Intrinsically Safe Remote I/O System

- Intrinsically safe remote I/O system for use in zone 1 and zone 2
- Redundant power supplies and gateways
- Intrinsically safe connection to PROFINET with V1 functionality
- Online programming and configuration of all parameters
- Consistent HART® parameterisation from the process control system to the field device
- Temperature range from -20...+60 °C
- Exchange and extension of all components during operation
- Simple manual insertion and removal of modules without tools
- 128 binary or 64 analogue intrinsically safe channels via a single bus address
- „Forcing“ and substitute value programming of analogue and binary I/O
### excom® – System Overview

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<th>Short Description</th>
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<td>30</td>
</tr>
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<td>32</td>
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¹) current sourcing (active)  
²) current sinking (passive)

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### Page Numbers

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- Analogue modules 18
- Module racks 30
- Power supply units 32
Intrinsically Safe Remote I/O System

System Overview

excom® is a remote I/O system for use in potentially explosion hazardous locations. It provides bus-compatible, decentralised input and output modules in protection degree IP20 for connection of binary and analogue intrinsically safe field devices. The explosion protection type of the systems allows use in zones 1 and 2. The fieldbus circuits are approved for use in zone 0.

The system consists of power supplies, gateways, I/O modules and a module rack to accommodate all components. The backplane is integrated into the module rack. The backplane serves to distribute energy, to transmit data and to connect field devices. The power supply units ensure reliable supply of the entire system. A single power supply is sufficient for correct system operation. In order to enhance system availability, it is possible to connect a second supply unit (redundancy) when using the module rack type MT18.

The gateways fulfil both master and slave functions: as a master they control the internal data bus and as a slave they communicate with the higher level fieldbus. The gateways control the entire data communication between an I/O module and the process control system (PLC). Redundancy of gateways is also possible when using the module rack MT18-R024, thus increasing availability and fail-safety of the system.

The I/O modules are the interface to the periphery. The inputs and outputs serve to connect field devices in protection type EEx ia IIC. Up to 16 I/O modules may be operated in conjunction with a single module rack. The backplane provides the intrinsically safe supply of the I/O modules - an additional power supply is not needed. Connection of modules is easily accomplished: gateways, power supplies and I/O modules are simply plugged into the rack. After establishing the internal connections, the field components are connected.

Modules can be plugged into and removed from the rack during operation (hot swapping). Defect devices can be exchanged during operation. The system automatically checks whether the new module accords to the defined slot assignment. The system supports substitute value programming.

The internal cycle time of a fully assembled system is below 5 ms for binary processing and below 20 ms for analogue signals. The response time also depends on the type of PLC and fieldbus used in the application. The system supports connection of HART®-compatible field devices. Consistent HART® communication up to the PLC is possible via the PROFIBUS-DPV1.

System Configuration

- redundant power supply
- bus address setting via coded rotary switches
- open I/O modules in various designs
- integrated rails for module mounting, coding
- module rack with backplane
- two redundant gateways possible
- connection of external power supply
- connection of higher-level fieldbus
- LEDs for status/I/O status indications
- connection of EEx i field devices
- module front cap with mechanical coding
Required components for system assembly

In order to assemble a system, it is required to use at least the following components:

1 x MT9-R024 module rack without redundancy function
or MT18-R024 module rack with redundancy function
1 x PSD24Ex 24 VDC power supply unit
1 x GDP1,5 PROFIBUS-DP gateway 1.5 MBaud
1 x RS485 I.S. coupler I.S. coupler for Profieldbus

Binary or analogue input and output modules (depending on the kind of application) from our selection of excom® devices:

- DM80Ex: binary input/output module for connection of NAMUR sensors and low voltage actuators
- DF20Ex: binary input module for frequency measurements or as a counter module
- DI40Ex: binary input module for connection of NAMUR sensors
- DO40Ex: binary output module for connection of EEx i magnetic valves < 0.5 W
- AIH40Ex: analogue input module for connection of 2-wire transmitters with HART® functionality
- AIH41Ex: analogue input module for connection of 4-wire transmitters with HART® functionality
- AOH40Ex: analogue output module for connection of analogue actuators with HART® functionality
- AO40Ex: analogue output module for connection of analogue actuators
- TI40Ex: analogue input module for connection of temperature detectors

PLC/SPC connection

excom® may be connected to all systems with PROFIBUS-DP interface (master functionality).
In order to obtain access to the full function range it is required to use a master with PROFIBUS-DPV1 functionality.

Connections

Bus:
Depending on the kind of module rack, there are either one or two 9-pole D-SUB connectors (redundancy) for bus connection. An explosion proof bus connector (D-SUB connector) must be used, e.g. TURCK type D9T-Ex. It is permitted to use copper cables conform to PROFIBUS-DP or fibre optics (with matching transducers). Due to the RS485 Ex-i layer, it is required to use a DP-Ex-i coupler for mounting.

Power supply:
The module rack contains EEx e terminals for connection of the power supply.

Modules:
The modules are connected via two connectors (16 poles/12 poles) with the backplane.

Inputs/outputs:
The module rack contains four 4-pole connectors for connection of field devices. It is possible to use various connection methods, e.g. screw terminals.

Attention:
It is indispensable to observe and follow the respective regulations of the various protection classes. The components may only be used in combination with the excom® system.

Diagnosis

The gateway provides extended PROFIBUS-DP diagnostics, i.e. the user is provided with the full range of diagnosis data including channel-specific error indications. Additionally, each module is equipped with LEDs for error indications directly in the field. Moreover, all I/O modules feature LEDs for input/output diagnosis and status indications. All LED indications accord to NAMUR NE 44 or DIN EN 60073, i.e.

- green = operational readiness (power on/module function)
- red = error
- yellow = switching status of binary inputs/outputs

Further details are contained in the operation manual.
Intrinsically Safe Remote I/O System

Addressing

The modules are addressed in accordance to the slot they are inserted in. Thus it is not necessary to carry out address settings on the modules. A module inserted into slot 0 has the internal address 0, a module in slot 1 is assigned to address 1, ... a module in slot 16 has address 16.

Setting of the PROFIBUS-DP address is carried out via three coded rotary switches. The maximum address of a rack is therefore address 125. According to PROFIBUS-DP, the system is configured as a modular slave and therefore only the actually present I/O modules are assigned to addresses of the programmable logic control or the process control system.

Transmission Rates/Cycle Times

The PROFIBUS-DP master determines the system-specific transmission rate. Admissible baud rates range from 9.6 to 1500 kBaud. The internal cycle time for processing of 128 binary signals is below 5 ms and for 64 analogue signals below 20 ms. The cycle time of the higher-level bus and the process control system must be added to the response time of the entire system.

The general formula is: \[ T_R = 2 \times (T_I + T_B + T_{PLS}) \]

\( T_R \) = response time; \( T_I \) = internal cycle time Ex link; \( T_B \) = cycle time of higher level bus; \( T_{PLS} \) = cycle time of the process control system.

Software/System Files

Incl. in delivery

Device data base file (GSD-File)

Download from:
www.turck.de
→ Download
→ Software

PROFIBUS-DP (structure)

Up to 126 stations with user data can be operated within a PROFIBUS network. However, the specific transmission characteristics limit the number of stations to 32. If more than 32 stations are to be operated within the network, it must be divided into several segments by installing repeaters and/or segment couplers. The specific task of a repeater is to segment the network but by connecting several repeaters in series it is also possible to extend the network. The maximum number of series-connected repeaters depends on the manufacturer’s specifications. When using segment coupler DP-Ex-i, the physical bus characteristics are limited to intrinsically safe electrical values. The maximum number of stations in an RS485-Ex-i segment is 16. The network expansion accords to that of a non-safe network. Based on the fact that excom® may be operated in zone 1 and that it is required to disconnect the gateway during operation from the bus, the RS485-Ex-i layer is used here. Due to the special characteristics of the RS485-Ex-i layer, it is required to operate excom® with these segment couplers only. Segment couplers and repeaters require a physical address on the bus because of their emitter/receiver circuitry and must therefore be counted to the number of stations within the segment.

<table>
<thead>
<tr>
<th>Baud rate</th>
<th>Bus segment (Length of bus line)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.6 kbps</td>
<td>1200 m</td>
</tr>
<tr>
<td>19.2 kbps</td>
<td>1200 m</td>
</tr>
<tr>
<td>93.75 kbps</td>
<td>1200 m</td>
</tr>
<tr>
<td>187.50 kbps</td>
<td>1000 m</td>
</tr>
<tr>
<td>500 kbps</td>
<td>400 m</td>
</tr>
<tr>
<td>1.5 Mbps</td>
<td>200 m</td>
</tr>
</tbody>
</table>

Fig. Maximum line lengths and various transmission speeds accord. to EN50170-2 when using type A cables.
**Installation Guidelines**

*excom®* is a remote I/O system for installation in explosion hazardous areas, zone 1.

The connection to the SPC or PLC is carried out via PROFIBUS-DP. When using copper cables it is required to use an approved segment coupler. The use of fibre-optics (together with a corresponding transformer) is also permitted. If redundancy is needed, it is possible to install two gateways (module rack MT18 only). These may be exchanged during operation.

The external power supply is connected via EEx e terminals (increased safety) located on the module rack and fed to the 24 VDC power supply modules. Please observe the standard safety regulations for the terminal connections. It is permitted to exchange the power supply modules in zone 1 during operation. If redundancy is required, it is possible to install two power supply units, provided module rack MT18 is used.

The field components, i.e. sensors and actuators located in the explosion hazardous area, are connected via terminals on the module rack. The modules feature protection type “intrinsic safety” and provide secure galvanic isolation. Thus the modules, sensors and actuators may be exchanged during operation (hot-swapping).

If the system is to be installed in zone 1, it is required to use suitable field enclosures. Mounting in field housings in accordance to the requirements of EN 50014 and the respective operation manuals is the responsibility of the customer. Alternatively, it is possible to order factory-assembled systems in an appropriate field housing to ensure that protection type IP54 is fulfilled.

All modules, the gateway to the higher level fieldbus and the power supply feature separate approvals. They may only be used in conjunction with the module rack.
The GDP1.5 serves to connect the excom® system to PROFIBUS-DP networks. Connections to the PROFIBUS-DP can be established via fibre optics (additional module) or copper cables. When using copper cables it is required to use a segment coupler (RS 485 I.S. coupler) on the PROFIBUS-DP side to ensure explosion protection.

The gateway may be configured for a maximum transmission rate of 1500 kBaud. The bus is connected via a standard miniature D-SUB connector on the module rack.

A device data base file (DDBF) for system configuration is available. This file contains all configuration files and parameter sets needed by the system. When connected to certain host systems, it is possible to alter the system configuration during operation.

The gateway provides the entire range of PROFIBUS diagnostic functions including channel-related diagnosis. Additional manufacturer-specific error codes are generated, e.g. HART® communication errors, power supply errors, configuration errors as well as information on simulators, internal communication and redundancy status.

**Redundancy:** The use of two gateways and two bus lines ensures error-free and continuous communication in case of the failure of one of the gateways or bus lines. If one of the components fails, the other immediately takes over (module rack MT18 only).

**Recommended connection components:**
- PROFIBUS-DP cable: ident-no. 6914367
- Connector: ident-no. 6890938

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**GDP1.5**

- Intrinsically safe gateway for PROFIBUS-DP/V1
- Redundant configuration possible
- Up to 16 I/O modules per gateway
- Cycle times:
  - < 5 ms (binary)
  - < 20 ms (analogue)
- LED indications for
  - operational readiness
  - CAN
  - PROFIBUS-DP communication
  - redundancy stand-by
  - configuration errors

**Connections**

- PROFIBUS-DP via D-SUB connectors on module rack
## Gateway GDP1,5
### PROFIBUS-DP interface

<table>
<thead>
<tr>
<th>Type</th>
<th>GDP1,5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ident-no.</td>
<td>68 840 08</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power supply</th>
<th>from central power supply via module rack</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal power consumption</td>
<td>&lt; 3 W</td>
</tr>
</tbody>
</table>

### Connections

<table>
<thead>
<tr>
<th>Connections</th>
<th>PROFIBUS-DP</th>
<th>9-pole D-SUB connector on module rack</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply</td>
<td></td>
<td>via connectors on module rack</td>
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</tbody>
</table>

### Ex Approval

<table>
<thead>
<tr>
<th>Marking</th>
<th>PTB 00 ATEX 2162</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS485 field bus connection (terminal pair)</td>
<td>SYST EEx ib IIC T4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Protection type</th>
<th>EEx ib IIC/IIB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum values</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No-load voltage $U_0$</th>
<th>3.72 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short-circuit current $I_0$</td>
<td>157 mA</td>
</tr>
<tr>
<td>Max. power $P_0$</td>
<td>146 mW</td>
</tr>
<tr>
<td>Typical curve</td>
<td>linear</td>
</tr>
<tr>
<td>– $U_i$</td>
<td>4.2 V</td>
</tr>
</tbody>
</table>

### LED indications

<table>
<thead>
<tr>
<th>Power on</th>
<th>1 x green/red (dual colour LED)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAN</td>
<td>1 x yellow</td>
</tr>
<tr>
<td>PROFIBUS-DP</td>
<td>1 x yellow</td>
</tr>
<tr>
<td>Redundancy stand-by</td>
<td>1 x yellow</td>
</tr>
<tr>
<td>Configuration error</td>
<td>1 x red</td>
</tr>
</tbody>
</table>

### General data

| Galvanic isolation to PROFIBUS-DP | acc. to EN 50020 ($U_{in} = 60 V$) |
| Degree of protection | IP20 |
| Operating temperature | -20...+60 °C |
| Relative humidity | 95% at 55 °C according to EN 60068-2 |
| Vibration and shock testing | according to IEC 68-2-6 und IEC 68-2-27 |

### External RS485 field bus system:

<table>
<thead>
<tr>
<th>Protection type</th>
<th>SYST EEx ib IIC/IIB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum values per terminal pair:</td>
<td></td>
</tr>
<tr>
<td>– $U_i$</td>
<td>4.2 V</td>
</tr>
<tr>
<td>Accumulated max. value of terminal pairs:</td>
<td></td>
</tr>
<tr>
<td>– $I_i$</td>
<td>2.66 A</td>
</tr>
</tbody>
</table>

### Cables: cable type A or B to EN 50039

| – $L'/R'$:      | $\leq 28.5 \mu H/\Omega \leq 15 \mu H/\Omega$ (loop resistance) |
| – $C'$:         | $\leq 250 \text{nF/km}$ |
| Litz wire diameter | $\geq 0.2 \text{mm}$ |

lumped inductances and capacitances within the fieldbus system are not admissible.
The DM80Ex is designed for connection of NAMUR sensors (DIN EN 60947-5-6) and actuators. If mechanical contacts are connected when wire-break and short-circuit monitoring is activated, it is required to integrate a resistor circuitry (WM1, ident-no. 0912101).

The module features protection type EEx ib II C and can thus be used in combination with excom® in explosion hazardous locations, zone 1. The inputs/outputs feature protection type EEx ia IIC.

When connecting field devices, please observe that all inputs/outputs feature a common potential.

The input and output performance is programmed via the PROFIBUS master. Possible parameters are: switching performance, input delay, substitute values, wire-break and short-circuit monitoring. User-defined input/output configuration of the connection points is also possible. The following arrangements are permitted: 8 inputs/0 outputs, 6 inputs /2 outputs .... , 0 inputs/8 outputs (see device data base file, mode 2). Therefore the system can be adjusted optimally to specific application needs.
### Input/output module DM80Ex
8 inputs/outputs for NAMUR sensors/actuators

<table>
<thead>
<tr>
<th>Type</th>
<th>DM80Ex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ident-no.</td>
<td>68 840 06</td>
</tr>
</tbody>
</table>

#### Power supply
- Internal power consumption: < 1.5 W

#### Inputs
- No-load voltage: 8 VDC
- Short-circuit current: approx. 4 mA per input
- Switch-on/off threshold: 1.8 mA/1.4 mA
- Switching frequency: < 100 Hz
- Short-circuit resistance: $R_s < 367 \Omega$
- Wire-break: < 0.2 mA

#### Outputs
- No-load voltage: 8 VDC
- Nominal current: approx. 4 mA per output
- Internal resistance: 320 $\Omega$
- Switching frequency: < 100 Hz
- Short-circuit resistance: $R_s < 367 \Omega$
- Wire-break: < 0.2 mA

#### Ex Approval
- PTB 00 ATEX 2178
- Marking: II 2 (1) G EEx ib [ia] IIC T4
- Max. Ex values (fieldbus circuits): EEx ia IIC/IIB
- No-load voltage: $U_0 \leq 9.6$ V
- Short-circuit current: $I_0 \leq 44$ mA
- Max. power: $P_0 \leq 106$ mW
- Typical curve: linear
- Max. internal capacitances: $L_i$ negligible
- Max. internal capacitances: $C_i$ negligible

<table>
<thead>
<tr>
<th>Max. external capacitances $L_{0i}$</th>
<th>$C_{0i}$ (μF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IIC</td>
<td>IIB</td>
</tr>
<tr>
<td>2</td>
<td>0.9</td>
</tr>
<tr>
<td>1</td>
<td>1.1</td>
</tr>
<tr>
<td>0.5</td>
<td>1.3</td>
</tr>
<tr>
<td>0.2</td>
<td>1.7</td>
</tr>
</tbody>
</table>

#### Parameterisation/configuration
- Bounce time: 0, 10, 20, 50 ms, for groups of two channels
- Inputs/outputs: for groups of two channels
- Wire-break monitoring: for groups of two channels
- Short-circuit monitoring: for groups of two channels
- Function mode: inputs separately programmable for groups of two channels
- Substitute value programming: for groups of two channels

#### LED indications
- Power on/module function: 1 x green/red (dual colour LED)
- Input/output status: 8 x yellow/red (dual colour LED)

#### General data
- Galvanic isolation: to bus and to supply
- Degree of protection: IP20
- Operating temperature: -20…+60 °C
- Relative humidity: 95% at 55 °C according to EN 60068-2
- Vibration and shock testing: according to IEC 68-2-6 and IEC 68-2-27
The input module DF20Ex is equipped with eight channels according to NAMUR which are divided into two blocks. Per block there are one frequency input and three control inputs/outputs.

The module features protection type EEx ib II C and can thus be used in combination with excom® in explosion hazardous locations, zone 1. When connecting field devices, please observe that all inputs/outputs feature a common potential. The inputs/outputs feature protection type EEx ia IIC.

The module can be used as counter or frequency input module and is thus suited for pulse counting of binary input signals or frequency measurements of binary pulse sequences of NAMUR sensors. The counting direction can either be set externally via the control input or parameterised internally.

The maximum frequency of one block is 4 kHz; with 2 blocks the maximum frequency is reduced to 2 kHz.

The input and output performance is programmed via the PROFIBUS master. Each channel is equipped with a parameterisable wire-break and short-circuit monitoring function.

### DF20Ex
- Intrinsically safe frequency module for connection of intrinsically safe NAMUR sensors
- Protection type of field circuits: EEx ia IIC
- Operating modes: counter and frequency input
- Control inputs for direction detection, usable as a reset or enable input
- Short-circuit and wire-break detection per channel
- Galvanic isolation between input and output block, bus and power supply
- All inputs/outputs on common plus potential, i.e. no galvanic isolation between channels

### Connections
- Inputs and outputs via connections on module rack

<table>
<thead>
<tr>
<th>terminal configuration</th>
<th>connection possibilities (selectable)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>counter frequency</td>
</tr>
<tr>
<td></td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>-</td>
</tr>
<tr>
<td>channel 1</td>
<td>IN A</td>
</tr>
<tr>
<td></td>
<td>BN +</td>
</tr>
<tr>
<td></td>
<td>BU -</td>
</tr>
<tr>
<td>channel 2</td>
<td>IN B</td>
</tr>
<tr>
<td></td>
<td>BN +</td>
</tr>
<tr>
<td></td>
<td>BU -</td>
</tr>
<tr>
<td>channel 3</td>
<td>DIR A</td>
</tr>
<tr>
<td></td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>-</td>
</tr>
<tr>
<td>channel 4</td>
<td>DIR B</td>
</tr>
<tr>
<td></td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>-</td>
</tr>
<tr>
<td>channel 5</td>
<td>GATE A</td>
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<tr>
<td></td>
<td>+</td>
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<tr>
<td></td>
<td>-</td>
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<td>channel 6</td>
<td>DIR-OUT B</td>
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<td>+</td>
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<td>-</td>
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<tr>
<td>channel 7</td>
<td>RST A</td>
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<tr>
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<td>+</td>
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<tr>
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<td>-</td>
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<tr>
<td>channel 8</td>
<td>ZERO B</td>
</tr>
<tr>
<td></td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>
Input module
DF20Ex
2 inputs for frequency generators

Type
Ident-no.
DF20Ex
68 840 61

Power supply
from central power supply via module rack
Internal current consumption
< 1.5 W

Inputs/Ouputs
8 channels according to NAMUR (DIN EN 60 947-5-6)
No-load voltage
8 VDC
Short-circuit current/nominal current
approx. 4 mA per channel
Switch-on/off threshold
1.8 mA/1.4 mA
Internal channel resistance
320 Ω
Min switching frequency
> 0.1 Hz
Max. switching frequency
< 4 kHz/2 kHz
Short-circuit
R_s < 367 Ω
Wire-break
< 0.2 mA

Ex Approval
PTB 00 ATEX 2178
Marking
II 2 (1) G EEx ib [ia] IIC T4
Max. Ex values (fieldbus circuits)
EEEx ia IIC/IIB
No-load voltage U_0
≤ 9.6 V
Short-circuit current I_0
≤ 44 mA
Max. power P_0
≤ 106 mW
Typical curve
linear
Max. internal capacitances L_i
negligible
Max. internal capacitances C_i
negligible
Max. external capacitances L_0
Max. external capacitances C_0

<table>
<thead>
<tr>
<th>L_0 (mH)</th>
<th>C_0 (µF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0,9</td>
</tr>
<tr>
<td>1</td>
<td>1,1</td>
</tr>
<tr>
<td>0,5</td>
<td>1,3</td>
</tr>
<tr>
<td>0,2</td>
<td>1,7</td>
</tr>
</tbody>
</table>

Parameters/configuration
Operating mode
counter or frequency input, per module
Wire-break monitoring
per channel
Short-circuit monitoring
per channel
Substitute value programming
per block
Counting direction
per block
Direction detection
per block
Inversion
per channel
Damping of control signals
per block
Gate input
per block
Average forming
per block
Accuracy
– Resolution
0.1% of actual measuring value with a peak time of 300 ms
or 1% of actual measuring value with a peak time of 50 ms

LED indications
Power on/module function
1 x green/red (dual colour LED)
Input/output status
8 x yellow/red (dual colour LED)

General data
Galvanic isolation
to bus and to supply
Degree of protection
IP20
Operating temperature
-20...+60 °C
Relative humidity
95% at 55 °C according to EN 60068-2
Vibration and shock testing
according to IEC 68-2-6 and IEC 68-2-27
The DI40Ex is designed for connection of sensors according to NAMUR (DIN EN 60947-5-6) or mechanical contacts. If mechanical contacts are connected and wire-break and short-circuit monitoring is activated, it is required to implement an appropriate resistor circuitry (WM1, Ident-no. 0912101).

The module features protection type EEx ib II C and can thus be used in explosion hazardous locations, zone 1, in combination with the excom® system. The inputs feature protection type EEx ia IIC.

The inputs are galvanically isolated from each other.

The input performance is programmed via the PROFIBUS master. Possible parameters are: switching performance, input delay, substitute values, wire-break and short-circuit monitoring.
Input module DI40Ex
4 inputs for NAMUR sensors

<table>
<thead>
<tr>
<th><strong>Type</strong></th>
<th>DI40Ex</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ident-no.</strong></td>
<td>68 840 04</td>
</tr>
</tbody>
</table>

**Power supply**
- Internal power consumption: < 2 W
- Power supply: from central power supply via module rack

**Inputs**
- No-load voltage: 8 VDC
- Short-circuit current: approx. 4 mA per input
- Switch-on/off threshold: 1.8 mA/1.3 mA
- Switching frequency (binary input): < 50 Hz
- Short-circuit: $R_s < 367 \, \Omega$
- Wire-break: < 0.1 mA
- 4 sensors acc. to NAMUR (DIN EN 60947)

**Ex approval**
- Marking: II 2 (1) G  EEx ib [ia] IIC T4
- Max. Ex values (field circuits): EEx ia IIC/IIB
- No-load voltage $U_0$: ≤ 8.7 V
- Short-circuit current $I_0$: ≤ 9.6 mA
- Max. power $P_0$: ≤ 21 mW
- Typical curve: linear
- Max. internal inductances $L_i$: negligible
- Max. internal capacitances $C_i$: ≤ 10 nF

<table>
<thead>
<tr>
<th>$L_i$ (mH)</th>
<th>$C_i$ (µF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1.2</td>
</tr>
<tr>
<td>5</td>
<td>5.2</td>
</tr>
</tbody>
</table>

**Parameterisation/configuration**
- Bounce time: 0, 10, 20, 50 ms per channel
- Wire-break monitoring: per channel
- Short-circuit monitoring: per channel
- Function mode: per channel
- Substitute value programming: per channel

**LED indications**
- Power on/module function: 1 x green/red (dual colour LED)
- Input status: 4 x yellow/red (dual colour LED)

**General data**
- Galvanic isolation: complete channels
- Degree of protection: IP20
- Operating temperature: -20...+70 °C
- Relative humidity: 95% at 55 °C according to EN 60068-2
- Vibration and shock testing: according to IEC 68-2-6 and IEC 68-2-27
The DO40Ex is designed for connection of intrinsically safe actuators.

The module features protection type EEx ib IIC and can thus be used in combination with excom® in explosion hazardous locations, zone 1. The protection type of the outputs is EEx ia IIC.

The outputs are galvanically isolated from each other.

One actuator per channel can be connected. By selection the connection, each channel has two intrinsically safe circuits with different Ex data.

The values of the solenoid drive are shown in the table on the right. The admissible limit values can be taken from the respective Ex approvals of the valve manufacturers.

The following variations are possible:
- 24 V/6 mA
- 18 V/25 mA
- 15 V/35 mA
- 12 V/45 mA

DO40Ex

- Output module for connection of intrinsically safe actuators
- Protection type of field circuits: EEx ia IIC
- For connection of up to four valves or displays
- Wire-break and short-circuit monitoring
- Galvanic isolation between output, bus and power supply
- Galvanic isolation between channels

Connections
- Outputs via connections on module rack

\[ \text{terminal configuration} \]

\[ \begin{align*}
\text{channel 1} & : & U_0 < 27.0 \, \text{V} \\
\text{channel 2} & : & U_0 < 18.9 \, \text{V} \\
\text{channel 3} & : & U_0 < 18.9 \, \text{V} \\
\text{channel 4} & : & U_0 < 27.0 \, \text{V}
\end{align*} \]

\[ \text{connection possibilities (selectable)} \]
Output module DO40Ex
4 outputs for actuators 10...24 VDC

Type
DO40Ex
Ident-no.
68 840 07

Power supply
from central power supply via module rack
Internal power consumption
< 4.5 W

Outputs
4 actuators
4 actuators
No-load voltage
16 VDC
24 VDC
Nominal current
15 V/35 mA; 12 V/45 mA
24V/6 mA; 18 V/25 mA
Internal resistance
300 Ω
300 Ω
Switching frequency
< 100 Hz
< 100 Hz
Short-circuit (cyclic)
R_s < 180 Ω
R_s < 180 Ω
Wire-break
< 1 mA
< 1 mA

Ex Approval
Marking
PTB 01 ATEX 2047
PTB 01 ATEX 2047
Maximum Ex values (field circuits)
II 2 (1) G EEx ib [ia] IIC T4
II 2 (1) G EEx ib [ia] IIC T4
Short-circuit current I_s
≤ 100 mA
≤ 100 mA
No-load voltage U_s
≤ 18.9 V
≤ 27 V
Max. power P_0
≤ 675 mW
≤ 675 mW
Typical curve
trapezoidal
linear
Max. internal inductances L_i
Max. internal capacitances C_i
24 nF
negligible
Max. external inductances L_0
Max. external capacitances C_0
negligible

IIC IIB
L_s (mH) C_s (nF) C_0 (nF)

<table>
<thead>
<tr>
<th>L_s (mH)</th>
<th>C_s (nF)</th>
<th>C_0 (nF)</th>
<th>L_s (mH)</th>
<th>C_s (nF)</th>
<th>C_0 (nF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>–</td>
<td>976</td>
<td>2</td>
<td>–</td>
<td>286</td>
</tr>
<tr>
<td>1</td>
<td>86</td>
<td>976</td>
<td>0.99</td>
<td>30</td>
<td>346</td>
</tr>
<tr>
<td>0.5</td>
<td>106</td>
<td>976</td>
<td>0.5</td>
<td>46</td>
<td>426</td>
</tr>
<tr>
<td>0.2</td>
<td>156</td>
<td>1176</td>
<td>0.2</td>
<td>66</td>
<td>576</td>
</tr>
</tbody>
</table>

Parameterisation/Configuration
Wire-break monitoring per channel
Short-circuit monitoring per channel
Substitute value programming per channel
Line of action per channel

LED indications
Power on/module function 1 x green/red (dual colour LED)
Output status 4 x yellow/red (dual colour LED)

General data
Galvanic isolation complete isolation
Degree of protection IP20
Operating temperature -20...+60 °C
Relative humidity 95% at 55 °C according to EN 60068-2
Vibration and shock testing according to IEC 68-2-6 and IEC 68-2-27

Load curve

Сенсорлинк-Логистика +7 495 9250054 - email:sl@sensorlink.ru - www.sensorlink.ru
The AIH40Ex is designed to connect up to four 2-wire transducers (active input = source mode/transducer passive).

The module features protection type EEx ib IIC and can thus be used in combination with excom® in explosion hazardous locations, zone 1. The inputs feature protection type EEx ia IIC.

There is no galvanic isolation between the inputs. When connecting field devices, please observe that all inputs feature a common potential.

The resolution is 14 bits, i.e. the analogue value of 0...25 mA is digitized as a figure between 0 and 16384. To simplify data reproduction, the digitized value is then spread between a range of 0...25,000 and transferred to the host system.

HART®-compatible sensors may be connected to the modules; communication takes place via the integrated HART® controller.

Up to 8 HART® variables (a maximum of four per channel) can be read via the cyclic user data transfer of the PROFIBUS-DP. The bidirectional data transfer between the host system and the HART® transmitter is enabled by PROFIBUS-DPV1 services. Parameters such as wire-break and short-circuit monitoring, measuring range and HART® communication parameters can be set separately for each channel. They can be set via the PROFIBUS-DP master only.
**Input module AIH40Ex**

4 analogue inputs (HART®)

<table>
<thead>
<tr>
<th><strong>Type</strong></th>
<th>AIH40Ex</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ident-no.</strong></td>
<td>68 840 01</td>
</tr>
</tbody>
</table>

**Power supply**

- From central power supply via module rack
- Internal power consumption: < 3.5 W

<table>
<thead>
<tr>
<th><strong>Inputs</strong></th>
<th>4 analogue sensors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input voltage</strong></td>
<td>&gt; 15.0 VDC at 22 mA (at transducer)</td>
</tr>
<tr>
<td><strong>Input current</strong></td>
<td>0/4...20 mA per input</td>
</tr>
<tr>
<td><strong>HART® impedance</strong></td>
<td>&gt; 240 Ω</td>
</tr>
<tr>
<td><strong>Overrange</strong></td>
<td>&gt; 22 mA</td>
</tr>
<tr>
<td><strong>Short-circuit</strong></td>
<td>&lt; 5 V (in live zero mode only)</td>
</tr>
<tr>
<td><strong>Underrange</strong></td>
<td>2...3.6 mA</td>
</tr>
<tr>
<td><strong>Wire-break</strong></td>
<td>&lt; 2 mA (in live zero mode only)</td>
</tr>
<tr>
<td><strong>Resolution</strong></td>
<td>14 bit</td>
</tr>
</tbody>
</table>

**Ex Approval**

- PTB 00 ATEX 2059 X
- Marking: II 2 (1) G Ex [ia] ib IIC T4
- Max. Ex values (field circuits): EEx ia IIC/IIB
- No-load voltage $U_0$: ≤ 22.1 V
- Short-circuit current $I_0$: ≤ 93 mA
- Max. power $P_0$: ≤ 403 mW
- Typical curve: trapezoidal
- $U_0$: 27.54 V
- $R$: 298 Ω
- Max. internal inductances $L_i$: ≤ 0.22 mH
- Max. internal capacitances $C_i$: ≤ 1.1 nF

| Max. external inductances $L_o$ | IIC | 1.78 mH | IIB | 1.78 mH |
| Max. external capacitances $C_o$ | 100 nF | 500 nF |

**Parameterisation/Configuration**

- Wire-break monitoring: per channel
- Short-circuit monitoring: per channel
- Substitute value programming: per channel
- Live zero/dead zero: per channel
- Software filter: per channel
- HART® status polling: per channel
- Mapping of virtual HART® variables: per channel
- 50/60 Hz suppression: > 30 dB

**LED indications**

- Power on/module function: 1 x green/red (dual colour LED)
- Input status: 4 x red

**General data**

- Galvanic isolation: to bus and to supply
- Degree of protection: IP20
- Operating temperature: -20...+70 °C
- Relative humidity: 95% at 55 °C according to EN60069-2
- Vibration and shock testing: according to IEC 68-2-6 and IEC 68-2-27
The AIH41Ex is designed to connect up to four 4-wire transducers (passive input = sink mode/transducer active).

The module features protection type EEx ib IIC and can thus be used in combination with excom® in explosion hazardous locations, zone 1. The inputs feature protection type EEx ia IIC.

There is no galvanic isolation between the inputs. When connecting field devices, please observe that all inputs feature a common potential.

The resolution is 14 bits, i.e. the analogue value of 0...25 mA is digitized as a figure between 0 and 16384. To simplify data reproduction, the digitized value is then spread between a range of 0...25,000 and transferred to the host system.

HART®-compatible sensors may be connected to the modules; communication takes place via the integrated HART® controller.

Up to 8 HART® variables (a maximum of four per channel) can be read via the cyclic user data transfer of the PROFIBUS-DP. The bidirectional data transfer between the host system and the HART® transmitter is enabled by PROFIBUS-DPV1 services. Parameters such as wire-break and short-circuit monitoring, measuring range and HART® communication parameters can be set separately for each channel. They can be set via the PROFIBUS-DP master only.
<table>
<thead>
<tr>
<th>Type</th>
<th>AIH41Ex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ident-no.</td>
<td>68 840 05</td>
</tr>
<tr>
<td>Power supply</td>
<td>from central power supply via module rack</td>
</tr>
<tr>
<td>Internal power consumption</td>
<td>&lt; 3.5 W</td>
</tr>
<tr>
<td>Inputs</td>
<td>4 analogue sensors</td>
</tr>
<tr>
<td>Input current</td>
<td>0/4...20 mA per input</td>
</tr>
<tr>
<td>HART® impedance</td>
<td>&gt; 240 Ω</td>
</tr>
<tr>
<td>Overrange</td>
<td>&gt; 22 mA</td>
</tr>
<tr>
<td>Short-circuit</td>
<td>&lt; 5 V (in live zero mode only)</td>
</tr>
<tr>
<td>Underrange</td>
<td>2...3.6 mA</td>
</tr>
<tr>
<td>Wire-break</td>
<td>&lt; 2 mA (in live zero mode only)</td>
</tr>
<tr>
<td>Resolution</td>
<td>14 bit</td>
</tr>
<tr>
<td>Linearity tolerance</td>
<td>&lt; 0.1 % (of final value)</td>
</tr>
<tr>
<td>Temperature drift</td>
<td>&lt; 50 ppm/K</td>
</tr>
<tr>
<td>Rise/release time</td>
<td>&lt; 50 ms (10...90 %)</td>
</tr>
<tr>
<td>Ex Approval</td>
<td>PTB 00 ATEX 2059 X</td>
</tr>
<tr>
<td>Marking</td>
<td>II 2 (1) G EEx ib [ia] IIC T4</td>
</tr>
<tr>
<td>Max. Ex values (field circuits)</td>
<td>EEx ia IIC/IIB</td>
</tr>
<tr>
<td>No-load voltage $U_0$</td>
<td>≤ 7.2 V</td>
</tr>
<tr>
<td>Short-circuit current $I_0$</td>
<td>≤ 16 mA</td>
</tr>
<tr>
<td>Max. power $P_0$</td>
<td>≤ 29 mW</td>
</tr>
<tr>
<td>Typical curve</td>
<td>linear</td>
</tr>
<tr>
<td>Max. internal inductances $L_1$</td>
<td>≤ 0.11 mH</td>
</tr>
<tr>
<td>Max. internal capacitances $C_1$</td>
<td>≤ 1.1 nF</td>
</tr>
<tr>
<td>Max. external inductances $L_0$</td>
<td>see tables on page 22</td>
</tr>
<tr>
<td>Max. external capacitances $C_0$</td>
<td>see tables on page 22</td>
</tr>
<tr>
<td>Parameterisation/Configuration</td>
<td>per channel</td>
</tr>
<tr>
<td>Wire-break monitoring</td>
<td>per channel</td>
</tr>
<tr>
<td>Short-circuit monitoring</td>
<td>per channel</td>
</tr>
<tr>
<td>Substitute value programming</td>
<td>per channel</td>
</tr>
<tr>
<td>Live zero/dead zero</td>
<td>per channel</td>
</tr>
<tr>
<td>Software filter</td>
<td>per channel</td>
</tr>
<tr>
<td>HART® status polling</td>
<td>per channel</td>
</tr>
<tr>
<td>Mapping of virtual HART® variables</td>
<td>per channel</td>
</tr>
<tr>
<td>50/60 Hz suppression</td>
<td>&gt; 30 dB</td>
</tr>
<tr>
<td>LED indications</td>
<td>1 x green/red (dual colour LED)</td>
</tr>
<tr>
<td>Power on/module function</td>
<td>4 x red</td>
</tr>
<tr>
<td>Input status</td>
<td></td>
</tr>
<tr>
<td>General data</td>
<td>to bus and to supply</td>
</tr>
<tr>
<td>Galvanic isolation</td>
<td>IP20</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>-20...+70 °C</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>95% at 55 °C according to EN60069-2</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>according to IEC 68-2-6 and IEC 68-2-27</td>
</tr>
<tr>
<td>Vibration and shock testing</td>
<td></td>
</tr>
</tbody>
</table>

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**Input module**

**AIH41Ex**

4 analogue inputs (HART®)

Max. external inductances $L_0$
Max. external capacitances $C_0$

### For active intrinsically safe transducers with linear output curve $I_i = 100$ mA

<table>
<thead>
<tr>
<th>$U_i$</th>
<th>$L_0$</th>
<th>$C_0$</th>
<th>$L_i$</th>
<th>$C_i$</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 V</td>
<td>2.4 mH</td>
<td>4.2 µF</td>
<td>9.8 mH</td>
<td>33 µF</td>
</tr>
<tr>
<td>5 V</td>
<td>2.4 mH</td>
<td>1.3 µF</td>
<td>9.8 mH</td>
<td>8.3 µF</td>
</tr>
<tr>
<td>10 V</td>
<td>2.4 mH</td>
<td>358 nF</td>
<td>9.8 mH</td>
<td>2.1 µF</td>
</tr>
<tr>
<td>15 V</td>
<td>2.4 mH</td>
<td>158 nF</td>
<td>9.8 mH</td>
<td>1.1 µF</td>
</tr>
<tr>
<td>16.5 V</td>
<td>2.4 mH</td>
<td>126 nF</td>
<td>9.8 mH</td>
<td>950 nF</td>
</tr>
<tr>
<td>20 V</td>
<td>2.4 mH</td>
<td>87 nF</td>
<td>9.8 mH</td>
<td>688 nF</td>
</tr>
<tr>
<td>22 V</td>
<td>2.4 mH</td>
<td>71 nF</td>
<td>9.8 mH</td>
<td>594 nF</td>
</tr>
<tr>
<td>25 V</td>
<td>2.0 mH</td>
<td>54 nF</td>
<td>9.0 mH</td>
<td>465 nF</td>
</tr>
<tr>
<td>30 V</td>
<td>2.0 mH</td>
<td>37 nF</td>
<td>9.0 mH</td>
<td>345 nF</td>
</tr>
</tbody>
</table>

### For active intrinsically safe transducers with trapezoidal output curve

<table>
<thead>
<tr>
<th>$U_i$</th>
<th>$I_i$</th>
<th>$L_0$</th>
<th>$C_0$</th>
<th>$L_i$</th>
<th>$C_i$</th>
</tr>
</thead>
<tbody>
<tr>
<td>22.1 V</td>
<td>93 mA</td>
<td>0.5 mH</td>
<td>60 nF</td>
<td>2 mH</td>
<td>250 nF</td>
</tr>
</tbody>
</table>

### For active intrinsically safe transducers with rectangular or trapezoidal output curve

<table>
<thead>
<tr>
<th>$U_i$</th>
<th>$I_i$</th>
<th>$L_0$</th>
<th>$C_0$</th>
<th>$L_i$</th>
<th>$C_i$</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 V</td>
<td>100 mA</td>
<td>1.99 mH</td>
<td>500 nF</td>
<td>4.89 mH</td>
<td>3 µF</td>
</tr>
<tr>
<td>5 V</td>
<td>100 mA</td>
<td>1.99 mH</td>
<td>300 nF</td>
<td>4.89 mH</td>
<td>1.5 µF</td>
</tr>
<tr>
<td>10 V</td>
<td>90 mA</td>
<td>1.99 mH</td>
<td>200 nF</td>
<td>4.89 mH</td>
<td>1 µF</td>
</tr>
<tr>
<td>15 V</td>
<td>56 mA</td>
<td>0.99 mH</td>
<td>100 nF</td>
<td>4.89 mH</td>
<td>500 nF</td>
</tr>
<tr>
<td>16.5 V</td>
<td>49 mA</td>
<td>0.99 mH</td>
<td>100 nF</td>
<td>4.89 mH</td>
<td>500 nF</td>
</tr>
<tr>
<td>20 V</td>
<td>35 mA</td>
<td>0.99 mH</td>
<td>70 nF</td>
<td>4.89 mH</td>
<td>300 nF</td>
</tr>
<tr>
<td>16.5 V</td>
<td>97 mA</td>
<td>–</td>
<td>–</td>
<td>1.99 mH</td>
<td>400 nF</td>
</tr>
<tr>
<td>20 V</td>
<td>80 mA</td>
<td>–</td>
<td>–</td>
<td>0.99 mH</td>
<td>300 nF</td>
</tr>
<tr>
<td>22 V</td>
<td>65 mA</td>
<td>–</td>
<td>–</td>
<td>0.99 mH</td>
<td>300 nF</td>
</tr>
<tr>
<td>25 V</td>
<td>50 mH</td>
<td>–</td>
<td>–</td>
<td>0.99 mH</td>
<td>250 nF</td>
</tr>
</tbody>
</table>
The AOH40Ex is designed for connection of intrinsically safe actuators such as control valves or process indicators.

The module features protection type EEx ib IIC and can be used in combination with excom® in explosion hazardous locations, zone 1. The protection type of the outputs is EEx ia IIC.

The module is suited for connection of HART®-compatible actuators which communicate directly with the HART® controller.

The resolution is 12 bits, i.e. the analogue value of 0...25 mA is reproduced as a figure between 0 and 4095. To simplify data presentation, the host system operates with a value range of 0...25,000. This non-linearised value is reduced by the AO40Ex to resolution of 12 bits.

Parameters such as line monitoring, substitute values, can be set separately for each channel. They can be set via a PROFIBUS-DP master only.

**AOH40Ex**

- Intrinsically safe output module for connection of 0/4...20 mA actuators
- Protection type of field circuits: EEx ia IIC
- For connection of up to four actuators
- Wire-break and short-circuit monitoring
- Galvanic isolation between output, bus and power supply
- Outputs connected to a common frame potential, i.e. no galvanic isolation between channels
- Transmission of HART® data

**Connections**
- Outputs via connections on module rack
Output module AOH40Ex
4 analogue outputs for actuators

<table>
<thead>
<tr>
<th>Type</th>
<th>AOH40Ex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ident-no.</td>
<td>68 840 03</td>
</tr>
</tbody>
</table>

**Power supply**
- from central power supply via module rack
- Internal power consumption: < 3.5 W

**Outputs**
- 4 analogue actuators
  - No-load voltage: < 16 VDC
  - Output current: 0...22 mA per output
  - External load: < 600 Ω
  - HART® impedance: > 240 Ω
  - Short-circuit: < 50 Ω (in live zero mode only)
  - Wire-break: > 15 V (in live zero mode only)
  - Resolution: 12 bit
  - Linearity tolerance: < 0.1 % of final value
  - Temperature drift: < 50 ppm/K
  - Rise/release time: < 50 ms (10...90 %)

**Ex Approval**
- PTB 00 ATEX 2051
- Marking: II 2 (1) G EEx ib [ia] IIC T4
- Max. Ex values (field circuits):
  - EEx ia IIC/IIB

<table>
<thead>
<tr>
<th>Parameterisation/configuration</th>
<th>EEx ia und EEx ib</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. external inductances L_i</td>
<td>IIC</td>
</tr>
<tr>
<td>Max. internal inductances L_i</td>
<td>≤ 0.22 mH</td>
</tr>
<tr>
<td>Max. internal capacitances C_i</td>
<td>≤ 1.1 nF</td>
</tr>
<tr>
<td>Max. external capacitances C_0</td>
<td>1.78 mH</td>
</tr>
<tr>
<td>Max. external capacitances C_0</td>
<td>100 nF</td>
</tr>
</tbody>
</table>

**Parameterisation/configuration**
- Wire-break monitoring: per channel
- Short-circuit monitoring: per channel
- Substitute value programming: per channel
- Live zero/dead zero: per channel

**LED indications**
- Power on/module function: 1 x green/red (dual colour LED)
- Output status: 4 x red

**General data**
- Galvanic isolation: to bus and to supply
- Degree of protection: IP20
- Operating temperature: -20...+70 °C
- Relative humidity: 95% at 55 °C according to EN 60068-2
- Vibration and shock testing: according to IEC 68-2-6 and IEC 68-2-27
The AO40Ex is designed for connection of intrinsically safe actuators such as control valves or process indicators.

The module features protection type EEx ib IIIC and can be used in combination with excom® in explosion hazardous locations, zone 1. The protection type of the outputs is EEx ia IIIC.

The module is suited for connection of HART®-compatible actuators. Parameterisation can thus be accomplished with an approved modem directly via the connection level of the module rack.

The resolution is 13 bits, i.e. the analogue value of 0...25 mA is reproduced as a figure between 0 and 8191. To simplify data presentation, the host system operates with a value range of 0...25,000. This non-linearised value is reduced by the AO40Ex to a resolution of 13 bits.

Parameters such as line monitoring, substitute values, can be set separately for each channel. They can be set via a PROFIBUS-DP master only.
Output module AO40Ex
4 analogue outputs for actuators

<table>
<thead>
<tr>
<th>Type</th>
<th>AO40Ex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ident-no.</td>
<td>68 840 02</td>
</tr>
</tbody>
</table>

**Power supply**
- Internal power consumption: < 3.5 W

**Outputs**
- 4 analogue actuators
- No-load voltage: < 16 VDC
- Output current: 0/4...20 mA per output
- External load: < 600 Ω
- HART® impedance: > 240 Ω
- Short-circuit: < 100 Ω (in live zero mode only)
- Wire-break: < 2 mA (in live zero mode only)
- Resolution: 13 bit
- Linearity tolerance: < 0.1 % of final value
- Temperature drift: < 50 ppm/K
- Rise/release time: < 50 ms (10...90 %)

**Ex Approval**
- PTB 00 ATEX 2179
- Marking: II 2 (1) G EEx ib [ia] IIC T4
- Max. Ex values (field circuits): EEEx ia IIC/IIB

**Parameterisation/configuration**
- Wire-break monitoring: per channel
- Short-circuit monitoring: per channel
- Substitute value programming: per channel
- Live zero/dead zero: per channel

**LED indications**
- Power on/module function: 1 x green/red (dual colour LED)
- Output status: 4 x red

**General data**
- Galvanic isolation: complete isolation
- Degree of protection: IP20
- Operating temperature: -20...+60 °C
- Relative humidity: 95% at 55 °C according to EN 60068-2
- Vibration and shock testing: according to IEC 68-2-6 and IEC 68-2-27
Intrinsically Safe Remote I/O System

The TI40Ex is designed for connection of 2, 3 and 4-wire temperature detectors, types PT100, PT200, PT400, PT1000, Ni100 and CU100, as well as for connection of thermo-element types B, E, D, J, K, L, N, R, S, T and U. The module may also be used for measuring low voltage signals (-75...+75 mV, -1.2...+1.2 V) and for resistance measurements (0...30 Ω, 0...300 Ω, 0...3 kΩ).

The module features protection type EEx ib IIC and can thus be used in combination with excom® in explosion hazardous locations, zone 1. The inputs feature protection type EEx ia IIC.

When connecting 2-wire temperature detectors, compensation is accomplished during on-line parameterisation. The measuring circuits as well as the two additional terminals are short-circuited and compensation is carried out automatically. When using thermo-elements, cold junction compensation can be accomplished separately for each channel by connecting resistance detectors as specified above, e.g. PT100 resistors, to the two unused terminals. Selection and parameterisation of internal compensation via an integrated PT100 resistance detector affects all channels.

The resolution is 16 bits, i.e. the analogue value is reproduced as a figure between 0 and 65536. The temperature is indicated as a value in Kelvin. For conversion to °C, please observe an offset of 273.2.

Parameters such as line monitoring, substitute values, can be set separately for each channel. They can be set via a PROFIBUS-DP master only.

TI40Ex

- Intrinsically safe analogue input module for connection of temperature detectors such as PT100, PT200, PT400, PT1000, CU100 and Ni100 as well as thermo-elements, types B, E, D, J, K, L, N, R, S, T, U
- Protection type of field circuits: EEx ia IIC
- For connection of up to four 2-, 3- or 4-wire detectors
- Wire-break and short-circuit monitoring
- Galvanic isolation between input, bus and power supply
- Galvanic isolation between channels

Connections

- Inputs via connections on module rack

terminal configuration

connection possibilities (selectable)

channel 1

11

12

13

14

channel 2

21

22

24

RTH-3L

channel 3

31

34

RTH-2L

channel 4

41

42

43

44

RTH-4L

TC

PT100-VG
## Input module TI40Ex

### 4 inputs for thermo-elements

<table>
<thead>
<tr>
<th>Type</th>
<th>TI40Ex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ident no.</td>
<td>68 840 00</td>
</tr>
<tr>
<td>Power supply</td>
<td>from central power supply via module rack</td>
</tr>
<tr>
<td>Internal power consumption</td>
<td>&lt; 3 W</td>
</tr>
</tbody>
</table>

### Inputs

- **Input (resistance temperature detector)**: four 2-/3-/4-wire resistance temperature detectors
  - Line resistance (4-wire): < 50 Ω
  - Line resistance (3-wire): < 10 Ω
  - Line resistance (2-wire): < 5 Ω
  - Resolution: 16 bits
  - Short-circuit: < 5 Ω
  - Wire-break: > 500 Ω measuring range 0...300 Ω
  - Temperature drift: < 50 ppm/K
- **Input (thermo-element)**: types B, E, D, J, K, L, N, R, S, T and U
  - Resolution: 16 bits
  - Wire-break: < 100 nA / > 150 mV

### Ex Approval

- PTB 00 ATEX 2181
- Marking II 2 (1) G Ex ib [ia] IIC T4
- Max. Ex values (field circuits): connection to passive field device (e.g. resistance detectors) Ex ia IIC/IEEx ia IIC/IE
- Connection to active field device (e.g. thermo-elements)

### Ex Approval (continued)

- No-load voltage $U_0$: ≤ 5.5 V
- Short-circuit current $I_0$: ≤ 25 mA
- Max. power $P_0$: ≤ 35 mW
- Typical curve: linear
- Max. internal inductances $L_1$: negligible
- Max. internal capacitances $C_1$: 60 nF
- Max. external inductances $L_0$: negligible
- Max. external capacitances $C_0$: negligible

### LED indications

- Power on/module function: 1 x green/red (dual colour LED)
- Input status: 4 x red

### General data

- **Galvanic isolation**: complete isolation
- **Degree of protection**: IP20
- **Operating temperature**: -20...+70 °C
- **Relative humidity**: 95% at 55 °C according to EN60069-2
- **Vibration and shock testing**: according to IEC 68-2-6 and IEC 68-2-27

<table>
<thead>
<tr>
<th>$L_0$ (mH)</th>
<th>IIIC</th>
<th>IIIB</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2.6</td>
<td>15</td>
</tr>
<tr>
<td>1</td>
<td>2.9</td>
<td>17</td>
</tr>
<tr>
<td>0.5</td>
<td>3.6</td>
<td>21</td>
</tr>
<tr>
<td>0.2</td>
<td>4.5</td>
<td>27</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$C_0$ (µF)</th>
<th>IIIC</th>
<th>IIIB</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1.6</td>
<td>9.8</td>
</tr>
<tr>
<td>1</td>
<td>1.9</td>
<td>12</td>
</tr>
<tr>
<td>0.5</td>
<td>2.3</td>
<td>14</td>
</tr>
<tr>
<td>0.2</td>
<td>3.0</td>
<td>19</td>
</tr>
</tbody>
</table>

### Parameterisation/configuration

- Wire-break monitoring: per channel
- Short-circuit monitoring: per channel
- Substitute value programming: per channel
- Software filter: per channel
- 50/60 Hz suppression: > 20 dB

**Сенсорлинк-Логистика** +7 495 9250054 - email: sl@sensorlink.ru - www.sensorlink.ru
The module rack MT18-R024 consists of the backplane and the actual rack system. It accommodates two gateways, two power supplies and sixteen I/O modules. Up to 128 binary inputs/outputs or 64 analogue inputs/outputs can be connected to the rack. Any combination is possible.

A further module rack version such as the MT9-R024 is also available. The module rack MT9-R024 allows connection of one power supply unit, one gateway and up to eight I/O modules. Contrary to the MT18-R024 module rack, it is not possible to configure a redundant system with double gateways or power supplies.

Modules can be inserted and removed during operation without interruption of data communication (gateways and power supplies only in case of redundant system design).

The module rack features a combined protection type: EEx e and EEx i. It is thus suited for installation in zone 1.

The power supply for the modules is located on the backplane. Its energy is limited to avoid sparking. Therefore modules can be plugged into or removed from the rack in zone 1 during operation.

The rack system is made of extruded aluminium sections to increase robustness and ensure shielding. The module racks are suited for wall mounting and 19" rail mounting.
<table>
<thead>
<tr>
<th>Connections</th>
<th>MT18-R024</th>
<th>MT9-R024</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus (D-SUB, miniature 9-pole version)</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Supply (EEx e dual screw terminals)</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Connection profile</td>
<td>0.2...4 mm², rigid, or 0.2...2.5 mm² with wire sleeve</td>
<td></td>
</tr>
<tr>
<td>Field devices</td>
<td>per module: 4 x 4 screw terminals</td>
<td></td>
</tr>
<tr>
<td>Connection profile</td>
<td>0.25...1.5 mm² with wire sleeve (without plastic sleeve)</td>
<td></td>
</tr>
<tr>
<td>Plug-in terminals &quot;Mini Combi&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Slots</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Gateway</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I/O module</td>
<td>16</td>
<td>8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Adjustments</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus address</td>
<td></td>
<td>3 decimal-coded rotary switches</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ex Approval</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Marking</td>
<td>PTB 00 ATEX 2194 U</td>
<td></td>
</tr>
<tr>
<td>Power supply connection</td>
<td>II 2 (1) G EEx e ib [ia] IIC</td>
<td></td>
</tr>
<tr>
<td>– $U_{in}$</td>
<td>$\leq 40$ V</td>
<td></td>
</tr>
<tr>
<td>– $I_{in}$</td>
<td>$\leq 11$ A</td>
<td></td>
</tr>
<tr>
<td>– $P_{in}$</td>
<td>$\leq 100$ W</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>General data</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree of protection</td>
<td>IP20</td>
<td></td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-20...+70 °C</td>
<td></td>
</tr>
<tr>
<td>Relative humidity</td>
<td>95% at 55 °C according to EN60069-2</td>
<td></td>
</tr>
<tr>
<td>Vibration and shock testing</td>
<td>according to IEC 68-2-6 and IEC 68-2-27</td>
<td></td>
</tr>
<tr>
<td>Dimensions (w x h x d) [mm]</td>
<td>439.5 x 320 x 130</td>
<td>226.5 x 210 x 130</td>
</tr>
<tr>
<td>(without mounting brackets)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Intrinsically Safe Remote I/O System

The power supply unit PSD24Ex serves to supply the excom® system. It is sufficient for a fully assembled system.

The power supply features a protection type combining EEx m, EEx e and EEx i and can thus be installed in zone 1. Power supplies are integrated into protective aluminium housings and are fully encapsulated.

If the system is configured with redundant power supplies, it is possible to remove a defect power supply from the rack for replacement during operation (with module rack MT18-R024 only).

The PSD24Ex provides a supply voltage of 18...32 VDC.

Connection of the external supply is established via Ex e terminals. It is not permitted to access live terminals of this kind. They are located under a protective cap and may only be accessed after suspending the power supply.

Redundancy:
It is possible to use two power supplies. If one of the devices or the incoming line fails, the second power supply takes over supply of the entire system. It is possible to use different potentials for supply.

PSD24Ex

- DC power supply unit for supply of a fully configured module rack
- Redundant operation possible
- Protection type EEx m, EEx e, EEx i
- Supply of up to 128 binary or 64 analogue inputs/outputs
- Aluminium housing
- Complete encapsulation

Connections
- Via module rack
<table>
<thead>
<tr>
<th>Type</th>
<th>PSD24Ex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ident-no.</td>
<td>68 817 21</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power supply</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>External</td>
<td>18...32 VDC (ripple Wpp &lt; 10 %)</td>
</tr>
<tr>
<td>Power output</td>
<td>60 W</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LED indications</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Power on/module function</td>
<td>1 x green</td>
</tr>
<tr>
<td>Supply</td>
<td>1 x green</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ex Approval</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Marking</td>
<td>PTB 00 ATEX 2193</td>
</tr>
<tr>
<td>– U_in</td>
<td>II 2 G EEx m [b] e IIC T4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>General data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Galvanic isolation</td>
<td>complete isolation</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP50</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-20...+70 °C</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>95% at 55 °C according to EN60069-2</td>
</tr>
<tr>
<td>Vibration and shock testing</td>
<td>according to IEC 68-2-6 and IEC 68-2-27</td>
</tr>
<tr>
<td>Mounting</td>
<td>flange, 4 x M4 screws</td>
</tr>
<tr>
<td>Dimensions (w x h x d)</td>
<td>45 mm x 155 mm x 106 mm</td>
</tr>
</tbody>
</table>
Bitte senden Sie mir Unterlagen:

**Sensortechnik**
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- Temperaturwächter
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- Linearweg-Sensoren
- Drehweg-Sensoren
- Steckverbinder
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**Interfacechnik**
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- Zeit- und Überwachungsrelais
- Ex-Schutz – Grundlagen für die Praxis (Übersichtsposter)
- CD-ROM Interfacechnik

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- busstop®-Feldbuskomponenten
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- Bussystem sensoplex®2Ex
- Bussystem sensoplex®MC
- Bussystem DeviceNet™
- Ethernet Netzwerkkomponenten
- BL20 – modulares Feldbus-I/O-System in IP20
- BL67 – modulares Feldbus-I/O-System in IP67
- Bussystem FOUNDATION™ fieldbus
- Bussystem PROFIBUS-DP
- Bussystem PROFIBUS-PA
- Bussystem piconet®
- Remote I/O excom®
- …………………………………………

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- pressure controls
- temperature controls
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- rotary position sensors
- connectors
- CD-ROM Sensors

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- devices on 19" card for DIN-rail mounting (DIN 41494)
- miniature relays, industrial relays, time cubes, sockets
- programmable relays and timers
- explosion protection – basics for practical application (overview poster)
- CD-ROM Interfacechnology

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- busstop® fieldbus components
- bus system sensoplex®2
- bus system sensoplex®2Ex
- bus system sensoplex®MC
- bus system DeviceNet™
- Ethernet network components
- BL20 – modular fieldbus I/O-system in IP20
- BL67 – modular fieldbus I/O-system in IP67
- bus system FOUNDATION™ fieldbus
- bus system PROFIBUS-DP
- bus system PROFIBUS-PA
- bus system piconet®
- Remote I/O excom®
- …………………………………………

---

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Absender/Sender:

Name:

Firma/Company:

Abt./Position:

Adresse/Address:

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E-Mail:

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www.sensorlink.ru
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