Contains the name of the currently set target gas in ASCII format E.g.: GAS_NAME[GAS_INDEX=0x00] = „METHANE" GAS_NAME[GAS_INDEX=0x01] = „PROPANE"
28	GAS_INDEX	Unsigned8	D / RW	1	0x00	Valid for sensor variant: EC, IR Contains the index of the currently set target gas. The parameter can be modified within a value range from 0 to MAX_GAS_INDEX using a write process, and the respective target gas can be set. E.g.: GAS_NAME [GAS_INDEX = 0] = „METHANE" GAS_NAME [GAS_INDEX = 1] = „PROPANE" ... GAS_NAME [GAS_INDEX = MAX_GAS_INDEX] = „ETHANE "

29	MAX_GAS_INDEX	Unsigned8	D / RO	1	0x00	Valid for sensor variant: EC, IR Contains information on the maximum possible index position of the GAS_INDEX parameter and is equivalent to the maximum number of selectable target gases supported by the current configuration of the gas detector. E.g.: GAS_NAME [0 ≤ GAS_INDEX ≤ MAX_GAS_INDEX] = „XXXXXXXX“
30	GAS_LOWER_EXPLOSION_LEVEL	Float	D / RW	4	0.00	Valid for sensor variant: EC, IR Lower explosive limit of the gas in Vol%.
31	SECONDARY_VALUE.VALUE SECONDARY_VALUE.STATUS	Float Unsigned8	N / RO	4 1	0x0 0x4F	Valid for sensor variant: EC, IR, CAT Second measured value (temperature) of the sensor.
32	SECONDARY_VALUE_UNIT	Unsinged16	S / RO	2	1001	Valid for sensor variant: EC, IR, CAT Measuring unit of the "SECONDARY_VALUE". **Degrees Celsius**
33	NEXT_CALIBRATION_DATE	Date	D / RO	7	0x00	Valid for sensor variant: EC, IR, CAT Date of the next calibration
34	CALIBRATION_INTERVAL	Unsinged16	D / RW	2	0	Valid for sensor variant: EC, IR, CAT Calibration interval in days Value of MAX_CALIBRATION_INTERVAL
35	CONFIGURE_SENSOR_SELF_TEST	Unsigned8	D / RW	1	**0x00** 0x01	Valid for sensor variant: EC If the sensor self-test is activated, the gas detector can continuously monitor the connected sensor for proper operation. If the sensor self-test fails, the warning is displayed in the DEVICE_STATUS_VALUE and can be read. The sensor self-test option can only be activated if the sensor test dongle is connected. **Inactive** Active
36	SENSOR_SELFTEST_STATUS	Unsigned8	D / RO	1	**0x00** 0x01 0x02 0x03 0x04 0x05 0x06 0x07 0x08 0x09 0x0A 0xFF	Valid for sensor variant: EC Contains current information on the status of the sensor self-test. After the sensor self-test has been activated, this parameter can be used to query the current status. The parameter can only be used in combination with the START_SENSOR_TEST parameter. The DEVICE_STATUS_VALUE parameter contains the status for the automatic sensor self-test. **Ready** No dongle available. Sensor does not support sensor test. Error Sensor is in warm-up phase. Sensor calibration running. Sensor temperature outside the permissible range. Sensor test temporarily not available. Delay after sensor test (duration depends on the sensor). Sensor test running. Other error. Timeout

37	SENSOR_SELFTEST_RESULT	Unsigned8	D / RO	1	 **0x00** 0x01 0x02 0x03	Valid for sensor variant: EC Contains the result of the last sensor self-test. The parameter can only be used in combination with the START_SENSOR_TEST parameter. **No result** Successful Successful, but fault expected soon. Failed
38	START_SENSOR_TEST	Unsigned8	D / RW	1	 **0x00** 0x01 0x02 0x03	Valid for sensor variant: EC Enables the user to start the sensor self-test manually by means of a write process and/or determine the current status of the sensor self-test (see SENSOR_SELFTEST_STATUS parameter). **No sensor test** Start sensor test Start cyclic sensor test. Stop cyclic sensor test.
39	SENSOR_VITALITY	Unsigned8	D / RO	1	 **0x01** – 0x64 0xFD 0xFE 0xFF	Valid for sensor variant: EC Describes the remaining sensitivity of the sensor currently in use. The sensor vitality option can only be activated if the diagnostic dongle is connected. **1%** – 100% Not supported: the sensor currently in use does not support the SENSOR_VITALITY parameter. No dongle: the diagnostic dongle is not detectable or not present. The diagnostic dongle is required to enable the function. Not calculated: the vitality could not be calculated. Please check the installation date and the current date for valid values!
40	SENSOR_LOCK_INFO	Unsigned8	D / RW	1	 **0x00** 0x01	Valid for sensor variant: EC, IR If the SENSOR_LOCK_INFO parameter is activated, successful replacement of the sensors is only possible with identical part numbers. If the part number of the old sensor and the part number of the new sensor are not identical, an error message is issued. If, however, the SENSOR_LOCK_INFO parameter is deactivated, sensors can be replaced with sensors of the same sensor type with different part numbers. **Locking inactive** Locking active
41	PREDICTIVE_MAINTENANCE_INFO.STATUS	Unsigned8	D / RO	1	 **0x00** 0x01 0x02 0x03 0x04	Valid for sensor variant: EC The parameter consists of the following sub-parameters and can only be used with a diagnostic dongle. Contains the current status of the sensor in use. the diagnostic dongle is not detectable or not present. The diagnostic dongle is required to enable the function. The status could not be calculated. Please check the installation date and the current date for valid values! Sensor status: good Sensor status: OK Sensor status: replacement required soon
	PREDICTIVE_MAINTENANCE_INFO.DIAGNOSTIC	Unsigned8			 **0x00** 0x01	Valid for sensor variant: EC Contains information on the status of the sensor diagnostic functions. Sensor diagnosis is not available for the gas detector. Please purchase diagnostic dongle to enable it. Sensor diagnosis is available for the gas detector.

42	A1_ALARM_CONFIGURATION.A1_ALARM_VALUE	Float	D / RW	4	0	Valid for sensor variant: EC, IR, CAT Contains the currently set gas concentration for the A1 alarm.
	A1_ALARM_CONFIGURATION. HYSTERESIS	Float		4	0	Valid for sensor variant: EC, IR, CAT The alarm hysteresis defines a range around the A1 alarm within which A1_ALARM remains set until the current gas concentration falls below this threshold. E.g.: A1_ALARM_CONFIGURATION.VALUE = 20ppm H2S A1_ALARM_CONFIGURATION.HYSTERESE = 3ppm H2S A1_ALARM.STATUS is activated for measured gas concentrations ≥ 20 ppm H2S A1_ALARM.STATUS is deactivated for measured gas concentrations ≤ 17 ppm H2S
	A1_ALARM_CONFIGURATION.DIRECTION	Unsigned8		1	 0x00 0x01	Valid for sensor variant: EC, IR, CAT Contains information on the triggering behavior of the A1 alarm. The following is possible: A1 alarm is triggered if the target gas concentration is below the A1 alarm threshold and exceeds it. A1 alarm is triggered if the target gas concentration is above the A1 alarm threshold and falls below it.
	A1_ALARM_CONFIGURATION.ACKNOWLEDGEMENT	Unsigned8		1	 0x00 0x01	Valid for sensor variant: EC, IR, CAT Contains information whether an alarm can be acknowledged while the alarm condition exists. The A1 alarm cannot be acknowledged. The A1 alarm cannot be acknowledged.
	A1_ALARM_CONFIGURATION.PREACKNOWLEDGMENT	Unsigned8		1	 0x00 0x01	Valid for sensor variant: EC, IR, CAT Contains information whether a latching alarm is already acknowledged when the alarm condition is present. The A1 alarm cannot be pre-acknowledged. The A1 alarm cannot be pre-acknowledged.
	A1_ALARM_CONFIGURATION.LATCHING	Unsigned8		1	 0x00 0x01	Valid for sensor variant: EC, IR, CAT Contains information whether an alarm has to be acknowledged. The A1 alarm is not latching. The A1 alarm is latching.
43	A1_ALARM_PLAUSIBILITY	Unsigned8	D / RO	1	 **0x00** 0x01 0x02 0x04 0x08 0x10	Valid for sensor variant: EC, IR, CAT Plausibility of the A1 alarm configuration: **No error.** The value entered for the A1_ALARM_CONFIGURATION.VALUE is too low. The value entered for the A1_ALARM_CONFIGURATION.VALUE is too high. The value entered for the A1_ALARM_CONFIGURATION.HYSTERESE is too low. The value entered for the A1_ALARM_CONFIGURATION.HYSTERESE is too low. The sensor is not available. Check whether there is a sensor in the gas detector.

44	A2_ALARM_CONFIGURATION.A2_ALARM_VALUE	Float	D / RW	4	0	Valid for sensor variant: EC, IR, CAT Contains the currently set gas concentration for the A2 alarm.
	A2_ALARM_CONFIGURATION. HYSTERESIS	Float		4	0	Valid for sensor variant: EC, IR, CAT The alarm hysteresis defines a range around the A1 alarm within which A2_ALARM remains set until the current gas concentration falls below this threshold. E.g.: A2_ALARM_CONFIGURATION.VALUE = 20ppm H2S A2_ALARM_CONFIGURATION.HYSTERESE = 3ppm H2S A2_ALARM.STATUS is activated for measured gas concentrations ≥ 20 ppm H2S A2_ALARM.STATUS is deactivated for measured gas concentrations ≤ 17 ppm H2S
	A2_ALARM_CONFIGURATION.DIRECTION	Unsigned8		1	 0x00 0x01	Valid for sensor variant: EC, IR, CAT Contains information on the triggering behavior of the A2 alarm. The following is possible: A2 alarm is triggered if the target gas concentration is below the A2 alarm threshold and exceeds it. A2 alarm is triggered if the target gas concentration is above the A2 alarm threshold and falls below it.
	A2_ALARM_CONFIGURATION.ACKNOWLEDGEMENT	Unsigned8		1	 0x00 0x01	Valid for sensor variant: EC, IR, CAT Contains information whether an alarm can be acknowledged while the alarm condition exists. The A2 alarm cannot be acknowledged. The A2 alarm cannot be acknowledged.
	A2_ALARM_CONFIGURATION.PREACKNOWLEDGMENT	Unsigned8		1	 0x00 0x01	Valid for sensor variant: EC, IR, CAT Contains information whether a latching alarm is already acknowledged when the alarm condition is present. The A2 alarm cannot be pre-acknowledged. The A2 alarm cannot be pre-acknowledged.
	A2_ALARM_CONFIGURATION.LATCHING	Unsigned8		1	 0x00 0x01	Valid for sensor variant: EC, IR, CAT Contains information whether an alarm has to be acknowledged. The A2 alarm is not latching. The A2 alarm is latching.
45	A2_ALARM_PLAUSIBILITY	Unsigned8	D / RO	1	 **0x00** 0x01 0x02 0x04 0x08 0x10	Valid for sensor variant: EC, IR, CAT Plausibility of the A2 alarm configuration: **No error.** The value entered for the A2_ALARM_CONFIGURATION.VALUE is too low. The value entered for the A2_ALARM_CONFIGURATION.VALUE is too high. The value entered for the A2_ALARM_CONFIGURATION.HYSTERESE is too low. The value entered for the A2_ALARM_CONFIGURATION.HYSTERESE is too low. The sensor is not available. Check whether there is a sensor in the gas detector.
46	A1_ALARM.STATUS	Unsigned8	D / RO	1	 **0x00** 0x01	Valid for sensor variant: EC, IR, CAT The A1_ALARM parameter consists of the following sub-parameters. Contains the current status of the internal alarm module and its settings. A1 alarm is not activated A1 alarm is activated
	A1_ALARM.CONDITION	Unsigned8			 **0x00** 0x01	Valid for sensor variant: EC, IR, CAT Contains information whether the current target gas concentration is above or below the A1 alarm threshold (depending on the configuration of the A1 alarm). A1 alarm condition is currently not present. A1 alarm condition is currently present.

Dräger

47	ALARM_FAULT_TEST	Unsigned8	D / RW	1	**0** 1 2 4	Valid for sensor variant: EC, IR, CAT Function for relay test. Alarm 1 State active Alarm 2 State active Error State active
48	MAX_CALIBRATION_INTERVAL	Unsigned16	D / RO	2	1	Valid for sensor variant: EC, IR, CAT Maximum calibration interval
49	A2_ALARM.STATUS	Unsigned8	D / RO	1	**0x00** 0x01	Valid for sensor variant: EC, IR, CAT The A2_ALARM parameter consists of the following sub-parameters. Contains the current status of the internal alarm module and its settings. A2 alarm is not activated A2 alarm is activated
	A2_ALARM.CONDITION	Unsigned8			**0x00** 0x01	Valid for sensor variant: EC, IR, CAT Contains information whether the current target gas concentration is above or below the A1 alarm threshold (depending on the configuration of the A2 alarm). A2 alarm condition is currently not present. A2 alarm condition is currently present.
50	ALARM_ACKNOWLEDGE	Unsigned8	D / RW	1	**0x00** 0xFF	Valid for sensor variant: EC, IR, CAT The data content 0xFF of a write process enables acknowledging active alarms if the alarm module has been configured correspondingly. **Default value. After writing the value 0xFF, the default value is displayed again.** Active alarms are acknowledged by writing the value 0xFF.
51	FAST_RESPONSE	Bit String	D / RW	1	**0x00** 0x01	Valid for sensor variant: IR Response behavior of the P87X0. **Default** Fast
52	SET_GASNAME_CAT	Visible String	D / RW	10	" "	Valid for sensor variant: CAT This parameter enables editing of the target gas to be measured by analog sensors. Analog sensors include the family of catalytic sensors and do not provide any additional information. This parameter can be used to name the analog sensor. E.g.: "Power house 1" "Methane"
53	CAL_UNIT_NAME	Visible String	D / RO	5	" "	Valid for sensor variant: EC, IR, CAT Contains the name of the currently set calibration gas unit in ASCII format. E.g.: CAL_UNIT_NAME for CAL_UNIT_INDEX=0x00 ="VOL%" CAL_UNIT_NAME for CAL_UNIT_INDEX=0x01 = "LEL"
54	CAL_GAS_NAME	Visible String	D / RO	10	" "	Valid for sensor variant: EC, IR, CAT Contains the name of the currently set target gas in ASCII format E.g.: CAL_GAS_NAME[CAL_GAS_INDEX=0x00] = „METHANE“ CAL_GAS_NAME[CAL_GAS_INDEX=0x01] = „PROPANE“

55	CAL_GAS_INDEX	Unsigned8	D / RW	1	**0** ... MAX_CAL_GAS_INDEX	Valid for sensor variant: EC, IR Contains the index of the currently set calibration gas. The parameter can be modified within a value range from 0 to MAX_CAL_GAS_INDEX using a write process, and the respective target calibration gas unit can be set. E.g.: CAL_GAS_NAME[CAL_GAS_INDEX=0x00] = „METHANE" CAL_GAS_NAME[CAL_GAS_INDEX=0x01] = „PROPANE"
56	CAL_UNIT_INDEX	Unsigned8	D / RW	1	See table of units	Valid for sensor variant: EC, IR, CAT Contains the index of the currently set calibration gas unit. The parameter can be modified and the respective calibration gas unit set with a write process. E.g.: CAL_UNIT_NAME for CAL_UNIT_INDEX=0x00 =„VOL%" CAL_UNIT_NAME for CAL_UNIT_INDEX=0x01 = „LEL"
57	MAX_CAL_GAS_INDEX	Unsigned8	D / RO	1	-	Valid for sensor variant: EC, IR Contains information on the maximum possible index position of the CAL_GAS_INDEX parameter and is equivalent to the maximum number of selectable calibration gases supported by the current configuration of the gas detector. E.g.: CAL_GAS_NAME [0 ≤ CAL_GAS_INDEX ≤ MAX_CAL_GAS_INDEX] = „XXXXXXXX"
58	CAPTURE_OFFSET	Float	D / RW	4	-	Valid for sensor variant: EC, IR, CAT Offset of the capture range
59	CAPTURE_LOW	Float	D / RW	4	-	Valid for sensor variant: EC, IR, CAT Lower limit of the capture range.
60	CAPTURE_HIGH	Float	D / RW	4	-	Valid for sensor variant: EC, IR, CAT Upper limit of the capture range.
61	MEASUREMENT_MODE.VALUE	Float	D / RW	6	**0**	Valid for sensor variant: EC, IR, CAT Contains the currently measured gas concentration.
	MEASUREMENT_MODE.DECIMAL_ADJUST	Unsigned8			 **0x00** 0x01 0x02 0x03	Valid for sensor variant: EC, IR, CAT Number of decimal places for the target gas concentration on the display Display: 1 Display: 1.1 Display: 1.12 Display: 1,123
	MEASUREMENT_MODE.ALARM_CONDITION	Unsigned8			 0x01 0x02 0x04 0x08 0x10 0x20 0x40 0x80	Valid for sensor variant: EC, IR, CAT Contains information whether the A1 or A2 alarm is activated and whether the current measured value is above or below the alarm condition. Alarm 1 triggered Alarm 2 triggered Error triggered Not used A1 alarm condition exists A2 alarm condition exists Reserved -
62	DEVICE_DATE_TIME	Date	D / RW	7		Valid for sensor variant: EC, IR, CAT Displays date and time.

63	UNIT_NAME	Visible String	D / RO	5		Valid for sensor variant: EC, IR, CAT Contains the name of the currently set target gas unit in ASCII format. e.g., UNIT_NAME for UNIT_NAME_INDEX=0x00 ="VOL%" UNIT_NAME for UNIT_NAME_INDEX=0x01 = "LEL"
64	CAPTURE_OFFSET_ASCII	Visible String	D / RO	8	"__________"	Valid for sensor variant: EC, IR, CAT
65	CAPTURE_LOW_ASCII	Visible String	D / RO	8	"__________"	Valid for sensor variant: EC, IR, CAT
66	CAPTURE_HIGH_ASCII	Visible String	D / RO	8	"__________"	Valid for sensor variant: EC, IR, CAT
67	A1_ALARM_CONFIGURATION_ASCII	Float Float Unsigned8 Unsigned8 Unsigned8 Unsigned8	D / RO	20	"__________"	Valid for sensor variant: EC, IR, CAT
68	A2_ALARM_CONFIGURATION_ASCII	Float Float Unsigned8 Unsigned8 Unsigned8 Unsigned8	D / RO	20	"__________"	Valid for sensor variant: EC, IR, CAT
69	GAS_LOWER_EXPLOSION_LEVEL_ASCII	Visible String	D / RO	8	"__________"	Valid for sensor variant: EC, IR, CAT
70	SENSOR_LOCK_INFO_ASCII	Visible String	D / RO	3		Valid for sensor variant: EC, IR, CAT
71	FAST_RESPONSE_ASCII	Visible String	D / RO	3		Valid for sensor variant: EC, IR, CAT
72	CATEGORY	Unsigned8	D / RW	1		Valid for sensor variant: IR Index of the set category for P87X0.
73	CATEGORY_ASCII	Visible String	D / RO	5		Valid for sensor variant: EC, IR, CAT
74	CONFIGURE_SENSOR_SELF_TEST_ASCII	Visible String	D / RO	3		Valid for sensor variant: EC, IR, CAT
75	UNIT_NAME_INDEX	Unsigned8	D / RW	1		Valid for sensor variant: EC, IR, CAT Contains the index of the currently set target gas unit. The parameter can be modified and the respective target gas unit set by writing in the parameter. e.g., UNIT_NAME for UNIT_NAME_INDEX=0x00 ="VOL%" UNIT_NAME for UNIT_NAME_INDEX=0x01 = "LEL"
76	GAS_CAS_NUMBER	Visible String	D / RO	12	"_________"	Valid for sensor variant: IR Contains the international CAS registration number (CAS= Chemical Abstracts Service) of the currently set target gas.
77	GAS_LEL_LIMITS_LOWER	Float	D / RO	4	0.0	Valid for sensor variant: EC, IR Lowest value that can be set for the lower explosive limit in ppm.
78	GAS_LEL_LIMITS_UPPER	Float	D / RO	4	0.0	Valid for sensor variant: EC, IR Highest value that can be set for the lower explosive limit in ppm.
79	SENSOR_WARM_UP_TIME_1	Unsigned16	D / RO	2	0	Valid for sensor variant: EC, IR, CAT
80	SENSOR_WARM_UP_TIME_2	Unsigned16	D / RO	2	0	Valid for sensor variant: EC, IR, CAT
81	DD_SENSOR_LATCHING	Unsigned8	D / RW	1	0	Valid for sensor variant: EC, IR, CAT
82	CAL_GAS_NAME_CAS	Visible String	D / RO	12	"_______"	Valid for sensor variant: IR Contains the international CAS registration number (CAS= Chemical Abstracts Service) of the currently set calibration gas.

83	CAL_GAS_CONCENTRATION	Float	D / RW	4	0	Valid for sensor variant: EC, IR, CAT Calibration gas concentration.
84	CAL_GAS_PLAUSIBLIITY	Unsigned8	D / RO	1	 **0x00** 0x04 0x08 0x10	Valid for sensor variant: EC, IR, CAT Plausibility information for calibration. **No error** Calibration gas concentration too low Calibration gas concentration too high No sensor
85	START_STOP_CALIBRATION	Unsigned8	D / RW	1	 **0x00** 0x01 0x02 0x03 0x04 0x05	Valid for sensor variant: EC, IR, CAT Parameters serve to calibrate the gas detector via the Modbus RTU interface. A detailed description of the parameters and the calibration procedure is available from your local Dräger service organization. Start of the zero adjustment Start of the span calibration Measurement of the calibration gas concentration Measurement of the target gas concentration Save the calibration Exit calibration mode without saving
86	STATUS_CALIBRATION.ECHO	Unsigned8	D / RO	2	0	Valid for sensor variant: EC, IR, CAT
	STATUS_CALIBRATION.RESPONSE	Unsigned8			 0x00 0x01 0x02 0x03 0x04 0x05 0x06	Valid for sensor variant: EC, IR, CAT Vale read back from calibration control. Start of the zero adjustment Start of the span calibration Measurement of the calibration gas concentration Measurement of the target gas concentration Save the calibration Exit calibration mode Calibration mode not accessible
87	PERFORM_CALIBRATION.STATUS	Unsigned8	D / RW (D / RO)	2	 0x00 0x02 0x03 0x04 0x05 0x06 0x07 0x0A	Valid for sensor variant: EC, IR, CAT This command is sent if the calibration parameters have to be recalculated. The recalculation is triggered with a write process containing the data content 0xFFFF. The status can then be analyzed with the parameters listed below. The following responses are possible: Zero adjustment possible Measurement of the calibration gas concentration Measurement of the target gas concentration Gas detector is in warm-up phase Calibration not possible Date and time incorrect Calibration not OK Not in calibration mode See also STATUS_CALIBRATION
	PERFORM_CALIBRATION.REST_SPAN	Unsigned8			0x00..0xFF	Valid for sensor variant: EC, IR, CAT Rest span after calibration in %
88	LAST_CALIBRATION_DATE	Date	D / RO	7	0	Valid for sensor variant: EC, IR, CAT Last date of a successful calibration

89	LAST_CALIBRATION_GAS_NAME	Visible String	D / RO	11	"________"	Valid for sensor variant: EC, IR, CAT Name of the calibration gas used for the last calibration.
90	LAST_CALIBRATION_GAS_UNIT	Visible String	D / RO	6	"____________"	Valid for sensor variant: EC, IR, CAT Unit of the calibration gas used for the last calibration.
91	LAST_CALIBRATION_GAS_CONCENTRATION	Float	D / RO	4	0	Valid for sensor variant: EC, IR, CAT Calibration gas concentration used for the last calibration.
92	LAST_CALIBRATION_GAS_MEAS_VALUE	Float	D / RO	4	0	Valid for sensor variant: EC, IR, CAT Measured value before the last calibration.
93	CAL_GAS_LOWER_EXPLOSION_LEVEL	Float	D / RO	4	0	Valid for sensor variant: EC, IR Lower explosive limit of the gas in Vol%.
94	CALIBRATION_AUTOMATIC_ON_OFF	Unsigned8	D / RW	1	 **0x00** 0x01	Valid for sensor variant: EC, IR, CAT Auto-calibration menu function is available. **Inactive** active
95	READ_CALIBRATION_CONCENTRATION	Float	D / RO	4	0	Valid for sensor variant: EC, IR, CAT Calibration gas concentration.
96	CAL_ALLOWED_UNITS	Unsigned8	D / RO	1	0	Valid for sensor variant: EC, IR, CAT Allowed units for calibration.
97	CAL_GAS_LOWER_LEL_LIMIT	Float	D / RO	4	0	Valid for sensor variant: EC, IR, CAT Lowest value that can be set for the lower explosive limit in Vol% of the calibration gas.
98	CAL_GAS_UPPER_LEL_LIMIT	Float	D / RO	4	0	Valid for sensor variant: EC, IR, CAT Highest value that can be set for the lower explosive limit in Vol% of the calibration gas.
99	DATA_LOGGER_MODULE	Unsigned8	D / RO	1	 0x00 0x01	Valid for sensor variant: EC, IR, CAT The data logger module is not included in the gas detector. The function can be enabled with a data logger dongle. The data logger module is included in the gas detector and can be used.
100	DATA_LOGGER. BUFFER_MODE	Unsigned8	D / RW	8	0	Valid for sensor variant: EC, IR, CAT Contains information whether the data logger memory is configured as a stack or as a circular buffer. Memory of the data logger is configured as a stack. (Limited storage of measured values!) Memory of the data logger is configured as a circular buffer. (Caution: older measured values may be overwritten.)
	DATA_LOGGER.ACTIVE	Unsigned8			0	Valid for sensor variant: EC, IR, CAT The data logger is currently not active and does not save measured values. To deactivate the data logger, write the value 0x00 into the parameter. The data logger is active or can be activated using this parameter.
	DATA_LOGGER.SAMPLE_TIME	Unsigned16			0	Valid for sensor variant: EC, IR, CAT Contains the currently set sampling time in seconds, e.g., 1 s, 600 s
	DATA_LOGGER.TRIGGER_THRESHOLD	Unsigned16			0	Valid for sensor variant: EC, IR, CAT Parameter defines the trigger threshold for saving measured values in the data logger. The function is activated using the DATA_LOGGER.TRIGGER_CONFIG parameter. The trigger threshold is calculated as a percentage of the set measuring range. Trigger threshold in % of the set measuring range =DATA_LOGGER.TRIGGER_THRESHOLD*0.5%

	DATA_LOGGER.EVALUATE_MODE	Unsigned8			0	Valid for sensor variant: EC, IR, CAT The peak value within the set sampling time (parameter: DATA_LOGGER.SAMPLE_TIME) is saved in the data logger. The average value within the set sampling time (parameter: DATA_LOGGER.SAMPLE_TIME) is saved in the data logger.
	DATA_LOGGER. TRIGGER_CONFIG	Unsigned8			0	Valid for sensor variant: EC, IR, CAT The data logger saves measured values irrespective of the value of the DATA_LOGGER.TRIGGER_THRESHOLD parameter. The data logger only saves measured values that are above value of the DATA_LOGGER.TRIGGER_THRESHOLD parameter.
101	DATA_LOGGER_PLAUSIBLITY	Unsigned8	D / RO	1	0	Valid for sensor variant: EC, IR, CAT
102	DATA_EVENT_LOGGER_CLEAR	Unsigned8	D / RW	1	 0x00 0x01	Valid for sensor variant: EC, IR, CAT A telegram with the value 0x00 will delete the data logger. A telegram with the value 0x01 will delete the event logger.
103	LANGUAGE_INDEX	Unsigned8	D / RW	1	 0x00 0x01 0x02 0x03 0x04 0x05 0x06	Valid for sensor variant: EC, IR, CAT Contains the index of the set display language. The parameter can be modified within a value range from 0 to 0x06 using a write process to set the respective language. GERMAN ENGLISH SPANISH FRENCH RUSSIAN CHINESE USER
104	LANGUAGE	Visible String	D / RO	9	"______"	Valid for sensor variant: EC, IR, CAT Contains the name of the currently set display language in ASCII format. E.g.: LANGUAGE [LANGUAGE_INDEX =0x00] = „GERMAN“ LANGUAGE [LANGUAGE_INDEX =0x01] = „ENGLISH“
105	LANGUAGE_STATUS	Unsigned8	D / RO	1	 **0x00** 0x01 0x02 0x04 0x08 0x10 0x20 0x40	Valid for sensor variant: EC, IR, CAT Available languages Language 0 is valid Language 1 is valid Language 2 is valid Language 3 is valid Language 4 is valid Language 5 is valid Language 6 is valid
106	SET_CFG_PASSWORD.OLD SET_CFG_PASSWORD.NEW	Visible String	D / RW	8	"_______"	Valid for sensor variant: EC, IR, CAT

107	SET_CAL_PASSWORD.OLD	Visible String	D / RW	8	**0x00003** 0..9 A..Z	Valid for sensor variant: EC, IR, CAT Set the password for calibration 0 .. 3 old password
	SET_CAL_PASSWORD.NEW					4 .. 7 new password
108	DEVICE_INIT	Unsigned8	D / RW	1	**0x00**	Valid for sensor variant: EC, IR, CAT Reset the sensor and device configuration to factory setting.
109	SENSOR_INIT	Unsigned8	D / RW	1	**0x00**	Valid for sensor variant: EC, IR, CAT Reset the sensor configuration to factory setting.
110	DONGLE_DEACTIVATION	Unsigned8	D / RW	1	**0x00**	Valid for sensor variant: EC, IR, CAT Acknowledgment of the dongle deactivation
111	ALARM_MODULE_ACTIVE	Unsigned8	D / RW	1	**0x00** 0x01	Valid for sensor variant: EC, IR, CAT A1 and A2 alarms are analyzed **Inactive** Active
112	LCD_FUNCTION_KEY	Unsigned8	D / RW	1	**0x00** 0x01 0x02 0x03 0x04 0x05	Valid for sensor variant: EC, IR, CAT Function key assignment FCT_KEY_OFF FCT_KEY_GRAPH FCT_KEY_FAULT FCT_KEY_NOTICE FCT_KEY_FAULT_CODES FCT_KEY_VITALITY
113	LCD_FUNCTION_KEY_STATUS.SELECTION	Unsigned8	D / RO	2	**0x00** 0x01 0x02 0x03 0x04 0x05	Valid for sensor variant: EC, IR, CAT Returns the current assignment of the function keys. FCT_KEY_OFF FCT_KEY_GRAPH FCT_KEY_FAULT FCT_KEY_NOTICE FCT_KEY_FAULT_CODES FCT_KEY_VITALITY
	LCD_FUNCTION_KEY_STATUS_ERROR_CODE	Unsigned8			0x00 0x01 0x02	Valid for sensor variant: EC, IR, CAT Contains the status for the function key assignment. The following information is possible: No error. Function not supported. The key assignment may refer to sensor-specific functions that are not supported by the current sensor. E.g., information on the sensitivity is only available for the EC sensor.
114	LCD_CONTRAST_VALUE	Unsigned8	D / RW	1	**0** **0..128**	Valid for sensor variant: EC, IR, CAT Value range for the display contrast.
115	LCD_MODE	Unsigned8	D / RW	1	**0x00** 0x01	Valid for sensor variant: EC, IR, CAT Display settings. Non Display Default
116	A1_LEVEL_MIN	Float	D / RO	4	**0.0**	Valid for sensor variant: EC, IR, CAT Lowest value that can be set for the A1 alarm.

117	A1_LEVEL_MAX	Float	D / RO	4		Valid for sensor variant: EC, IR, CAT Highest value that can be set for the A1 alarm.
118	A2_LEVEL_MIN	Float	D / RO	4	**0.0**	Valid for sensor variant: EC, IR, CAT Lowest value that can be set for the A2 alarm.
119	A2_LEVEL_MAX	Float	D / RO	4		Valid for sensor variant: EC, IR, CAT Highest value that can be set for the A2 alarm.
120	DECIMAL_POINT_SETTINGS_ALARM	Unsigned8	D / RO	1	**0x00**	Valid for sensor variant: EC, IR, CAT Number of decimal places for the alarm levels on the display E.g.: **0x00** Display: 1 0x01 Display: 1.1 0x02 Display: 1.12 0x03 Display: 1,123
121	NUMBER_CATEGORIES	Unsigned8	D / RO	1	**0x00**	Valid for sensor variant: IR Number of categories that can be set for P87X0.
122	NAME_CATEGORY_5	String (5 Byte)	D / RO	5	" "	Valid for sensor variant: IR Name of the category with the index 5.
123	NAME_CATEGORY_6	String (5 Byte)	D / RO	5	" "	Valid for sensor variant: IR Name of the category with the index 6.
124	NAME_CATEGORY_7	String (5 Byte)	D / RO	5	" "	Valid for sensor variant: IR Name of the category with the index 7.
125	NAME_CATEGORY_8	String (5 Byte)	D / RO	5	" "	Valid for sensor variant: IR Name of the category with the index 8.
126	NAME_CATEGORY_9	String (5 Byte)	D / RO	5	" "	Valid for sensor variant: IR Name of the category with the index 9.
127	NAME_CATEGORY_10	String (5 Byte)	D / RO	5	" "	Valid for sensor variant: IR Name of the category with the index 10.
128	NAME_CATEGORY_11	String (5 Byte)	D / RO	5	" "	Valid for sensor variant: IR Name of the category with the index 11.
129	DISPLAY_CONTRAST_ALLOWED_LIMITS	Unsigned8 Unsigned8	D / RO	2	0x00 0x00	Valid for sensor variant: EC, IR, CAT
130	PASSWORD_STATUS.CAL PASSWORD_STATUS.CFG	Unsigned8 Unsigned8	D / RO	2	**0** ≠0	Valid for sensor variant: EC, IR, CAT Password has been changed. **Successfully changed** Not changed
131	GAS_NAME_VISIBLE	String	D / RO	10	"_____"	Valid for sensor variant: EC, IR This parameter enables reading of the target gas table without changing the currently set target gas and affecting the running measuring operations. E.g.: GAS_NAME_VISIBLE for GAS_INDEX_VISIBLE=0x00 = "METHANE" GAS_NAME_VISIBLE for GAS_INDEX_VISIBLE=0x01 = "ETHANE"
132	GAS_INDEX_VISIBLE	Unsigned8	D / RW	1	**0x00**	Valid for sensor variant: EC, IR Gas index for reading the gas table.

Manufacturer

Dräger Safety AG & Co. KGaA
Revalstraße 1
D-23560 Lübeck
Germany
+49 451 8 82-0
FAX +49 451 8 82-2080
http://www.draeger.com

9033782 – IfU 4683.800 enUS

Edition/Edition: 02 – 2019-04
(Edition/Edition: 1 – 2016-01)
Subject to alteration