Mounting and Operating Instructions

Solenoid Valve Island Type 3965-DP

CE ⟨Ex⟩   SAMSO MATIC

Contents

EB 3965-2 EN

General instructions

⚠ **The devices may only be mounted, started up, and operated by experienced personnel familiar with this product.**
Proper shipping and appropriate storage of the device are assumed.

In these mounting and operating instructions, the term "experienced personnel" refers to persons, who are able to evaluate the responsibilities assigned to them as well as recognize potential hazards due to their specialized training, knowledge, and experience as well as their special knowledge of the relevant standards.

Staff handling or operating explosion-protected devices in hazardous areas must be specially trained or instructed, i.e. staff must be authorized to handle or operate explosion-protected devices.

Refer to Data Sheet T 3965 EN for technical data, ordering data, accessories and spare parts.

Model number and device index

The model number and device index are written on the nameplate:

```
3965-XXXXXXXXXXXXXXX XX
      └ Model number ┘  └ Device index ┘
```
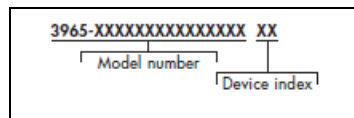
Fig. 1

Serial number

Because three Ex certificates are valid for solenoid valve island 3965-DP, three type labels are placed at the device. The serial number as unique identification of the device is only printed to one of them.

Current HW/FW-Version: DP module

DP module	Hardware	Firmware
Power supply	VN10-00	-
CPU	VN00-50	SR0x03
NAMUR modul	VN10-00	SR0x01

Aktuelle Version: GSD-Datei

Version	File name	edited
GSD_V1.1	39650A55.GSD	26.11.2012

Article code

3965-DPplus / 3965-	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Type of protection																			
II 2 G Ex i/ II 2 D Ex tD A21	1	1																	
Electrical connection																			
PROFIBUS-DP (SV-Island 3965-DP)			3	1															
Nominal signal																			
6 V DC (solenoid valve)					1														
Status indication																			
Without / LED (yellow)						0 / 3													
Switching function																			
3/2-way / 5/2-way / 2/2-way							0/1/2												
No. of switching functions																			
1 to 16								0|1	1|6										
Base module (reserve)																			
Without / 1 to 7										0	1|7								
Pneumatic connection module																			
With pressure reducer, G / With press. reducer, NPT / Without press. reducer, G / Without pr. reducer, NPT												0/1/2/3							
Manual override																			
Without / Pushbutton / Switch													0/1/2						
Ambient temperature																			
−20 to +50 °C														0					
Ext. NAMUR sensors																			
Without															0				
Safety function																			
Without																0			
Special version																			
Without																	0	0	0

Technical data

Electric connection module for PROFIBUS-DP (Ex ib[ia])		
Version		Electric connection module for PROFIBUS-DP (Ex ib[ia]) for use in hazardous areas; Controlling of 16 solenoid valves (6 V DC) with cable break monitoring; Connection of two input modules for 32 NAMUR sensors (Ex ia) with cable break and short-circuit monitoring
Explosion protection certification		PTB 09 ATEX 2032 (power supply unit) and PTB 09 ATEX 2033 (CPU)
Material	Module enclosure	GD AlSi12, powder-coated, gray-beige RAL 1019
	End plates	GD AlSi12, anodized, black
	Gaskets	Silicone rubber
	Screws	1.4571
	Plug-type connector	Polyamide
Status indication		1 x LED (external communication DP): green = Connection OK; red = Connection interrupted
		1 x LED (operation): green = ON; red = OFF
Cycle time		< 100 ms (NAMUR sensors)
		< 500 ms (solenoid valves)
Power supply		24 V DC (+/–15 %)
		Power input $\leq$ 4.5 W; output rating $\leq$3.5 W
		Galvanic isolation between input circuit and output circuit; rated voltage: 60 V
Connection	Power supply	Two-wire connecting cable (wire cross-section 1.5 mm², flexible); 2 m length
	PROFIBUS-DP	Plug-type connector, 9-pole
	Input modules	Round plug connector M12x1, 5-pole (max. two input modules can be connected)
Transmission rate		9.6 kBit/s to 1.5 Mbit/s
Bus address setting		With two rotary code switches at the front (address range between 1 and 99)
Degree of protection		IP 40
Ambient temperature		–20 to +50 °C
Weight, approx.		750 g
Comments		External RS-485 fieldbus network (RS485-IS according to PNO guidelines): - Max. value per terminal pair: U_i = 4.2 V - Max. value of terminal pair: Total I_i = 4.8 A Cables type A or B according to EN 60079-25 with following data: - L'/R' <= 15μH/Ohm - C' <= 250 nF/km - Diameter of stranded wire >= 0.2 mm Concentrated inductance and capacitance in the external fieldbus are **not** permissible Compensating currents are prevented by shielding according to IEC 60079-4

Input module for NAMUR sensors (Ex ia)		
Version		Input module for 16 NAMUR sensors (Ex ia) for use in hazardous areas
Explosion protection certification		PTB 09 ATEX 2033
Power supply		System-internal current circuit, central supply by the power supply unit of the driver module
		Power input <= 500 mW
		Galvanic isolation to internal electronics and to supply current circuit
Input circuits		According to EN 60947-5-6 (NAMUR), intrinsically safe according to EN 60079-11
		Open-circuit voltage: 8 V DC; short-circuit current: 6 mA; wire break <= 0.2 mA
		On/off switching threshold: typically 2.1 mA/1.2 mA
Material	Enclosure	Aluminum, polyamide
	Front plate	Printed circuit board FR 4, light gray, printed in black
Status indication		1 x LED (operation); green: power supply ON
		16 x LED (sensor state); green: NAMUR sensor unattenuated LED flashes in the event of failure: wire break 0.5 Hz/short circuit 2 Hz
Mounting		Snap-on mounting for top hat rail TH 35 according to EN 60715
Connection	NAMUR sensors	Terminals, detachable
	BUS INPUT/OUTPUT	Round plug connector M12x1, 5-pole
Degree of protection		IP 20
Ambient temperature		–20 to +50 °C
Weight, approx.		380 g

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Mounting

Type 3965-DP Solenoid Valve Island

See EB 3965 EN, page 8

NAMUR input module

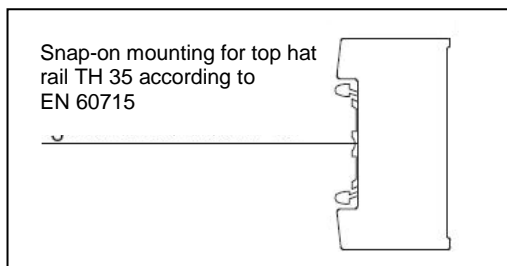A snap-on fixture is located on the bottom of the module which is used to attach the modules to a top-hat rail.

Snap-on mounting for top hat rail TH 35 according to EN 60715

Fig. 2

Pneumatic connection

Type 3965-DP Solenoid Valve Island

See EB 3965 EN, pages 9 and 10

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Electrical connection

⚠ As far as the electrical installation of the device is concerned, the relevant electrotechnical regulations and the accident prevention regulations of the country in which the device is used must be observed. In Germany these are the VDE regulations and the accident prevention regulations of the employers' liability insurance association.

For mounting in hazardous areas, the respective national regulations of the country in which the device is used applies. In Germany these are VDE 0165/EN 60079.

For connection to certified intrinsically safe current circuits, the EC Type Examination Certificate PTB 09 ATEX 2032 and PTB 09 ATEX 2033 for Zone 1 or 21 applies (see pages 18 to 22).

When connected to DC voltage signals, correct polarity must be ensured.

⚠ Adhere to the terminal assignment!
Switching the assignment of the electrical terminals may cause the explosion protection to become ineffective!
Do not loosen enameled screws in or on the housing.

The maximum permissible values specified in the EC type examination certificate apply when interconnecting intrinsically safe electrical equipment (Ui or Uo; Ii or Io; Pi or Po; Ci or Co, and Li or Lo) (see pages 18 to 22).

Power supply 24 V DC

The power supply is connected at the power supply unit of the device using a 2 m cable with the type of protection Ex e (increased safety).
Attach a grounding screw to the base plate of the power supply unit for the equipotential bonding required in hazardous areas (Fig. 3).
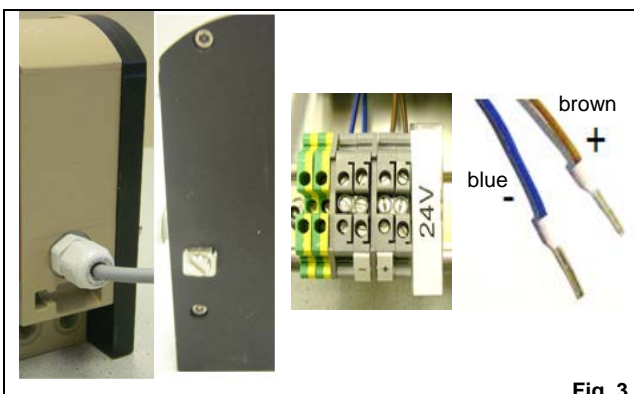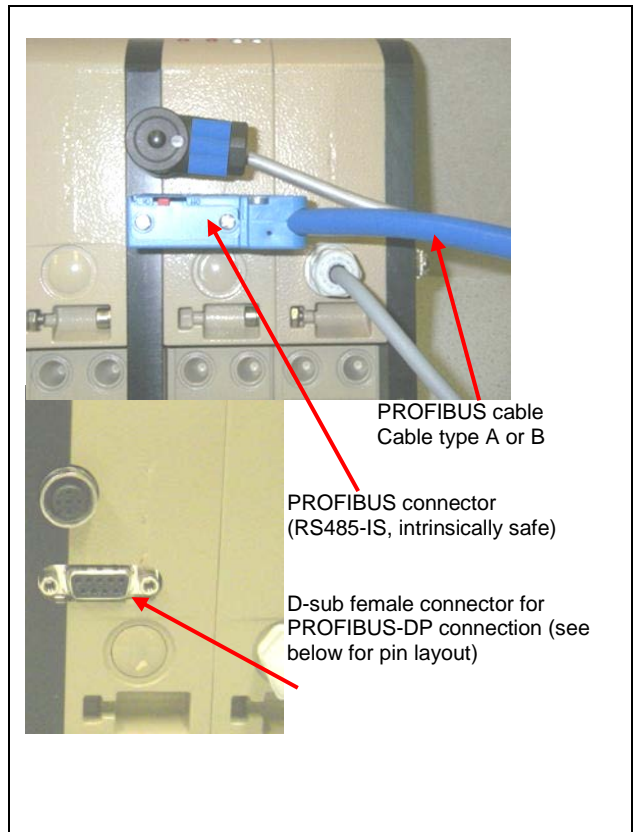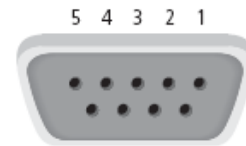

Fig. 3

PROFIBUS connection

PROFIBUS cable
Cable type A or B

PROFIBUS connector
(RS485-IS, intrinsically safe)

D-sub female connector for PROFIBUS-DP connection (see below for pin layout)

D-sub female connector

D-sub male connector

D-sub connector pin layout for RS485-IS

Pin no.	Pin layout of D-sub	Meaning
1	n.c.	*Not assigned*
2	n.c.	*Not assigned*
3	RxD/TxD-P	Receive/send data of non-inverting line
4	n.c.	*Not assigned*
5	ISGND	Bus termination (minus)
6	ISP	Bus termination (plus)
7	n.c.	*Not assigned*
8	RxD/TxD-N	Receive/send data of inverting line
9	n.c.	*Not assigned*

Fig. 4

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The device must be connected to an intrinsically safe PROFIBUS-DP network (according to PNO User and Installation Guideline 2.262). If necessary, connect a DP-Ex-i segment coupler in front of the device.

The bus network is connected using a 9-pole D-sub female connector (see Fig. 4). Only use a D-sub connector suitable for RS495-IS.

Use a standard PROFIBUS cable (cable type A or B) according EN 50039 for the supply lines.

⚠ *During installation work, make sure that the PROFIBUS network is terminated at the first and last participant of the segment by a termination resistor.*

Resistance combinations are usually integrated into the bus connectors which can be activated for active termination.

Connecting the NAMUR input modules

A maximum of two input modules may be connected to the Type 3965-DP solenoid valve island (see Fig. 6).

These modules are connected to the driver module by an internal, intrinsically safe system bus (category ib). This internal bus is responsible for data communication as well as power supply of the NAMUR input modules.

These modules do not require their own PROFIBUS-DP address since they are not directly connected to the PROFIBUS network. They are assigned to the corresponding driver module.

The first module is connected to the base module using a connecting cable (max. 1.5 m, see below for accessories: 8831-0874). This module is connected to the Type 3965-DP at the M12 female connector intended for this purpose which is located above the D-sub female connector. It is connected to the NAMUR input module at the M12 female connector marked 'BUS INPUT'.

To connect a further NAMUR input module (cascading), the BUS OUTPUT connection of the first module is connected to the BUS INPUT of the second module using a connecting cable (**max. 0.3 m**, see below for accessories: 8831-0873).

Fig. 6

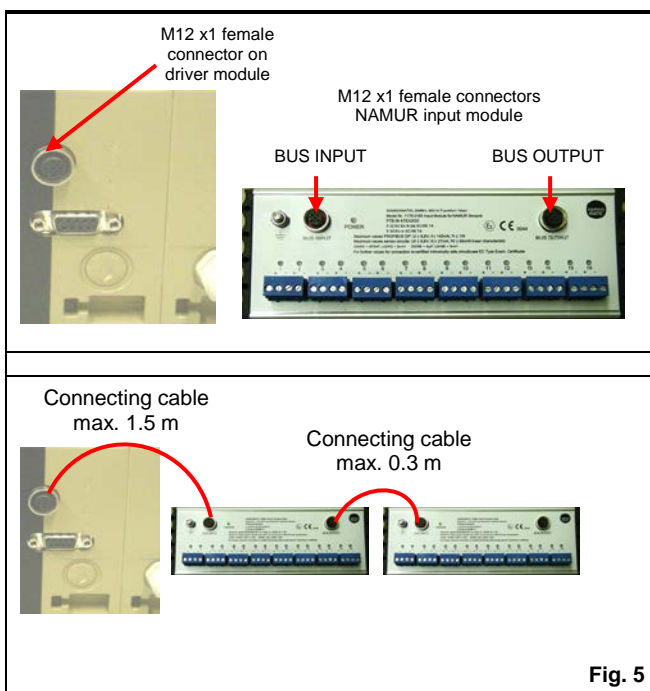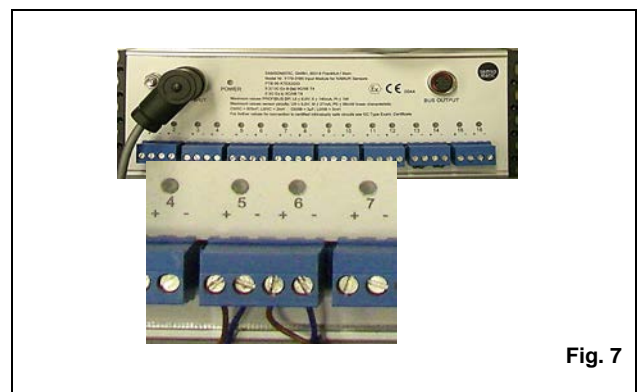| Accessories	Order no.
Input module for NAMUR sensors for 16 NAMUR sensors (Ex ia), IP 20	1170-3185
Connecting cable, with M12x1 round connector, 5 pole, on both sides: ▪ 0.3 m length ▪ 1.0 m length	**8831-0873** **8831-0874**

Fig. 5

Connecting NAMUR sensors

Fig. 7

The NAMUR sensors can be connected directly to the 4-pole terminal block (Combicon, blue) as shown in Fig. 7. Two sensors per terminal block can be connected. The maximum line length to connect sensors is 30 m.

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Data communication between master and slave
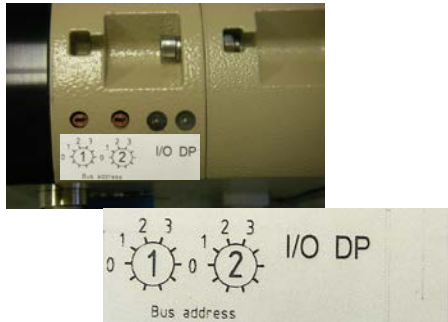
Setting the PROFIBUS-DP address

Fig. 8

Use the two rotary code switches on the connection module to set the PROFIBUS-DP address. Use switch 1 to set the first digit of the address and switch 2 for the second digit of the address. Range of code switch marking is from 0 to 9 (0, 1, 2, 3 as digits, others as bars in clockwise direction)

The address range is between 01 and 99. The address of all PROFIBUS participants (regardless of whether master or slave) must be unique. Factory-provided preset of the address is "55".
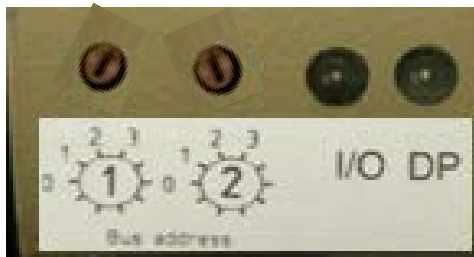
Fig. 8 shows the bus address setting 32

Fig. 9

Status indication on the connection module

The two LEDs on the connection module (Fig. 9) indicate whether the power supply is connected (I/O) and the communication status between master and slave.

LED	Status	Description
I/O	OFF	Power supply switched off
	Green	Power supply OK
	Blinking red: 0.5 Hz	Malfunction of NAMUR sensor(s)
DP	OFF	Power supply switched off
	Red	PROFIBUS communication error
	Green	PROFIBUS OK

Status indication on NAMUR input module

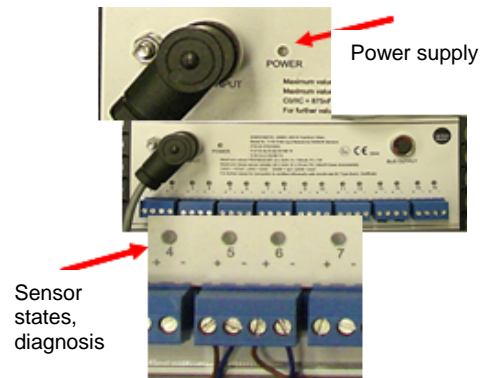Power supply

Sensor states, diagnosis

Fig. 10

The POWER LED indicates whether the power supply is connected to the NAMUR input module. Each sensor is assigned an LED to indicate the sensor state and the corresponding diagnosis.

LED	Status	Description
POWER	OFF	Power supply switched off
	Green	Power supply OK
Sensor state and diagnosis	OFF	Not initialized
	OFF	
	Green continuously ON	PROFIBUS communication error
	Green continuously ON	PROFIBUS OK
	Blinking green (0.5 Hz)	Wire break detected
	Blinking green (2 Hz)	Short circuit detected

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GSD file

GSD files are readable ASCII text files and contain both general and device-specific specifications for communication. They describe the entire scope of configuration and the communication properties of a PROFIBUS participant.

By means of keywords, a configuration tool reads the device identification (ID number), the adjustable parameters, the corresponding data type and the permitted limit values for the configuration of the device from the GSD.

Properties, such as transmission rate, time behavior, configuration data, parameters, diagnostic data etc, are described in this file by the keywords.

Device configuration and parameterization

The Type *3965-DP* Solenoid Island Valve is connected to the PROFIBUS-DP networks as a **slave**.

The device is configured and parameterized based on the associated GSD file.

The solenoid valve drivers and sensor inputs can be configured in groups containing either 8 or 16 binary signals. Note that a maximum of three groups are permitted for more than 24 signals to be processed (sensor signals and drivers in total).

Minimum configuration:
- 8 solenoid valve drivers without diagnosis
- At least one solenoid valve must be connected to prevent a configuration error from being displayed.

Device combinations:
(the maximum number of groups with 8 or 16 binary signals are written in parentheses)

3965-DP without NAMUR input modules:

- 8 solenoid valve drivers (1x8)
  0 sensor inputs

- 16 solenoid valve drivers (1x16 or 2x8)
  0 sensor inputs

3965-DP with one NAMUR input module:

- 8 solenoid valve drivers (1x8)
  8 sensor inputs (1x8)

- 8 solenoid valve drivers (1x8)
  16 sensor inputs (1x16 or 2x8)

- 16 solenoid valve drivers (1x16 or 2x8)
  8 sensor inputs (1x8)

- 16 solenoid valve drivers (1x16)
  16 sensor inputs (1x16 or 2x8)
  or
  16 solenoid valve drivers (1x16 or 2x8)
  16 sensor inputs (1x16)

3965-DP with two NAMUR input modules:

- 8 solenoid valve drivers (1x8)
  16 sensor inputs (1x8 + 1x8)

- 8 solenoid valve drivers (1x8)
  24 sensor inputs (1x16 + 1x8)

- 8 solenoid valve drivers (1x8)
  32 sensor inputs (1x16 + 1x16)

- 16 solenoid valve drivers (1x16)
  16 sensor inputs (1x8 + 1x8)
  or
  16 solenoid valve drivers (2x8)
  16 sensor inputs (1x16)

- 16 solenoid valve drivers (1x16)
  24 sensor inputs (1x16 + 1x8)

- 16 solenoid valve drivers (1x16)
  32 sensor inputs (1x16 + 1x16)

The device is configured and parameterized using a suitable configuration tool. Refer to the user manual of the corresponding tool for more details.

See page 10 to 12 for screenshots of various configuration tools (e.g. Siemens, Procentec, Bihl-Wiedemann).

Follow the following instructions to configure and parameterize the device:

- Install the GSD file 39650A55.GSG (DE) or 39650A55.GSE (EN).

- Connect the Type 3965-DPplus slave(s) to the PROFIBUS-DP network and assign the slave address(es) within the range between 1 and 99.

- Parameterize the Type 3965-DPplus slaves (number of drivers/binary outputs, number of NAMUR sensor signals/binary inputs)

- Optional *(provided the tool supports the function)*: Display fault alarms over PROFIBUS standard diagnostic function (parameterization in channel pairs).

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Example: Siemens (STEP7)

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Eigenschaften - DP-Slave ☒

Adresse / Kennung | Parametrieren

E/A Typ: Ausgang ▾ Direkteingabe...

Ausgang
| | Adresse: | Länge: | Einheit: | Konsistent über: |
Anfang: 0 | 1 ⇳ | Byte ▾ | Einheit ▾
Ende: 0

Prozeßabbild: OB1-PA ▾

Herstellerspezifische Daten:
(maximal 14 Byte hexadezim

☐ Ersatzwertverhalten des

OK

Eigenschaften - DP-Slave ☒

Adresse / Kennung | Parametrieren

Parameter	Wert
⊟ 📁 Stationsparameter	
⊟ 📁 Gerätespezifische Parameter	
📄 Y1 Bruchueberwachung	
📄 Y2 Bruchueberwachung	
📄 Y3 Bruchueberwachung	
📄 Y4 Bruchueberwachung	
📄 Y5 Bruchueberwachung	
📄 Y6 Bruchueberwachung	
📄 Y7 Bruchueberwachung	
📄 Y8 Bruchueberwachung	
📄 Y9 Bruchueberwachung	
📄 Y10 Bruchueberwachung	
📄 Y11 Bruchueberwachung	
📄 Y12 Bruchueberwachung	
📄 Y13 Bruchueberwachung	
📄 Y14 Bruchueberwachung	
📄 Y15 Bruchueberwachung	
📄 Y16 Bruchueberwachung	

OK

Eigenschaften - DP-Slave ☒

Adresse / Kennung | Parametrieren

Parameter	Wert
⊟ 📁 Stationsparameter	
⊟ 📁 Gerätespezifische Parameter	
📄 S1 Bruch-/Kurzschlussueberw.	aus
📄 S2 Bruch-/Kurzschlussueberw.	aus
📄 S3 Bruch-/Kurzschlussueberw.	aus
📄 S4 Bruch-/Kurzschlussueberw.	aus
📄 S5 Bruch-/Kurzschlussueberw.	aus
📄 S6 Bruch-/Kurzschlussueberw.	aus
📄 S7 Bruch-/Kurzschlussueberw.	aus
📄 S8 Bruch-/Kurzschlussueberw.	aus
📄 S9 Bruch-/Kurzschlussueberw.	aus
📄 S10 Bruch-/Kurzschlussueberw.	aus
📄 S11 Bruch-/Kurzschlussueberw.	aus
📄 S12 Bruch-/Kurzschlussueberw.	aus
📄 S13 Bruch-/Kurzschlussueberw.	aus
📄 S14 Bruch-/Kurzschlussueberw.	aus
📄 S15 Bruch-/Kurzschlussueberw.	aus
📄 S16 Bruch-/Kurzschlussueberw.	aus

OK   Abbrechen   Hilfe

Example: Procentec (ProfiTrace2)

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Example: Bihl+Wiedemann (PROFIBUS-DP-Master)

EB 3965-2 EN
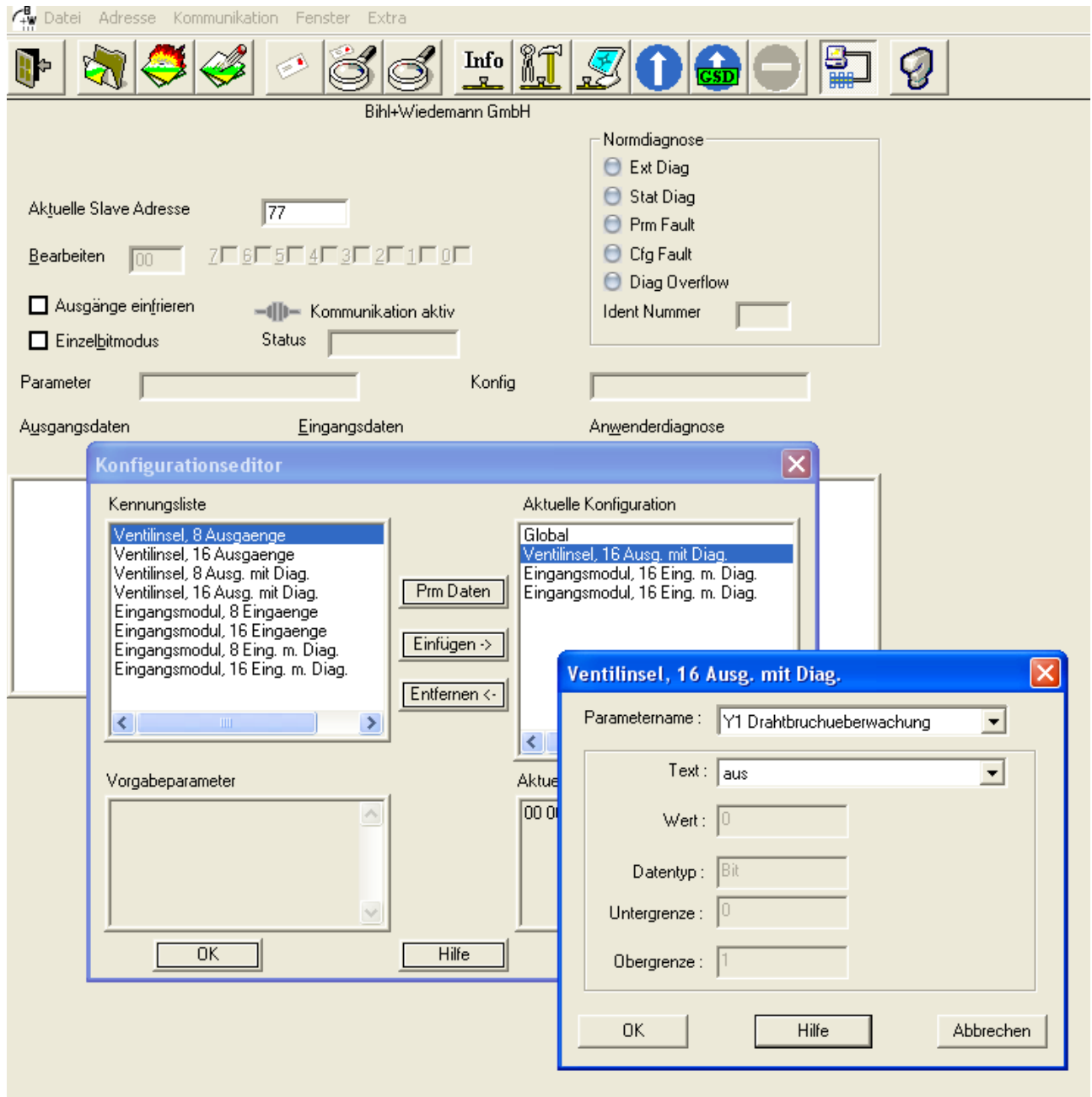
Process mapping (binary outputs and inputs)

Communication between the PROFIBUS-DP master and the Type 3965-DP solenoid valve island (PROFIBUS-DP slave) is performed cyclically based on DP-V0 protocol. The binary outputs (drive bits) and the binary inputs (NAMUR sensor states, diagnosis data) are transferred completely in each cycle.

As a result, the drive bits in the Type 3965-DP are cyclically refreshed during active data transmission and the status and diagnosis data in the process control system (or PLC) are updated in the same cycle.

The drive bits are configured as binary outputs in the I/O modules of the process control system (or PLC) and the input signals are configured correspondingly as binary inputs. In this way, they can be easily processed with default functions in the higher-level system.

With the maximum configuration (16 solenoid valve drivers and 32 NAMUR sensor signals), the data volume is 12 bytes per PROFIBUS-DP slave. Other configurations have a correspondingly smaller data volume.

The entire process mapping is represented below including the corresponding assignments of bits to the solenoid valves and NAMUR sensor inputs.

Solenoid valves

Type 3965-DP Solenoid Valve Island

Fig. 11

Binary outputs	Solenoid valve drive bits						
Assignment according to Fig. 11							
BYTE 0	X11				X10		
	MV8	MV7	MV6	MV5	MV4	MV3	MV2	MV1
Bit	7	6	5	4	3	2	1	0
BYTE 1	X13				X12		
	MV16	MV15	MV14	MV13	MV12	MV11	MV10	MV9
Bit	7	6	5	4	3	2	1	0

Binary inputs	Solenoid valve diagnosis bits						
Assignment according to Fig. 11							
BYTE 0	X11				X10		
	MV8	MV7	MV6	MV5	MV4	MV3	MV2	MV1
Bit	7	6	5	4	3	2	1	0
BYTE 1	X13				X12		
	MV16	MV15	MV14	MV13	MV12	MV11	MV10	MV9
Bit	7	6	5	4	3	2	1	0

Coding of solenoid valve states

Drive bits	0	OFF (idle position/safe state)
	1	ON

Diagnosis bit	0	Connection OK
	1	Wire break diagnosis

Example 1:
Solenoid valve 4 (connection X10/MV4): ***ON/Line OK***
Binary outputs: Byte 0 / Bit 3 = 1
Binary inputs: Byte 0 / Bit 3 = 0

Example 2:
Solenoid valve 13 (connection X13/MV12): ***Wire break***
Binary outputs: Byte 1 / Bit 4 = Last switching state (1/0)
Binary inputs: Byte 1 / Bit 4 = 1

NAMUR sensor input modules

Binary inputs	NAMUR sensor signals, status bits						
Assignment according to the ports of the NAMUR modules							
BYTE 2	NAMUR input module 1, ports 1-8						
	8	7	6	5	4	3	2	1
Bit	7	6	5	4	3	2	1	0
BYTE 3	NAMUR input module 1, ports 1-8						
	16	15	14	13	12	11	10	9
Bit	7	6	5	4	3	2	1	0

Binary inputs	NAMUR sensor signals, diagnosis bits						
Assignment according to the ports of the NAMUR modules							
BYTE 4	NAMUR input module 1, ports 9-16						
	8	7	6	5	4	3	2	1
Bit	7	6	5	4	3	2	1	0
BYTE 5	NAMUR input module 1, ports 9-16						
	16	15	14	13	12	11	10	9
Bit	7	6	5	4	3	2	1	0

Binary inputs	NAMUR sensor signals, status bits						
Assignment according to the ports of the NAMUR modules							
BYTE 6	NAMUR input module 1, ports 1-8						
	8	7	6	5	4	3	2	1
Bit	7	6	5	4	3	2	1	0
BYTE 7	NAMUR input module 1, ports 1-8						
	16	15	14	13	12	11	10	9
Bit	7	6	5	4	3	2	1	0

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Binary inputs	NAMUR sensor signals, diagnosis bits							
Assignment according to the ports of the NAMUR modules								
BYTE 8	NAMUR input module 1, ports 9-16							
	8	7	6	5	4	3	2	1
Bit	7	6	5	4	3	2	1	0
BYTE 9	NAMUR input module 1, ports 9-16							
	16	15	14	13	12	11	10	9
Bit	7	6	5	4	3	2	1	0

Coding of NAMUR sensor states

Status bit	Diagnosis bit	
0	0	Attenuated; line OK
1	0	Unattenuated; line OK
0	1	Wire break diagnosis
1	1	Short circuit diagnosis

Example 3:
NAMUR sensor, input module 1; sensor 6
Status: *Attenuated/Line OK*
Binary input: Byte 2 / Bit 5 = 0
Binary input: Byte 4 / Bit 5 = 0

Example 4:
NAMUR sensor, input module 2; sensor 13
Status: *Unattenuated/Line OK*
Binary input: Byte 7 / Bit 4 = 1
Binary input: Byte 9 / Bit 4 = 0

Example 5:
NAMUR sensor, input module 1; sensor 11
Status: *Wire break*
Binary input: Byte 3 / Bit 2 = 0
Binary input: Byte 5 / Bit 2 = 1

Example 6:
NAMUR sensor, input module 2; sensor 7
Status: *Short-circuit*
Binary input: Byte 6 / Bit 6 = 1
Binary input: Byte 8 / Bit 6 = 1

Start-up checklist

1. *Switch off power supply*

   First check whether the cables are correctly connected. This must be performed with the power supply switched off:

   - Power cable connected to 24 V DC?
   - PROFIBUS cable connected at the D-sub female connector of the driver module?
   - Bus terminators activated (in first or last slave in the segment)?
   - Cable for NAMUR input modules connected?
   - External solenoid valves connected correctly?

2. *Switch on power supply,*
   Master ←→ slave offline

   After checking the cables with the power switched off, switch on the power supply of 24 V DC.
   Check the status LEDs on the driver module and NAMUR modules to ensure they indicate the correct status:

   - LEDs on the driver module
     - I/O: green (power supply connected)
     - DP: red (PROFIBUS offline)

   - LEDs on NAMUR modules
     - Power: green (power supply switched on)
     - Sensor inputs: all LEDs off (inputs are first initialized after the PROFIBUS has been connected)

3. *Master ←→ slave online*

   Check the communication between master and slave when they are online.
   Check the status LEDs on the driver module and NAMUR modules to ensure they indicate the correct status:

   - LEDs on the driver module
     - I/O: green (power supply switched on)
     - DP: green (PROFIBUS online)

   - LEDs on the NAMUR modules
     - Power: green (power supply switched on)
     - Sensor inputs: current sensor states (attenuated/unattenuated) or wire break for all unoccupied connections (LED blinks, 0.5 Hz)

EB 3965-2 EN

Troubleshooting

Type 3965-DPplus Valve Driver Module/PROFIBUS-DP slave			
Malfunction LED status	Diagnosis (possible cause of malfunction)	Possible causes	Recommended action
I/O LED OFF DP LED OFF	Interrupted power supply	Power supply unit of driver module defective	Make sure that the power supply unit is working. If this is not the case, replace the unit. Connect mains cable of the power supply unit to 230 V AC supply.
		Wiring faulty	Connect mains cable of the driver module to the 24 V DC output terminals; Observe polarity (brown: +, blue: –)!
I/O LED green DP LED red	Power supply OK PROFIBUS-DP not active	PROFIBUS cable and/or connectors not correctly connected or defective	Check that the cable is OK. If this is not the case, replace it. Check whether the connectors are wired correctly. Connect the bus termination resistor in the first and last device of the segment *(see page 6, PROFIBUS connection)* Fasten connector connection.
		Master ←→ slave communication still offline (not started)	Activate master ←→ slave communication from the master
		Configuration is invalid (master shows configuration error)	Check entered configuration and correct *(see page 10, Device configuration and parameterization)*
		Baud rate setting incorrect	Correct Baud rate setting (the same Baud rate must be set for all participants (master, slave and, if applicable, segment coupler).
		Address error	Check master and/or slave address and correct, if necessary *(see p. 9, Setting the PROFIBUS-DP address)*
I/O LED red (blinking) DP LED green	Communication to the NAMUR input module(s) interrupted Power LED: OFF	Connecting cable and/or connector not connected or defective (master shows diagnosis error)	Make sure that the cable and connector work properly. If this is not the case, replace them. Connect cable properly *(see p. 7, Connecting the NAMUR input modules)* Fasten connector connection.
	Communication to the NAMUR input module(s) interrupted Power LED: ON	Connecting cable not connected properly; INPUT/OUTPUT connection wrong (master shows diagnosis error)	Connect cable properly *(see p. 7, Connecting the NAMUR input modules)* Fasten connector connection.

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NAMUR input module

Malfunction LED status	Diagnosis (possible cause of malfunction)	Possible causes	Recommended action
POWER LED OFF Sensor LEDs OFF	Interrupted power supply to driver module	Power supply unit of driver module defective	Make sure that the power supply unit is working. If this is not the case, replace the unit. Connect mains cable of the power supply unit to 230 V AC supply.
		Wiring in driver module faulty	Connect mains cable of the driver module to the 24 V DC output terminals; Observe polarity (brown: +, blue: –)!
POWER LED ON Sensor LEDs OFF	Power supply driver module OK Processing of sensor signals switched off	PROFIBUS connection not yet active (input modules are initialized first when the connection is activated for the first time)	Activate master ←→ slave communication from the master
		Wiring in NAMUR signal modules faulty; BUS INPUT and BUS OUTPUT incorrectly connected with connecting cable	Make sure that the output of the driver module is connected to BUS INPUT of the first NAMUR module and, if applicable, the BUS OUTPUT of the first module is connected with BUS INPUT of the second module.

EB 3965-2 EN

Servicing explosion-protected devices

If a part of the device on which the explosion protection is based needs to be serviced, the device must not be put back into operation until a qualified inspector has assessed it according to explosion protection requirements, has issued an inspection certificate or given the device a mark of conformity.

Inspection by a qualified inspector is not required if the manufacturer performs a routine test on the device prior to putting it back into operation. The passing of the routine test must be documented by attaching a mark of conformity to the device.

Replace explosion-protected components only by original, routine-tested components from the manufacturer.

⚠ **Devices that have already been operated outside hazardous areas and are intended for future use inside hazardous areas must comply with the safety requirements placed on serviced devices.**

Before being used inside hazardous areas, test the devices according to the specifications for servicing explosion-protected devices.

Maintenance, calibration and work on equipment

The interconnection with intrinsically safe circuits to check or calibrate the apparatus must only be performed with intrinsically safe current/voltage calibrators and measuring instruments to rule out any damage to components relevant for explosion protection.

The maximum values for intrinsically safe circuits specified in the approvals must be kept (see pages 19 to 22).

EB 3965-2 EN

Certification

Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin

TRANSLATION

EC TYPE EXAMINATION CERTIFICATE

(1)

(2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres – Directive 94/9/EC

(3) EC type examination certificate number

PTB 09 ATEX 2032

(4) Equipment: Type 1170-3010 Power Supply Unit for Type 3965-1131 Solenoid Valve Island (PROFIBUS DP)

(5) Manufacturer: SAMSON AG, Mess- und Regeltechnik

(6) Address: Weismüllerstrasse 3, 60314 Frankfurt am Main, Germany

(7) This equipment and any acceptable variation thereto are specified in the schedule to this certificate and the documents therein referred to.

(8) Physikalisch-Technische Bundesanstalt, notified body no. 0102 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the essential health and safety requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive.

The examination and test results are recorded in the confidential Assessment and Test Report **PTB Ex 10-28134.**

(9) Compliance with the essential health and safety requirements is ensured by compliance with:

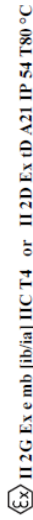EN 60079-0:2006   EN 60079-7:2007   EN 61241-0:2006
EN 60079-11:2007   EN 60079-18:2004   EN 61241-1:2004

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use as specified in the schedule to this certificate.

(11) This EC Type Examination Certificate relates only to the design and construction of the specified equipment or protective system in accordance with Directive 94/9/EC. Further requirements of this Directive apply to the manufacture and supply of this equipment. These requirements are not covered by this certificate.

The results laid down in this test report refer exclusively to the test object and the technical documentation submitted. Test reports without signature and seal are invalid. This test report may be reproduced unaltered only. Extracts or amendments shall require the prior approval of the Physikalisch-Technische Bundesanstalt.

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Braunschweig und Berlin

(12) The marking of the equipment must include the following:

⟨Ex⟩ II 2G Ex e mb [ib/ia] IIC T4   or   II 2D Ex tD A21 IP 54 T80 °C

Certification Sector for Explosion Protection   Braunschweig, 9 February 2010
O/o

[Signature Johannsmeyer, stamp: Physikalisch-Technische Bundesanstalt 56]

Dr.-Ing. U. Johannsmeyer
Director and Professor

The results laid down in this test report refer exclusively to the test object and the technical documentation submitted. Test reports without signature and seal are invalid. This test report may be reproduced unaltered only. Extracts or amendments shall require the prior approval of the Physikalisch-Technische Bundesanstalt.

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Enclosure to EC Type Examination Certificate PTB 09 ATEX 2032

(13)   **Enclosure**

(14)   **EC Type Examination Certificate PTB 09 ATEX 2032**

(15)   **Description of the equipment or protective system:**

The Type 1170-3010 Power Supply Unit is an optional component of the Type 3965-1.. Solenoid Valve Island type tested in PTB 05 ATEX 2044 X and is designed for intrinsically safe voltage supply for the Type 3965-1131 (PROFIBUS DP), The Type 3965-1131 is composed of the Type 1170-3184 CPU Module and the Type 1170-3185 NAMUR Module certified in PTB 09 ATEX 2033.
The power supply unit is designed for use inside hazardous areas.
The permissible ambient temperature range is –20°C to 60°C

Electric data

Voltage supply .... $U = $ 18 to 32 V DC
                                               $U_m = $ 60 V
                                               $P = $ 4.5 W

Output circuit Vcc-A .... in type of protection Intrinsic Safety Ex ib IIC
In-system, no external connection options

                                               Max. values:

(terminal X1, contacts 10/11) $U_0 = $ 9.6 V
                                       $I_0 = $ 145 mA
                                       $P_0 = $ 1 W
                                       $L_i = $ negligibly small
                                       $C_i = $ 63.5 nF

Output circuit Vcc-B .... in type of protection Intrinsic Safety Ex ib IIC
In-system, no external connection options

                                               Max. values:

(terminal X1, contacts 7/14) $U_0 = $ 14.1 V
                                       $I_0 = $ 105 mA
                                       $P_0 = $ 500 mW
                                       $L_i = $ negligibly small
                                       $C_i = $ 56.3 nF

Output circuit Vcc-C .... in type of protection Intrinsic Safety Ex ib IIC
In-system, no external connection options

                                               Max. values:

(terminal X1, contacts 4/17) $U_0 = $ 9.6 V
                                       $I_0 = $ 145 mA
                                       $P_0 = $ 1 W
                                       $L_i = $ negligibly small
                                       $C_i = $ 254 nF

Enclosure to EC Type Examination Certificate PTB 09 ATEX 2032

Output circuit Vcc-D .... in type of protection Intrinsic Safety Ex ia IIC
In-system, no external connection options

                                               Max. values:

(terminal X1, contacts 1/20) $U_0 = $ 9.6 V
                                       $I_0 = $ 145 mA
                                       $P_0 = $ 1 W
                                       $L_i = $ negligibly small
                                       $C_i = $ 254 nF

Under normal operating conditions, the output circuits Vcc-A and Vcc-C are to be considered as galvanically coupled. They are safely galvanically isolated from the input circuit Vcc-B up to a maximum peak voltage of 30 V.

The output circuit Vcc-D is safely galvanically isolated from all other circuits up to a maximum peak voltage of 60 V.

All output circuits are safely galvanically isolated from the supply circuit up to a maximum peak voltage of 60 V.

(1)   Assessment and Test Report PTB Ex 10-28134

(2)   Special conditions for safe use
       None, see notes on manufacturing and operation in the assessment and test report.

(3)   Essential health and safety requirements
       Compliance with the essential health and safety requirements is ensured by compliance with the standards mentioned above.

Certification Sector for Explosion Protection   Braunschweig, 9 February 2010
O/o

[Signature Johannsmeyer, stamp: Physikalisch-Technische Bundesanstalt 56]

Dr.-Ing. U. Johannsmeyer
Director and Professor

PTB

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Braunschweig und Berlin

requirements of this Directive apply to the manufacture and supply of this equipment. These requirements are not covered by this certificate.

(12)   The marking of the equipment must include the following:

⟨Ex⟩ II 2 (1)G Ex ib [ia] IIC T4 or II 2 D Ex tD A21 IP54 T120 °C

Certification Sector for Explosion Protection   Braunschweig, 10 February 2010
O/o
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Dr.-Ing. U. Johannsmeyer
Director and Professor

Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin

TRANSLATION

EC TYPE EXAMINATION CERTIFICATE

(1) Equipment and Protective Systems Intended for Use in Potentially
Explosive Atmospheres – **Directive 94/9/EC**

(2) EC Type Examination Certificate Number

PTB 09 ATEX 2033

(3) Equipment: Type 1170-3184 CPU Module and Type 1170-3185 NAMUR Module
for Type 3965-1131 Solenoid Valve Island (PROFIBUS DP)

(4) Manufacturer: SAMSON AG, Mess- und Regeltechnik

(5) Address: Weismüllerstrasse 3, 60314 Frankfurt am Main, Germany

(6) This equipment and any acceptable variation thereto are specified in the schedule to this certificate
and the documents therein referred to.

(7) The Physikalisch-Technische Bundesanstalt, notified body number 0102 accordance with Article 9
of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to
comply with the essential health and safety requirements relating to the design and construction of
equipment and protective systems intended for use in potentially explosive atmospheres as specified
in Annex II to the Directive.

The examination and test results are recorded in the confidential Assessment and Test
PTB Ex 10-28235

(8) Compliance with the essential health and safety requirements is ensured by compliance with:

EN 60079-0:2006	**EN 61241-0:2006**
EN 60079-11:2007	**EN 61241-1:2004**

(9) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to
special conditions for safe use as specified in the schedule to this certificate.

(10) This EC Type Examination Certificate relates only to the design and construction of the specified
equipment or protective system in accordance with Directive 94/9/EC. Further

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Braunschweig und Berlin

S c h e d u l e

(13)

(14)   EC Type Examination Certificate Number PTB 09 ATEX 2033

(15) **Description of Equipment**

The Type 1170-3184 CPU Module and the Type 1170-3185 NAMUR Module is an optional component of the Type 3965-1... Solenoid Valve Island type tested in version Type 3965-1131 for PROFIBUS DP connection in PTB 05 ATEX 2044 X. The CPU module serves as communication interface between the in-system communication lines and the external RS485 IS bus systems (PROFIBUS DP).
The NAMUR module serves for connection of inductive proximity sensors and assessment of their signals.
The voltage for the CPU and NAMUR module is supplied intrinsically safe by the Type 1170-3010 Power Supply Unit certified in PTB 09 ATEX 2032.

The modules are designed for use inside hazardous areas.

The permissible ambient temperature range is −20°C to 60°C.

Electric data

All circuits are safely galvanically isolated from each other up to a maximum peak voltage of 30 V. The input circuit Vcc-D is safely galvanically isolated from all other circuits up to a maximum peak voltage of 60 V.

The input circuits are supplied by the internal circuits certified in PTB 09 ATEX 2032.

Input circuit Vcc-A .... in-system circuit without external connection
(strip X5, pin 19/20)   options

Input circuit Vcc-B.......... in-system circuit without external connection
(strip X5, pin 13/14)   options

Input circuit Vcc-C.......... in-system circuit without external connection
(strip X5, pin 7/8)   options

Input circuit Vcc-D .... in-system circuit without external connection
(strip X5, pin 1/2)   options

Enclosure to EC Type Examination Certificate PTB 09 ATEX 2033

PROFIBUS DP, RS-485-IS

RS-485-IS fieldbus connection .... in type of protection Intrinsic Safety Ex ib IIC
(D-SUB port X1, pin 3, 5, 6, 8)

Max. values:

$U_0 = 4.1$ V
$I_0 = 82$ mA
$P_0 = 84$ mW
Linear characteristic
C_i negligibly small

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L_i negligibly small

External RS-485-IS fieldbus system.......... in type of protection Intrinsic Safety Ex ib IIC
Max. value per pair of terminals:
$U_i = 4.2$ V
Max. value of sum per pair of terminals:
$I_i = 4.8$ A

Lines (loop resistance).......... cable type A or B acc. to EN 60079-25 with the following linear electric constants:
$L'/R' \leq 15$ μH/Ω
$C' \leq 250$ nF/km
Braided wire diameter ≥ 0.2 mm

Concentrated reactance across the external RS485 IS fieldbus systems are not permissible.

Note!
Specifications on the maximum permissible external reactance on the fieldbus connections of the individual devices in the external RS-485-IS fieldbus network are not applied in this EC Type Examination Certificate.

Type 1170-3185 NAMUR Module

Input circuit Vcc-D .... in-system circuit without external connection
(round connector X8)   options

Signal current circuits .... in type of protection Intrinsic Safety Ex ia IIC
(terminals X1 to X8)

Max. values per channel:

$U_0 = 9.6$ V
$I_0 = 27$ mA
$P_0 = 66$ mW
Linear characteristic
L_i negligibly small
$C_i = 210$pF

The relation between explosion group and external reactances is shown in the table:

	IIC	IIB
L_0	2 mH	5 mH
C_0	875 nF	3 μF

Solenoid valves

Input circuits .... in type of protection Intrinsic Safety Ex ia IIC
(terminal rows X10 to X13)   only for connection to a certified intrinsically safe circuit

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Enclosure to EC Type Examination Certificate PTB 09 ATEX 2033

Max. values per channel:

U_i = 28 V
I_i = 100 mA
P_i = 250 mW

or

Solenoid valve control .... in type of protection Intrinsic Safety Ex ib IIC

Max. values per channel:

U_0 = 9,6 V
I_0 = 32 mA
P_0 = 78 mW

Linear characteristic

L_i negligibly small
C_i negligibly small

The relation between explosion group and external reactance's is shown in the table:

	IIC	IIB
L_0	5 mH	5 mH
C_0	650 nF	3,7 µF

(16) **Assessment and Test Report PTB Ex 10-28235**

(17) **Special conditions for safe use**
None, see notes on manufacturing and operation in the assessment and test report

(18) **Essential health and safety requirements**
Compliance with the essential health and safety requirements is ensured by compliance with the standards mentioned above.

Certification Sector for Explosion Protection   Braunschweig, 10 February 2010
O/o
[Signature Johannsmeyer, stamp: Physikalisch-Technische Bundesanstalt 56]

Dr.-Ing. U. Johannsmeyer
Director and Professor

Specifications subject to change without notice