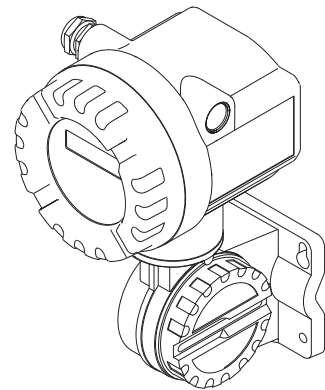Operating Instructions

Proline Prowirl 72

Vortex Flow Measuring System
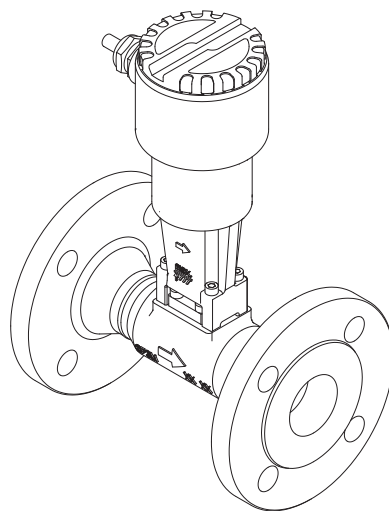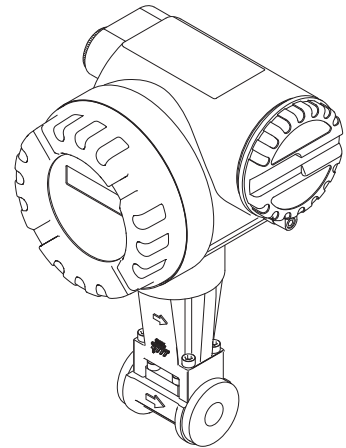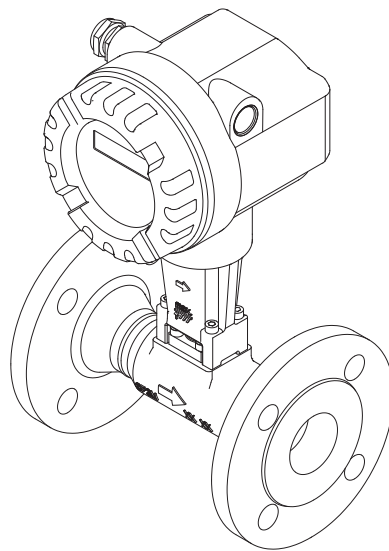
PROFI
PROCESS FIELD BUS
BUS

Endress+Hauser

People for Process Automation

Table of contents

1 Safety instructions

1.1 Designated use

The measuring system is used to measure the volume flow of saturated steam, overheated steam, gases and liquids. If the process pressure and process temperature are constant, the measuring device can also output the flow as the calculated mass flow or corrected volume flow.

Resulting from incorrect use or from use other than that designated, the operational safety of the measuring devices can be suspended. The manufacturer accepts no liability for damages being produced from this.

1.2 Installation, commissioning and operation

Note the following points:
- Installation, electrical installation, commissioning and maintenance of the device must be carried out by trained, qualified specialists authorized to perform such work by the facility's owner-operator. The specialist must have read and understood these Operating Instructions and must follow the instructions they contain.
- The device must be operated by persons authorized and trained by the facility's owner-operator. Strict compliance with the instructions in these Operating Instructions is mandatory.
- Endress+Hauser is willing to assist in clarifying the chemical resistance properties of parts wetted by special fluids, including fluids used for cleaning. However, small changes in temperature, concentration or the degree of contamination in the process can result in changes of the chemical resistance properties. Therefore, Endress+Hauser can not guarantee or accept liability for the chemical resistance properties of the fluid wetted materials in a specific application. The user is responsible for the choice of fluid wetted materials in regards to their in-process resistance to corrosion.
- The installer must ensure that the measuring system is correctly wired in accordance with the wiring diagrams.
- Invariably, local regulations governing the operation, maintenance and repair of electrical devices apply. Special instructions relating to the device can be found in the relevant sections of the documentation.

1.3 Operational safety

Note the following points:
- Measuring systems for use in hazardous environments are accompanied by separate "Ex documentation", which is an *integral part* of these Operating Instructions. Strict compliance with the installation instructions and ratings as listed in this supplementary documentation is mandatory. The symbol on the front of the Ex documentation indicates the approval and the certification center (⬡ Europe, ⬡ USA, ⬡ Canada).
- The measuring system complies with the general safety requirements in accordance with EN 61010-1 and the EMC requirements of IEC/EN 61326 and NAMUR Recommendations NE 21, NE 43 and NE 53.
- The manufacturer reserves the right to modify technical data without prior notice. Your Endress+Hauser distributor will supply you with current information and updates to these Operating Instructions.

1.4   Return

The following procedures must be carried out before a flowmeter requiring repair or calibration, for example, is returned to Endress+Hauser:

- Always enclose a fully completed "Declaration of Contamination" form with the device. Only then can Endress+Hauser transport, examine and repair a returned device.
- Enclose special handling instructions if necessary, for example a safety data sheet as per European Directive 91/155/EEC.
- Remove all fluid residues. Pay special attention to the grooves for seals and crevices which could contain fluid residues.
  This is particularly important if the fluid is hazardous to health, e.g. flammable, toxic, caustic, carcinogenic, etc.

Warning!
- Do not return a measuring device if you are not absolutely certain that all traces of hazardous substances have been removed, e.g. substances which have penetrated crevices or diffused through plastic.
- Costs incurred for waste disposal and injury (caustic burns, etc.) due to inadequate cleaning will be charged to the owner–operator.

Note!
A *copy* of the "Declaration of Contamination" can be found at the end of these Operating Instructions.

1.5   Notes on safety conventions and icons

The devices are designed to meet state-of-the-art safety requirements, have been tested and left the factory in a condition in which they are safe to operate.
The devices comply with the applicable standards and regulations in accordance with EN 61010-1 "Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures". They can, however, be a source of danger if used incorrectly or for anything other than the designated use.
Consequently, always pay particular attention to the safety instructions indicated in these Operating Instructions by the following symbols:

Warning!
"Warning" indicates an action or procedure which, if not performed correctly, can result in injury or a safety hazard. Comply strictly with the instructions and proceed with care.

Caution!
"Caution" indicates an action or procedure which, if not performed correctly, can result in incorrect operation or destruction of the device. Comply strictly with the instructions.

Note!
"Note" indicates an action or procedure which, if not performed correctly, can have an indirect effect on operation or trigger an unexpected response on the part of the device.

2   Identification

2.1   Device designation

The "Proline Prowirl 72 PROFIBUS PA" flowmeter system consists of the following components:

- Transmitter Proline Prowirl 72 PROFIBUS PA
- Prowirl F or Prowirl W sensor

In the *compact version*, the transmitter and sensor form a mechanical unit; in the *remote version* they are mounted separate from one another.

2.1.1   Nameplate of the transmitter/sensor
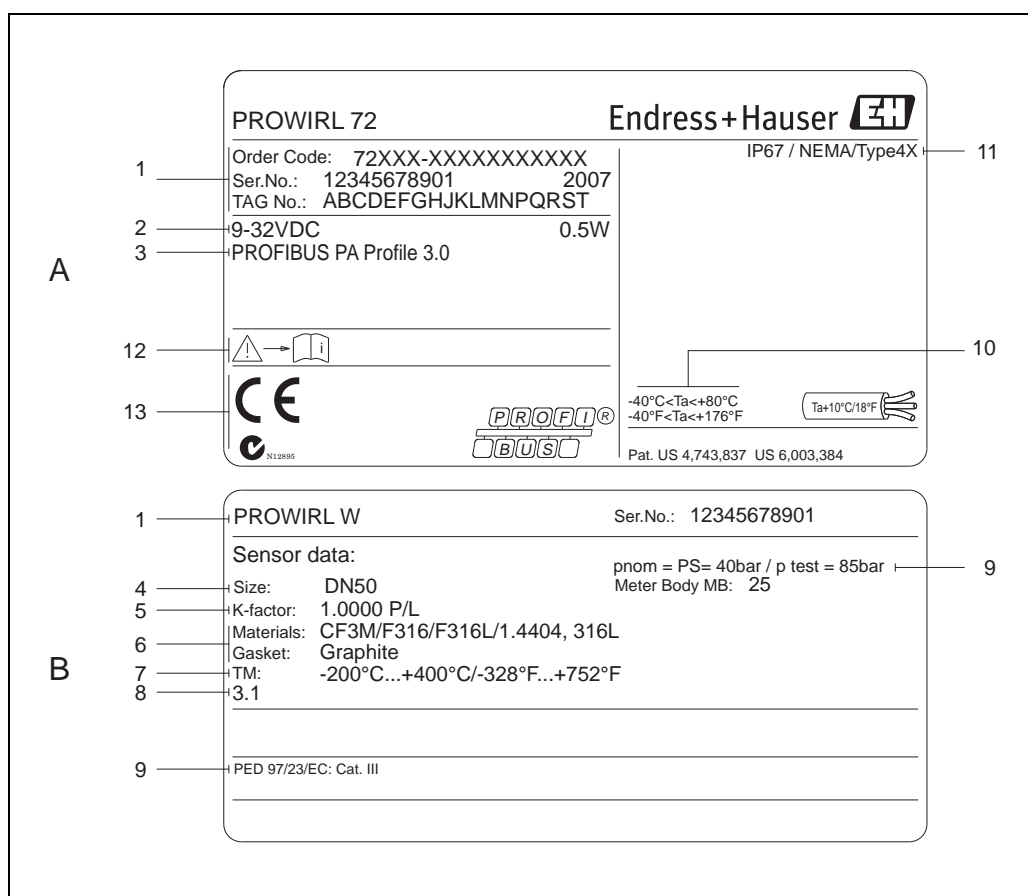
Fig. 1:   *Nameplate specifications for transmitter and sensor (example)*
A = nameplate on transmitter, B = nameplate on sensor (only compact version)

1   Order code / serial number: see the specifications on the order confirmation for the meanings of the individual letters and digits.
2   Power supply: 9 to 32 V DC, Power consumption: 1.2 W
3   PROFIBUS PA, Profile 3.0
4   Nominal diameter
5   Calibration factor
6   Material sensor and gasket
7   Medium temperature range
8   Reserved for information on special products
9   Data regarding Pressure Equipment Directive (optional)
10   Permitted ambient temperature range
11   Degree of protection

2.1.2 Nameplate of the sensor, remote version
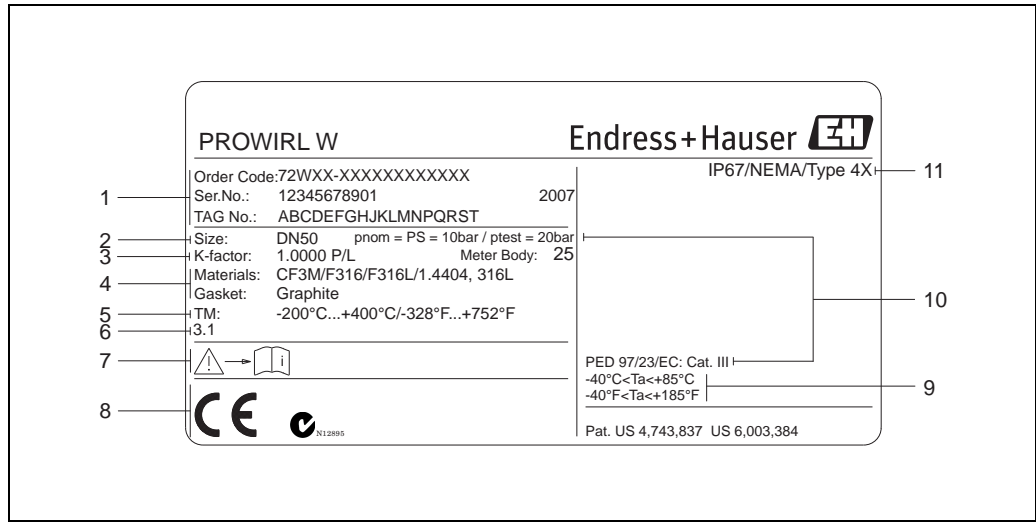
Fig. 2:   Nameplate specifications for transmitter, remote version (example)

1   Order code / serial number: see the specifications on the order confirmation for the meanings of the individual letters and digits.
2   Nominal diameter
3   Calibration factor
4   Material sensor and gasket
5   Medium temperature range
6   Reserved for information on special products
7   Permitted ambient temperature range
8   Data regarding Pressure Equipment Directive (optional)
9   Degree of protection

2.1.3 Service nameplate
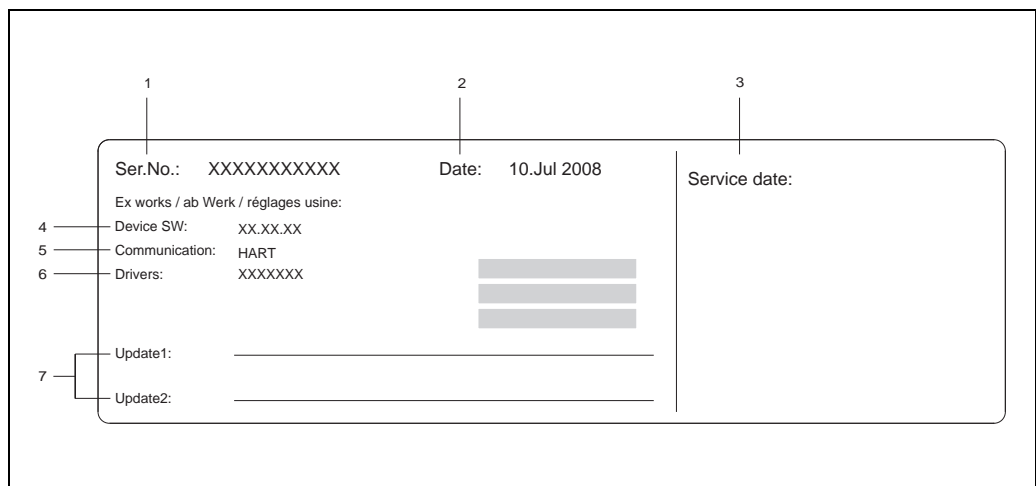
Fig. 3:   Service nameplate specifications for transmitter (example)

1   Serial number
2   Date of manufacturing
3   Service date
4   Device software
5   Type of device communication (e.g. PROFIBUS PA)
6   Revision number
7   Space for update entries

2.2   Certificates and approvals

The devices are designed according to good engineering practice to meet state-of-the-art safety requirements, have been tested and left the factory in a condition in which they are safe to operate. The devices comply with the applicable standards and regulations in accordance with EN 61010-1 "Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures" and the EMC requirements as per IEC/EN 61326.
The measuring system described in these Operating Instructions complies with the legal requirements of the EU Directives. Endress+Hauser confirms this by affixing the CE mark to it and by issuing the CE declaration of conformity.
The measuring system meets the EMC requirements of the "Australian Communications and Media Authority (ACMA)".

2.3   Registered trademarks

GYLON $^®$
Registered trademark of Garlock Sealing Technologies, Palmyar, NY, USA

PROFIBUS $^®$
Registered trademark of PROFIBUS User Organization e.V., Karlsruhe, Germany

INCONEL $^®$
Registered trademark of Inco Alloys International Inc., Huntington, USA

KALREZ $^®$, VITON $^®$
Registered trademarks of E.I. Du Pont de Nemours & Co., Wilmington, USA

Fieldcheck$^®$, Applicator$^®$, FieldCare$^®$
Registered or registration-pending trademarks of Endress+Hauser Flowtec AG, Reinach, Switzerland

3   Installation

3.1   Incoming acceptance, transport, storage

3.1.1   Incoming acceptance

On receipt of the goods, check the following points:
- Check the packaging and the contents for damage.
- Check the shipment, make sure nothing is missing and that the scope of supply matches your order.

3.1.2   Transport

Please note the following when unpacking or transporting to the measuring point:

- The devices must be transported in the container supplied.
- Devices with nominal diameter DN 40 to 300 (1½ to 12") may not be lifted at the transmitter housing or at the connection housing of the remote version when transporting (see Fig. 4). Use carrier slings when transporting and put the slings around both process connections. Avoid chains as these could damage the housing.

Warning!
Risk of injury if the measuring device slips.
The center of gravity of the entire measuring device might be higher than the points around which the slings are slung. Therefore, when transporting, make sure that the device does not unintentionally turn or slip.
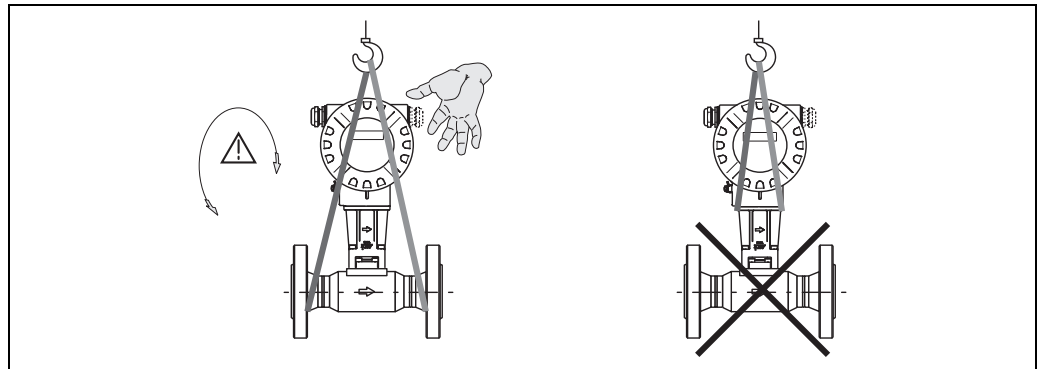
A0001871

Fig. 4:   Transportation instructions for sensors with DN 40 to 300 (1½ to 12")

3.1.3   Storage

Note the following points:

- Pack the measuring device in such a way as to protect it reliably against impact for storage (and transportation). The original packaging provides optimum protection.
- The permissible storage temperature is:
  - Standard: –40 to +80 °C (–40 to +176 °F)
  - ATEX II 1/2 GD version/dust ignition-proof: –20 to +55 °C (–4 to +131 °F)
- When in storage, the device should not be exposed to direct sunlight in order to avoid impermissibly high surface temperatures.

3.2   Installation conditions

Note the following points:

- The measuring device requires a fully developed flow profile as a prerequisite for correct volume flow measurement. The inlet and outlet runs must be taken into account (see Page 14).
- The maximum permitted ambient temperatures (see Page 83) and fluid temperatures (see Page 84) must be observed.
- Pay particular attention to the notes on orientation and piping insulation (see Page 12).
- Verify that the correct nominal diameter and pipe standard (DIN/JIS/ANSI) were taken into account when ordering since the calibration of the device and the achievable accuracy depend on these factors. If the mating pipe and the device have different nominal diameters/pipe standards, an inlet correction can be made via the device software by entering the actual pipe diameter (see MATING PIPE DIAMETER function on Page 115).
- The correct operation of the measuring system is not influenced by plant vibrations up to 1 g, 10 to 500 Hz.
- For mechanical reasons, and in order to protect the piping, it is advisable to support heavy sensors. For weight information, please refer to Technical Information TI070D/06/en.

3.2.1   Dimensions

The dimensions and lengths of the sensor and transmitter can be found in the Technical Information TI070D/06/en.

3.2.2   Installation location

We recommend you observe the following dimensions to guarantee problem-free access to the device for service purposes:
- Minimum spacing (A) in all directions = 100 mm (3.94 inch)
- Necessary cable length (L): L + 150 mm (L + 5.91 inch).
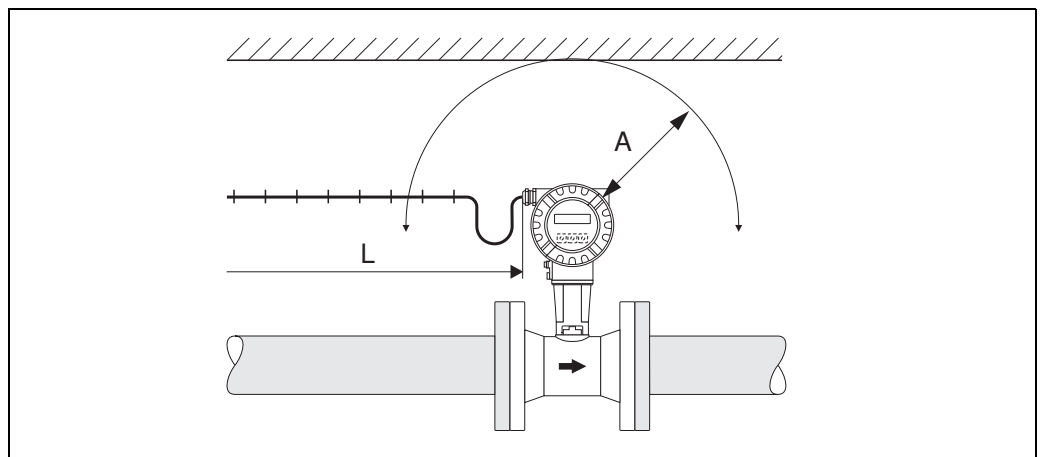
A0001870

Fig. 5:   A = Minimum spacing in all directions, L = cable length

3.2.3   Orientation

The device can be installed basically in any orientation. Please consider the following, however (Fig. 6):
- In the case of liquids, there should be upward flow in vertical pipes to avoid partial pipe filling (see orientation A).
- The arrow on the meter body has to point in flow direction.
- In order to make sure that the maximum ambient temperature (see Page 83) is not exceeded, we recommend the following orientations:
  - In the case of hot fluids (e.g. steam or fluid temperature ≥ 200 °C/≥392 °F), select orientation C or D.
  - Orientations B and D are recommended for very cold fluids (e.g. liquid nitrogen).

Caution!
- If fluid temperature is ≥ 200 °C (≥392 °F), orientation B is **not** permitted for the wafer version (Prowirl 72 W) with a nominal diameter of DN 100 (4") and DN 150 (6").
- In case of vertical orientation and downward flowing liquid, the piping has always to be completely filled.
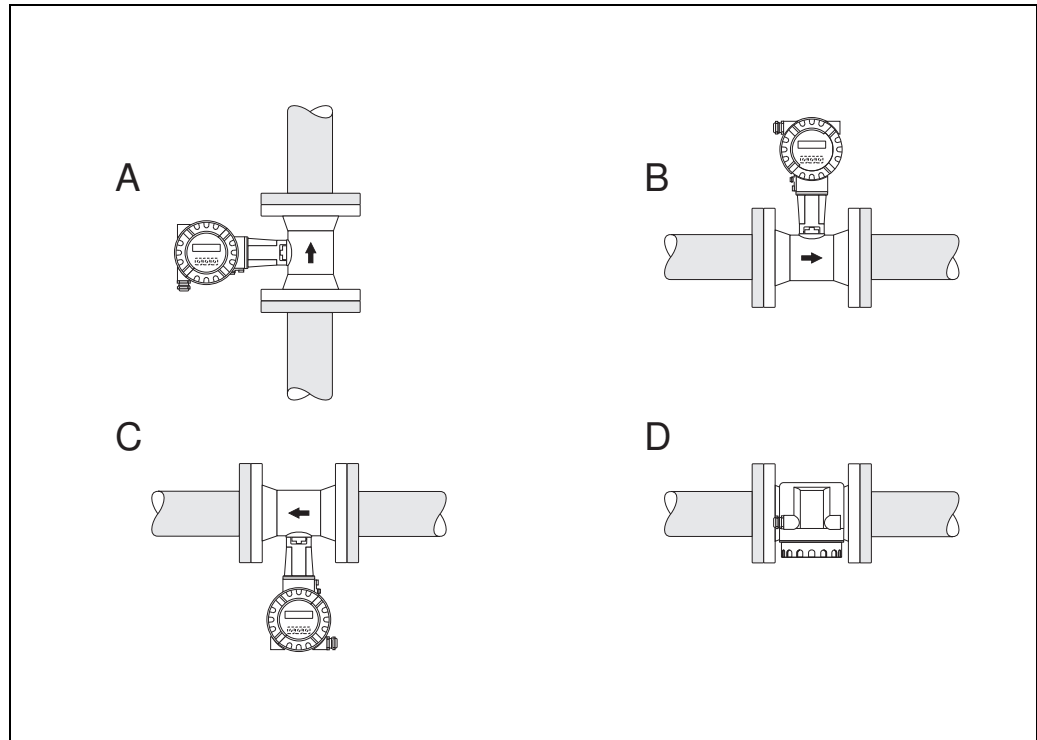
A0001869

Fig. 6:   Possible orientations of the device

High fluid temperature:
– horizontal piping: orientation C or D
– vertical piping: orientation A

Low fluid temperature:
– horizontal piping: orientation B or D
– vertical piping: orientation A

3.2.4   Heat insulation

Some fluids require suitable measures to avoid heat transfer at the sensor. A wide range of materials can be used to provide the required insulation.

When insulating, please ensure that a sufficiently large area of the housing support is exposed. The uncovered part serves as a radiator and protects the electronics from overheating (or undercooling). The maximum insulation height permitted is illustrated in the Fig. 7. These apply equally to both the compact version and the sensor in the remote version.
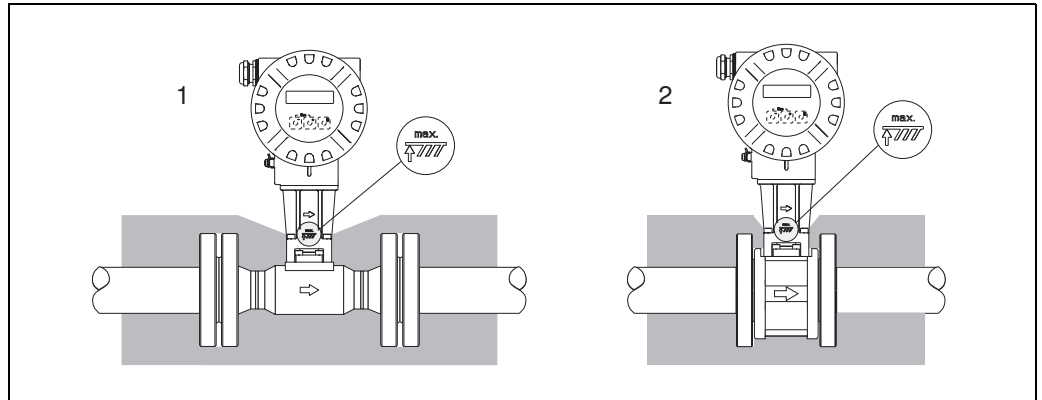
A0001868

Fig. 7:   1 = Flanged version, 2 = Wafer version

Caution!
Danger of electronics overheating!

- Therefore, make sure that the adapter between sensor and transmitter and the connection housing of the remote version is always exposed.
- Note that a certain orientation might be required, depending on the fluid temperature→ Page 12.
- Information on permissible temperature ranges→ Page 83.

3.2.5 Inlet and outlet run

As a minimum, the inlet and outlet runs shown below must be observed to achieve the specific accuracy of the device. The longest inlet run shown must be observed if two or more flow disturbances are present.
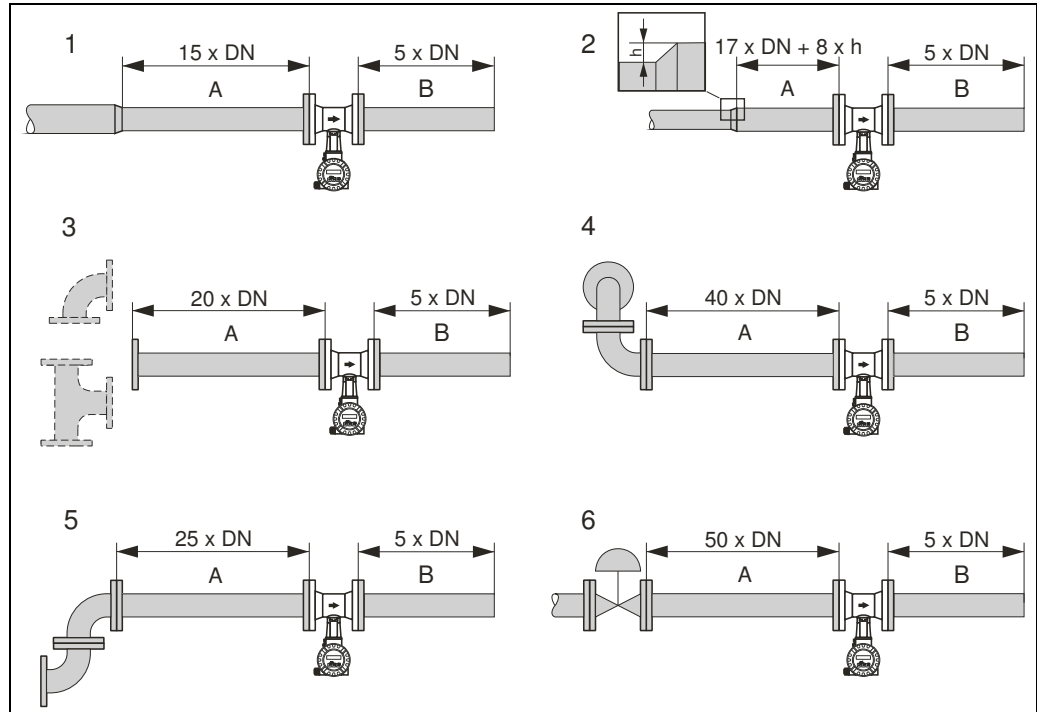
A0001867

Fig. 8:   Minimum inlet and outlet runs with various flow obstructions

A   Inlet run
B   Outlet run

1 = Reduction
2 = Expansion
3 = 90° elbow or T-piece
4 = 2 x 90° elbow, 3-dimensional
5 = 2 x 90° elbow
6 = Control valve

✎ Note!
A specially designed perforated plate flow conditioner can be installed if it is not possible to observe the inlet runs required (see Page 15).

Outlet runs with pressure and temperature measuring points
If pressure and temperature measuring points are installed after the device, please ensure there is a large enough distance between the device and the measuring point so there are no negative effects on vortex formation in the sensor.
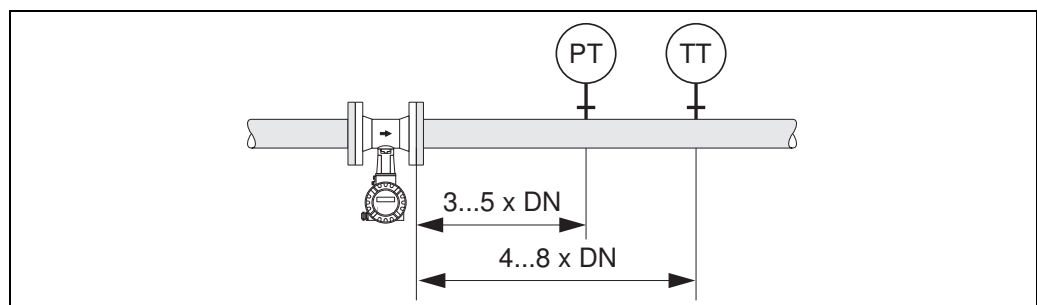
A0003780

Fig. 9:   Installation of pressure measuring point (PT) and temperature measuring point (TT)

Perforated plate flow conditioner

A specially designed perforated plate flow conditioner, available from Endress+Hauser, can be installed if it is not possible to observe the inlet runs required. The flow conditioner is fitted between two piping flanges and centered with mounting bolts. Generally, this reduces the inlet run required to $10 \times DN$ with complete accuracy.
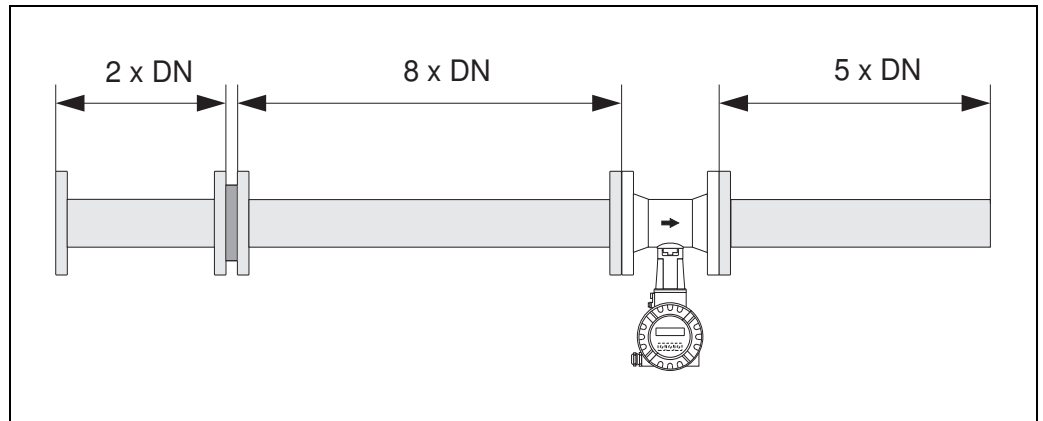
Fig. 10:   Perforated plate flow conditioner

Calculation examples (SI units) for the pressure loss of flow conditioners:
The pressure loss for flow conditioners is calculated as follows:
Δp [mbar] $= 0.0085 \cdot \rho$ [kg/m³] $\cdot v^2$ [m/s]

- Example with steam
  p = 10 bar abs
  t = 240 °C $\rightarrow \rho$ = 4.39 kg/m³
  v = 40 m/s
  $\Delta p = 0.0085 \cdot 4.39 \cdot 40^2 = 59.7$ mbar

- Example with H_2O condensate (80°C)
  ρ = 965 kg/m³
  v = 2.5 m/s
  $\Delta p = 0.0085 \cdot 965 \cdot 2.5^2 = 51.3$ mbar

3.2.6   Vibrations

The correct operation of the measuring system is not influenced by plant vibrations up to 1 g, 10 to 500 Hz. Consequently, the sensors require no special measures for attachment.

3.2.7   Limiting flow

3.3   Installation

3.3.1   Mounting sensor

Caution!
Please note the following prior to mounting:

- Prior to installing the measuring device in the piping, remove all traces of transport packaging and any protective covers from the sensor.
- Make sure that the internal diameters of seals are the same as, or greater than, those of the measuring pipe and piping. Seals projecting into the flow current have a negative effect on the vortex formation after the bluff body and cause inaccurate measurement. The gaskets provided by Endress+Hauser for the wafer version have therefore an inner diameter with a bigger inner diameter than the piping.
- Ensure that the arrow on the measuring pipe matches the direction of flow in the piping.
- Lengths:
  - Prowirl W (wafer version): 65 mm (2.56 inch)
  - Prowirl F (flanged version) → See Technical Information TI070D/06/en.

Mounting Prowirl W
The centering rings supplied are used to mount and center the wafer-style devices.
A mounting kit consisting of tie rods, seals, nuts and washers can be ordered separately.
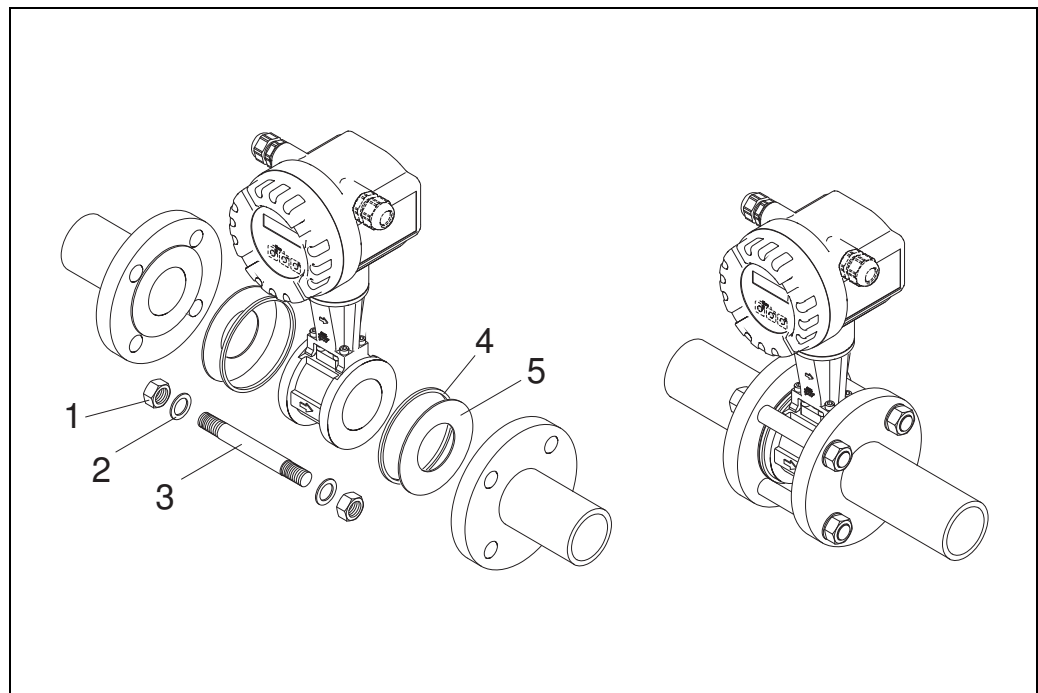
A0001888

Fig. 11:   Mounting the wafer version

1   Nut
2   Washer
3   Tie rod
4   Centering ring (is supplied with the device)
5   Seal

3.3.2   Rotating the transmitter housing

The electronics housing can be rotated continuously 360° on the housing support.

1. Loosen the safety screw.
2. Turn the transmitter housing to the desired position (max. 180° in each direction to the stop).

✎   Note!
There are recesses in the rotating groove at 90° stages (only compact version).
These help you align the transmitter easier.

3. Tighten the safety screw.
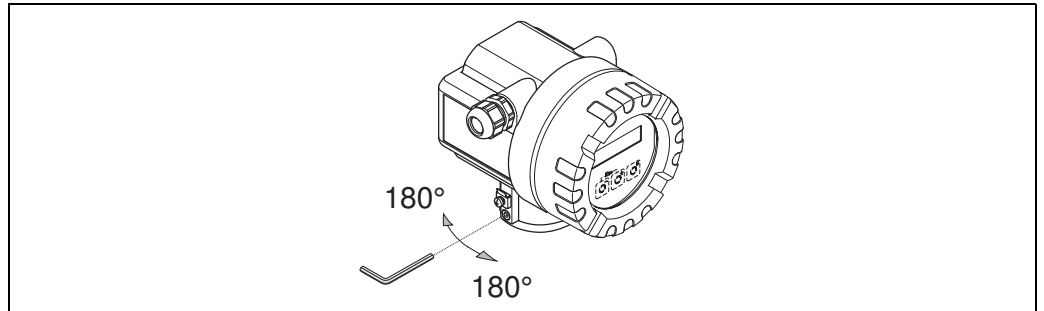
A0001889

Fig. 12:   Rotating the transmitter housing

3.3.3   Rotating the local display

1. Unscrew the cover of the electronics compartment from the transmitter housing.
2. Remove the display module from the transmitter retainer rails.
3. Turn the display to the desired position (max. 4 × 45° in each direction) and reset it onto the retaining rails.
4. Screw the cover of the electronics compartment firmly back onto the transmitter housing.
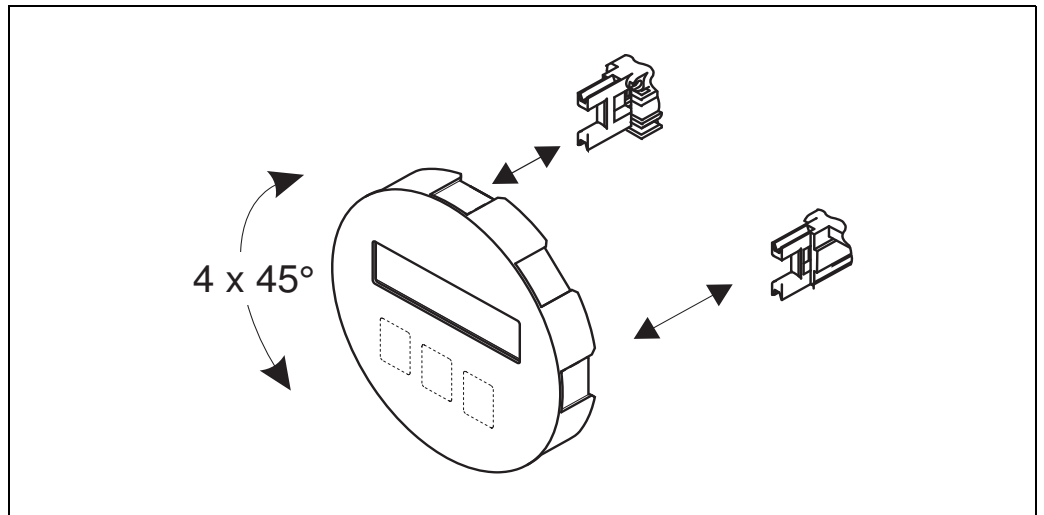
A0003237

Fig. 13:   Rotating the local display

3.3.4   Mounting transmitter (remote)

The transmitter can be mounted in the following ways:
- Wall mounting
- Pipe mounting (with separate mounting kit, accessories→ Page 64)

The transmitter and the sensor must be mounted separate in the following circumstances:
- poor accessibility,
- lack of space,
- extreme ambient temperatures.

Caution!
If the device is mounted to warm piping, make certain that the housing temperature does not exceed the max. permissible temperature value.
– Standard: –40 to +80 °C (–40 to +176 °F)
– EEx d/XP version: –40 to +60 °C (–40 to +140 °F)
– ATEX II 1/2 GD version/dust ignition-proof: –20 to +55 °C (–4 to +131 °F)

Mount the transmitter as illustrated in the diagram.
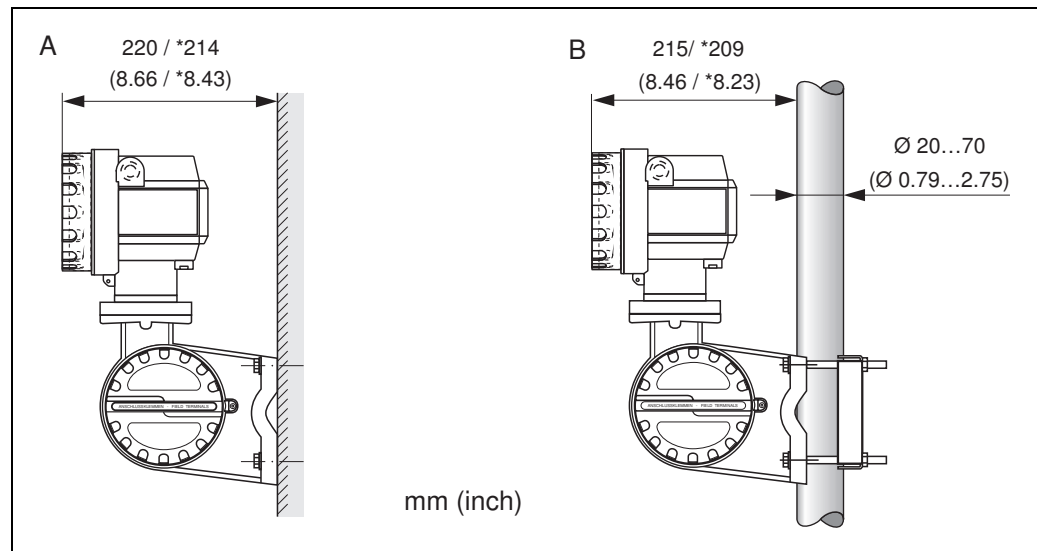
Fig. 14:   *Mounting the transmitter (remote version)*

A   *Direct wall mounting*
B   *Pipe mounting*
* Dimensions for version without local operation

3.4   Post-installation check

Perform the following checks after installing the measuring device in the piping:

Device condition and specifications	Notes
Is the device damaged (visual inspection)?	–
Do the process temperature/pressure, ambient temperature, measuring range etc. correspond to the specifications of the device?	see Page 79 ff.
Installation	Notes
Does the arrow on the pipe stand or on the sensor match the direction of flow through the pipe?	–
Are the measuring point number and labeling correct (visual inspection)?	–
Is the orientation chosen for the sensor correct, in other words suitable for sensor type, fluid properties (outgassing, with entrained solids) and fluid temperature?	see Page 11 ff.
Process environment / process conditions	Notes
Is the measuring device protected against moisture and direct sunlight?	–

4   Wiring

Warning!
When connecting Ex–certified devices, please refer to the notes and diagrams in the Ex–specific supplement to these Operating Instructions. Please do not hesitate to contact your Endress+Hauser representative if you have any questions.

4.1   PROFIBUS PA cable specifications

Cable type
Twin–core cables are recommended for connecting the device to the fieldbus. Following IEC 61158-2 (MBP), four different cable types (A, B, C, D) can be used with the fieldbus, only two of which (cable types A and B) are shielded.

- Cable types A or B are particularly preferable for new installations. Only these types have cable shielding that guarantees adequate protection from electromagnetic interference and thus the most reliable data transfer. In the case of multi-pair cables (type B), it is permissible to operate multiple fieldbuses (with the same degree of protection) on one cable. No other circuits are permissible in the same cable.
- Practical experience has shown that cable types C and D should not be used due to the lack of shielding, since the freedom from interference generally does not meet the requirements described in the standard.

The electrical data of the fieldbus cable have not been specified but determine important characteristics of the design of the fieldbus, such as distances bridged, number of users, electromagnetic compatibility, etc.

	Type A	Type B
Cable structure	Twisted pair, shielded	One or more twisted pairs, fully shielded
Wire size	$0.8 \ mm^2$ (AWG 18)	$0.32 \ mm^2$ (AWG 22)
Loop-resistance (direct current)	44 Ω/km	112 Ω/km
Impedance at 31.25 kHz	100 Ω ± 20%	100 Ω ± 30%
Attenuation constant at 39 kHz	3 dB/km	5 dB/km
Capacitive asymmetry	2 nF/km	2 nF/km
Envelope delay distortion (7.9 to 39 kHz)	1.7 μs/km	*
Shield coverage	90%	*
Max. cable length (inc. spurs >1 m (>3 ft))	1 900 m (6200 ft)	1 200 m (4 000 ft)

* Not specified

Suitable fieldbus cables from various manufacturers for non–hazardous areas are listed below:

- Siemens: 6XV1 830–5BH10
- Belden: 3076F
- Kerpen: CeL–PE/OSCR/PVC/FRLA FB–02YS(ST)YFL

Maximum overall cable length
The maximum network expansion depends on the type of protection and the cable specifications.
The overall cable length combines the length of the main cable and the length of all spurs (>1 m
(>3 ft)).

Note the following points:
- The maximum permissible overall cable length depends on the cable type used:

Type A	1 900 m	6 200 ft
Type B	1 200 m	4 000 ft

- If repeaters are used, the maximum permissible cable length is doubled.
  A maximum of three repeaters are permitted between user and master.

Maximum spur length
The line between the distribution box and field device is described as a spur.
In the case of non-Ex applications, the max. length of a spur depends on the number of spurs (>1 m)
(>3 ft):

Number of spurs		1 to 12	13 to 14	15 to 18	19 to 24	25 to 32
Max. length per spur	[m]	120	90	60	30	1
	[ft]	400	300	200	100	3

Number of field devices
In systems that meet FISCO in the EEx ia type of protection, the line length is limited to
max. 1 000 m (3280 ft). A maximum of 32 users per segment in non-Ex areas or a maximum of
10 users in an Ex-area (EEx ia IIC) is possible. The actual number of users must be determined
during project planning.

Bus termination
The start and end of each fieldbus segment are always to be terminated with a bus terminator. With
various junction boxes (non-Ex), the bus termination can be activated via a switch. If this is not the
case, a separate bus terminator must be installed.

Note the following points:
- In the case of a branched bus segment, the device furthest from the segment coupler represents
  the end of the bus.
- If the fieldbus is extended with a repeater then the extension must also be terminated at both
  ends.

Further information
General information and further notes regarding the wiring can be found in the BA034S/04: "Field
communication PROFIBUS DP/PA: Guidelines for planning and commissioning".

4.1.1 Shielding and grounding

When planning the shielding and grounding for a fieldbus system, there are three important points to consider:
- Electromagnetic compatibility (EMC)
- Explosion protection
- Safety of the personnel

To ensure the optimum electromagnetic compatibility of systems, it is important that the system components and above all the cables, which connect the components, are shielded and that no portion of the system is unshielded. Ideally, the cable shields will be connected to the field devices' housings, which are usually metal. Since these are generally connected to the protective earth, the shield of the bus cable is grounded many times. Make sure that the stripped and twisted lengths of cable shield to the terminals are as short as possible.
This approach, which provides the best electromagnetic compatibility and personnel safety, can be used without restriction in systems with good potential equalization.
In the case of systems without potential equalization, a power supply frequency (50 Hz) equalizing current can flow between two grounding points which, in unfavorable cases, e.g. when it exceeds the permissible shield current, may destroy the cable.
To suppress the low frequency equalizing currents on systems without potential equalization, it is therefore recommended to connect the cable shield directly to the building ground (or protective earth) at one end only and to use capacitive coupling to connect all other grounding points.

Caution!
The legal EMC requirements are met **only** when the cable shield is grounded at both ends!.

4.2 Connecting the remote version

4.2.1 Connecting the sensor

Note!
- The remote version must be grounded. In doing so, the sensor and transmitter must be connected to the same potential matching.
- When using the remote version, always make sure that you connect the sensor only to the transmitter with the same serial number. Compatibility errors (e.g. the incorrect K-factor will be used) can occur if the devices are not connected in this way.

1. Remove the cover of the connection compartment of the transmitter (a).
2. Remove the cover of the connection compartment of the sensor (b).
3. Feed the connecting cable (c) through the appropriate cable entries.
4. Wire the connecting cable between the sensor and transmitter in accordance with the electrical connection diagram:
   → Fig. 15
   → Wiring diagram in the screw caps
5. Tighten the glands of the cable entries on the sensor housing and transmitter housing.
6. Screw the cover of the connection compartment (a/b) back onto the sensor housing or transmitter housing.
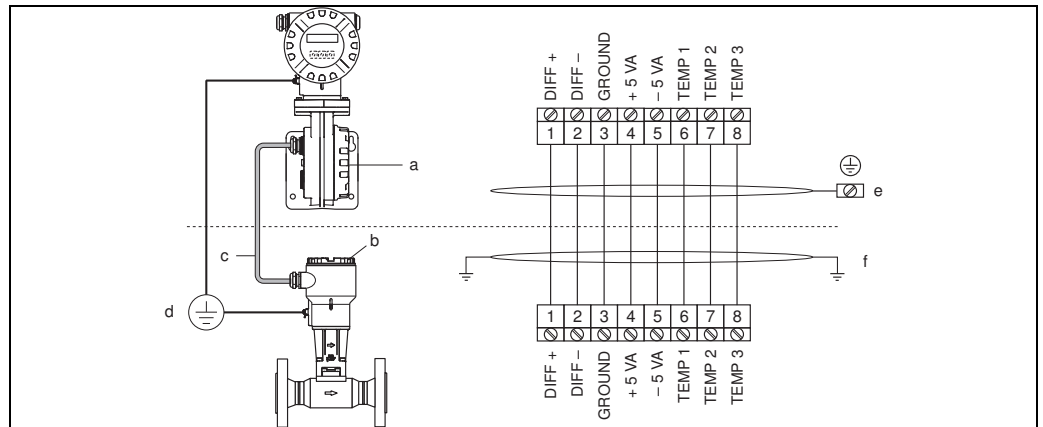
A0001893

Fig. 15:   Connecting the remote version

a   Connection compartment cover (transmitter)
b   Connection compartment cover (sensor)
c   Connecting cable (signal cable)
d   Identical potential matching for sensor and transmitter
e   Connect shielding to ground terminal in transmitter housing and keep as short as possible
f   Connect shielding to cable strain relief clamp in connection housing

Wire color (colour code according to DIN 47100):
Terminal number: 1 = white; 2 = brown; 3 = green; 4 = yellow, 5 = gray; 6 = pink; 7 = blue; 8 = red

4.2.2   Cable specifications, standard connecting cable

The specifications of the cable connecting the transmitter and the sensor of the remote version are as follows:

- $4 \times 2 \times 0.5$ mm^2 (AWG 20) PVC cable with common shield (4 pairs, pair-stranded).

Note!
If the cross-section of a cable deviates from the specification, the value for the cable length has to be calculated. See $\rightarrow$ "Calculating and entering the cable length".

- Conductor resistance according to DIN VDE 0295 class 5 or IEC 60228 class 5: 39 Ω/km

Note!
The conductor resistance specified by the standard is compensated for.

- Capacity core/screen: < 400 pF/m (<122 pF/ft)
- Cable length: max. 30 m (98 ft)
- Operating temperature: –40 to +105 °C (–40 to +221 °F)

4.2.3   Cable specifications, armored connecting cable

The optionally available armored connecting cable between transmitter and sensor possesses the following specifications:

- $4 \times 2 \times 0.5$ mm^2 (AWG 20) PVC cable with common shield (4 pairs, pair-stranded).

✎ Note!
If the cross-section of a cable deviates from the specification, the value for the cable length has to be calculated. See → "Calculating and entering the cable length".

- Conductor resistance according to DIN VDE 0295 class 5 or IEC 60228 class 5: 39 Ω/km

✎ Note!
The conductor resistance specified by the standard is compensated for.

- Extensively resistant against acids, bases and specific oils
- A galvanized braided steel wire forms the total shield
- Outer sheath version: smooth, uniform, round
- Cable length: max. 30 m (98 ft)
- Operating temperature: –30 to +70 °C (–22 to +158 °F)

✎ Note!
The cable resistance specified as 39 Ω/km in accordance with the standard, is compensated. If a cable is used with a cable cross-section deviating from the specification, the value for the cable length must be calculated as follows and entered in the CABLE LENGTH function (→ Page 107).

$$\frac{\text{Cable resistance of the cable used } [\Omega/\text{km}]}{\text{Cable resistance in accordance with specification } [\Omega/\text{km}]} \cdot \text{Actual cable length [m]} = \text{cable length to be entered [m]}$$

Example:
- Cable resistance of used cable = 26 Ω/km
- Cable resistance as per specification = 39 Ω/km
- Actual cable length = 15 m

$$\frac{26\ \Omega/\text{km}}{39\ \Omega/\text{km}} \cdot 15\ \text{m} = 10\ \text{m}$$

Conclusion:
In the CABLE LENGTH function (→ Page 107) the value 10 m (32.81 ft), depending on the unit selected in the UNIT LENGTH function, must be entered.

4.3   Connecting the measuring unit

4.3.1   Connecting the transmitter

✎   Note!
- When connecting Ex-certified devices, please refer to the notes and diagrams in the Ex-specific supplement to these Operating Instructions.
- The remote version must be grounded. In doing so, the sensor and transmitter must be connected to the same potential equalization.
- The national regulations governing the installation of electrical equipment must be observed.
- When connecting the transmitter, use a connecting cable with a continuous service temperature of at least –40 °C (–40 °F) to permitted max. ambient temperature plus 10 °C (plus 18 °F).

- A shielded cable must be used for the connection.
- The terminals for the PROFIBUS PA connection (terminal 1 = PA+, terminal 2 = PA –) have integrated reverse polarity protection. This ensures correct signal transmission via the fieldbus even if lines are confused.
- Cable cross-section: max. 2.5 mm²
- Observe the grounding concept.

☞   Caution!
- Risk of damaging the PROFIBUS cable!
  If the shielding of the cable is grounded at more than one point in systems without additional potential equalization, power supply frequency equalization currents can occur that damage the cable or the shielding. In such cases the shielding of the cable is to be grounded on only one side, i.e. it must not be connected to the ground terminal of the housing. The shield that is not connected should be insulated!
- We recommend that the PROFIBUS not be looped using conventional cable glands. If you later replace even just one measuring device, the bus communication will have to be interrupted.

Connecting the transmitter, non-Ex / Ex i/IS and Ex n version (→ Fig. 16)

1. Unscrew the cover (a) of the electronics compartment from the transmitter housing.
2. Remove the display module (b) from the retaining rails (c) and refit onto right retaining rail with the left side (this secures the display module).
3. Loosen screw (d) of the cover of the connection compartment and fold down the cover.
4. Push the power supply/PROFIBUS cable through the cable gland (e).
5. Tighten the cable glands (e) (see also Page 30).
6. Pull the terminal connector (f) out of the transmitter housing and connect the power supply/PROFIBUS cable (→ Fig. 18).

✎ Note!
The terminal connector (d) is pluggable, i.e. it can be plugged out of the transmitter housing to connect the cable.

7. Plug the terminal connector (f) into the transmitter housing.
8. Secure the ground cable to the ground terminal (g).

✎ Note!
Between the stripped PROFIBUS cable and the ground terminal, the cable shielding should not exceed a length of 5 mm (0.20 inch).

9. Only remote version:
   Secure ground cable to the ground terminal (→ Fig. 18, B).
10. Fold up the cover of the connection compartment and tighten the screws (d).
11. Remove the display module (b) and fit on the retaining rails (c).
12. Screw the cover of the electronics compartment (a) onto the transmitter housing.
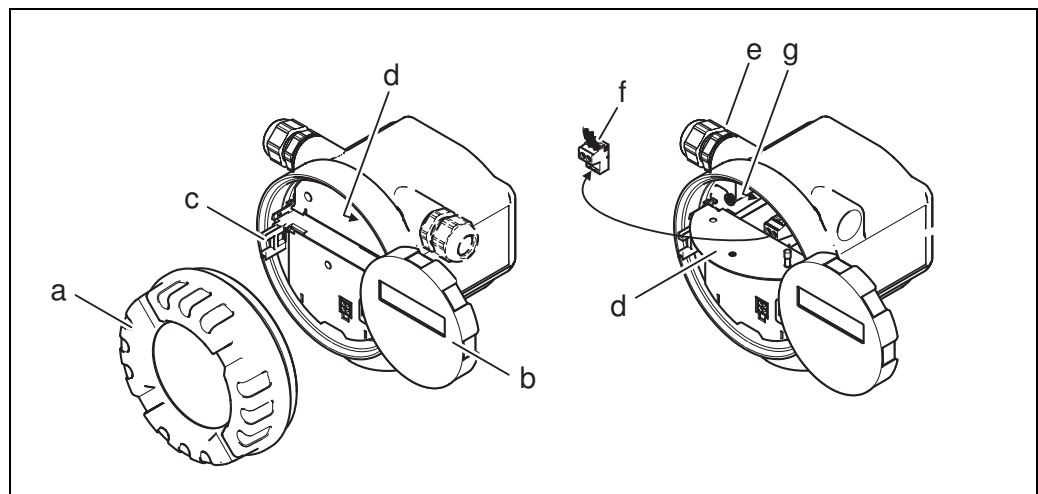
a0003782

Fig. 16:   Procedure when connecting the transmitter, non-Ex/Ex i/IS and Ex n version

a   Cover of electronics compartment
b   Display module
c   Retaining rail for display module
d   Connection compartment cover
e   Cable gland
f   Terminal connector
g   Ground terminal

Connecting the transmitter, Ex d/XP version (→ Fig. 17)

1. Release the securing clamp (a) of the connection compartment cover.
2. Screw the connection compartment cover (b) off the transmitter housing.
3. Push the power supply/PROFIBUS cable through the cable gland (c).
4. Tighten the cable glands (c) (see also Page 30).
5. Pull the terminal connector (d) out of the transmitter housing and connect the power supply/PROFIBUS cable (see Fig. 18).

✎   Note!
The terminal connector (d) is pluggable, i.e. it can be plugged out of the transmitter housing to connect the cable.

6. Plug the terminal connector (d) into the transmitter housing.
7. Secure the ground cable to the ground terminal (g).

✎   Note!
Between the stripped PROFIBUS cable and the ground terminal, the cable shielding should not exceed a length of 5 mm (0.20 inch).

8. Only remote version:
    Secure ground cable to the ground terminal (see Fig. 18, B).
9. Screw the connection compartment cover (b) onto the transmitter housing.
10. Tighten the securing clamp (a) of the connection compartment cover.
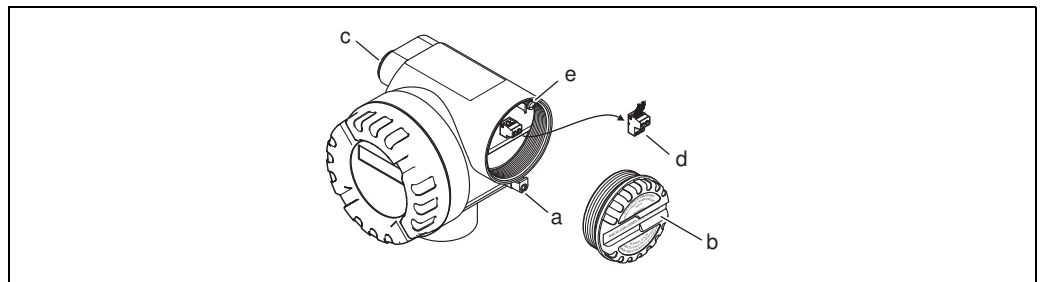
a0003783

Fig. 17:   Procedure when connecting the transmitter, Ex d/XP version

a   Securing clamp for connection compartment cover
b   Connection compartment cover
c   Cable gland
d   Terminal connector
e   Ground terminal

Wiring diagram
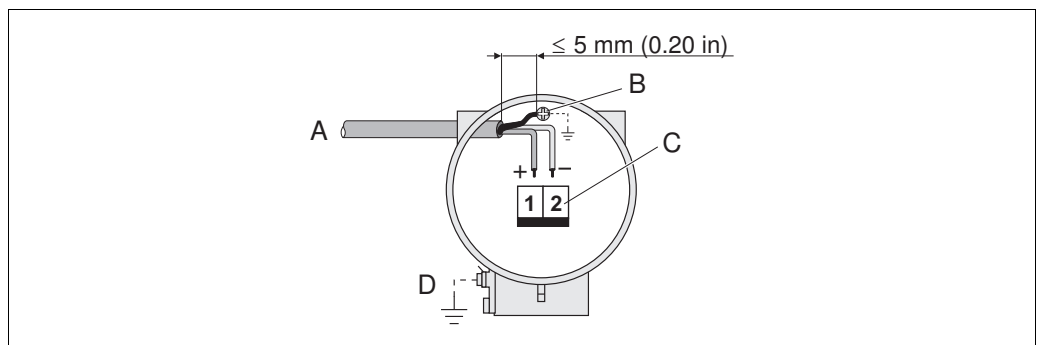
a0003784

Fig. 18:   Connecting the transmitter

A   PROFIBUS cable
B   Ground terminal (between the stripped PROFIBUS cable and the ground terminal, the cable shielding should not exceed a length of 5 mm (0.20 inch)).
C   Terminal connector (1 = PA +; 2 = PA −)
D   Ground terminal (external, only relevant for remote version)

4.3.2 Terminal assignment

Order version	Terminal no. (inputs/outputs)	
	1	2
72***_***********H	PA +	PA –

4.3.3 Fieldbus connector

The connection technology of PROFIBUS PA allows measuring devices to be connected
to the fieldbus via uniform mechanical connections such as T-boxes, distribution modules, etc.
This connection technology using prefabricated distribution modules and plug-in connectors offers
substantial advantages over conventional wiring:

- Field devices can be removed, replaced or added at any time during normal operation.
  Communication is not interrupted.
- Installation and maintenance are significantly easier.
- Existing cable infrastructures can be used and expanded instantly, e.g. when constructing new
  star distributors using 4-channel or 8-channel distribution modules.

The device can therefore be supplied with the option of a ready-mounted fieldbus connector.
Fieldbus connectors for retrofitting can be ordered from Endress+Hauser as a spare part (see
Page 73).

Supply line/T-box shielding
Use cable glands with good EMC properties, if possible with all-round contact of the cable shielding
(Iris spring). This requires small differences in potential, poss. potential equalization.

- The PA cable shielding must be intact.
- The shielding connection must always be kept as short as possible.

Ideally, cable glands with Iris springs should be used for the shielding connection. The shielding is
positioned on the T-box housing by means of the Iris spring located inside the gland. The shielding
braid is located beneath the Iris spring. When the armored thread is tightened, the Iris spring is
pressed against the shielding, thereby creating a conductive connection between the shielding and
the metal housing.

A connection box or a plug-in connection is to be seen as part of the shielding (Faraday shield). This
applies, in particular, to remote boxes if these are connected to a PROFIBUS PA measuring device
by means of a pluggable cable. In such instances, a metallic connector must be used where the cable
shielding is positioned at the plug housing (e.g. prefabricated cables).
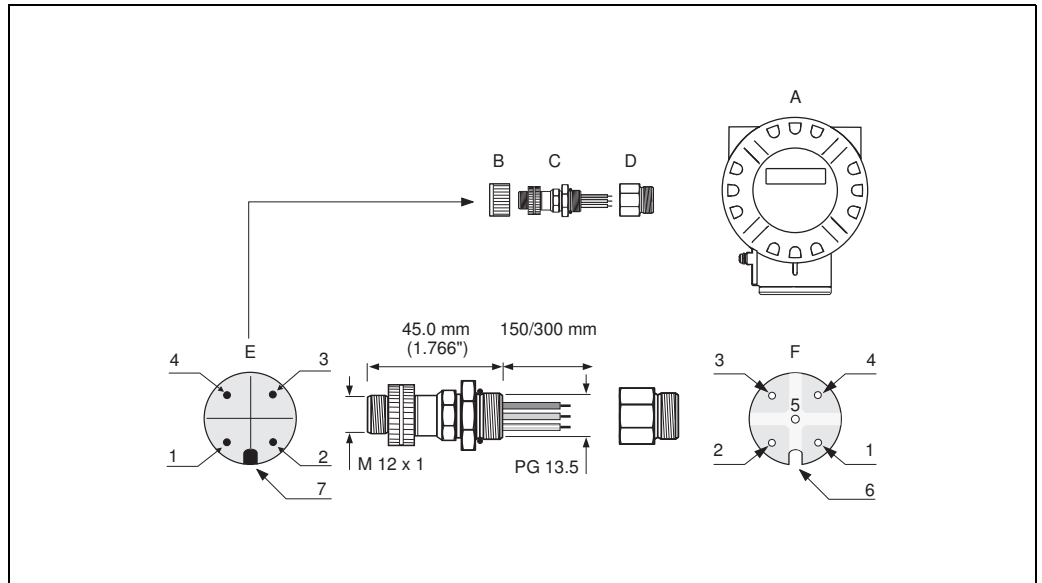
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Fig. 19:   Connectors for connecting to the PROFIBUS PA

A	Aluminum field housing	Pin assignment / color codes:
B	Protection cap for connector	1 Brown wire: PA+ (terminal 1)
C	Fieldbus connector	2 Not connected
D	Adapter PG 13.5 / M 20.5	3 Blue wire: PA – (terminal 2)
E	Connector at housing (male)	4 Black wire: ground
F	Female connector	5 Middle female connector not assigned
		6 Positioning groove
		7 Positioning key

Technical data (connector):

Connection cross section	0.75 mm^2
Connector thread	PG 13.5
Degree of protection	IP 67 in accordance with DIN 40 050 IEC 529
Contact surface	CuZnAu
Housing material	Cu Zn, surface Ni
Flammability	V - 2 in accordance with UL - 94
Operating temperature	−40 to +85 °C, (−40 to +185 °F)
Ambient temperature range	−40 to +150 °C, (−40 to +302 °F)
Nominal current per contact	3 A
Nominal voltage	125 to 150 V DC in accordance with the VDE Standard 01 10/ISO Group 10
Resistance to tracking	KC 600
Volume resistance	≤ 8 mΩ in accordance with IEC 512 Part 2
Insulation resistance	≤10^{12} Ω in accordance with IEC 512 Part 2

4.4   Degree of protection

The measuring device meets all the requirements for IP 67 (NEMA 4X).

Caution!
Do not loosen the screws of the sensor housing, as otherwise the degree of protection guaranteed by Endress+Hauser no longer applies.

Compliance with the following points is mandatory following installation in the field or servicing in order to ensure that IP 67 (NEMA 4X) protection is maintained:
- The housing seals must be clean and undamaged when inserted into their grooves. The seals must be dried, cleaned or replaced if necessary.
- The housing screws and screw caps must be firmly tightened.
- The cables used for connection must be of the specified outside diameter→ Page 81, cable entries.
- The cable entries must be firmly tightened (point **a** → Fig. 20).
- The cable must loop down before it enters the cable entry ("water trap") (point **b** → Fig. 20). This arrangement prevents moisture penetrating the entry.
  The cable entries should not point upwards.
- Replace all unused cable entries with dummy plugs.
- Do not remove the grommet from the cable entry.

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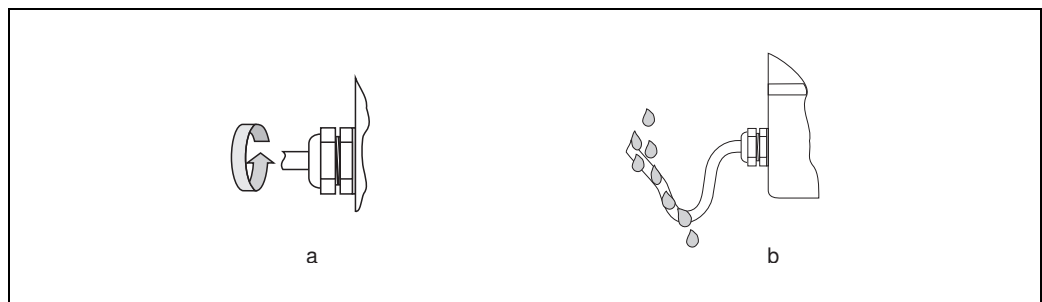
Fig. 20:   *Installation instructions for cable entries*

4.5   Post-connection check

Perform the following checks after completing electrical installation of the measuring device:

Device condition and specifications	Notes
Are cables or the device damaged (visual inspection)?	–
Electrical connection	Notes
Does the supply voltage match the specifications on the nameplate?	9 to 32 V DC
Do the cables used comply with the specifications?	■ Fieldbus cable see Page 20 ■ Signal cable see Page 20
Do the cables have adequate strain relief?	–
Are the power supply and signal cables correctly connected?	See the wiring diagram inside the cover of the terminal compartment
Are all terminals firmly tightened?	–
Are all the cable entries installed, tightened and sealed? Cable run with "water trap"?	see Page 30
Are all the housing covers installed and tightened?	–
Electrical connection – PROFIBUS PA	Notes
Are all the connecting components (T-boxes, junction boxes, connectors, etc.) connected with each other correctly?	–
Has each fieldbus segment been terminated at both ends with a bus terminator?	–
Has the max. length of the fieldbus cable been observed in accordance with the PROFIBUS specifications?	see Page 20
Has the max. length of the spurs been observed in accordance with the PROFIBUS specifications?	see Page 21
Is the fieldbus cable fully shielded and correctly grounded?	see Page 21

5   Operation

5.1   Quick operation guide

You have a number of options for configuring and commissioning the device:

1. Configuration programs→ Page 35
The configuration of profile and device-specific parameters is primarily done via the PROFIBUS PA
interface. You can obtain special configuration and operating programs from various manufacturers
for these purposes.

2. Jumpers/miniature switches (for hardware settings)
You can make the following hardware settings for the PROFIBUS PA interface using miniature
switches or a jumper on the I/O board:
- Entering the device bus address→ Page 44
- Switching the hardware write protection on/off→ Page 45
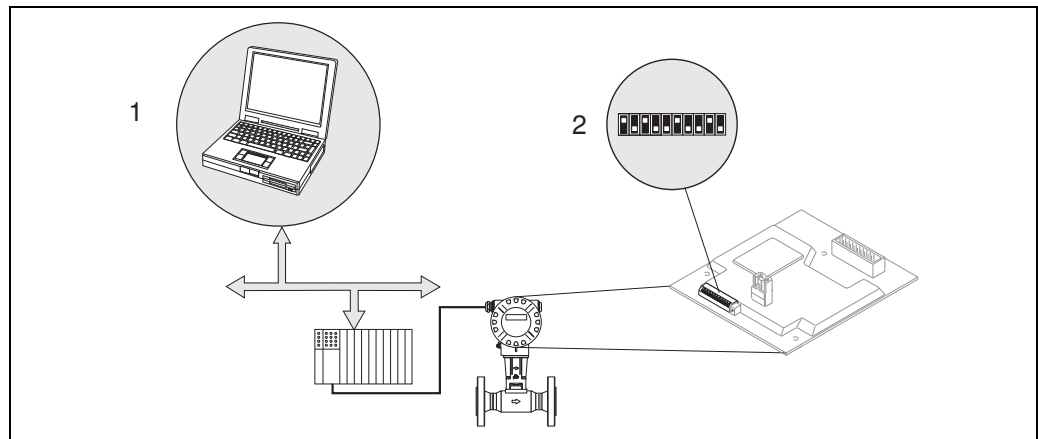
A0003862

Fig. 21:   Device operating options via the PROFIBUS PA interface

1   Configuration/operating programs for operation via PROFIBUS PA
2   Jumper/miniature switches for hardware settings (write protection, device address)

5.2   Display elements

Local display
The local display enables you to read important parameters directly at the measuring point. The display consists of two lines; this is where measured values and/or status variables (e.g. bar graph) are displayed.

You can change the assignment of the display lines to suit your needs and preferences (see Page 109 ff.).
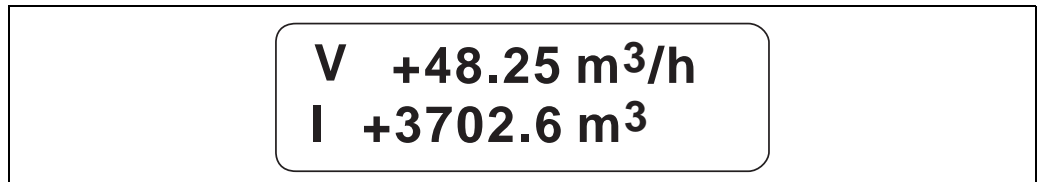
A0003787

Fig. 22:   Liquid crystal display

The two-line liquid-crystal display shows measured values, fault messages and notice messages.
– Top line: shows main measured values, e.g. calculated volume flow in [m³/h] or in [%].
– Bottom line: shows additional measured variables and status variables, e.g. totalizer reading in [m³], bar graph, tag name

5.2.1   Display symbols

The symbols shown in the left display field flash if the device is not involved in cyclic data exchange with the automation system.

Display symbol	Meaning
S	System error
P	Process error
$\frac{1}{2}$	Fault message
!	Notice message
1	Analog Input function block 1, output value OUT
I	Totalizer function block 1, output value OUT
1 ←	Cyclic communication of Analog Input function block 1 from the measuring device to the automation system is active
I ←	Cyclic communication of Totalizer function block 1 from the measuring device to the automation system is active
V	Volume flow
s	Corrected volume flow
m	Mass flow

5.3 Error message display

5.3.1 Type of error

Errors which occur during commissioning or measuring operation are displayed immediately. If two or more system or process errors occur, the error with the highest priority is always the one shown on the display. The measuring system distinguishes between two types of error:

- *System errors:* this group includes all device errors, for example communication errors, hardware errors, etc.
- *Process error:* this group includes all application errors e.g. device being operated outside the resonance frequency etc.
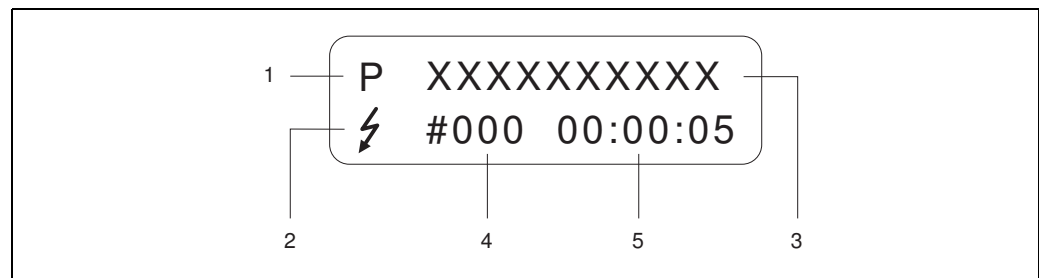
Fig. 23:   *Error messages on the display (example)*

1   *Type of error: P = Process error, S = System error*
2   *Error message type:⌁ = Fault message, ! = Notice message*
3   *Error designation: e.g. DSC SENS LIMIT = Device being operated near application limits*
4   *Error number: e.g. #395*
5   *Duration of most recent error occurrence (in hours, minutes and seconds)*

5.3.2 Type of error message

The measuring device always assigns system and process errors which occur to two types of error messages (fault or notice messages), resulting in different weightings → Page 68 ff.
Serious system errors, e.g. electronic module defects, are always categorized and displayed as "fault messages" by the measuring device!

5.4   Operating options

5.4.1   Operating program "FieldCare"

FieldCare is Endress+Hauser's FDT-based plant asset management tool and allows the configuration and diagnosis of intelligent field devices. By using status information, you also have a simple and effective tool for monitoring devices. The Proline flowmeters are accessed via a service interface or the FXA 193 service interface.

For further information, visit www.endress.com → Download

5.4.2   Operating program "SIMATIC PDM" (Siemens)

SIMATIC PDM is a vendor-independent tool for operating, configuring, maintaining and diagnosing intelligent field devices.

For further information, visit www.endress.com → Download

5.4.3   Commuwin II operating program

Commuwin II is a program for remote operation of field and control-room equipment. Commuwin II can be used irrespective of the device type and the mode of communication (HART or PROFIBUS).

✎ Note!
You can find more information on the Commuwin II operating program in the following Endress+Hauser documents:

- System Information: SI 018F/00/en "Commuwin II"
- Operating Instructions: BA 124F/00/en "Commuwin II"- operating program
- An exact description of the data types can be found in the slot/index lists on Page 158 ff.

All of the device's device functions are clearly arranged in a matrix for programming with the Commuwin II – operating program.
You can call up various parts of the matrix using the MATRIX SELECTION function in the device matrix (VAH5→ Page 37):
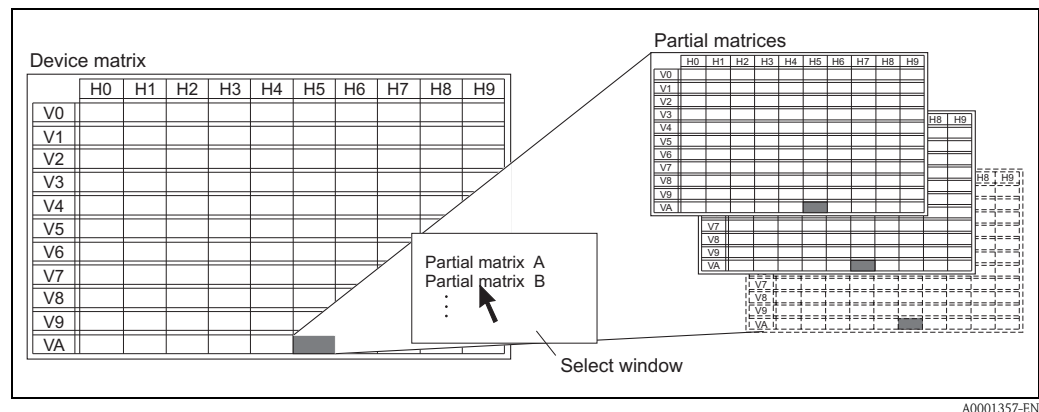
A0001357-EN

Fig. 24:   Selecting parts of the matrix

The following matrixes are available for programming with the Commuwin II – operating program:

- Device matrix→ Page 37
- Diagnose/Alarm/Simulation/Version Info/Service&Analysis (partial matrix)→ Page 38
- Physical Block (operation via profile)→ Page 39
- Transducer Block Flow (operation via profile)→ Page 40
- Analog Input Block (operation via profile)→ Page 41
- Totalizer Block (operation via profile)→ Page 42

Device matrix

	H0	H1	H2	H3	H4	H5	H6	H7	H8	H9
V0 MEASURING VALUES	VOLUME FLOW (display)	CALC. MASS FL. (display)	CORRECTED VOLUME FLOW (display)	VORTEX FREQUENCY (display)						
V1 SYSTEM UNITS	UNIT VOL. FLOW (selection)	UNIT MASS FLOW (selection)	UNIT CORR. VOL. FL (selection)	UNIT LENGTH (selection)	UNIT DENSITY (selection)	UNIT TEMPERATURE (selection)				
V2 OPERATION	LANGUAGE (selection)	ACCESS CODE (input)	DEFINE PRIVATE CODE (input)	STATUS ACCESS (display)						
V3 USER INTERFACE	ASSIGN LINE 1 (selection)	ASSIGN LINE 2 (selection)	100% VALUE (input)	100% VALUE (input)	FORMAT (input)	TIME CONSTANT (input)	CONTRAST LCD (input)	TEST DISPLAY (selection)		
V4 PROCESS PARAM	APPLICATION (selection)	OPERATING DENSITY (input)	REFERENCE DENSITY (input)	OPERAT. TEMP. (input)	MATING PIPE DIAM. (input)	ASSIGN LF CUT OFF (selection)	ON VAL. LF CUT OFF (input)	OFF VAL. LF CUT OFF (input)		
V5 SYSTEM PARAMETER	POSITIVE ZERO RETURN (selection)	SYSTEM DAMPING (input)								
V6 PROFIBUS DP/PA	WRITE PROTECT (display)	SELECTION GSD (selection)	SET UNIT TO BUS (selection)	CHECK CONFIG. (display)	AI BLOCK SELECTION (selection)	CHANNEL (selection)	OUT VALUE (display)	OUT STATUS (display)		
V7 PROFIBUS INFO	BUS ADDRESS (display)	PROFILE VERSION (display)	DEVICE ID (display)		TOT BLOCK SELECT (selection)	CHANNEL (selection)	OUT VALUE (display)	OUT STATUS (display)		
V8										
V9 SENSOR DATA	K-FACTOR (display)	K-FACTOR COMPENS (display)	NOMINAL DIAMETER (display)	METER BODY MB (input)		T-COEFF. SENSOR (input)	AMPLIFICATION (input)			
VA MEASURING POINT	TAG NAME (input)					MATRIX SELECTION (selection)	DEVICE NAME (display)			

Diagnose/Alarm/Simulation/Version Info/Service&Analysis (partial matrix)

Proline Prowirl 72 PROFIBUS PA

	H0	H1	H2	H3	H4	H5	H6	H7	H8	H9
V0 SUPERVISION	ACT. SYST. COND. (display)	PREV. SYS. CON. (display)			ALARM DELAY (input)	SYSTEM RESET (selection)				
V1										
V2 OPERATION	LANGUAGE (selection)	ACCESS CODE (input)	DEFINE PRIVATE CODE (input)	STATUS ACCESS (display)						
V3										
V4 SIMULATION	SIM. MEASURAND (selection)	VALUE SIM. MEAS (input)	SIM. FAILSAFE (selection)							
V5										
V6 SENSOR INFO	SERIAL NUMBER (display)	SENSOR TYPE (display)	SN DSC SENSOR (display)							
V7 AMPLIFIER INFO			SW REV. AMP. (display)							
V8 I/O MODULE INFO			SW REV. I/O (display)							
V9										
VA MEASURING POINT	TAG NAME (input)					MATRIX SELECTION (selection)	DEVICE NAME (display)			

Physical Block (operation via profile)

	H0	H1	H2	H3	H4	H5	H6	H7	H8	H9
V0 DEVICE DATA	DEVICE ID (display)	SERIAL NUMBER (display)	SOFTW VERSION (display)	HARDW VERSION (display)	MANUFACTURER ID (display)					
V1 DESCRIPTION	DESCRIPTOR (input)	INSTALLATION DATE (display)	MESSAGE (input)	DEVICE CERTIFICAT (display)						
V2 SOFTWRE RESET	SOFTWARE RESET (input)									
V3 SECURITY LOCKING	WRITE LOCKING (input)	HW WRITE PROTEC (selection)	LOCAL OPERATION (input)							
V4 DEVICE DATA	IDENT NUMBER (selection)									
V5 DIAGNOSIS MASK	MASK (display)	MASK 1 (display)	MASK 2 (display)	DIAG MASK EXTENS (display)						
V6 DIAGNOSIS	DIAGNOSIS (display)	DIAGNOSIS 1 (display)	DIAGNOSIS 2 (display)	DIAGNOSIS EXTENS (display)						
V7										
V8 BLOCK MODE	TARGET MODE (input)	ACTUAL (display)	NORMAL (display)	PERMITTED (display)						
V9 ALARM CONFIG	CURRENT (display)	DISABLE (display)				ST REVISION (display)				
VA BLOCK PARAMETER	TAG (input)	STRATEGY (input)	ALERT KEY (input)	PROFILE VERSION (display)						

Transducer Block Flow (operation via profile)

	H0	H1	H2	H3	H4	H5	H6	H7	H8	H9
V0 VOLUME FLOW	VOLUME FLOW (display)	STATUS (display)	UNIT (selection)	LOWER RANGE VAL. (input)	UPPER RANGE VAL. (input)					
V1										
V2										
V3										
V4										
V5 VORTEX	VORTEX FREQ (display)	STATUS (display)	UNIT (selection)	LOWER RANGE VAL. (input)	UPPER RANGE VAL. (input)					
V6										
V7 SYSTEM PARAMETER			LOW FLOW CUTOFF (input)				CALIB. FACTOR (input)	NOMINAL SIZE (input)	NOMINAL SIZE UNIT (input)	
V8 BLOCK MODE	TARGET MODE (input)	ACTUAL (display)	NORMAL (display)	PERMITTED (display)				UNIT MODE (selection)		
V9 ALARM CONFIG	CURRENT (display)	DISABLE (display)				ST REVISION (display)				
VA BLOCK PARAMETER	TAG (input)	STRATEGY (input)	ALERT KEY (input)	PROFILE VERSION (display)						

Endress + Hauser

Analog Input Block (operation via profile)

	H0	H1	H2	H3	H4	H5	H6	H7	H8	H9
V0 OUT	OUT VALUE (display)	OUT STATUS (display)	OUT STATUS (display)	OUT SUB STATUS (display)	OUT LIMIT (display)		FAILSAFE ACTION (selection)	FAILSAFE VALUE (input)		
V1 SCALING	PV SCALE MIN (input)	PV SCALE MAX (input)	TYPE OF LIN (selection)	OUT SCALE MIN (input)	OUT SCALE MAX (input)	OUT UNIT (input)	USER UNIT (input)	DEC POINT OUT (input)	RISING TIME (input)	
V2 ALARM LIMITS	ALARM HYSTERESIS (input)									
V3 HI HI ALARM	HI HI LIM (input)	VALUE (display)	ALARM STATE (display)	SWITCH ON POINT (input)	SWITCH OFF POINT (input)					
V4 HI ALARM	HI LIM (input)	VALUE (display)	ALARM STATE (display)	SWITCH ON POINT (input)	SWITCH OFF POINT (input)					
V5 LO ALARM	LO LIM (input)	VALUE (display)	ALARM STATE (display)	SWITCH ON POINT (input)	SWITCH OFF POINT (input)					
V6 LO LO ALARM	LO LO LIM (input)	VALUE (display)	ALARM STATE (display)	SWITCH ON POINT (input)	SWITCH OFF POINT (input)					
V7 SIMULATION	SIMULATION VALUE (input)	SIMULATION STAT. (selection)	SIMULATION MODE (selection)							
V8 BLOCK MODE	TARGET MODE (input)	ACTUAL (display)	NORMAL (display)	PERMITTED (display)		CHANNEL (selection)		UNIT MODE (selection)		
V9 ALARM CONFIG	CURRENT (display)	DISABLE (display)				ST REVISION (display)				
VA BLOCK PARAMETER	TAG (input)	STRATEGY (input)	ALERT KEY (input)	PROFILE VERSION (display)	BATCH ID (input)	BATCH RUP (input)	BATCH PHASE (input)	BATCH OPERATION (selection)		

Totalizer Block (operation via profile)

	H0	H1	H2	H3	H4	H5	H6	H7	H8	H9
V0 TOTALIZER	TOTAL VALUE (display)	TOTAL STATUS (display)	TOTAL STATUS (display)	TOTAL SUB STATUS (display)	TOTAL LIMIT (display)		FAILSAFE MODE (input)			
V1 CONFIGURATION	TOTAL UNIT (display)	SET TOTALIZER (selection)	PRESET TOTALIZER (input)	TOTALIZER MODE (selection)						
V2 ALARM LIMITS	ALARM HYSTERESIS (input)									
V3 HI HI ALARM	HI HI LIM (input)	VALUE (display)	ALARM STATE (display)	SWITCH-ON POINT (input)	SWITCH-OFF POINT (input)					
V4 HI ALARM	HI LIM (input)	VALUE (display)	ALARM STATE (display)	SWITCH-ON POINT (input)	SWITCH-OFF POINT (input)					
V5 LO ALARM	LO LIM (input)	VALUE (display)	ALARM STATE (display)	SWITCH-ON POINT (input)	SWITCH-OFF POINT (input)					
V6 LO LO ALARM	LO LO LIM (input)	VALUE (display)	ALARM STATE (display)	SWITCH-ON POINT (input)	SWITCH-OFF POINT (input)					
V7										
V8 BLOCK MODE	TARGET MODE (input)	ACTUAL (display)	NORMAL (display)	PERMITTED (display)		CHANNEL (input)		UNIT MODE (selection)		
V9 ALARM CONFIG	CURRENT (display)	DISABLE (display)				ST REVISION (display)				
VA BLOCK PARAMETER	TAG (input)	STRATEGY (input)	ALERT KEY (input)	PROFILE VERSION (display)	BATCH ID (input)	BATCH RUP (input)	BATCH PHASE (input)	BATCH OPERATION (selection)		

5.4.4 Current device description files

The following table illustrates the suitable device description file for the operating tool in question and then indicates where these can be obtained.

PROFIBUS PA protocol (IEC 61158–2 (MBP)):

Valid for software:	1.03.XX	→ DEVICE SOFTWARE function
PROFIBUS PA device data		
Profile Version:	3.0	→ PROFILE VERSION function
Prowirl 72 device ID:	153B$_{hex}$	→ DEVICE ID function
Profile ID:	9740$_{hex}$	
GSD information:		
Prowirl 72 GSD:	Extended	eh3x153B.gsd
	Standard	eh3_153B.gsd
Profile GSD:	PA139740.gsd	
Bitmaps:	EH_153B_d.bmp/.dib	
	EH_153B_n.bmp/.dib	
	EH_153B_s.bmp/.dib	
Software release:	01.2007	
Operating program/device driver:	**Sources for obtaining device descriptions/program updates:**	
GSD	■ www.endress.com (→ Download → Software → Drivers) ■ www.profibus.com ■ CD-ROM	
Fieldcare / DTM	■ www.endress.com (→ Download → Software → Drivers) ■ CD-ROM	
SIMATIC PDM	■ www.endress.com (→ Download → Software → Drivers) ■ www.www.fielddevices.com	

Tester and simulator:	**Sources for obtaining device descriptions:**
Fieldcheck	■ Update by means of FieldCare via flow device FXA 193/291 DTM in the Fieldflash Module

✎ Note!
The Fieldcheck tester/simulator is used for testing flowmeters in the field. When used in conjunction with the " FieldCare" software, test results can be imported into a database, printed and used for official certification.
Contact your Endress+Hauser representative for more information.

5.5   Hardware configuration

5.5.1   Switching write protection on/off

A DIP switch on the I/O amplifier board provides the means of activating or deactivating the write protection. When write protection is active, parameters cannot be modified.
The current write protection status is displayed in the HW WRITE PROTECT parameter (Physical Block).

1. Switch off power supply.
2. Unscrew the cover of the electronics compartment from the transmitter housing.
3. Remove the local display module (a) from the retaining rails (b) and refit onto right retaining rail with the left side (this secures the local display module).
4. Fold up the plastic cover (c).
5. Set the DIP switch (f) to the desired position.
   Position **A**, DIP switch at front = Write protection disabled
   Position **B**, DIP switch at rear = Write protection enabled
6. Installation is the reverse of the removal procedure.

A0003876
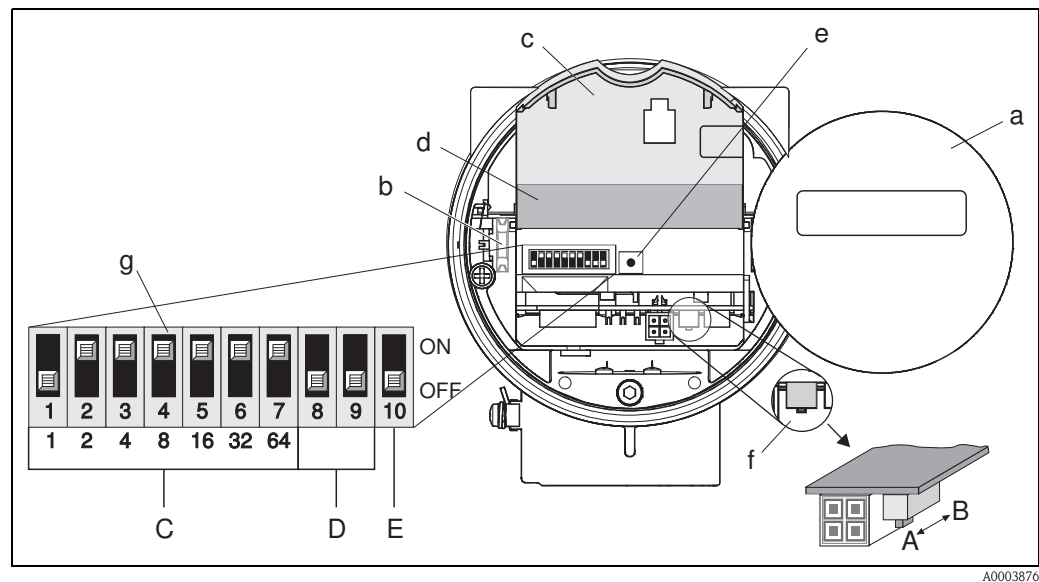
Fig. 25:   DIP switch for write protection, configuring device address, LED

a   Local display module
b   Retaining rails of the local display module
c   Plastic cover
d   I/O board cover (COM module)
e   LED (light emitting diode):
   – lit continuously = ready for operation
   – not lit = not ready for operation
   – flashing = system or process error present → Page 68 ff.
f   DIP switch for write protection
   – A = write protection disabled (DIP switch to the front = factory setting)
   – B = write protection enabled (DIP switch to the rear)
g   DIP switch for device address
   – C = DIP switches 1 to 7 = sets the device address (factory setting = 126)
   – D = DIP switches 8 to 9 = not assigned
   – E = DIP switch 10 = addressing option
   (ON = hardware addressing / OFF = software addressing = factory setting)

5.5.2   Configuring the device address

Note the following points:
- In the case of a PROFIBUS PA device, the address must always be configured.
  The valid device addresses are in the range from 1 to 126. In a PROFIBUS PA network, each address can only be assigned once. If an address is not configured correctly, the device is not recognized by the master.
  The address 126 can be used for initial commissioning and for service purposes.
- All devices have the address 126 and software addressing on leaving the factory.

Procedure for configuring the device address (→ Fig. 25 on Page 44):

1. Switch off power supply.
2. Unscrew the cover of the electronics compartment from the transmitter housing.
3. Remove the display module (a) from the retaining rails (b) and refit onto right retaining rail with the left side (this secures the display module).
4. Fold up the plastic cover (c).
5. Fold up the cover (d) of the I/O board (COM module).
6. Configure the device address using DIP switches 1 to 7.
7. Activate hardware addressing using DIP switch 10 (=ON).
8. Installation is the reverse of the removal procedure.

6 Commissioning

6.1 Function check

Make sure that all final checks have been completed before you commission your measuring point:
- "Post-installation check" checklist → Page 19
- "Post-connection check" checklist → Page 31

✎ Note!
- The PROFIBUS PA interface's technical data must be maintained in accordance with IEC 61158-2 (MBP).
- A normal multimeter can be used to check the bus voltage of 9 to 32 V and the current consumption of 16 mA at the device.
- Using the LED on the I/O board (→ Page 44), it is possible to carry out a simple function check on the fieldbus communication in the non-hazardous area.

6.1.1 Switching on the measuring device

Once the final checks have been completed, switch on the supply voltage. The device is ready for operation after approx. 5 seconds!

The measuring device performs a number of internal test functions after power-up. As this procedure progresses the following sequence of messages appears on the local display:

PROWIRL 72 **START-UP RUNNING**	Start-up message

▼

DEVICE SOFTWARE **V XX.XX.XX**	Current software version

▼

FIELDBUS ADDRESS	The PROFIBUS address is displayed
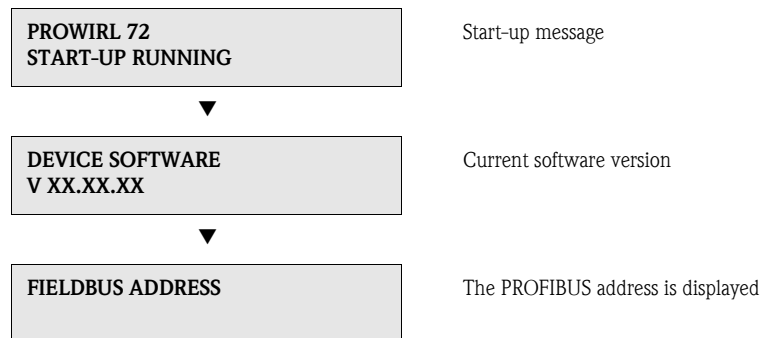
Normal measuring mode commences as soon as startup completes.
Various measured value and/or status variables appear on the display.

✎ Note!
If startup fails, an appropriate error message is displayed, depending on the cause.

6.2   Commissioning the PROFIBUS interface

6.2.1   Commissioning via the Class 2 master

Operation with Commuwin II is described in the Endress+Hauser document BA 124F/00/a2.
The configuration parameters are found in the following places in the Commuwin II operation
matrix:
- In the Physical Block→ Page 39
- In the manufacturer-specific device matrix→ Page 37
- In the Analog Input Block→ Page 41
- In the Totalizer Block→ Page 42

1. Configuring the "Physical Block":
    – Open the Physical Block.
    – Software and hardware write protection is disabled in Prowirl 72 so that you can access the
      write parameters. Check this status via the WRITE LOCKING (V3H0, software write
      protection) and HW WRITE PROTECT. (V3H1, hardware write protection) parameters.
    – Enter the tag name in the TAG (VAH0) parameter.

2. Configuring the manufacturer-specific device parameters in the Transducer Block:
    – Open the manufacturer-specific Transducer Block "PROWIRL 72".
    – Enter the desired name for the block (tag name).
    – Factory setting: no block name (tag name).
    – Configure the device-specific parameters for flow measurement.

✎ Note!
    Other matrixes can be selected in the matrix cell VAH5 if you wish to configure other
    manufacturer-specific parameters.
    Please note that alterations made to device parameters will only be activated once a valid
    release code has been entered. The release code can be entered in the matrix cell V2H0
    (factory setting: 72).

3. Configuring the "Analog Input function block":
    The Prowirl 72 has an Analog Input function block. This is selected using the profile block
    "Analog Input Block" in the connection clearance list.
    – Enter the required block name for Analog Input function block (factory setting: ANALOG
      INPUT 1).
    – Select the process variable (volume flow, calculated mass flow or corrected volume flow) via
      the CHANNEL parameter (channel, V8H5).
    – In the Analog Input function block, the input value or the input range can be scaled in
      accordance with the requirements of the automation system (→ Page 135).
    – If necessary, set the limit values (→ Page 136).

4. Configuring the "Totalizer Block":
    Prowirl 72has a Totalizer function block. This is selected using the profile block "Totalizer
    Block" in the connection clearance list.
    – Enter the required name for the Totalizer function block (factory setting: TOTALIZER
      BLOCK).
    – Select the process variable (volume flow, calculated mass flow or corrected volume flow) via
      the CHANNEL parameter (channel, V8H5).
    – Select the required units for the totalizer (UNIT TOTALIZER, V1H0).
    – Configure the totalizer status (SET TOT, V1H1), e.g. for totalizing.
    – Configure the totalizer mode (TOTALIZER MODE, V1H3), e.g. for balancing.

5. Configuring cyclic data traffic:
    – All the relevant data are described in the "System integration" ($\rightarrow$ Page 48) section.
    – We recommend that the "Coupling Documentation" be used for step–by–step configuration. This can be obtained from Endress+Hauser Process Solutions for various automation systems and programmable logic controllers.
    – The files required for commissioning and network configuration can be obtained as described on Page 48 ff.

6.3   System integration

The device is ready for system integration once commissioning has been effected via the Class 2 master (Commuwin II). The PROFIBUS PA system requires a description of the device parameters, e.g. output data, input data, data format, data volume and supported transmission rate so that it can integrate the field devices into the bus system.
These data are contained in a Device Master File (GSD file) which is placed at the disposal of the PROFIBUS PA master while the communication system is being commissioned.
Device bitmaps, which appear as icons in the network tree, can also be integrated. The Profile 3.0 Device Master File (GSD) allows field devices from various manufacturers to be exchanged without having to reconfigure.
Generally, the Profile 3.0 distinguishes between three different versions of GSD (factory setting: manufacturer–specific GSD):

Manufacturer–specific GSD: This GSD guarantees the unlimited functionality of the field device. Device-specific process parameters and functions are therefore available.

Profile GSD: This GSD is different in terms of the number of Analog Input Blocks (AI) and the measuring principles. If a system is configured with profile GSDs, it is possible to exchange devices that are supplied by various manufacturers. It is, however, essential that the cyclic process values follow the same sequence.

Example:
The Proline Prowirl 72 PROFIBUS PA supports the Profile PA139740.gsd (IEC 61158–2 (MBP)). This GSD contains one Analog Input Block and one Totalizer Block. The following measured variable is always assigned to the Analog Input Block: AI 1 = Volume flow. This guarantees that the first measured variable agrees with the field devices of other manufacturers.

Profile GSD (multivariable) with the ID number 9760_{Hex}: This GSD contains all function blocks such as AI, DO, DI etc. This GSD is not supported by Prowirl 72.

✎   Note!
■ A decision should be made with respect to which GSD is to be used before configuration takes place.
■ The setting can be changed using a Class 2 master.

Prowirl 72 supports the following GSD files:

Name of device	Manufacturer-spec. ID No.	Profile 3.0 ID No.	Manufacturer-spec. GSD
Prowirl 72 PA PROFIBUS PA (IEC 61158–2 (MBP))	153B (Hex)	9740 (Hex)	EH3_153B.gsd EH3X153B.gsd
	Profile 3.0 GSD	**Type file**	**Bitmaps**
	PA139740.gsd	EH_153B.200	EH153B_d.bmp/.dib EH153B_n.bmp/.dib EH153B_s.bmp/.dib

Each device receives an identification number from the Profibus User Organization (PNO). The name of the Device Master File (GSD) is derived from this.
For Endress+Hauser, this ID No. starts with the manufacturer ID 15xx.
In order to ensure clarity and make assignment easier, the GSD names (with the exception of type files) at Endress+Hauser are as follows:

EH3_15xx	EH = Endress + Hauser 3 = Profile 3.0 _ = Standard identification 15xx = ID No.
EH3x15xx	EH = Endress + Hauser 3 = Profile 3.0 x = Extended identification 15xx = ID No.

The GSD files for all Endress+Hauser devices can be acquired in the following manner:
- Internet (Endress+Hauser) → http://www.endress.com (Products → Process Solutions → PROFIBUS → GSD files)
- Internet (PNO) → http://www.profibus.com (GSD library)
- On CD ROM from Endress+Hauser

Structure of GSD files from Endress+Hauser
For Endress+Hauser field transmitters with PROFIBUS interface, all the data which are needed for configuration are contained in one file. Once unpacked, this file will create the following structure:
- Revision #xx stands for the corresponding device version. Device-specific bitmaps can be found in the directories "BMP" and "DIB". The utilization of these will depend on the configuration software that is being used.
- The GSD files are saved in the "Extended" and "Standard" subdirectories of the "GSD" folder. Information relating to the implementation of the field transmitter and any dependencies in the device software can be found in the "Info" folder. Please read this information carefully before configuring. The files with the extension .200 can be found in the "TypDat" folder.

Standard and extended formats
The modules of some GSD files are transmitted with an extended identification (e.g. 0x42, 0x84, 0x08, 0x05). These GSD files can be found in the "Extended" folder. All GSD files that have a standard identification (e.g. 0x94) can be found in the "Standard" folder.
When integrating field transmitters, the GSD files with the extended identification should be used first. If, however, the integration is not successful, the standard GSD should be used. This differentiation is the result of specific implementation in the master systems.

Contents of the download file from the Internet and the CD-ROM:
- All Endress+Hauser GSD files
- Endress+Hauser type files
- Endress+Hauser bitmap files
- Useful information relating to the devices

Working with GSD / type files
The GSD files must be integrated into the automation system.
Depending on the software that is being used, the GSD files can be copied to the program-specific
directory or can be read into the database using the import function within the configuration
software.

Example 1:
In the case of the configuration software Siemens STEP 7 (Siemens PLC S7-300 / 400) the files are
copied to the subdirectory ...\ siemens \ step7 \ s7data \ gsd.
The GSD files also have bitmap files. These bitmap files are used to display the measuring points in
image form. The bitmap files must be saved to the directory ...\ siemens \ step7 \ s7data \ nsbmp.

Example 2:
If you have a PLC Siemens S5 where the PROFIBUS DP network is configured with the
configuration software COM ET 200, you will have to use the type files (x.200 files).

If you are using configuration software other than that referred to above, ask your PLC manufacturer
which directory you should use.

Compatibility of Profile 2.0 and 3.0 devices
It is possible to operate Profile 2.0 and 3.0 devices with different GSD files in one system using one
DP master as the cyclic data for the automation system in both profile versions are compatible.

6.3.1 Compatibility with previous model Prowirl 77

In the event of the device being replaced, Prowirl 72 PROFIBUS PA ensures compatibility of the cyclic data with the previous model Prowirl 77 PROFIBUS PA with Profile version 2.0 (ID No. 1510).
It is possible to replace a Prowirl 77 PROFIBUS PA device with a Prowirl 72 PROFIBUS PA without adjusting the planning of the PROFIBUS DP/PA network in the automation device even though the devices differ with regard to their name and their ID number. Once replaced, the device is recognized either automatically (factory setting) or this can be set manually.

Automatic recognition (factory setting)
The Prowirl 72 PROFIBUS PA automatically recognizes the measuring device (Prowirl 77 PROFIBUS PA) planned in the automation system and makes the same input and output data and measured value status information available for cyclic data exchange.

Manual setting
The manual setting is made in the manufacturer-specific device matrix in the SELECTION GSD (V6H1) parameter, see Page 119. When replacing instead of a Prowirl 77 PROFIBUS PA, "Prowirl 77" must be selected in the SELECTION GSD parameter.
Then the Prowirl 72 PROFIBUS PA makes the same input and output data and measured value status information available for cyclic data exchange.

✎ Note!
- At 16 mA, the current consumption of the Prowirl 72 PROFIBUS PA is slightly higher than that of the Prowirl 77 PROFIBUS PA (12 mA). After replacing the devices, make sure that the sum of the base currents of all the PROFIBUS PA bus users does not exceed the maximum permitted feed current of the bus feed device.
- When acyclically configuring the Prowirl 72 PROFIBUS PA by means of an operating program (Class 2 master), access takes place directly via the block structure or the parameters of the measuring device.
- If parameters in the device to be replaced (Prowirl 77 PROFIBUS PA) have been changed (parameter setting no longer corresponds to the original factory setting), these parameters have to be adjusted accordingly in the new Prowirl 72 PROFIBUS PA in use by means of an operating program (Class 2 master).

Example:
The assignment of low flow cut off was changed from volume flow (factory setting) to corrected volume flow in a Prowirl 77 PROFIBUS PA which is in use. This measuring device is now being replaced by a Prowirl 72 PROFIBUS PA. Once the device has been replaced, the low flow cut off assignment in the Prowirl 72 PROFIBUS also has to be adjusted manually, i.e. changed to corrected volume flow to ensure that the device behaves identically.

Procedure when replacing the measuring devices

Replacing a Prowirl 77 PROFIBUS PA with a Prowirl 72 PROFIBUS PA
- Remove the Prowirl 77 PROFIBUS PA
- Configure the device address (see Page 42).   The same device address as that configured for the Prowirl 77 PROFIBUS PA must be used.
- Check that the maximum permitted feed current of the bus feed device is not exceeded. This could be caused by the higher current consumption of the Prowirl 72 PROFIBUS PA.
- Connect the Prowirl 72 PROFIBUS PA

- If necessary, the following settings must be adjusted (if the factory setting had been altered):
  – Configuration of the application-specific parameters
  – Configuration of the units for the process variables

6.4 Cyclic data exchange

In the case of PROFIBUS PA, the cyclic transmission of analog values to the automation system is effected in data blocks of 5 bytes. The measured value is portrayed in the first 4 bytes in the form of floating point numbers in accordance with IEEE 754 standard (see IEEE floating point number). The 5th byte contains status information pertaining to the measured value which is implemented in accordance with the Profile 3.0 Specification ($\rightarrow$ Page 48). The status is indicated on the display of the device, if present.

✎ Note!
An exact description of the data types can be found in Section 11 "Operation via PROFIBUS PA" on Page 95 ff.

IEEE floating point number
Converting a hexadecimal value to an IEEE floating point number for measured value acquisition. The measured values are shown in numerical format IEEE–754 in the following manner and are transferred to the Class 1 master:

Byte n			Byte n+1			Byte n+2		Byte n+3
Bit 7	Bit 6	Bit 0	Bit 7	Bit 6	Bit 0	Bit 7	Bit 0	Bit 7 Bit 0
Sign	2^7 2^6 2^5 2^4 2^3 2^2 2^1		2^0	2^{-1} 2^{-2} 2^{-3} 2^{-4} 2^{-5} 2^{-6} 2^{-7}		2^{-8} 2^{-9} 2^{-10} 2^{-11} 2^{-12} 2^{-13} 2^{-14} 2^{-15}		2^{-16} to 2^{-23}
	Exponents			Mantissa		Mantissa		Mantissa

Formula value = $(-1)^{\text{sign}} * 2^{(\text{exponent} -127)} * (1 + \text{mantissa})$

Example:

40 F0 00 00 hex	=	0100 0000 1111 0000 0000 0000 0000 0000 binary
Value	=	$(-1)^0 * 2^{(129-127)} * (1 + 2^{-1} + 2^{-2} + 2^{-3})$
	=	$1 * 2^2 * (1 + 0.5 + 0.25 + 0.125)$
	=	$1 * 4 * 1.875 = 7.5$

Block model
The analog values transmitted by Prowirl 72 during cyclic data exchange are:
- Volume flow
- Calculated mass flow
- Corrected volume flow
- Totalizer and the corresponding controls
- Control for manufacturer-specific functions

✎ Note!
The totalizer can be configured in various combinations with the totalizer controls.
It is possible to configure the totalizer only, or additionally integrate one or two control blocks in order to reset the totalizer or stop totalizing, for example.
The configuration is explained in detail on Page 55.

The block model illustrated (→ Fig. 26) shows which input and output data Prowirl 72 provides for cyclic data exchange.
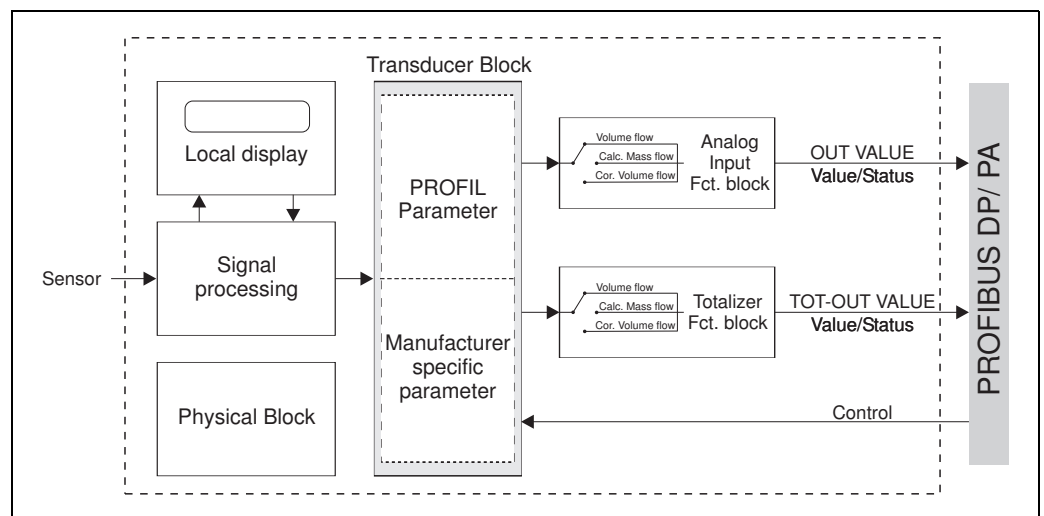
A0003881-EN

Fig. 26:   Block model Proline Prowirl 72 PROFIBUS PA Profile 3.0

Input data
Input data are: volume flow, calculated mass flow, corrected volume flow and totalizer. The current measured value can be transmitted to the automation system using these measured variables.

Data transfer from Prowirl to the automation system
The input and output bytes are structured in a fixed sequence. If addressing is effected automatically using the configuration program, the numerical values of the input and output bytes may deviate from the values in the following table.

Input byte	Process parameter	Access type	Comment/data format	Unit factory setting
0, 1, 2, 3	* e.g. Volume flow	Read	32-bit floating point number (IEEE–754) Display→ Page 52	m³/h
4	* e.g. Volume flow status	Read	Status code→ Page 57	–
5, 6, 7, 8	Totalizer	Read	32-bit floating point number (IEEE–754) Display→ Page 52	m³
9	Totalizer status	Read	Status code→ Page 57	–

* Depends on the option selected in the CHANNEL parameter of the Analog Input function block (see P. 144).

Possible settings:
– VOLUME FLOW   → Select in CHANNEL parameter → 273
– CALCULATED MASS FLOW   → Select in CHANNEL parameter → 277
– CORRECTED VOLUME FLOW → Select in CHANNEL parameter → 398

✎ Note!
- The system units in the table correspond to the preset scales which are transferred during cyclic data exchange. In the case of customized settings, the units can deviate from the factory setting, however.
- The measured variable can be assigned to the totalizer via the CHANNEL parameter using a Class 2 master (see Page 155).
  The following settings are possible for the totalizer:
    – VOLUME FLOW   → Select in CHANNEL parameter → 273
    – CALCULATED MASS FLOW   → Select in CHANNEL parameter → 277
    – CORRECTED VOLUME FLOW → Select in CHANNEL parameter → 398

Controls (output data), manufacturer-specific
The device is capable of processing controls (output data) during cyclic data exchange e.g. the switching on of positive zero return.
The following table shows the possible controls (output data) that can be transmitted to the device.

Data transfer from the automation system to the Prowirl 72 (control)

Output byte	Process parameter	Access type	Comment/control variable	Unit factory setting
2	Control	Write	This parameter is manufacturer-specific and can process the following control variables: 0 → 1: Reserved 0 → 2: Positive zero return **ON** 0 → 3: Positive zero return **OFF** 0 → 24: Set unit to bus	–

✎ Note!
A control can be executed through the cyclic data exchange each time the output byte changes from "0" to another bit pattern. It is then necessary to reset to "0" before a further control can be executed. The transition from any bit pattern to "0" does not have any effect.

Controls for the totalizer (output data)
These functions allow the totalizer to be controlled from the automation system. The following controls are possible:
- Totalizing
- Resetting
- Activation of a preset value
- Balancing
- Only positive flow detection
- Only negative flow detection (Prowirl 72 cannot measure any negative flow)
- Stop totalizing

Data transfer from the automation system to Prowirl 72 (totalizer controls)

Output byte	Process parameter	Access type	Comment/control variable	Unit factory setting
The following control variables can be entered for the totalizer using these parameters.				
0	SET_TOT 1	Write Write Write	**Control variable for SET_TOT:** 0: Totalizing 1: Reset totalizer 2: Preset totalizer	–
1	MODE_TOT 1	Write Write Write	**Control variable for MODE_TOT:** 0: Balancing 1: Only positive flow detection 2: * Only negative flow detection 3: Stop totalizing	–
* Prowirl 72 cannot measure any negative flow.				

✎ Note!
- "One" control can be executed through the cyclic data exchange each time the output byte changes from one bit pattern to any other bit pattern. It is not necessary to reset to "0" to execute a control.
- It is only possible to preset a predefined totalizer value via the Class 2 master or the FieldCare FieldCare service and configuration software!

Example for SET_TOT and MODE_TOT:
If the control variable SET_TOT is set to "1" (1 = reset the totalizer), the value of the totalizer is set to "0". The value of the totalizer will now be added up starting from "0".
If the totalizer is to retain the value "0", it is necessary to set the control variable MODE_TOT to "3" (3 = STOP totalizing). The totalizer will now stop adding up. The totalizer can then be reset to "1" using control variable SET_TOT (1 = reset the totalizer).

Factory settings for the cyclic measured variables
The following measured variables are configured in Prowirl 72 at the factory:
- Volume flow (channel 273)
- Calculated mass flow (channel 277)
- Corrected volume flow (channel 398)
- Totalizer (with control variable SET_TOT and MODE_TOT)
- Control (manufacturer-specific)

If all measured variables are not required, you can use the placeholder "EMTY_MODULE" (0x00) – which can be found in the GSD file – to deactivate individual measured variables using the configuration software of the Class 1 master. Examples of configuration→ Page 56.

✎ Note!
Only activate the data blocks which are processed in the automation system. This improves the data throughput rate of a PROFIBUS PA network.
A double-arrow symbol flashes on the display to show that the device is communicating with the automation system.

☞ Caution!
- It is essential to adhere to the following sequence when configuring the measured variables: Analog Input, Totalizer and Control.
- The device has to be reset once a new measured variable configuration has been loaded to the automation system. This can be effected in either of two ways:
  – Via a Class 2 master
  – Switching supply voltage OFF and then ON again.

System units
The measured values are transmitted in the system units, as described in the table on Page 54, to the automation system via cyclic data exchange.

Examples of configuration
The configuration of a PROFIBUS DP system is normally effected in the following manner:

1. The field devices (Prowirl 72 PA) which are to be configured are integrated into the configuration program of the automation system via the PROFIBUS DP network. The GSD file is used here. Measured variables required can be configured "off line" using the configuration software.
2. The automation system's user program should now be programmed. The user program controls the input and output data and defines the location of the measured variables so that they can be processed further.
An additional measured value configuration module may have to be used in the case of automation systems which do not support the IEEE-754 floating point format.
It may also be necessary to change the byte sequence (byte swapping) depending on the type of data management employed in the automation system (little-endian format or big-endian format).
3. When configuration is completed, this is transferred to the automation system in the form of a binary file.
4. The system can be started now. The automation system establishes a connection to the configured devices. The device parameters which are relevant for the process can now be set using a Class 2 master, e.g. with Commuwin II (→ Page 47).

6.4.1   Configuration examples with Simatic S7 HW-Konfig

Example 1:
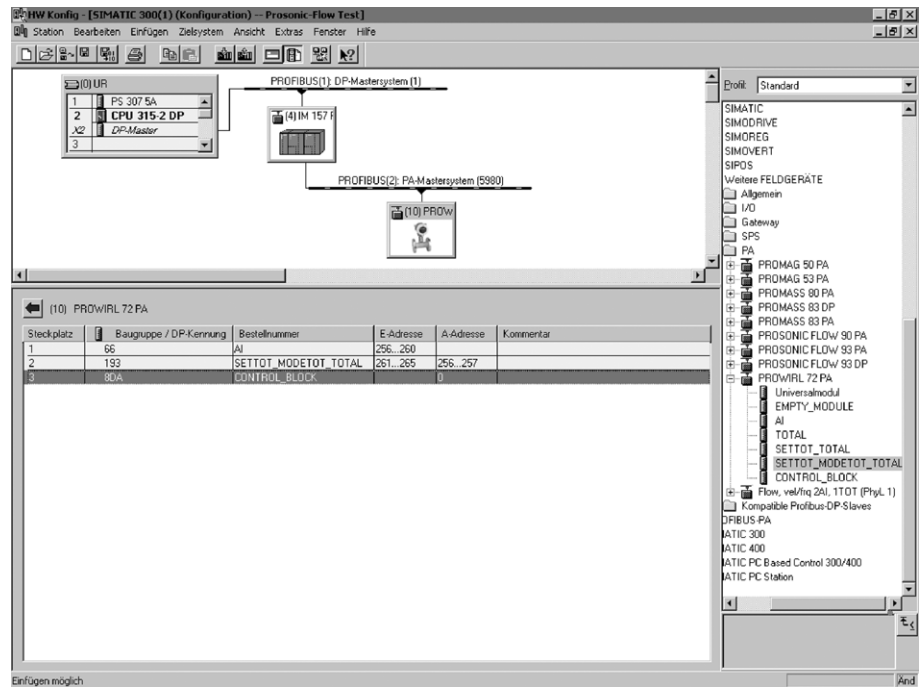
A0003885

Fig. 27:   Full configuration using the manufacturer-specific GSD file.

In this form of configuration, all the data blocks which are supported by Prowirl 72 are activated. The meaning of SET_TOT and MODE_TOT is described on Page 55.

Configuration data	Slot 1	Slot 2	Slot 3
Byte length (input)	0 to 4	5 to 9	–
Byte length (output)	–	0 + 1	2
Data blocks	AI + status	Totalizer + status + control	Control
Status	Active	Active	Active
Access type	Read	Read + write	Write
GSD block name	AI	SETTOT_MODETOT_ TOTAL	CONTROL_BLOCK
GSD extended block identification	0x42, 0x84, 0x08, 0x05	0xC1, 0x81, 0x84, 0x85	0x20
GSD standard block identification	0x94	0xC1, 0x81, 0x84, 0x85	0x20

Example 2:
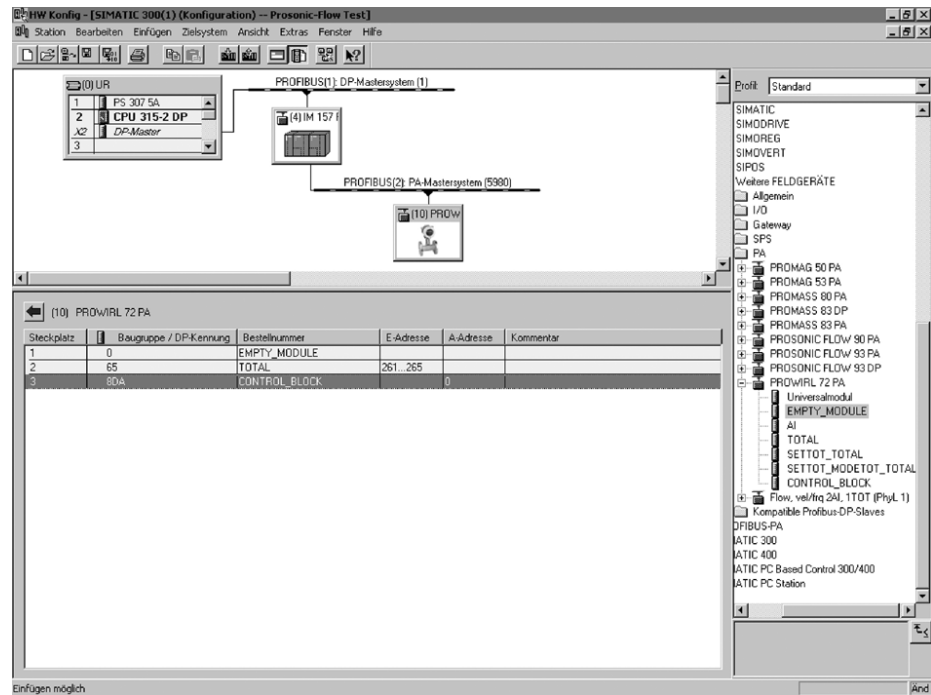
A0003888

Fig. 28:   Replacing measured variables with placeholders (EMPTY_MODULE) using the manufacturer-specific GSD file:

This configuration activates the totalizer and the manufacturer-specific controller. The totalizer is configured "without a controller". In this example, it only returns the measured value and cannot be controlled. It is not possible to reset or stop the totalizer.

Configuration data	Slot 1	Slot 2	Slot 3
Byte length (input)	–	0 to 4	–
Byte length (output)	–	–	0
Data blocks	Placeholder	Totalizer + status	Control
Status	Inactive	Active	Active
Access type	–	Read	Write
GSD block name	EMPTY_MODULE	TOTAL	CONTROL_BLOCK
GSD extended block identification	0x00	0x41, 0x84, 0x85	0x20
GSD standard block identification	0x00	0x41, 0x84, 0x85	0x20

Example 3:
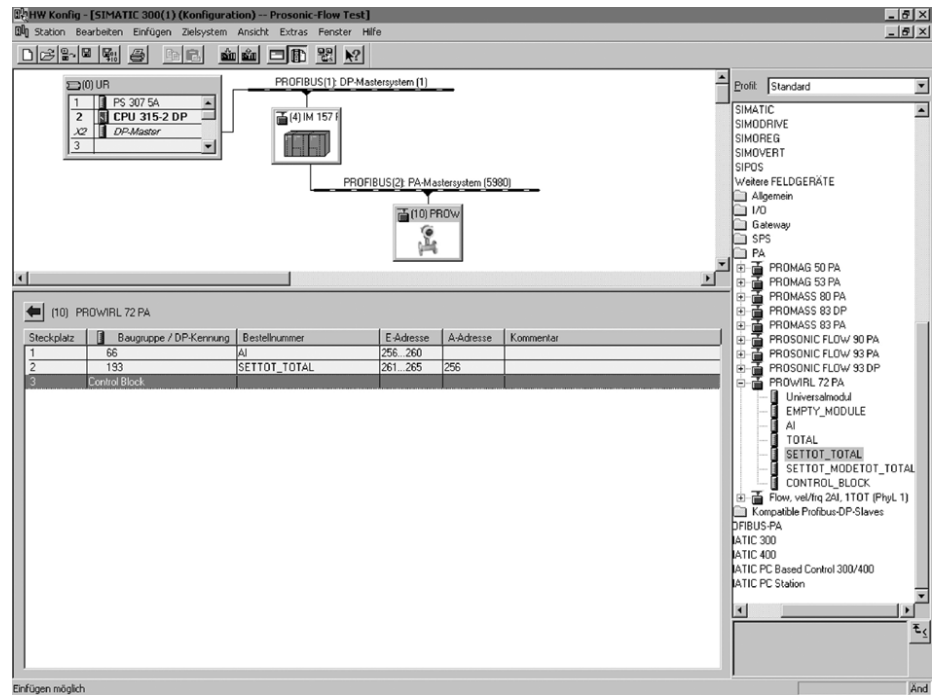
A0003889

Fig. 29:   Configuration of the measured variables without placeholders (EMPTY_MODULE) using the manufacturer-specific GSD file.

This configuration transmits the AI (Analog Input) and the totalizer and control (SET_TOT). If no further measured variables are required, the placeholders do not need to be used.

✎   Note!
This only applies if no Control Block (manufacturer-specific) is used.

Configuration data	Slot 1	Slot 2
Byte length (input)	0 to 4	5 to 9
Byte length (output)	–	0
Data blocks	AI + status	Totalizer + status + control
Status	Active	Active
Access type	Read	Read + write
GSD block name	AI	SETTOT_ TOTAL
GSD extended block identification	0x42, 0x84, 0x08, 0x05	0xC1, 0x81, 0x84, 0x85
GSD standard block identification	0x94	0xC1, 0x81, 0x84, 0x85

Example 4:
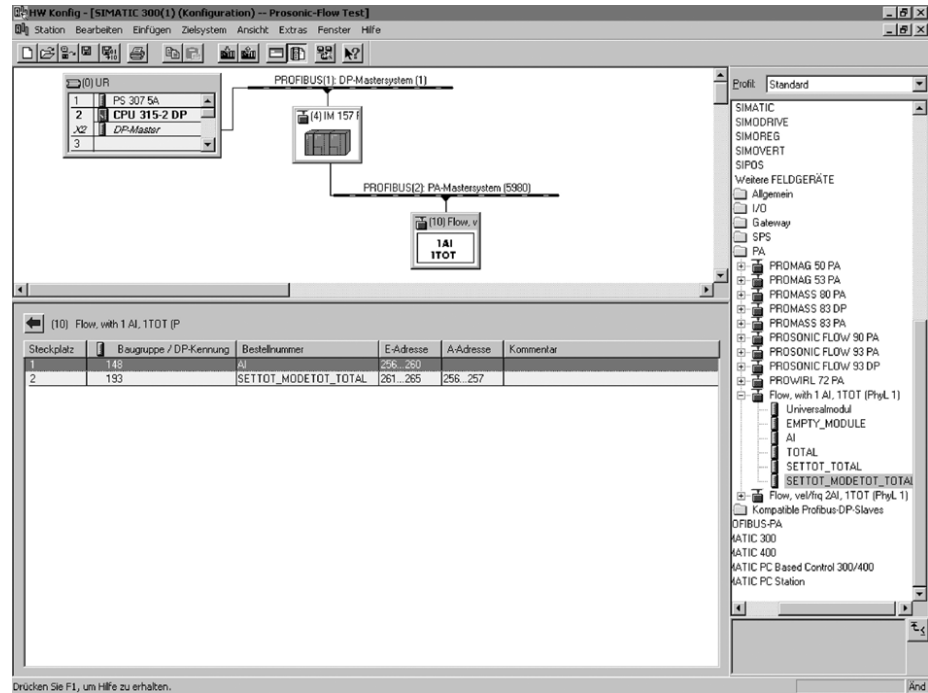
A0003890

Fig. 30:   Full configuration via the profile GSD file PA139740.gsd (IEC 61158-2) MBP.

This configuration transmits the AI (Analog Input) and the totalizer and control.

✎ Note!
This GSD file contains an Analog Input and a Totalizer Block. The Analog Input Block is always assigned to the volume flow measured variable. This guarantees that the measured variables agree with the field devices of other manufacturers.

Configuration data	Slot 1	Slot 2
Byte length (input)	0 to 4	5 to 9
Byte length (output)	–	0 + 1
Data blocks	AI + status	Totalizer + status + control
Status	Active	Active
Access type	Read	Read + write
GSD block name	AI	SETTOT_MODETOT_ TOTAL
GSD extended block identification	–	–
GSD standard block identification	0x94	0xC1, 0x81, 0x84, 0x85

Status code

The status codes which are supported by the AI (Analog Input) and TOT (Totalizer) Blocks are listed in the following table.

The coding of the status corresponds to the PROFIBUS Profiles 3.0 "PROFIBUS PA Profile for Process Control Devices – General Requirements" V 3.0:

Status code	Meaning	Device status	Limits
0x1C 0x1D 0x1E 0x1F	Out of service	Bad	OK LOW_LIM HIG_LIM CONST
0x10 0x11 0x12	Sensor error Sensor limit undershot Sensor limit exceeded	Bad	NO_LIMIT LOW_LIM HIG_LIM
0x0C 0x0D 0x0E 0x0F	Device error	Bad	OK LOW_LIM HIG_LIM CONST
0x18	No communication	Bad	NO_LIMIT
0x08 0x09 0x0A 0x0B	Function block not available	Bad	OK LOW_LIM HIG_LIM CONST
0x40 0x41 0x42 0x43	Uncertain status	Uncertain	OK LOW_LIM HIG_LIM CONST
0x44 0x45 0x46 0x47	Last useable value	Uncertain	OK LOW_LIM HIG_LIM CONST
0x48 0x49 0x4A 0x4B	Substitute set of failsafe status	Uncertain	OK LOW_LIM HIG_LIM CONST
0x4C 0x4D 0x4E 0x4F	Values which are not saved after the device or parameters have been reset	Uncertain	OK LOW_LIM HIG_LIM CONST
0x50 0x51 0x52 0x53	Measured value of sensor inaccurate	Uncertain	OK LOW_LIM HIG_LIM CONST
0x60 0x61 0x62 0x63	Manually specified value	Uncertain	OK LOW_LIM HIG_LIM CONST
0x80 0x81 0x82 0x83	Measuring system OK	Good	OK LOW_LIM HIG_LIM CONST
0x84 0x85 0x86 0x87	Change of parameters	Good	OK LOW_LIM HIG_LIM CONST
0x8C 0x8D 0x8E 0x8F	Critical alarm: Alarm limits exceeded	Good	OK LOW_LIM HIG_LIM CONST
0x88 0x89 0x8A 0x8B	Warning: Early warning limit exceeded	Good	OK LOW_LIM HIG_LIM CONST

6.5 Acyclic data exchange

Acyclic data exchange is used to transfer parameters during commissioning and maintenance or to display other measured variables that are not contained in the useful cyclic data traffic. Thus, parameters for recognizing, for controlling or for adjusting can be changed in the various blocks (Physical Block, Transducer Block, function block) while the device is involved in cyclic data exchange with a PLC.

When observing acyclic communication, a distinction must be made between two types:

6.5.1 Class 2 master acyclic (MS2AC)

MS2AC deals with acyclic communication between a field device and a Class 2 master (e.g. Fieldcare, Commuwin, PDM etc., see Page 35). Here, the master opens a communication channel by means of an SAP (service access point) to access the device.

A Class 2 master must be made aware of all the parameters which should be exchanged with a device by means of PROFIBUS. This assignment is made to each individual parameter either in a device description (DD), a DTM (Device Type Manager) or within a software component in the master via slot and index addressing.

The following should be noted with MS2AC communication:
- As already explained, a Class 2 master accesses a device by means of special SAPs. Thus, the number of Class 2 masters that can simultaneously communicate with a device is restricted to the number of SAPs made available for this communication.
- When a Class 2 master is used, the cycle time of the bus system increases.
  This should be taken into account when programming the control system used.

6.5.2 Class 1 master acyclic (MS1AC)

In the case of MS1AC, a cyclic master, which is already reading the cyclic data from the device or writing the data to the device, opens the communication channel via the SAP 0x33 (special service access point for MS1AC) and can then, like a Class 2 master, acyclically read or write a parameter by means of the slot and the index (if supported).

The following should be noted with MS1AC communication:
- At present, there are very few PROFIBUS masters on the market that support this kind of communication.
- Not all PROFIBUS devices support MS1AC.
- In the user program, you must be aware that constant parameter writing (e.g. with every program cycle) can drastically reduce the operating life of a device. Parameters written acyclically are written to memory modules (EEPROM, Flash, etc.). These are resistant to voltage. These memory modules are only designed for a limited number of writes. This number of writes is not even nearly reached in normal operation without MS1AC (during configuration). This maximum figure can be quickly reached as a result of incorrect programming and thus the operating time of a device can be drastically reduced.

The measuring device supports MS2AC communication with 2 available SAPs.
MS1AC communication is supported by the device.
The memory module is designed for 10^6 writes.

7   Maintenance

The flowmeter system requires no special maintenance.

Exterior cleaning
When cleaning the exterior of measuring devices, always use cleaning agents that do not attack the surface of the housing and the seals.

Cleaning with pigs
Cleaning with pigs is **not** possible!

Replacing sensor seals
Under normal circumstances, wetted seals must not be replaced. Replacement is necessary only in special circumstances, for example if aggressive or corrosive fluids are incompatible with the seal material.

✎   Note!
- The time span between the individual replacements depends on the fluid properties.
- Replacement seals (accessory)→ Page 64.
  Only sensor seals from Endress+Hauser can be used.

Replacing housing seals
The housing seals must be clean and undamaged when inserted into their grooves.
 The seals must be dried, cleaned or replaced if necessary.

✎   Note!
If the measuring device is used in a dust atmosphere, only the associated housing seals from Endress+Hauser should be used.

8 Accessories

Various accessories, which can be ordered separately from Endress+Hauser, are available for the transmitter and the sensor. The Endress+Hauser service organization can provide detailed information on the order codes of your choice.

Accessory	Description	Order code
Transmitter Prowirl 72	Transmitter for replacement or for stock. Use the order code to define the following specifications: – Approvals – Degree of protection / version – Cable entry – Display / operation – Software – Outputs / inputs	72XXX — XXXXX * * * * * *
Mounting kit for Prowirl 72 W	Mounting kit for wafer version consisting of: – Threaded studs – Nuts incl. washers – Flange seals	DKW — **_****
Mounting kit for sensor	Mounting kit for remote version, suitable for pipe and wall mounting.	DK5WM — B
Flow conditioner	To reduce the inlet run after interference in the flow.	DK7ST — * * * *
Applicator	Software for selecting and planning flowmeters. The Applicator can be downloaded from the Internet or ordered on CD-ROM for installation on a local PC. Contact your Endress+Hauser representative for more information.	DKA80 — *
FieldCare	FDT-basiertes Anlagen-Asset-Management-Tool von Endress+Hauser. Es kann alle intelligenten Feldeinrichtungen in Ihrer Anlage konfigurieren und unterstützt Sie bei deren Verwaltung. Durch Verwendung von Statusinformationen stellt es darüber hinaus ein einfaches, aber wirkungsvolles Mittel dar, deren Zustand zu kontrollieren.	Produktseite auf der Endress+Hauser-Website: www.endress.com
Fieldcheck	Tester/simulator for testing flowmeters in the field. When used in conjunction with the " FieldCare" software, test results can be imported into a database, printed and used for official certification. Contact your Endress+Hauser representative for more information.	DXC10 — * *
Memograph M graphic display recorder	The Memograph M graphic display recorder provides information on all the relevant process variables. Measured values are recorded correctly, limit values are monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on a DSD card or USB stick. Memograph M boasts a modular design, intuitive operation and a comprehensive security concept. The ReadWin® 2000 PC software is part of the standard package and is used for configuring, visualizing and archiving the data captured. The mathematics channels which are optionally available enable continuous monitoring of specific power consumption, boiler efficiency and other parameters which are important for efficient energy management.	RSG40 – ***********

Accessory	Description	Order code
Pressure transmitter Cerabar S	Cerabar S is used for measuring the absolute and gauge pressure of gases, steams and liquids. ✎ Note! To read in the pressure via PROFIBUS PA, only Cerabar S sensors are suitable for absolute pressure.	PMC71 – ********* PMP71 – *********
RTD thermometer Omnigrad TR10	Multipurpose process thermometer. Mineral insulated gauge slide; with well, terminal head and neck tube.	TR10 – * * * * * * * * * * * * *
PROFIBUS PA display RID 261	Displays process values and limit value overshoot on PROFIBUS PA, can be used in the Ex area (ATEX).	RID261 – * * *
Surge arrester HAW 562 Z	Surge arrester for limiting overvoltage in signal lines and components.	51003575
Surge arrester HAW569	Surge arrester for limiting overvoltage in Prowirl 72 and other sensors for direct mounting on the device.	HAW569 – **1A
Fieldgate FXA 720	Gateway for remote interrogation of PROFIBUS sensors and actuators via a Web browser ■ Web server for the remote monitoring of up to 30 measuring points ■ Intrinsically safe version [EEx ia]IIC for applications in the hazardous area ■ Communication via modem, Ethernet or GSM ■ Visualization via Internet/Intranet in the Web browser and/or WAP-enabled cellular phone ■ Limit value monitoring with alarm sent by e-mail or text message ■ Synchronized time–stamping for all measured values ■ Remote diagnosis and remote configuration of connected PROFIBUS devices	FXA720 – * * * *

9   Troubleshooting

9.1   Troubleshooting instructions

Always start troubleshooting with the checklists below if faults occur after startup or during operation. This takes you directly (via various queries) to the cause of the problem and the appropriate remedial measures.

Caution!
In the event of a serious fault, a flowmeter might have to be returned to the manufacturer for repair. In such cases, the procedures on Page 6 must be carried out before you return the measuring device to Endress+Hauser.
Always enclose a fully completed "Declaration of Contamination" form with the device. A copy of the form can be found at the end of these Operating Instructions.

Check the display	
No display visible and no output signals present	1. Check supply voltage $\rightarrow$ Terminal 1, 2 2. Electronics defective $\rightarrow$ Order spare part $\rightarrow$ Page 73
No display visible but output signals are present	1. Check whether the ribbon-cable connector of the display module is correctly plugged into the amplifier board $\rightarrow$ Page 74 2. Display module defective $\rightarrow$ Order spare part $\rightarrow$ Page 73 3. Electronics defective $\rightarrow$ Order spare part $\rightarrow$ Page 73

▼

Error messages on display
Errors which occur during commissioning or measuring operation are displayed immediately. Error messages consist of a variety of icons. The meanings of these icons are as follows (example): – Type of error: **S** = System error, **P** = Process error – Error message type: $\maltese$ = Fault message, **!** = Notice message – **DSC SENS LIMIT** = Error designation (device being operated near application limits) – **03:00:05** = Duration of error occurrence (in hours, minutes and seconds) – **#395** = Error number Caution! Please refer also to the information on Page 34 ff.!

Error message present	System error (device error)$\rightarrow$ Page 68 Process error (application error)$\rightarrow$ Page 70

▼

Faulty connection to control system	
No connection can be made between the control system and the device. Check the following points:	
Fieldbus connection	Check data lines
Fieldbus connector	– Check pin assignment / wiring $\rightarrow$ Page 25 ff. – Check connection between connector / fieldbus port. Is the coupling ring tightened correctly?
Fieldbus voltage	Check that a min. bus voltage of 9 V DC is present at terminals 1/2. Permissible range: 9 to 32 V DC
Network structure	Check permissible fieldbus length and number of spurs. $\rightarrow$ Page 21

Faulty connection to control system (contd.)	
Basic current	Is there a basic current of min. 16 mA?
Fieldbus address	Check bus address: make sure there are no double assignments!
Terminating resistors	Has the PROFIBUS network been terminated correctly? Each bus segment must always be terminated with a bus terminator at both ends (start and finish). Otherwise they may be interference in communication.
Current consumption Permissible feed current	Check the current consumption of the bus segment: The current consumption of the bus segment in question (= total of basic currents of all bus users) must not exceed the max. permissible feed current of the bus power supply.

▼

System or process error messages
System or process errors which occur during commissioning or operation can also be displayed in the manufacturer-specific device controls using the Commuwin II operating program → Page 68 ff.

▼

Other errors (without error message)	
Some other error has occurred.	Diagnosis and remedial measures → Page 71

9.2   System error messages

General notes
The measuring device always assigns system and process errors which occur to two types of error messages, resulting in different weightings.

"*Fault message*" *error message type:*
- If this message occurs, operation is immediately interrupted or stopped.
- Display on the PROFIBUS → Fault messages are relayed to downstream function blocks or higher-level process control systems with the status "BAD" of the corresponding process variable.
- Local display → A lightning symbol (⚡) flashes on the display

"*Notice message*" *error message type:*
- Normal operation continues despite this message.
- Display on the PROFIBUS → Notice messages are relayed to downstream function blocks or higher-level process control systems with the status "UNC(ERTAIN)" of the corresponding process variable.
- Local display → An exclamation mark (!) flashes on the display.

Serious system errors, e.g. electronic module defects, are always categorized and displayed as "fault messages" by the measuring device. On the other hand, the measuring system interprets simulations and positive zero return as "notice messages".

Error messages in the configuration program (Cl. 2 master) → see table
In Prowirl 72, system/process errors are recognized and reported in the Transducer and Analog Input Block. The following table contains a list of device status messages pertaining to the Analog Input Blocks (PROFIBUS Profile 3.0) as well as a description of the possible device status messages on the display (measured value Q = measured value quality).

Error messages on the local display, in the configuration program and the automation system

No.	Device status message display/type	Cause/remedy	Device status message, diagnosis message (control system)	Analog Input/Totalizer output status	Status/ alarm limit	Output variables affected
001	S CRITICAL FAIL. ⚡ # 001	Serious device error. Replace the amplifier board: Spare parts→ Page 73.	ROM / RAM failure	Device failure	BAD 0x0F / constant	All
011	S AMP HW EEPROM ⚡ # 011	Amplifier: faulty EEPROM. Replace the amplifier board: Spare parts→ Page 73.	Amplifier HW EEPROM failure	Device failure	BAD 0x0F / constant	All
012	S AMP SW EEPROM ⚡ # 012	Amplifier: error when accessing data of the EEPROM. Contact your Endress+Hauser service organization.	Amplifier SW-EEPROM failure	Device failure	BAD 0x0F / constant	All
021	S COM HW EEPROM ⚡ # 021	COM module: faulty EEPROM. Replace COM module: Spare parts→ Page 73.	COM-HW-EEPROM	Device failure	BAD 0x0F / constant	All
022	S COM SW EEPROM ⚡ # 022	COM module: error when accessing data of the EEPROM Contact your Endress+Hauser service organization.	COM-SW-EEPROM	Device failure	BAD 0x0F / constant	All
111	S CHECKSUM TOT. ⚡ # 111	Totalizer checksum error. Replace amplifier board: Spare parts→ Page 73.	Totalizer checksum error	Device failure	BAD 0x0F / constant	Totalizer only

No.	Device status message display/type	Cause/remedy	Device status message, diagnosis message (control system)	Analog Input/Totalizer output status	Status/ alarm limit	Output variables affected
261	S COMMUNICAT. I/O ⚡ # 261	Communication error: no data reception between amplifier and I/O board or faulty transfer. Check whether the electronics board is correctly inserted in its holder → Page 74.	Communication failure	No communication	BAD 0x18 / No limits	All
379	S RESONANCE DSC ⚡ # 379	Device being operated in the resonance frequency. Reduce the flow. ☝ Caution! If the device is operated in the resonance frequency, this can result in damage which can lead to complete device failure.	Resonance DSC	Out of service	BAD 0x13/ constant	All
394	S DSC SENS DEFCT ⚡ # 394	The DSC sensor is defective, measurement no longer takes place. Contact your Endress+Hauser service organization.	DSC Sensor defect	Sensor failure	BAD 0x13 / Constant	All
395	S DSC SENS LIMIT ! # 395	The DSC sensor is being operated near application limits, device failure is probable soon. If the message persists, please contact your local Endress+Hauser service organization.	DSC Sensor limit	Sensor failure	UNC 0x53 / Constant	All
396	S SIGNAL>LOW PASS ⚡ # 396	The device finds the signal outside the set filter range. Possible causes: ■ The flow is outside the measuring range. ■ The signal is caused by a strong vibration which is intentionally not measured and is outside the measuring range. Remedy: ■ Check whether the device was installed in the direction of flow. ■ Verify that the correct option was selected in the APPLICATION parameter (see P. 112). ■ Check whether the operating conditions are within the specifications of the measuring device (e.g. flow is above measuring range, i.e. the flow may have to be reduced) If the checks do not solve the problem, please contact your local E+H service organization.	Signal error	Device failure	BAD 0x13 / Constant	All
399	S PREAMP. DISCONN. ⚡ # 399	Pre-amplifier disconnected. Check the connection between the preamplifier and amplifier board and establish connection if necessary.	Pre-amplifier disconnected	Not connected (amplifier connection not present)	BAD 0x1F / constant	All
501	S SW. UPDATE ACT. ! # 501	New amplifier software version or data being loaded into the measuring device. No other commands can be executed. Wait until the procedure is complete. The device is restarted automatically.	Software update active	Non specific (uncertain status)	UNC 0x43 / no limits	All
502	S UP./DOWNLOAD ACT. ! # 502	Device data are being uploaded. No other commands can be executed. Wait until the procedure is complete.	Upload/download active	Initial value (Values which are not saved after the device or parameters have been reset)	UNC 0x43 / no limits	All
601	S POS. ZERO-RET. ! # 601	Positive zero return active. Switch off positive zero return. ✎ Note! This message has the highest display priority.	Positive zero return active	Sensor conversion not accurate (measured value from sensor not accurate)	UNC 0x53 / Constant	All

No.	Device status message display/type	Cause/remedy	Device status message, diagnosis message (control system)	Analog Input/Totalizer output status	Status/ alarm limit	Output variables affected
691	S SIM. FAILSAFE ! # 691	Simulation of failsafe mode (outputs) active. Switch off simulation.	Simulation failsafe active	Substitute set (substitute value of failsafe status)	UNC 0x4B/ Constant	All
692	S SIM. MEASURAND ! # 692	Simulation of a measured variable active (e.g. mass flow). Switch off simulation.	Simulation measurand	Simulated value (manually specified value)	UNC 0x60 to 0x63 / Low/high Constant	All
698	S DEVICE TEST ACT. ! # 698	The device is tested on site by the "Fieldcheck" tester and simulator.	Tool Active (e.g. Fieldcheck)	Sensor conversion not accurate (measured value from sensor not accurate)	UNC 0x53 / Constant	All

9.3 Process error messages

Process errors can be defined as either fault messages or notice messages and are thus weighted differently.
 This is specified by means of the function matrix
(see Operation via PROFIBUS PA as of Page 95).

✎ Note!
- The types of error listed below correspond to the factory settings.
- Please refer also to the information on Page 34 ff.

Type	Device status message display/error number	Cause/remedy	Device status message, diagnosis message (control system)	Analog Input/Totalizer output status	Status/ alarm limit	Process variables affected
P = Process error ⚡ = Fault message (with an effect on the inputs and outputs) ! = Notice message (without an effect on the inputs and outputs)						
P !	FLOW RANGE # 421	The current flow velocity exceeds the value permitted for the measuring device. Flow monitoring is active in the VELOCITY WARNING function (see P. 117). Reduce the flow.	Flow Range	Sensor failure	BAD (0x13) / constant	All apart from vortex frequency

9.4   Process errors without messages

Symptoms	Remedial measures
Remark: You may have to change or correct settings in certain parameters in order to rectify the fault. The parameters listed below, such as AMPLIFICATION etc., are described in detail in the Section »Operation via PROFIBUS PA« on Page 95 ff.	
No flow signal	■ For liquids: Check whether the piping is completely filled. The piping must always be completely filled for accurate and reliable flow measurement. ■ Check whether all the packaging material, including the meter body protective covers, was completely removed before mounting the device. ■ Check whether the desired electrical output signal was connected correctly.
Flow signal even though there is no flow	Check whether the device is subject to particularly strong vibrations. If so, a flow can be displayed even if the fluid is at a standstill, depending on the frequency and direction of the vibration. Remedial measures at the device: ■ Turn the sensor 90° (pay attention to the installation conditions,→ Page 11 ff.). The measuring system is most sensitive to vibrations which follow in the direction of the sensor. Vibrations have less of an effect on the device in the other axes. ■ The amplification can be altered using the AMPLIFICATION function (see Page 125). Remedy through constructive measures during installation: ■ If the source of the vibration (e.g. pump or a valve) has been identified, the vibrations can be reduced by decoupling or supporting the source. ■ Support the piping near the device. If these measures do not solve the problem, your Endress+Hauser service organization can adjust the filters of the device to suit your special application.

Faulty or highly fluctuating flow signal	■ The fluid is not sufficiently single-phase or homogeneous. The piping must always be completely filled and the fluid must be single-phase and homogeneous for accurate and reliable flow measurement.
	■ In many instances, the following measures can be taken to improve the measurement result even under non-ideal conditions:
	  – For liquids with a low gas content in horizontal pipework, it helps to install the device with the head pointing downwards or to the side. This improves the measuring signal since the sensor is not in the area where gas accumulates when this type of installation is used.
	  – For liquids with a low solids content, avoid installing the device with the electronics housing pointing downwards.
	  – For steam or gases with a low liquid content, avoid installing the device with the electronics housing pointing downwards.
	■ The inlet and outlet runs must be present as per the installation instructions (→ Page 14).
	■ Suitable seals with an internal diameter not smaller than the pipe internal diameter must be installed and correctly centered.
	■ The static pressure must be large enough to rule out cavitation in the area of the sensor.
	
	Continued on next page

Symptoms	Remedial measures
Faulty or highly fluctuating flow signal (contd.)	■ Check whether the correct fluid was selected in the APPLICATION function (see Page 112). The setting in this function determines the filter settings and can thus have an effect on the measuring range. ■ Check whether the data for the K–factor on the nameplate match the data in the K–FACTOR parameter (see Page 123). ■ Check whether the device is installed correctly in the direction of flow. ■ Check whether the nominal diameter of the mating pipe and the device match (see Page 115). ■ The flow must be in the measuring range of the device ($\rightarrow$ Page 79). The start of measuring range depends on the density and the viscosity of the fluid. Density and viscosity depend on temperature. Density also depends on the process pressure in the case of gases. ■ Check whether the operating pressure is affected by pressure pulsations (e.g. from piston pumps). The pulsations can affect vortex shedding if they have a frequency similar to the vortex frequency. ■ Check whether the correct engineering unit was selected for the flow or totalizer.
The fault cannot be rectified or some other fault not described above has occurred. In these instances, please contact your Endress+Hauser service organization.	The following options are available for tackling problems of this nature: **Request the services of an Endress+Hauser service technician** If you contact our service organization to have a service technician sent out, please be ready with the following information: – A brief description of the error with information on the application. – Nameplate specifications ($\rightarrow$ Page 7 ff.): order code and serial number. **Return devices to Endress+Hauser** The procedures on Page 6 must be carried out before you return a measuring device requiring repair or calibration to Endress+Hauser. Always enclose a fully completed "Declaration of Contamination" form with the flowmeter. A copy of the form can be found at the end of these Operating Instructions. **Replace transmitter electronics** Components in the electronics defective $\rightarrow$ Order spare part $\rightarrow$ Page 73

9.5   Spare parts

Section 9.1 contains detailed troubleshooting instructions (→ Page 66).
The measuring device, moreover, provides additional support in the form of continuous self–diagnosis and error messages.
Troubleshooting can entail replacing defective components with tested spare parts. The illustration below shows the available scope of spare parts.

✎ Note!
You can order spare parts directly from your Endress+Hauser service organization by quoting the serial number printed on the transmitter nameplate (→ Page 7).

Spare parts are shipped as sets comprising the following parts:
- Spare part
- Additional parts, small items (screws, etc.)
- Installation instructions
- Packaging
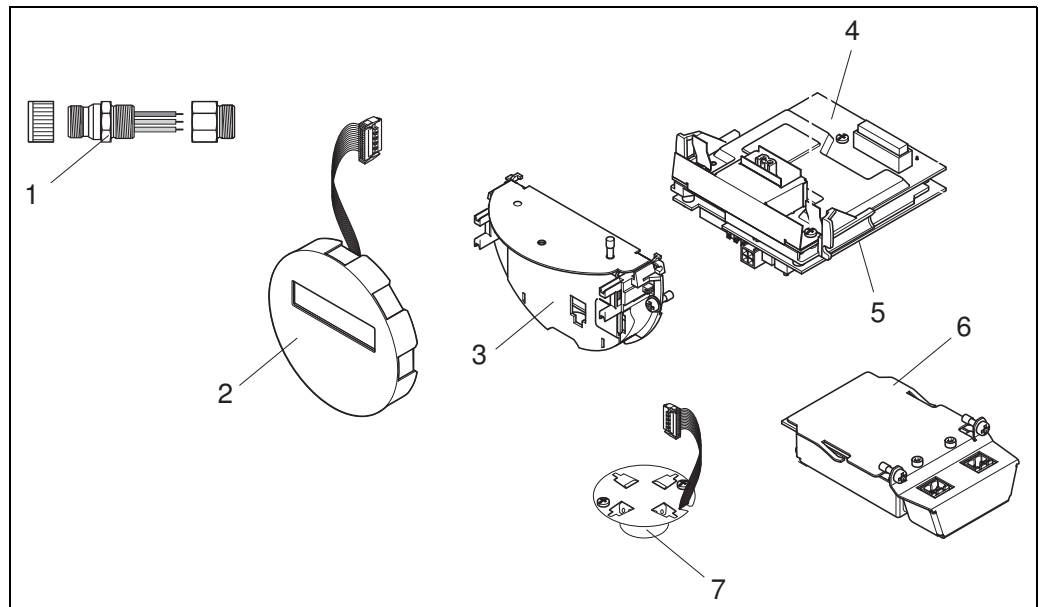
A0003791

Fig. 31:   Spare parts for transmitter Proline Prowirl 72 PROFIBUS PA (field and wall-mount housing)

1   *Fieldbus connector*
2   *Local display module*
3   *Board holder*
4   *I/O board (COM module); non-Ex / Ex i/IS and Ex n version*
5   *Amplifier board*
6   *I/O board (COM module); Ex d/XP version*
7   *Pre-amplifier*

9.6   Installing and removing electronics boards

9.6.1   Non-Ex / Ex i/IS and Ex n version

Note!
- When connecting Ex–certified devices, please refer to the notes and diagrams in the Ex–specific supplement to these Operating Instructions.

- Risk of damaging electronic components (ESD protection).
  Static electricity can damage electronic components or impair their operability. Use a workplace with a grounded working surface, purpose–built for electrostatically sensitive devices!

Caution!
Use only genuine Endress+Hauser parts.

Procedure when installing/removing electronics boards (→ Fig. 32)

1. Unscrew the cover (a) of the electronics compartment from the transmitter housing.
2. Remove the local display module (b) from the retaining rails (c).
3. Attach the left side of the local display module (b) to the right retaining rail (c) (this secures the local display module).
4. Loosen the set screw (d) of the cover of the connection compartment (e) and fold down the cover.
5. Disconnect the terminal connector (f) from the I/O board (COM module) (q).
6. Fold up the plastic cover (g).
7. Remove the signal cable connector (h) from the amplifier board (s) and release from the cable retainer (i).
8. Remove the ribbon–cable connector (j) from the amplifier board (s) and release from the cable retainer (k).
9. Detach the local display module (b) from the right retaining rail (c).
10. Fold down the plastic cover (g) again.
11. Release both screws (l) of the board holder (m).
12. Pull the board holder (m) out completely.
13. Press the side latches (n) of the board holder and separate the board holder (m) from the board body (o).

14. Replace the I/O board (COM module) (q):
    – Loosen the three fixing screws (p) of the I/O board (COM module).
    – Remove the I/O board (COM module) (q) from the board body (o).
    – Fix the new I/O board (COM module) onto the board body.

15. Replace the amplifier board (s):
    – Loosen fixing screws (r) on the amplifier board.
    – Remove the amplifier board (s) from the board body (o).
    – Fix the new amplifier board onto the board body.

16. Installation is the reverse of the removal procedure.
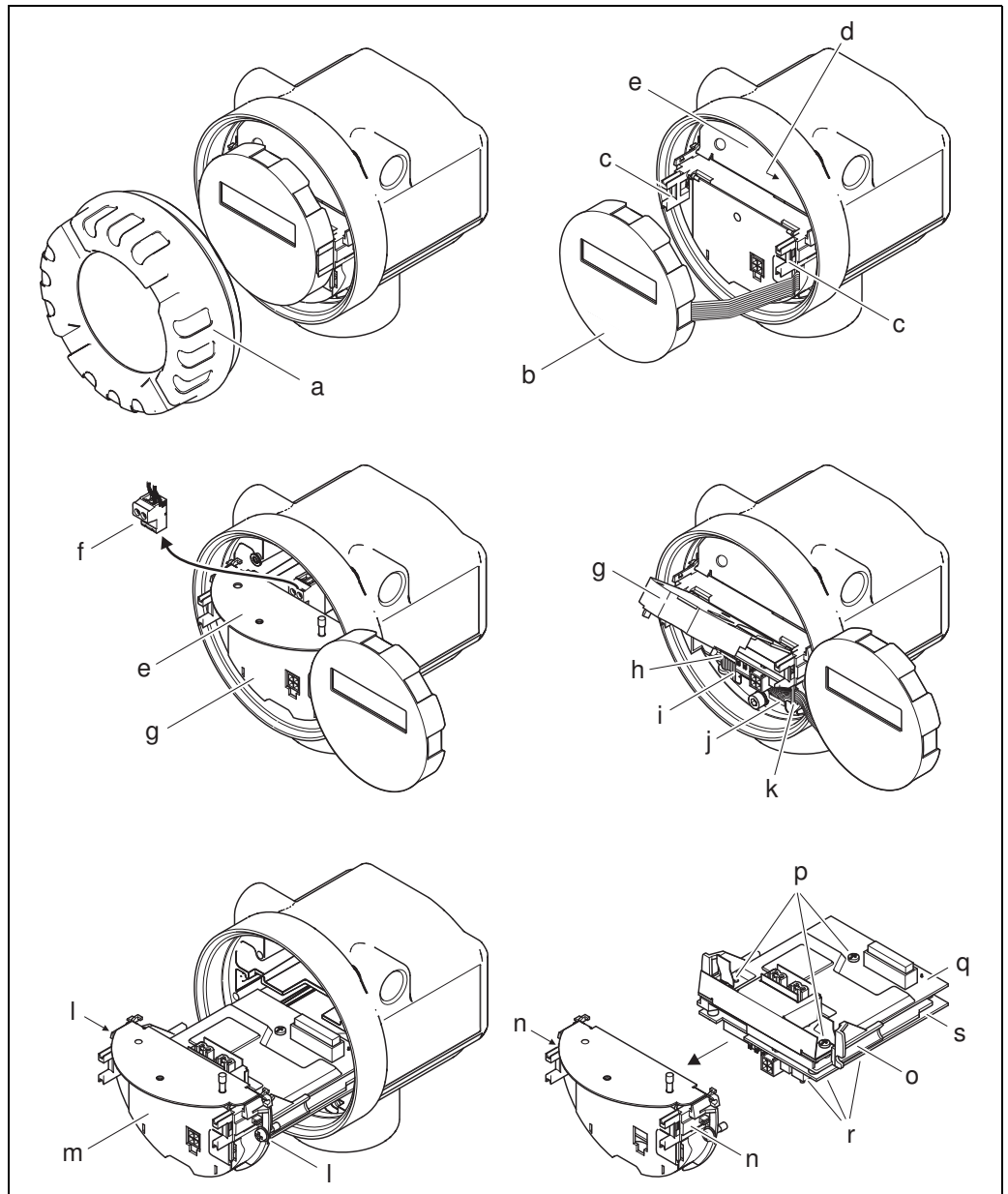
A0003792

Fig. 32:　　　*Installing and removing electronics boards, non-Ex/Ex i/IS and Ex n version*

a	*Cover of electronics compartment*
b	*Local display module*
c	*Retaining rails of local display module*
d	*Fixing screws of connection compartment cover*
e	*Connection compartment cover*
f	*Terminal connector*
g	*Plastic cover*
h	*Signal cable connector*
i	*Retainer for signal cable connector*
j	*Display module ribbon-cable connector*
k	*Retainer for ribbon-cable connector*
l	*Board holder threaded joint*
m	*Board holder*
n	*Board holder latches*
o	*Board body*
p	*I/O board threaded joint (COM module)*
q	*I/O board (COM module)*
r	*Amplifier board threaded joint*
s	*Amplifier board*

9.6.2   Ex d/XP version

Note!
- When connecting Ex–certified devices, please refer to the notes and diagrams in the Ex–specific supplement to these Operating Instructions.

- Risk of damaging electronic components (ESD protection).
  Static electricity can damage electronic components or impair their operability. Use a workplace with a grounded working surface, purpose–built for electrostatically sensitive devices!

Caution!
Use only genuine Endress+Hauser parts.

Procedure when installing/removing electronics boards (→ Fig. 33)

Installing/removing I/O board (COM module)

1. Release the securing clamp (a) of the connection compartment cover (b).
2. Remove connection compartment cover (b) from the transmitter housing.
3. Disconnect the terminal connector (c) from the I/O board (COM module) (e).
4. Slacken threaded joint (d) of the I/O board (COM module) (e) and pull the board out slightly.
5. Remove connecting cable plug (f) from the I/O board (COM module) (e) and remove the board completely.
6. Installation is the reverse of the removal procedure.

Installing and removing the amplifier board

1. Unscrew the cover (g) of the electronics compartment from the transmitter housing.
2. Remove the local display module (h) from the retaining rails (i).
3. Fold up the plastic cover (j).
4. Remove the ribbon–cable connector of the local display module (h) from the amplifier board (t) and release from the cable retainer.
5. Remove the signal cable connector (k) from the amplifier board (t) and release from the cable retainer.
6. Release the set screw (l) and fold down the cover (m).
7. Release both screws (n) of the board holder (o).
8. Pull the board holder (o) out slightly and disconnect the connecting cable plug (p) from the board body.
9. Pull the board holder (o) out completely.
10. Press the side latches (q) of the board holder and separate the board holder (o) from the board body (r).
11. Replace the amplifier board (t):
    – Loosen fixing screws (s) on the amplifier board.
    – Remove the amplifier board (t) from the board body (r).
    – Fix the new amplifier board onto the board body.

12. Installation is the reverse of the removal procedure.
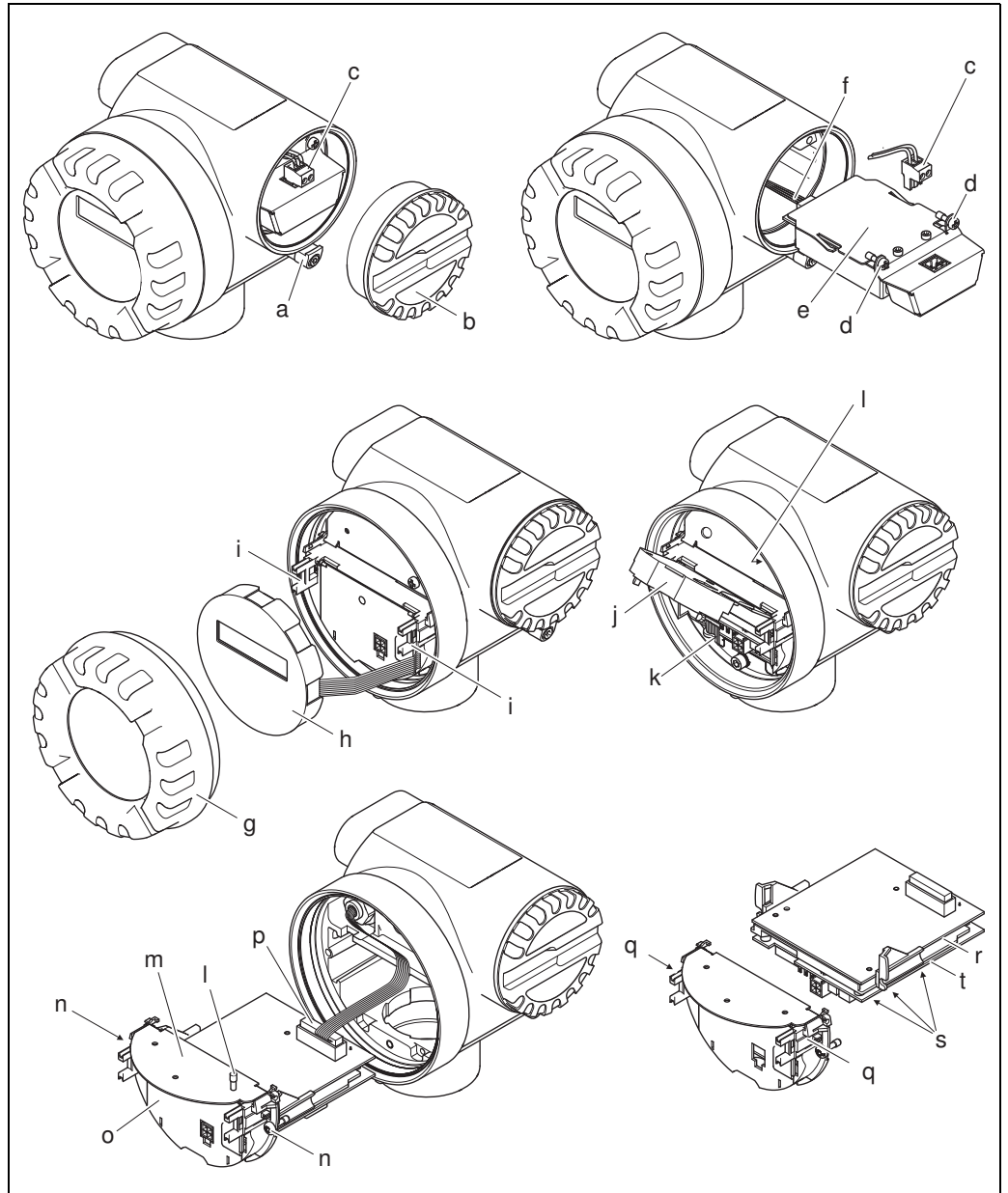
A0003793

Fig. 33:   *Installing and removing electronics boards, Ex d/XP version*

a   *Securing clamp for connection compartment cover*
b   *Connection compartment cover*
c   *Terminal connector*
d   *I/O board threaded joint (COM module)*
e   *I/O board (COM module)*
f   *I/O module connecting cable plug*
g   *Cover of electronics compartment*
h   *Local display module*
i   *Retaining rails of local display module*
j   *Plastic cover*
k   *Signal cable connector*
l   *Fixing screws of connection compartment cover*
m   *Connection compartment cover*
n   *Board holder threaded joint*
o   *Board holder*
p   *Connecting cable plug*
q   *Board holder latches*
r   *Board body*
s   *Amplifier board threaded joint*
t   *Amplifier board*

9.7 Software history

Date	Software version	Software modifications	Documentation
01.2007	V 1.03.00	Software extension: ■ For flange devices with a reduced internal diameter (R-type, S-type) New function: ■ Device software displayed (NAMUR Recommendation NE 53) ■ Maximum fluid velocity monitored (incl. warning message)	71040780/01.2007
11.2004	Amplifier: V 1.02.XX	New function: ■ Operation in Polish and Czech, V 1.02.01 and higher Welded flanges	71008396/12.2005
03.2004	Communication module (inputs/outputs): V 1.01.00/ and V 1.02.00/	Software adjustment: ■ Display symbols on onsite display ■ Support of compatibility with PROFIBUS previous model Prowirl 77 with Profile version 2.0 Compatible with: Commuwin II version 2.08-1 and higher (update E)	50103881/03.2004
07.2003	Amplifier: V 1.01.01	Fieldtool upload/download Compatible with service protocol: – ToF Tool – Fieldtool Package (version 1.04.00 and higher)	
03.2003	Amplifier: V 1.00.00	Original software	
	Communication module (inputs/outputs): V 1.00.00	Original software	

10   Technical data

10.1   Technical data at a glance

10.1.1   Application

The measuring system is used to measure the volume flow of saturated steam, overheated steam, gases and liquids. If the process pressure and process temperature are constant, the measuring device can also output the flow as the calculated mass flow and corrected volume flow.

10.1.2   Function and system design

Measuring principle	Vortex flow measurement on the principle of the Karman vortex street.

Measuring system	The measuring system consists of a transmitter and a sensor:
	■ Transmitter Proline Prowirl 72 PROFIBUS PA
	■ Prowirl F or W sensor
	
	Two versions are available:
	■ Compact version:
	  Transmitter and sensor form a single mechanical unit.
	
	■ Remote version:
	  Sensor is mounted separate from the transmitter.

10.1.3   Input

Measured variable	Volumetric flow (volume flow) is proportional to the frequency of vortex shedding after the bluff body. Volume flow can be output as the output variable, as can the calculated mass flow or corrected volume flow if process conditions are constant.

Measuring range	The measuring range depends on the fluid and the pipe diameter.

Start of measuring range:
Depends on the density and the Reynolds number (Re_{min} = 4000, Re_{linear} = 20000).
The Reynolds number is dimensionless and represents the ratio of the inertia force of a fluid to its viscous force. It is used to characterize the flow. The Reynolds number is calculated as follows:

$$Re = \frac{4 \cdot Q \, [m^3/s] \cdot \rho \, [kg/m^3]}{\pi \cdot di \, [m] \cdot \mu \, [Pa \cdot s]} \qquad\qquad Re = \frac{4 \cdot Q \, [ft^3/s] \cdot \rho \, [lb/ft^3]}{\pi \cdot di \, [ft] \cdot \mu \, [0.001 \, cP]}$$

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Re = Reynolds number, Q = flow, di = internal diameter, μ = dynamic viscosity, ρ = density

$$DN \, 15...25 \;\rightarrow\; v_{min.}^{*} = \frac{6}{\sqrt{\rho \, [kg/m^3]}} \; [m/s] \qquad DN \, 40...300 \;\rightarrow\; v_{min.}^{*} = \frac{7}{\sqrt{\rho \, [kg/m^3]}} \; [m/s]$$

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Full scale value

Liquids: v_{max} = 9 m/s (30 ft/s)

Gas/steam: see Table

Nominal diameter	v_{max}
Standard instrument: DN 15 (½") R-type: DN 25 (1") > DN 15 (½") S-type: DN 40 (1½") >> DN 15 (½")	46 m/s (151 ft/s) or Mach 0.3 (depending on which is smaller)
Standard instrument: DN 25 (1"), DN 40 (1½") R-type: – DN 40 (1½") > DN 25 (1") – DN 50 (2") > DN 40 (1½") S-type: – DN 80 (3") >> DN 40 (1½")	75 m/s (246 ft/s) or Mach 0.3 (depending on which is smaller)
Standard instrument: DN 50 (2") to 300 (12") R-type: – DN 80 (3") > DN 50 (2") – Nominal diameters larger than DN 80 (3") S-type: – DN 100 (4") >> DN 50 (2") – Nominal diameters larger than DN 100 (4")	120 m/s (394 ft/s) or Mach 0.3 (depending on which is smaller) Calibrated range: up to 75 m/s (246 ft/s)

✎ Note!

By using the selection and planning program "Applicator", you can determine the exact values for the fluid you use. You can obtain the Applicator from your Endress+Hauser sales center or on the Internet under www.endress.com.

K-factor range

The table helps you orientate yourself. The range in which the K-factor can be is indicated for individual nominal diameters and designs.

Nominal diameter		K-factor range [pulse/dm³]	
DIN	ANSI	72 F	72 W
DN 15	½"	390 to 450	245 to 280
DN 25	1"	70 to 85	48 to 55
DN 40	1½"	18 to 22	14 to 17
DN 50	2"	8 to 11	6 to 8
DN 80	3"	2.5 to 3.2	1.9 to 2.4
DN 100	4"	1.1 to 1.4	0.9 to 1.1
DN 150	6"	0.3 to 0.4	0.27 to 0.32
DN 200	8"	0.1266 to 0.1400	–
DN 250	10"	0.0677 to 0.0748	–
DN 300	12"	0.0364 to 0.0402	–

10.1.4 PROFIBUS PA output

Output signal	PROFIBUS PA in accordance with EN 50170 Volume 2, IEC 61158-2 (MBP), in accordance with PROFIBUS PA Profile Version 3.0, galvanically isolated
Signal on alarm	Status and alarm messages in accordance with PROFIBUS PA Profile Version 3.0
Current consumption	16 mA
Permissible feed voltage	9 to 32 V, not intrinsically safe
FDE (Fault Disconnection Electronic)	0 mA

Data transmission rate	Supported baud rate = 31.25 kBaud
Signal coding	Manchester II
Acyclic communication	■ Supports Class 2 master acyclic (MS2AC) communication with 2 available service access points. ■ Supports Class 1 master acyclic (MS1AC) communication with approx. 10^6 writes.
Low flow cut off	Switch points for low flow cut off can be selected as required.
Galvanic isolation	All electric connections are galvanically isolated from one another.

10.1.5 Power supply

Electrical connection	see Page 20 ff.
Supply voltage	9 to 32 V DC
Cable entry	Power supply cable / signal cable (outputs): ■ Cable entry: M20 × 1.5 (6 to 12 mm / 0.24 to 0.47 inch) ■ Thread for cable entry: ½" NPT, G ½", G ½" Shimada
Cable specification	■ Permitted temperature range: between –40 °C (–40 °F) and the max. permissible ambient temperature plus 10 °C (plus 18 °F) ■ Remote version→ Page 22
Power supply failure	■ Totalizer stops at the last value determined (can be configured). ■ All settings are kept in the EEPROM. ■ Error messages (incl. value of operated hours counter) are stored.

10.1.6 Performance characteristics

Reference operating conditions	Error limits following ISO/DIN 11631: ■ 20 to 30 °C ■ 2 to 4 bar ■ Calibration rig traced to national standards. ■ Calibration with the process connection corresponding to the standard in question.
Maximum measured error	■ Liquid: < 0.75% o.r. for Re > 20 000 <0.75% o.f.s for Re between 4000 and 20 000 ■ Gas/steam: <1% o.r. for Re > 20 000 and v < 75 m/s (246 ft/s) <1% o.f.s for Re between 4000 and 20 000 o.r. = of reading o.f.s = of full scale value Re = Reynolds number

Diameter jump correction
Prowirl 72 can correct shifts in the calibration factor which are caused by a jump in the diameter between the device flange and the mating pipe. The diameter jump should only be corrected within the following limit values (for which test measurements have also been performed).

Flange connection:
DN 15 (½"): ±20% of the internal diameter
DN 25 (1"): ±15% of the internal diameter
DN 40 (1½"): ±12% of the internal diameter
DN ≥ 50 (2"): ±10% of the internal diameter

Wafer:
DN 15 (½"): ±15% of the internal diameter
DN 25 (1"): ±12% of the internal diameter
DN 40 (1½"): ±9% of the internal diameter
DN ≥ 50 (2"): ±8% of the internal diameter

Repeatability	±0.25% o.r. (of reading)
Reaction time/step response time	If all the configurable functions are set to 0, you must reckon with a reaction time/step response time of 200 ms for vortex frequencies of 10 Hz and higher. For other settings where vortex frequencies are 10 Hz and higher, a reaction time/step response time of 100 ms has to be added to the overall filter reaction time. ■ SYSTEM DAMPING→ Page 118 ■ TIME CONSTANT→ Page 109 ■ RISING TIME→ Page 139
Influence of ambient temperature	**Current output (additional error, related to the span of 16 mA)** ■ Zero point (4 mA): average T_k: 0.05%/10K, max. 0.6% over the entire temperature range of –40 to +80 °C (–40 to +176 °F) ■ Span (20 mA): average T_k: 0.05%/10K, max. 0.6% over the entire temperature range of –40 to +80 °C (–40 to +176 °F) **Digital outputs (pulse output, PFM, HART)** Thanks to the digital measuring signal (vortex impulse) and digital processing, interface-specific errors are not caused by a change in the ambient temperature.

10.1.7   Operating conditions: Installation

Installation instructions	see Page 11 ff.
Inlet and outlet run	see Page 14 ff.

10.1.8   Operating conditions: Environment

Ambient temperature range

Compact version
- Standard: –40 to +70 °C (–40 to +158 °F)
- EEx d/XP version: –40 to +60 °C (–40 to +140 °F)
- ATEX II 1/2 GD version/dust ignition-proof: –20 to +55 °C (–4 to +131 °F)
- Display can be read between –20 and +70 °C (–4 to +158 °F)

Sensor remote version
- Standard: –40 to +85 °C (–40 to +185 °F)
- ATEX II 1/2 GD version/dust ignition-proof: –20 to +55 °C (–4 to +131 °F)

Transmitter remote version
- Standard: –40 to +80 °C (–40 to +176 °F)
- EEx d/XP version: –40 to +60 °C (–40 to +140 °F)
- ATEX II 1/2 GD version/dust ignition-proof: –20 to +55 °C (–4 to +131 °F)
- Display can be read between –20 °C and +70 °C (–4 to +158 °F)
- Version to –50 °C (–58 °F) on request

When mounting outside, we recommend you protect from direct sunlight with a protective cover (order number 543199-0001), especially in warmer climates with high ambient temperatures.

Storage temperature

Standard: –40 to +80 °C (–40 to +176 °F)
ATEX II 1/2 GD version/dust ignition-proof: –20 to +55 °C (–4 to +131 °F)
Version to –50 °C (–58 °F) on request

Degree of protection

IP 67 (NEMA 4X) in accordance with EN 60529

Vibration resistance

Acceleration up to 1 g (with factory setting for amplification), 10 to 500 Hz, following IEC 60068-2-6

Electromagnetic compatibility (EMC)

To IEC/EN 61326 and NAMUR Recommendation NE 21

10.1.9   Operating conditions: Process

Medium temperature range

DSC sensor (differential switched capacitor, capacitive sensor)

DSC standard sensor	−40 to +260 °C (−40 to +500 °F)
DSC high/low temperature sensor	−200 to +400 °C (−328 to +752 °F)
DSC sensor Inconel (PN 63 to 160, Class 600, JIS 40K)	−200 to +400 °C (−328 to +752 °F)
DSC sensor titanium Gr. 5 (PN 250, Class 900 to 1500 and butt-weld version)	−50 to +400 °C (−58 to +752 °F)
DSC sensor Alloy C-22	−200 to +400 °C (−328 to +752 °F)

Seals

|	
Graphite	−200 to +400 °C (−328 to +752 °F)
Viton	−15 to +175 °C (+5 to +347 °F)
Kalrez	−20 to +275 °C (−4 to +527 °F)
Gylon (PTFE)	−200 to +260 °C (−328 to +500 °F)

Sensor

Stainless steel	−200 to +400 °C (−328 to +752 °F)
Alloy C-22	−40 to +260 °C (−40 to +500 °F)
Special version for very high fluid temperatures (on request)	−200 to +450 °C (−328 to +842 °F) −200 to +440 °C (−328 to +824 °F), Ex version

Medium pressure

Pressure-temperature curve to EN (DIN), (stainless steel)
PN 10 to 40 → Prowirl 72W and 72F
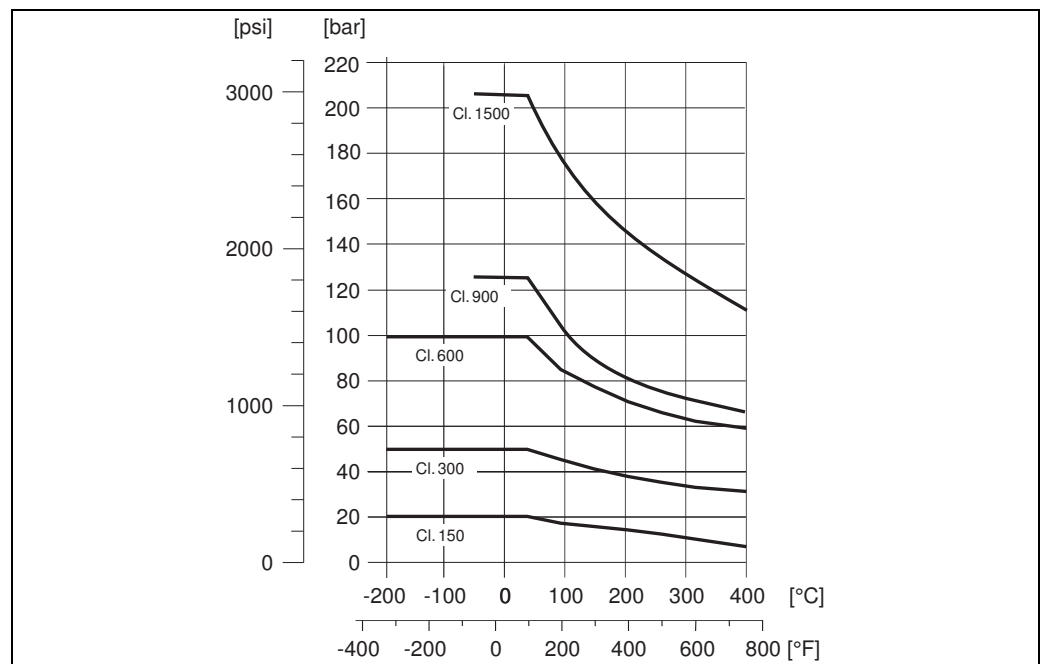PN 63 to 250 → Prowirl 72F
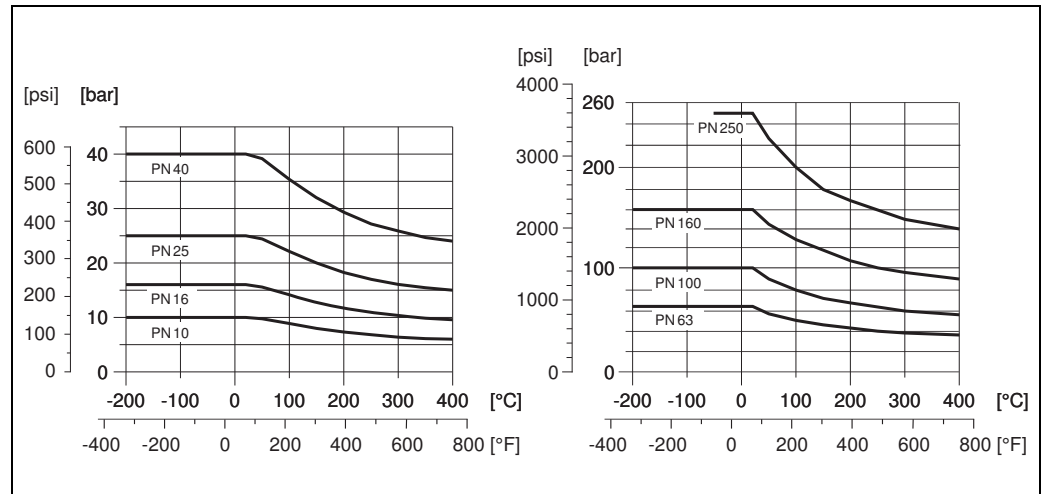
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Pressure-temperature curve to ANSI B16.5, stainless steel
Class 150 to 300 → Prowirl 72W and 72F
Class 600 to 1500 → Prowirl 72F

A0003402

Pressure–temperature curve to JIS B2220, stainless steel
10 to 20K → Prowirl 72W and 72F
40K → Prowirl 72F
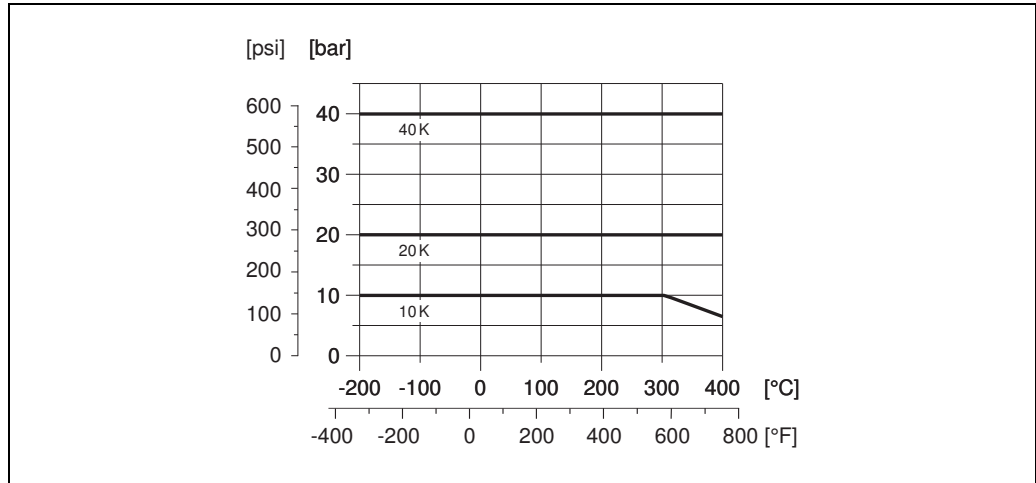
A0003404

Pressure–temperature curve to EN (DIN), ANSI B16.5 and JIS B2220, Alloy C-22
PN 16 to 40, Class 150 to 300, 10 to 20K → Prowirl 72F
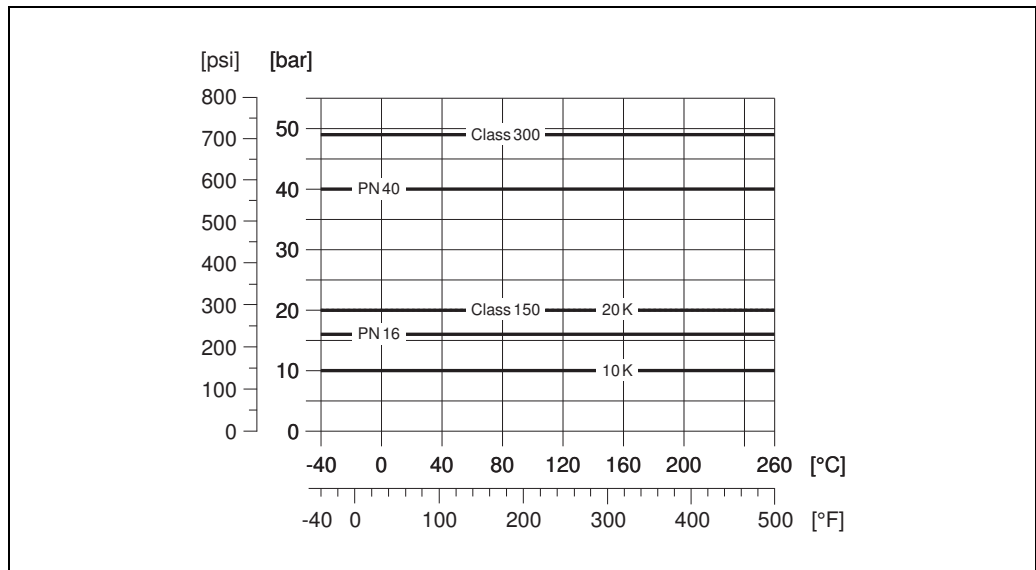
A0003395

Limiting flow	See data on Page 79 ff. ("measuring range")

Pressure loss	The pressure loss can be determined with the aid of the Applicator. The Applicator is software for selecting and planning flowmeters. The software is available both via the Internet (www.applicator.com) and on a CD-ROM for local PC installation.

10.1.10 Frequency ranges for air and water

You will find information on other media, such as steam for example, in the Applicator.

Prowirl 72W (SI units)

DN (DIN)	Air (at 0 °C, 1.013 bar)			Water (at 20 °C)			K-factor
	Corrected volume flow ($\dot{V}$) in [m^3/h]			Volume flow ($\dot{V}$) in [m^3/h]			[Pulse/dm^3]
	$\dot{V}_{min}$	$\dot{V}_{max}$	Frequency range [Hz]	$\dot{V}_{min}$	$\dot{V}_{max}$	Frequency range [Hz]	min to max
DN 15	4	35	330 to 2600	0.19	7	10.0 to 520	245 to 280
DN 25	11	160	180 to 2300	0.41	19	5.7 to 300	48 to 55
DN 40	31	375	140 to 1650	1.1	45	4.6 to 200	14 to 17
DN 50	50	610	100 to 1200	1.8	73	3.3 to 150	6 to 8
DN 80	112	1370	75 to 850	4.0	164	2.2 to 110	1.9 to 2.4
DN 100	191	2330	70 to 800	6.9	279	2.0 to 100	1.1 to 1.4
DN 150	428	5210	38 to 450	15.4	625	1.2 to 55	0.27 to 0.32

Prowirl 72W (US units)

DN (ANSI)	Air (at 32 °F, 14.7 psia)			Water (at 68 °F)			K-factor
	Corrected volume flow ($\dot{V}$) in [scfm]			Volume flow ($\dot{V}$) in [gpm]			[Pulse/dm^3]
	$\dot{V}_{min}$	$\dot{V}_{max}$	Frequency range [Hz]	$\dot{V}_{min}$	$\dot{V}_{max}$	Frequency range [Hz]	min to max
½"	2.35	20.6	330 to 2600	0.84	30.8	10.0 to 520	245 to 280
1"	6.47	94.2	180 to 2300	1.81	83.7	5.7 to 300	48 to 55
1½"	18.2	221	140 to 1650	4.84	198	4.6 to 200	14 to 17
2"	29.4	359	100 to 1200	7.93	321	3.3 to 150	6 to 8
3"	65.9	806	75 to 850	17.6	722	2.2 to 110	1.9 to 2.4
4"	112	1371	70 to 800	30.4	1228	2.0 to 100	1.1 to 1.4
6"	252	3066	38 to 450	67.8	2752	1.2 to 55	0.27 to 0.32

Prowirl 72F (SI units)

DN (DIN)	Air (at 0 °C, 1.013 bar)			Water (at 20 °C)			K-factor
	Corrected volume flow ($\dot{V}$) in [m^3/h]			Volume flow ($\dot{V}$) in [m^3/h]			[Pulse/dm^3]
	$\dot{V}_{min}$	$\dot{V}_{max}$	Frequency range [Hz]	$\dot{V}_{min}$	$\dot{V}_{max}$	Frequency range [Hz]	min to .max.
DN 15	3	25	380 to 2850	0.16	5	14.0 to 600	390 to 450
DN 25	9	125	200 to 2700	0.32	15	6.5 to 340	70 to 85
DN 40	25	310	150 to 1750	0.91	37	4.5 to 220	18 to 22
DN 50	42	510	120 to 1350	1.5	62	3.7 to 170	8 to 11
DN 80	95	1150	80 to 900	3.4	140	2.5 to 115	2.5 to 3.2
DN 100	164	2000	60 to 700	5.9	240	1.9 to 86	1.1 to 1.4
DN 150	373	4540	40 to 460	13.4	550	1.2 to 57	0.3 to 0.4
DN 200	715	8710	27 to 322	25.7	1050	1.0 to 39	0.1266 to 0.14
DN 250	1127	13 740	23 to 272	40.6	1650	0.8 to 33	0.0677 to 0.0748
DN 300	1617	19 700	18 to 209	58.2	2360	0.6 to 25	0.0364 to 0.0402

Prowirl 72F (US units)

DN (ANSI)	Air (at 32 °F, 14.7 psia)			Water (at 68 °F)			K-factor
	Corrected volume flow ($\dot{V}$) in [scfm]			Volume flow ($\dot{V}$) in [gpm]			[Pulse/dm^3]
	$\dot{V}_{min}$	$\dot{V}_{max}$	Frequency range [Hz]	$\dot{V}_{min}$	$\dot{V}_{max}$	Frequency range [Hz]	min to .max.
½"	1.77	14.7	380 to 2850	0.70	22.0	14.0 to 600	390 to 450
1"	5.30	73.6	200 to 2700	1.41	66.0	6.5 to 340	70 to 85
1½"	14.7	182	150 to 1750	4.01	163	4.5 to 220	18 to 22
2"	24.7	300	120 to 1350	6.6	273	3.7 to 170	8 to 11
3"	55.9	677	80 to 900	15.0	616	2.5 to 115	2.5 to 3.2
4"	96.5	1177	60 to 700	26.0	1057	1.9 to 86	1.1 to 1.4
6"	220	2672	40 to 460	59.0	2422	1.2 to 57	0.3 to 0.4
8"	421	5126	27 to 322	113	4623	1.0 to 39	0.1266 to 0.14
10"	663	8087	23 to 272	179	7265	0.8 to 33	0.0677 to 0.0748
12"	952	11 595	18 to 209	256	10 391	0.6 to 25	0.0364 to 0.0402

10.1.11 Mechanical construction

Design, dimensions	See Technical Information TI070D/06/en
Weight	See Technical Information TI070D/06/en
Material	Transmitter housing:

Material (continued)

Transmitter housing:
- Powder-coated die-cast aluminum AlSi10Mg
  – In accordance with EN 1706/EN AC-43400 (EEx d/XP version: cast aluminum EN 1706/EN AC-43000)

Sensor:
- Flanged version:
  – Stainless steel, A351-CF3M (1.4404), in conformity with NACE MR0175-2003 and MR0103-2003
  – Pressure ratings PN 250, Class 900 to 1500 and butt-weld version 1.4571 (316Ti; UNS S31635); in conformity with NACE MR0175-2003 and MR0103-2003
- Alloy C-22 version
  – Alloy C-22 2.4602 (A 494-CX2MW/N 26022); in conformity with NACE MR0175-2003 and MR0103-2003
- Wafer version
  – Stainless steel, A351-CF3M (1.4404), in conformity with NACE MR0175-2003 and MR0103-2003

Flanges:
- EN (DIN)
  – Stainless steel, A351-CF3M (1.4404), in conformity with NACE MR0175-2003 and MR0103-2003
  – DN 15 to 150 with pressure ratings to PN 40 and all devices with integrated nominal diameter reduction (R-type, S-type): construction with weld-on flanges made of 1.4404 (AISI 316L). PN 63 to 160, nominal diameters DN 200 to 300: fully cast construction A351-CF3M (1.4404 (AISI 316L)), in conformity with NACE MR0175-2003 and MR0103-2003
  – Pressure rating PN 250 1.4571 (316Ti, UNS S31635); in conformity with NACE MR0175-2003 and MR0103-2003
- ANSI and JIS
  – Stainless steel, A351-CF3M, in conformity with NACE MR0175-2003 and MR0103-2003
  – ½ to 6" with pressure ratings to Class 300 and DN 15 to 150 with pressure ratings to 20K and all devices with integrated nominal diameter reduction (R-type, S-type): construction with weld-on flanges made of 316/316L, in conformity with NACE MR0175-2003 and MR0103-2003. Class 600, DN 15 to 150 with pressure rating 40K, nominal diameters 8 to 12": fully cast construction A351-CF3M; in conformity with NACE MR0175-2003 and MR0103-2003
  – Pressure ratings Class 900 to 1500: 316/316L; in conformity with NACE MR0175-2003 and MR0103-2003
- Alloy C-22 version (EN/DIN/ANSI/JIS)
  – Alloy C-22 2.4602 (A 494-CX2MW/N 26022); in conformity with NACE MR0175-2003 and MR0103-2003

DSC sensor (differential switched capacitor; capacitive sensor):
- Wetted parts (marked as "wet" on the DSC sensor flange).
  – Standard for pressure ratings up to PN 40, Class 300, JIS 20K:
    Stainless steel 1.4435 (316L), in conformity with NACE MR0175-2003 and MR0103-2003
  – Pressure ratings PN 63 to 160, Class 600, 40K:
    Inconel 2.4668/N 07718 (B637) (Inconel 718), in conformity with NACE MR0175-2003 and MR0103-2003
  – Pressure ratings PN 250, Class 900 to 1500 and butt-weld version:
    titanium Gr. 5 (B-348; UNS R50250; 3.7165)
  – Alloy C-22 sensor:
    Alloy C-22, 2.4602/N 06022; in conformity with NACE MR0175-2003 and MR0103-2003

Non–wetted parts:
- Stainless steel 1.4301 (304)

Pipe stand:
- Stainless steel, 1.4308 (CF8)
- Pressure ratings PN 250, Class 900 to 1500 and butt–weld version: 1.4305 (303)

Seals:
- Graphite:
  – Pressure rating PN 10 to 40, Class 150 to 300, JIS 10 to 20K: Sigraflex Foil Z (BAM–tested for oxygen applications)
  – Pressure rating PN 63 to 160, Class 600, JIS 40K: Sigraflex Hochdruck™ with smooth sheet metal insert made of 316(L) (BAM–tested for oxygen applications, "high quality in terms of TA Luft (German Clean Air Act)"
  – Pressure rating PN 250, Class 900 to 1500: Grafoil with 316 perforated metal insert
- Viton
- Kalrez 6375
- Gylon (PTFE) 3504 (BAM–tested for oxygen applications, "high quality in terms of TA Luft (German Clean Air Act)")

10.1.12 Human interface

Display elements	■ Liquid crystal display, two–line plain text display, with 16 characters each. ■ Custom configurations for presenting different measured value and status variables
Operating elements	No local operating elements, remote operation possible.
Remote operation	Operation via: ■ PROFIBUS PA ■ FieldCare (software package from Endress+Hauser for complete configuration, commissioning and diagnosis)

10.1.13 Certificates and approvals

CE approval	→ Page 9
C–tick mark	→ Page 9
Ex approval	More information on the Ex approvals can be found in the separate Ex documentation.
Pressure measuring device approval	The measuring devices can be ordered with or without PED (Pressure Equipment Directive). If a device with PED is required, this must be ordered explicitly. For devices with nominal diameters less than or equal to DN 25 (1"), this is neither possible nor necessary. ■ With the identification PED/G1/III on the sensor nameplate, Endress+Hauser confirms conformity with the "Basic safety requirements" of Appendix I of the Pressure Equipment Directive 97/23/EC. ■ Devices with this identification (with PED) are suitable for the following types of fluid: – Fluids of Group 1 and 2 with a steam pressure of greater or less than 0.5 bar (7.3 psi) – Unstable gases ■ Devices without this identification (without PED) are designed and manufactured according to good engineering practice. They correspond to the requirements of Art. 3, Section 3 of the Pressure Equipment Directive 97/23/EC. Their application is illustrated in Diagrams 6 to 9 in Appendix II of the Pressure Equipment Directive 97/23/EC.

Certification PROFIBUS PA	The Prowirl 72 flowmeter has successfully passed all the test procedures implemented and has been certified and registered by the PNO (PROFIBUS User Organization). The flowmeter thus meets all the requirements of the specifications listed below: ■ Certified to PROFIBUS PA Profile Version 3.0, device certification number: available upon request ■ The device may also be operated using certified devices from other manufacturers (interoperability).
Other standards and guidelines	■ EN 60529: Degrees of protection by housing (IP code) ■ EN 61010-1: Protection measures for electrical equipment for measurement, control, regulation and laboratory procedures ■ IEC/EN 61326: Electromagnetic compatibility (EMC requirements) ■ NAMUR NE 21: Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment ■ NAMUR NE 53: Software of field devices and signal-processing devices with digital electronics. ■ NACE Standard MR0103-2003: Standard Material Requirements – Materials Resistant to Sulfide Stress Cracking in Corrosive Petroleum Refining Environments ■ NACE Standard MR0175-2003: Standard Material Requirements – Sulfide Stress Cracking Resistant Metallic Materials for Oilfield Equipment ■ VDI 2643: Measurement of volume flow by means of vortex flowmeters ■ ANSI/ISA-S82.01: Safety Standard for Electrical and Electronic Test, Measuring, Controlling and related Equipment – General Requirements. Pollution degree 2, Installation Category II. ■ CAN/CSA-C22.2 No. 1010.1-92: Safety Standard for Electrical Equipment for Measurement and Control and Laboratory Use. Pollution degree 2, Installation Category II.
Ordering information	Your Endress+Hauser service organization can provide detailed ordering information and information on the order codes on request.

10.1.14 Accessories

Various accessories, which can be ordered separately from Endress+Hauser, are available for the transmitter and the sensor (see Page 64). Your Endress+Hauser service organization can provide detailed information on the order codes of your choice.

10.1.15 Documentation

■ Flow measuring technology (FA005D/06/en)
■ Technical Information Proline Prowirl 72F, 72W, 73F, 73W (TI070/06/en)
■ Related Ex-documentation: ATEX, FM, CSA etc.
■ Information on Pressure Equipment Directive for Proline Prowirl 72/73 (SD072D/06/en)
■ Functional safety manual (Safety Integrity Level)

10.2 Dimensions of flow conditioner

Dimensions as per:
- EN 1092-1 (DIN 2501)
- ANSI B16.5
- JIS B2220

Material 1.4435 (316L), in conformity with NACE MR0175-2003 and MR0103-2003
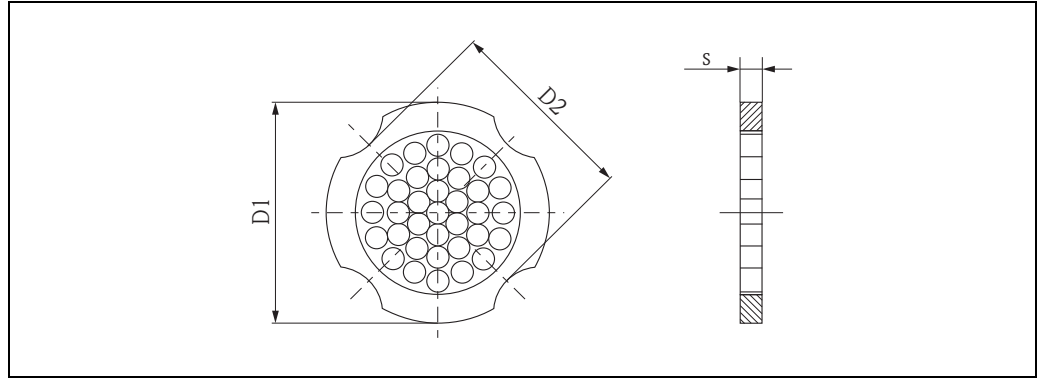
D1: The flow conditioner is fitted at the outer diameter between the bolts.
D2: The flow conditioner is fitted at the indentations between the bolts.

Dimensions of flow conditioner to EN (DIN)

DN	Pressure rating	Centering diameter [mm]	D1 / D2 *	s [mm]	Weight [kg]
15	PN 10 to 40 PN 63	54.3 64.3	D2 D1	2.0	0.04 0.05
25	PN 10 to 40 PN 63	74.3 85.3	D1 D1	3.5	0.12 0.15
40	PN 10 to 40 PN 63	95.3 106.3	D1 D1	5.3	0.3 0.4
50	PN 10 to 40 PN 63	110.0 116.3	D2 D1	6.8	0.5 0.6
80	PN 10 to 40 PN 63	145.3 151.3	D2 D1	10.1	1.4
100	PN 10/16 PN 25/40 PN 63	165.3 171.3 176.5	D2 D1 D2	13.3	2.4
150	PN 10/16 PN 25/40 PN 63	221.0 227.0 252.0	D2 D2 D1	20.0	6.3 7.8 7.8
200	PN 10 PN 16 PN 25 PN 40	274.0 274.0 280.0 294.0	D1 D2 D1 D2	26.3	11.5 12.3 12.3 15.9
250	PN 10/16 PN 25 PN 40	330.0 340.0 355.0	D2 D1 D2	33.0	25.7 25.7 27.5
300	PN 10/16 PN 25 PN 40	380.0 404.0 420.0	D2 D1 D1	39.6	36.4 36.4 44.7
* D1 → The flow conditioner is fitted at the outer diameter between the bolts. D2 → The flow conditioner is fitted at the indentations between the bolts.					

Dimensions of flow conditioner to ANSI

DN		Pressure rating	Centering diameter mm (inch)	D1 / D2	s mm (inch)	Weight kg (lbs)
15	½"	Cl. 150 Cl. 300	50.1 (1.97) 56.5 (2.22)	D1 D1	2.0 (0.08)	0.03 (0.07) 0.04 (0.09)
25	1"	Cl. 150 Cl. 300	69.2 (2.72) 74.3 (2.93)	D2 D1	3.5 (0.14)	0.12 (0.26)
40	1½"	Cl. 150 Cl. 300	88.2 (3.47) 97.7 (3.85)	D2 D2	5.3 (0.21)	0.3 (0.66)
50	2"	Cl. 150 Cl. 300	106.6 (4.20) 113.0 (4.45)	D2 D1	6.8 (0.27)	0.5 (1.1)
80	3"	Cl. 150 Cl. 300	138.4 (5.45) 151.3 (5.96)	D1 D1	10.1 (0.40)	1.2 (2.6) 1.4 (3.1)
100	4"	Cl. 150 Cl. 300	176.5 (6.95) 182.6 (7.19)	D2 D1	13.3 (0.52)	2.7 (6.0)
150	6"	Cl. 150 Cl. 300	223.9 (8.81) 252.0 (9.92)	D1 D1	20.0 (0.79)	6.3 (14) 7.8 (17)
200	8"	Cl. 150 Cl. 300	274.0 (10.8) 309.0 (12.2)	D2 D1	26.3 (1.04)	12.3 (27) 15.8 (35)
250	10"	Cl. 150 Cl. 300	340.0 (13.4) 363.0 (14.3)	D1 D1	33.0 (1.30)	25.7 (57) 27.5 (61)
300	12"	Cl. 150 Cl. 300	404.0 (15.9) 402.0 (16.5)	D1 D1	39.6 (1.56)	36.4 (80) 44.6 (98)

* D1 → The flow conditioner is fitted at the outer diameter between the bolts.
  D2 → The flow conditioner is fitted at the indentations between the bolts.

Dimensions of flow conditioner to JIS

DN	Pressure rating	Centering diameter [mm]	D1 / D2	s [mm]	Weight [kg]
15	10K	60.3	D2	2.0	0.06
	20K	60.3	D2	2.0	0.06
	40K	66.3	D1	2.0	0.06
25	10K	76.3	D2	3.5	0.14
	20K	76.3	D2	3.5	0.14
	40K	81.3	D1	3.5	0.14
40	10K	91.3	D2	5.3	0.31
	20K	91.3	D2	5.3	0.31
	40K	102.3	D1	5.3	0.31
50	10K	106.6	D2	6.8	0.47
	20K	106.6	D2	6.8	0.47
	40K	116.3	D1	6.8	0.5
80	10K	136.3	D2	10.1	1.1
	20K	142.3	D1	10.1	1.1
	40K	151.3	D1	10.1	1.3
100	10K	161.3	D2	13.3	1.8
	20K	167.3	D1	13.3	1.8
	40K	175.3	D1	13.3	2.1
150	10K	221.0	D2	20.0	4.5
	20K	240.0	D1	20.0	5.5
	40K	252.0	D1	20.0	6.2
200	10K	271.0	D2	26.3	9.2
	20K	284.0	D1	26.3	9.2
250	10K	330.0	D2	33.0	15.8
	20K	355.0	D2	33.0	19.1
300	10K	380.0	D2	39.6	26.5
	20K	404.0	D1	39.6	26.5

* D1 → The flow conditioner is fitted at the outer diameter between the bolts.
  D2 → The flow conditioner is fitted at the indentations between the bolts.

# 11   Operation via PROFIBUS PA

11.1   Block model

In the PROFIBUS PA interface, all the device parameters are categorized according to their functional properties and task and are generally assigned to three different blocks. A block may be regarded as a container in which parameters and the associated functionalities are contained.

A PROFIBUS PA device has the following block types:
- A Physical Block (device block)
  The Physical Block contains all the device-specific features of the unit.

- One or more Transducer Blocks
  The Transducer Block contains all the measuring and device-specific parameters of the device. The measurement principles (e.g. flow) are depicted in the Transducer Blocks in accordance with the PROFIBUS PA Profile 3.0 Specification.

- One or more function blocks
  Function blocks contain the automation functions of the device. We distinguish between different function blocks, e.g. Analog Input function block, Analog Output function block, Totalizer Block, etc. Each of these function blocks is used to process different application functions.

A number of automation-related tasks can be implemented with these blocks. In addition to these blocks, a field device may have any number of other blocks, e.g. several Analog Input function blocks if more than one process variable is available from the field device.
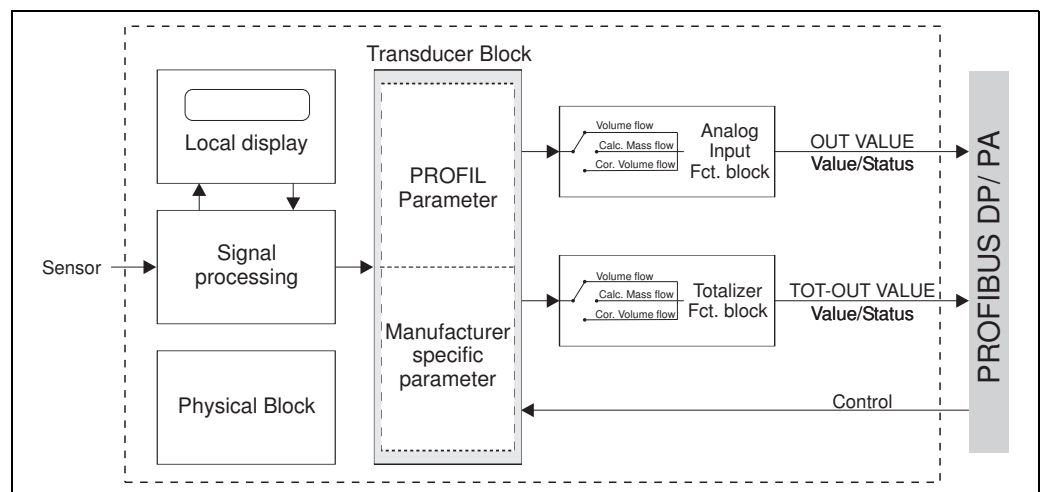
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Fig. 34:   Block types of a PROFIBUS PA device

The sensor signal is first prepared specifically for the flow in the measuring block (the Transducer Block). The process variable is then passed to the Analog Input and Totalizer function block for technical processing (e.g. scaling, limit value processing). The process variable goes through the entire function block algorithm and is available to the process control system as an output variable.

11.2   Physical Block (device block)

A Physical Block contains all the data that clearly identify and characterize the field device. It is an electronic version of a nameplate on the field device. Parameters of the Physical Block include the device type, device name, manufacturer ID, serial number, etc.
A further task of the Physical Block is the management of overall parameters and functions that have an influence on the execution of the remaining blocks in the field device. The Physical Block is thus the central unit that also checks the device status and thereby influences or controls the operability of the other blocks and thus also of the device.

11.2.1   Write protection

Hardware write protection for the device parameters is enabled and disabled by means of a DIP switch on the amplifier board ($\rightarrow$ Page 44).
The HW WRITE PROTECT parameter ($\rightarrow$ Page 98) shows the status of the hardware write protection. The following statuses are possible:
1 $\rightarrow$ Hardware write protection enabled, it is not possible to write to the device
0 $\rightarrow$ Hardware write protection disabled, device data can be overwritten

It is also possible to set software write protection to prevent all parameters from being acyclically overwritten. This lock is set by an entry in the WRITE LOCKING parameter ($\rightarrow$ Page 98). The following entries are permitted:
2457 $\rightarrow$ Device data can be overwritten (factory setting)
0 $\rightarrow$ Device data cannot be overwritten

11.2.2   Physical Block parameters

The following table shows all the available parameters of the Physical Block.
Abbreviations used in the table:
- R = Read
- W = Write
- P = Parameter, with a distinction between M = mandatory parameters and O = optional parameters

Physical Block (device block)					
Matrix text **(Commuwin II)**	**Parameter** **(SLOT/INDEX)**	**Description**	**L**	**S**	**P**
DEVICE DATA (V0...)					
DEVICE ID (V0H0)	**DEVICE ID**	The manufacturer-specific device ID appears on the display. **Display:** PROWIRL 72 PBUS	X		M
SERIAL NUMBER (V0H1)	**DEVICE SER NUM**	The serial number of the device appears on the display.	X		M
SOFTWARE VERSION (V0H2)	**SOFTWARE VERSION**	The software version of the measuring device appears on the display (I/O board)	X		M
HARDWARE VERSION (V0H3)	**HARDWARE VERSION**	The hardware version of the device appears on the display.	X		M
Not available in Commuwin II	**DEVICE SOFTWARE**	Displays the current device software version.	X		M
MANUFACTURER ID (V0H4)	**DEVICE MAN ID**	The manufacturer's ID number appears on the display. **Display:** 17 (decimal)^	X		M

Physical Block (device block)					
Matrix text (Commuwin II)	Parameter (SLOT/INDEX)	Description	L	S	P
DESCRIPTION (V1…)					
DESCRIPTOR (V1H0)	**DESCRIPTOR**	For entering a description of the application for which the device is used. **Factory setting:** No description	X	X	O
INSTALLATION DATE (V1H1)	**DEVICE INSTALL DATE**	For entering the installation date of the device. **Factory setting:** No date	X	X	O
MESSAGE (V1H2)	**DEVICE MESSAGE**	For entering a message about the application for which the device is used. **Factory setting:** No message	X	X	O
DEVICE CERTIFICATE (V1H3)	**DEVICE CERTIFICATION**	Information on the certification of the device appears on the display. **Factory setting:** No information	X		O
SOFTWARE RESET (V2…)					
SOFTWARE RESET (V2H0)	**FACTORY RESET**	Resets or restarts the device. **User input:** 0 → No action 1 → Resets all parameters to their factory settings with the exception of the set station address (units on PROFIBUS PA Profile Version 3.0, see→ Page 165 or → Page 166). The measuring device indicates the cold start that follows in the corresponding bit of the DIAGNOSIS parameter group for 10 seconds. 2506 → Perform a warm start. The measuring device displays the next warm start for 10 seconds in the appropriate bit of the DIAGNOSIS parameter group. 2712 → Reset the station address to the usual PROFIBUS default address, 126. 5000 → Reset to delivery status. **Factory setting:** 1 ☝ Caution! If 1 is selected, the units are reset to the factory settings and not to the status when delivered. After a reset, check the following parameters and set the units that you require in these parameters: ■ UNIT MASS FLOW (see Page 106) ■ UNIT CORR. VOL. (see Page 106) ■ UNIT DENSITY (see Page 107) ■ UNIT TEMPERATURE (see Page 107) Then run the SET UNIT TO BUS (V6H2) parameter (see P. 120).	X	X	O

Physical Block (device block)					
Matrix text (Commuwin II)	Parameter (SLOT/INDEX)	Description	L	S	P
SECURITY LOCKING (V3…)					
WRITE LOCKING (V3H0)	WRITE LOCKING	For enabling/disabling write protection for the acyclic parameters. **User input:** – 0 → Write protection enabled, parameters **cannot** be changed. – 2457 → Write protection disabled, parameters can be changed. **Factory setting:** 2457 ✎ Note! An "Access denied" error message is displayed if an attempt is made to change a parameter when write protection is enabled.	X	X	O
HW WRITE PROTECT (V3H1)	HW WRITE PROTECTION	The status of the general write protection appears on the display. **Display:** – 0 → Write protection disabled, parameters can be changed. – 1 → Write protection enabled, parameters **cannot** be changed. **Factory setting:** 0 ✎ Note! Write protection is activated and deactivated by means of a DIP switch (→ Page 44).	X		O
LOCAL OPERATION (V3H2)	LOCAL OP ENA	✎ Note! Parameter is not supported by Prowirl 72.	X	X	O
DEVICE DATA (V4…)					
IDENT NUMBER (V4H0)	IDENT NUMBER SELECTOR	For selecting the configuration response. ✎ Note! In the configuration phase, each PROFIBUS device must check an ID number allocated by the PNO (PROFIBUS User Organization). Along with this device-specific ID number there are also PROFILE ID numbers that have to be accepted in the configuration phase as well, for the purposes of interchangeability between devices of different make. In this case the device might, under certain circumstances, reduce the functionality for cyclic data to a profile-defined scope. **Options:** – 0 → Entry for PROFILE ID number – 1 → Entry for the device-specific ID number – 2 → Is **not** supported! (Entry of the device-specific ID number of forerunner device) – 3 → Is **not** supported! (Entry of the PROFILE ID number (0x9760) for multivariable devices) **Factory setting:** 1	X	X	M

Physical Block (device block)					
Matrix text (Commuwin II)	Parameter (SLOT/INDEX)	Description	L	S	P
DIAGNOSIS MASK (V5...)					
MASK (V5H0)	**DIAGNOSIS MASK** (Byte 1)	Display shows which DIAGNOSIS bits of the first diagnosis byte are supported. **Display:** 0 → Diagnosis message is not supported X → Diagnosis message is supported	X		M
MASK 1 (V5H1)	**DIAGNOSIS MASK** (Byte 2)	Display shows which DIAGNOSIS bits of the second diagnosis byte are supported. **Display:** 0 → Diagnosis message is not supported X → Diagnosis message is supported	X		M
MASK 2 (V5H2)	**DIAGNOSIS MASK** (Byte 4)	Display shows which DIAGNOSIS bits of the fourth diagnosis byte are supported. **Display:** 0 → Diagnosis message is not supported X → Diagnosis message is supported	X		M
DIAG MASK EXTENS. (V5H3)	**DIAGNOSIS MASK EXTENSION**	The bit mask which outputs the manufacturer-specific diagnosis messages appears on the display (see also system and process error messages,→ Page 68).	X		O
DIAGNOSIS (V6...)					
DIAGNOSIS (V6H0)	**DIAGNOSIS** (Byte 1)	Diagnosis information of the device (first byte) with bit encoding. Several messages are possible. If manufacturer-specific information is available it is shown in the DIAGNOSIS EXT parameter.	X		M
DIAGNOSIS 1 (V6H1)	**DIAGNOSIS** (Byte 2)	Diagnosis information of the device (second byte) with bit encoding. Several messages are possible. If manufacturer-specific information is available it is shown in the DIAGNOSIS EXT parameter. **Display:** 0 → Diagnosis message is not supported X → Diagnosis message is supported	X		M
DIAGNOSIS 2 (V6H2)	**DIAGNOSIS** (Byte 4)	Diagnosis information of the device (fourth byte) with bit encoding. Several messages are possible. If manufacturer-specific information is available it is shown in the DIAGNOSIS EXT parameter. **Display:** 0 → Diagnosis message is not supported X → Diagnosis message is supported	X		M
DIAGNOSIS EXT (V6H3)	**DIAGNOSIS EXTENSION**	Manufacturer-specific information with bit encoding. Several messages are possible.	X		O

Physical Block (device block)					
Matrix text (Commuwin II)	**Parameter** (SLOT/INDEX)	**Description**	**L**	**S**	**P**
BLOCK MODE (V8...)	**General information on the MODE BLK parameter group:** There are three elements in this parameter group: ■ The current operating mode of the block (Actual Mode) ■ The modes supported by the block (Permitted Mode) ■ The normal operating mode (Normal Mode) A distinction is drawn between "automatic operation" (AUTO), manual user intervention (MAN), local override (LO) and the "out-of-service" mode (O/S). A function block generally offers a choice of operating modes, whereas the other block types only work in the AUTO mode, for example.			
TARGET MODE (V8H0)	TARGET MODE	For selecting the desired operating mode. Only the automatic mode can be selected in the Physical Block. **Options:** AUTO **Factory setting:** AUTO	X	X	M
ACTUAL (V8H1)	MODE BLOCK (Actual)	The current operating mode appears on the display. **Display:** AUTO	X		M
NORMAL (V8H2)	MODE BLOCK (Normal)	The operating mode for normal operation appears on the display. **Display:** AUTO	X		M
PERMITTED (V8H3)	MODE BLOCK (Permitted)	The permissible operating modes appear on the display. **Display:** AUTO	X		M
ALARM CONFIG (V9...)	**General information on the ALARM CONFIG parameter group:** The Active Block Alarm is supported which flags a change in a parameter with static parameters (Static attribute) for 10 seconds and indicates that a warning limit or an alarm limit has been violated in a function block.			
CURRENT (V9H0)	ALARM SUM (CURRENT)	The current alarms of the device appear on the display.	X		M
DISABLE (V9H1)	ALARM SUM (DISABLE)	The acknowledged alarms of the device appear on the display.	X		M
ST REVISION (V9H5)	ST REV	A block has static parameters (Static attribute) that are not changed by the process. Static parameters whose values change during optimization or configuration increment the ST REV parameter by 1. This supports parameter-revision management. The Static Revision Counter can show a higher value if several parameters change within a very short period of time, for example when parameters are loaded to the device from Commuwin II. This counter can never be reset, nor does it return to a default setting even after a device reset. If the counter overflows (16 bits), it starts again at 1.	X		M

Physical Block (device block)					
Matrix text (Commuwin II)	Parameter (SLOT/INDEX)	Description	L	S	P
BLOCK PARAMETER (VA...)					
TAG (VAH0)	TAG DESC	For entering a user-specific text of max. 32 characters for unique identification and assignment of the block. **Factory setting:** "– – – – – – – –" no text	X	X	M
STRATEGY (VAH1)	STRATEGY	Parameter for grouping and thus faster evaluation of blocks. Grouping is carried out by entering the same numerical value in the STRATEGY parameter of each individual block. **Factory setting:** 0	X	X	M
ALERT KEY (VAH2)	ALERT KEY	For entering the identification number of the plant unit. This information can be used by the control system for sorting alarms and events. **User input:** 1 to 255 **Factory setting:** 0	X	X	M
PROFILE VERSION (VAH3)	—	The profile version implemented in the device appears on the display.	X		O

11.3 Transducer Block

The Transducer Block of the Prowirl 72 contains all the measuring and device-specific parameters of the flowmeter. All the settings directly connected with the application/flow measurement are made here.
It forms the interface between sensor-specific measured value preprocessing and the function blocks required for automation.

A Transducer Block allows you to influence the input and output variables of a function block. The parameters of a Transducer Block include information on the sensor configuration, physical units, calibration, damping, error messages, etc. as well as the device-specific parameters.
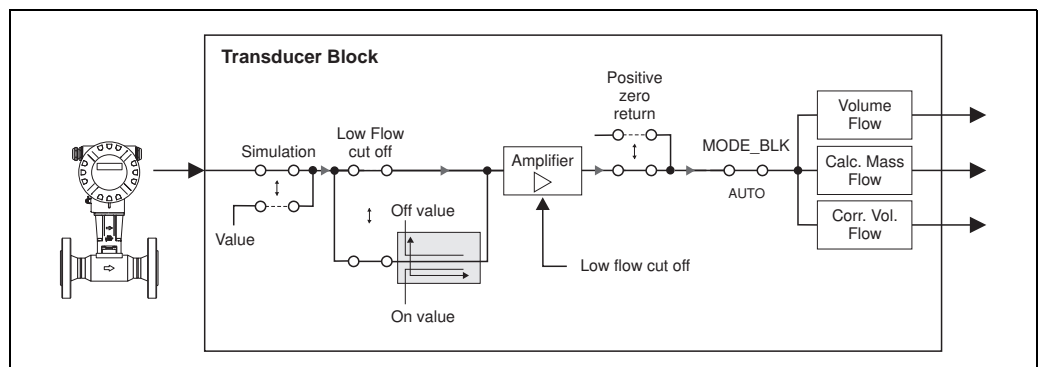

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Fig. 35:   Schematic illustration of the internal structure of a Transducer Block.

11.3.1 Signal processing

The Transducer Block receives a signal variable from the sensor (volume flow) as the input variable. Other process variables, such as calculated mass flow and corrected volume flow, are derived from these signal variables. The input signals are prepared for measuring via the amplifier.

The VALUE SIM. MEAS parameter (see Page 127) allows you to specify a simulation value for the Transducer Block in order to test assigned parameters in the device and downstream function blocks.

A low flow cut off allows you to hide measurement inaccuracies in the low flow range.

You can define a limit value via the ON VAL LF CUTOFF parameter (see Page 116). If the measured flow value undershoots this limit value, the output value of 0 is output.

You also have the option of setting the measured value to "zero flow" by means of the POSITIVE ZERO RETURN parameter (see Page 118). This is necessary when the piping system is being cleaned, for example.

The process variables of the Transducer Block are output via the following parameters:
- VOLUME FLOW (volume flow) → Page 103
- CALC. MASS FL. (calculated mass flow) → Page 103
- CORRECTED VOLUME FLOW (corrected volume flow) → Page 104

The most important functions and parameters of the Transducer Block are listed below. An overview of all the parameters available is provided from Page 103 onwards.

11.3.2 Block output variables

The Transducer Block has three process variables: volume flow, calculated mass flow and corrected volume flow. All three process variables are made available to the downstream function blocks for further processing.

11.3.3 Alarm detection and processing

The Transducer Block does not generate any process alarms. The status of the process variable of the Transducer Block is evaluated in the downstream Analog Input function block. If the Analog Input function block does not receive an input value that can be evaluated from the Transducer Block, then a process alarm is generated.
This process alarm is displayed via the OUT STATUS, OUT SUB STATUS and OUT LIMIT parameters of the Analog Input function block (see Page 136).
More detailed information on the current device status is provided in the manufacturer-specific ACTUAL.SYS.COND parameter (see Page 126).
This parameter also displays a device error that produced an input value that could not be evaluated and thus triggered the process alarm in the Analog Input function block.
More information on eliminating errors can be found on Page 66.

11.3.4 Accessing the manufacturer-specific parameters

To access the manufacturer-specific parameters, the following requirements must be met:

1. Hardware write protection must be disabled (see Page 96).
2. The correct code must be entered in the DEFINE PRIVATE CODE parameter (see Page 109).

11.3.5 Transducer Block parameters

The following table shows all the parameters available for the Transducer Block. The parameters can be changed by means of a Class 2 master, such as Commuwin II or PDM (Process Device Management).

A gray background indicates the manufacturer-specific parameters. Apart from the parameters in the "Using the profile parameters" parameter group (Page 129 onwards), no parameter of the Transducer Block can be changed unless the private code has first been entered.

Abbreviations used in the table:
- R = Read
- W = Write
- P = Parameter, with a distinction between M = mandatory parameters and O = optional parameters

Transducer Block (device matrix)					
Matrix text (Commuwin II)	**Parameter** (SLOT/INDEX)	**Description**	**L**	**S**	**P**
MEASURING VALUES (V0…)					
VOLUME FLOW (V0H0)	**VOLUME FLOW**	The current measured value of the first process variable (volume flow) appears on the display. The process variable is made available to the Analog Input function block as an input variable. **Display:** 5-digit floating-point number, including unit and sign (e.g. 5.5445 dm^3/min; 1.4359 m^3/h; etc.)	X		M
CALC. MASS FL. (V0H1)	**MASSFLOW**	The current measured value of the second process variable (calculated mass flow) appears on the display. The process variable is made available to the Analog Input function block as an input variable. **Display:** 5-digit floating-point number, including unit and sign (e.g. 462.87 kg/h; –731.63 lb/min; etc.) ✎ Note! The calculated mass flow is calculated using the measured volume flow and the value entered in the OPERATING DENSITY parameter (see P. 113). A fixed value is used for the calculation (specified OPERATING DENSITY). For this reason **only** select this process variable if the process conditions are known and do **not** change.	X	X	O

Transducer Block (device matrix)					
Matrix text	Parameter				
(Commuwin II)	(SLOT/INDEX)	Description	L	S	P
CORRECTED VOLUME FLOW (V0H2)	**CORRECT VOLUME FLOW**	The current measured value of the third process variable (corrected volume flow) appears on the display. The process variable is made available to the Analog Input function block as an input variable. **Display:** 5-digit floating point number, incl. unit and sign (e.g. 5.5445 dm^3/min; 1.4359 m^3/h; etc.) ✎ **Note!** The corrected volume flow is calculated using the measured volume flow and the ratio between the values entered in the OPERATING DENSITY (see P. 113) and REFERENCE DENSITY (see P. 113) parameters. Fixed values are used for the calculation (specified OPERATING DENSITY and REFERENCE DENSITY). For this reason **only** select this process variable if the process conditions are known and do **not** change.	X		O
VORTEX FREQUENCY (V0H3)	**VORTEX FREQ**	The vortex frequency currently measured appears on the display. **Display:** 5-digit floating-point number, including unit Hz (e.g. 120.23 Hz) ✎ **Note!** The parameter is only used for a plausibility check.	X		M
Not available in Commuwin II	**VELOCITY**	The flow velocity through the device appears on the display. This is calculated from the current flow through the device and the cross-sectional area flowed through. **Display:** 5-digit floating-point number, including unit ✎ **Note!** The unit displayed in this function depends on the option selected in the UNIT LENGTH function (see Page 107): ■ UNIT LENGTH option = mm → Unit in this function = m/s ■ UNIT LENGTH option = inch → Unit in this function = ft/s	X		O

Transducer Block (device matrix)					
Matrix text (Commuwin II)	**Parameter** (SLOT/INDEX)	Description	L	S	P
SYSTEM UNITS (V1…)					

UNIT VOL. FLOW
(V1H0)
	VOLUME FLOW UNITS	For selecting the unit required and displayed for the volume flow.
		
		The unit you select here is also valid for:
		■ Flow display
		■ On-value low flow cut off
		■ Simulation measurand
		
		✎ Note!
		The following units of time can be selected:
		s = second, m = minute, h = hour, d = day
		
		Options:
		
		Metric:
		– Cubic centimeter → cm³/time unit
		– Cubic decimeter → dm³/time unit
		– Cubic meter → m³/time unit
		– Milliliter → ml/time unit
		– Liter → l/time unit
		– Hectoliter → hl/time unit
		– Megaliter → Ml/time unit MEGA
		
		US:
		– Cubic centimeter → cc/time unit
		– Acre foot → af/time unit
		– Cubic foot → ft³/time unit
		– Fluid ounce → ozf/time unit
		– Gallon → US gal/time unit
		– Million gallon → US Mgal/time unit
		– Barrel (normal fluids: 31.5 gal/bbl)
		  → US bbl/time unit NORM.
		– Barrel (beer: 31.0 gal/bbl)
		  → US bbl/time unit BEER
		– Barrel (petrochemicals: 42.0 gal/bbl)
		  → US bbl/time unit PETR.
		– Barrel (filling tanks: 55.0 gal/bbl)
		  → US bbl/time unit TANK
		
		Imperial:
		– Gallon → imp. gal/time unit
		– Mega gallon → imp. Mgal/time unit
		– Barrel (beer: 36.0 gal/bbl)
		  → imp. bbl/time unit BEER
		– Barrel (petrochemicals: 34.97 gal/bbl)
		  → imp. bbl/time unit PETR.
		
		Factory setting
		See parameter printout supplied (the parameter printout is an integral part of these Operating Instructions)
			X	X	M

Transducer Block (device matrix)					
Matrix text	**Parameter**				
(Commuwin II)	**(SLOT/INDEX)**	**Description**	**L**	**S**	**P**
UNIT MASS FLOW (V1H1)	**CALC. MASS FLOW UNITS**	For selecting the unit required and displayed for the calculated mass flow. The unit you select here is also valid for: ■ Flow display ■ On-value low flow cut off ■ Simulation measurand ✎ Note! The following units of time can be selected: s = second, m = minute, h = hour, d = day **Options:** *Metric:* – Gram → g/time unit – Kilogram → kg/time unit – Metric ton → t/time unit *US:* – ounce → oz/time unit – pound → lb/time unit – ton → ton/time unit **Factory setting:** See parameter printout supplied (the parameter printout is an integral part of these Operating Instructions)	X	X	M
UNIT CORR. VOL. (V1H2)	**CORR. VOLUME FLOW UNITS**	For selecting the unit required and displayed for the corrected volume flow. The unit you select here is also valid for: ■ Flow display ■ On-value low flow cut off ■ Simulation measurand ✎ Note! The following units of time can be selected: s = second, m = minute, h = hour, d = day **Options:** *Metric:* – Norm liter → Nl/time unit – Norm cubic meter → Nm³/time unit *US:* – Standard cubic meter → Sm³/time unit – Standard cubic feet → Scf/time unit **Factory setting:** See parameter printout supplied (the parameter printout is an integral part of these Operating Instructions)	X	X	M

Transducer Block (device matrix)					
Matrix text (Commuwin II)	**Parameter** (SLOT/INDEX)	Description	L	S	P
UNIT LENGTH (V1H3)	**UNIT LENGTH**	For selecting the unit required and displayed for the length unit of the nominal diameter in the NOMINAL DIAMETER (see Page 124) and NOMINAL SIZE (see Page 130) parameters. **Options:** MILLIMETER INCH METER **Factory setting:** Depends on country (metric units, → Page 165, or US units, → Page 166) ✎ Note! If a setting is changed in this parameter, the setting in the UNIT parameter (see Page 130) is changed simultaneously.	X	X	O
UNIT DENSITY (V1H4)	**UNIT DENSITY**	For selecting the unit required and displayed for the density to be entered in the OPERATING DENSITY and REFERENCE DENSITY parameters (see Page 113). **Options:** *Metric:* g/cm³; g/cc; kg/dm³; kg/l; kg/m³; SD 4 °C, SD 15 °C, SD 20 °C; SG 4 °C, SG 15 °C, SG 20 °C *US:* lb/ft³; lb/US gal; lb/US bbl NORM (normal fluids); lb/US bbl BEER (beer); lb/US bbl PETR. (petrochemicals); lb/US bbl TANKS (filling tanks) *Imperial:* lb/imp. gal; lb/imp. bbl BEER (beer); lb/imp. bbl PETR. (petrochemicals) **Factory setting:** See parameter printout supplied (the parameter printout is an integral part of these Operating Instructions) SD = Specific Density, SG = Specific Gravity The specific density is the ratio of fluid density to water density (at water temperature = 4, 15, 20 °C)	X	X	O
UNIT TEMPERATURE (V1H5)	**UNIT TEMPERATURE**	Use this parameter to select the unit displayed for the temperature to be entered in the OPERATION TEMPERATURE parameter (see Page 114). **Options:** °C (CELSIUS) K (KELVIN) °F (FAHRENHEIT) R (RANKINE) Factory setting: Depends on country (metric units,→ Page 165, or US units,→ Page 166)	X	X	O

Transducer Block (device matrix)					
Matrix text **(Commuwin II)**	**Parameter** **(SLOT/INDEX)**	**Description**	**L**	**S**	**P**
OPERATION (V2...)					
LANGUAGE (V2H0)	**LANGUAGE**	Use this function to select the language for all texts, parameters and messages shown on the local display. **Options (with standard display):** ENGLISH DEUTSCH FRANCAIS ESPANOL ITALIANO NEDERLANDS NORSK SVENSKA SUOMI PORTUGUES POLSKI CESKY **Factory setting:** Depends on country (metric units, $\rightarrow$ Page 165, or US units, $\rightarrow$ Page 166)		X	O
ACCESS CODE (V2H1)	**ACCESS CODE**	All data of the measuring system are protected against inadvertent change. Programming is disabled and the device settings cannot be changed until a code is entered in this parameter. You can enable programming by entering the private code (**factory setting = 72**, see DEFINE PRIVATE CODE parameter). **User input:** Max. 4-digit number: 0 to 9999 ✎ Note! ■ You can also disable programming by entering any number in this parameter (other than the private code). ■ The Endress+Hauser service organization can be of assistance if you mislay your private code.		X	O

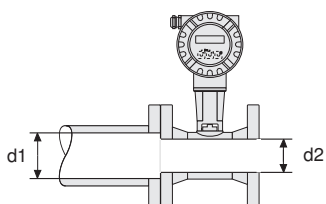| Transducer Block (device matrix)					
Matrix text	**Parameter**				
(Commuwin II)	**(SLOT/INDEX)**	**Description**	**L**	**S**	**P**
DEFINE PRIVATE CODE (V2H2)	**DEFINE PRIVATE CODE**	Use this function to specify the private code for enabling programming. **User input:** Max. 4-digit number: 0 to 9999 **Factory setting:** 72 ✎ Note! ■ Programming is always enabled if the code defined = 0. ■ Programming has to be enabled before this code can be changed. This parameter cannot be edited when programming is disabled. This precaution prevents others from accessing your personal code.		X	O
STATUS ACCESS (V2H3)	**STATUS ACCESS**	The access status for the parameters appears on the display. **Display:** ACCESS CUSTOMER (parameters can be modified) LOCKED (parameters cannot be modified)		X	O
USER INTERFACE (V3…)					
ASSIGN LINE 1 (V3H0)	**HMI ASSIGN LINE 1**	For selecting the display value for the main line (top line of the local display) to be displayed during normal operation. **Options:** OFF VOLUME FLOW MASS FLOW CORRECTED VOLUME FLOW VOLUME FLOW IN % MASS FLOW IN % CORRECTED VOLUME FLOW IN % AI 1 - OUT VALUE (flow) TOT 1 - OUT VALUE (totalizer) **Factory setting:** VOLUME FLOW	X	X	O

Transducer Block (device matrix)					
Matrix text	**Parameter**				
(Commuwin II)	**(SLOT/INDEX)**	**Description**	L	S	P
ASSIGN LINE 2 (V3H1)	HMI ASSIGN LINE 2	For selecting the display value for the additional line (bottom line of the local display) to be displayed during normal operation. **Options:** OFF VOLUME FLOW MASS FLOW CORRECTED VOLUME FLOW VOLUME FLOW IN % MASS FLOW IN % CORRECTED VOLUME FLOW IN % BARGRAPH VOLUME FLOW IN % BARGRAPH MASS FLOW IN % BARGRAPH CORRECTED VOLUME FLOW IN % AI 1 – OUT VALUE (flow) TOT 1 – OUT VALUE (totalizer) OPERATING/SYSTEM CONDITIONS TAG NAME **Factory setting:** TOT 1 – OUT VALUE	X	X	O
100% VALUE (V3H2)	100% VALUE	✎ Note! This parameter is not available unless one of the following options was selected in the ASSIGN LINE 1 (V3H0) parameter: ■ VOLUME FLOW IN % ■ MASS FLOW IN % ■ CORRECTED VOLUME FLOW IN % For entering the flow value which should be shown on the display as the 100% value. **User input:** 5-digit floating-point number **Factory setting:** Depends on nominal diameter, fluid and country (metric units, → Page 165, or US units, → Page 166)	X	X	O
100% VALUE (V3H3)	100% VALUE	✎ Note! This parameter is not available unless one of the following options was selected in the ASSIGN LINE 2 (V3H1) parameter: ■ VOLUME FLOW IN % ■ MASS FLOW IN % ■ CORRECTED VOLUME FLOW IN % ■ BARGRAPH VOLUME FLOW IN % ■ BARGRAPH MASS FLOW IN % ■ BARGRAPH CORRECTED VOLUME FLOW IN % For entering the flow value which should be shown on the display as the 100% value. **User input:** 5-digit floating-point number **Factory setting:** Depends on nominal diameter, fluid and country (metric units, → Page 165, or US units, → Page 166)	X	X	O

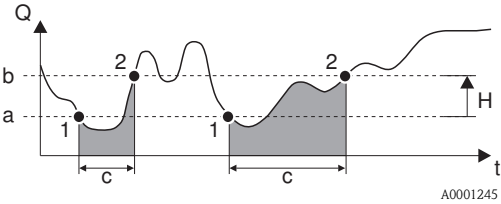| Transducer Block (device matrix)					
Matrix text (Commuwin II)	Parameter (SLOT/INDEX)	Description	L	S	P
FORMAT (V3H4)	**HMI FORMAT**	For selecting the maximum number of places displayed after the decimal point for the value displayed in the main line. **Options:** XXXXX. – XXXX.X – XXX.XX – XX.XXX –X.XXXX **Factory setting:** XX.XXX ✎ Note! • Note that this setting only affects the reading as it appears on the display, it has no influence on the accuracy of the system's calculations. • The places after the decimal point as computed by the measuring device cannot always be displayed, depending on this setting and the engineering unit. In these instances an arrow appears on the display between the measured value and the engineering unit (e.g. 1.2 → kg/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.	X	X	O
TIME CONSTANT (V3H6)	**HMI TIMECONST.**	For entering a time constant defining how the display reacts to severely fluctuating flow variables, either very quickly (enter a low time constant) or with damping (enter a high time constant). **User input:** 0 to 100 s **Factory setting:** 5 s ✎ Note! • The setting 0 seconds switches off damping. • The reaction time of the parameter depends on the time specified in the SYSTEM DAMPING parameter (see Page 118).	X	X	O
CONTRAST LCD (V3H6)	**HMI CONTRAST LCD**	For setting the display contrast to suit local operating conditions. **User input:** 10 to 100% **Factory setting:** 50%	X	X	O

Transducer Block (device matrix)					
Matrix text **(Commuwin II)**	**Parameter** **(SLOT/INDEX)**	**Description**	**L**	**S**	**P**
TEST DISPLAY (V3H6)	**HMI TEST DISP.**	Use this function to test the operability of the local display and its pixels. **Options:** OFF ON **Factory setting:** OFF Test sequence: 1. Start the test by selecting ON. 2. All pixels of the main line and additional line are darkened for minimum 0.75 seconds. 3. The main line and additional line show an "8" in each field for minimum 0.75 seconds. 4. The main line and additional line show a "0" in each field for minimum 0.75 seconds. 5. The main line and additional line show nothing (blank display) for minimum 0.75 seconds. 6. When the test is completed, the local display returns to its initial state and the displays the option OFF.	X	X	O
PROCESS PARAMETER (V4…)					
APPLICATION (V4H0)	**APPLICATION**	For selecting the state of aggregation of the fluid. **Options:** GAS/STEAM LIQUID **Factory setting:** See parameter printout supplied (the parameter printout is an integral part of these Operating Instructions) ✎ Note! If the selection is changed in this function, you are asked whether the totalizer should be reset to 0. We recommend you confirm this message and perform a reset.	X	X	O

Transducer Block (device matrix)					
Matrix text	Parameter				
(Commuwin II)	(SLOT/INDEX)	Description	L	S	P
OPERATING DENSITY (V4H1)	**FIX.OPN.DENSITY**	For entering a fixed value for the density at process conditions. This value is used to calculate the calculated mass flow and corrected volume flow. **User input:** 5-digit floating-point number **Factory setting:** See parameter printout supplied (the parameter printout is an integral part of these Operating Instructions) ✎ Note! ■ The appropriate unit is taken from the UNIT DENSITY parameter (see Page 107). ■ If the selection is changed in this function, you are asked whether the totalizer should be reset to 0. We recommend you confirm this message and perform a reset.	X	X	O
REFERENCE DENSITY (V4H2)	**REF.DENSITY**	For entering a fixed value for the density at reference conditions. This value is used to calculate the corrected volume flow. **User input:** 5-digit floating-point number **Factory setting:** See parameter printout supplied (the parameter printout is an integral part of these Operating Instructions) ✎ Note! ■ The appropriate unit is taken from the UNIT DENSITY parameter (see Page 107). ■ If the value in this parameter is changed, we recommend you reset the totalizer.	X	X	O

Transducer Block (device matrix)					
Matrix text (Commuwin II)	Parameter (SLOT/INDEX)	Description	L	S	P
OPERATION TEMPERATURE (V4H3)	**FIX.OPN.TEMP.**	For entering a fixed value for the process temperature. ✎ Note! The sensor (measuring pipe and bluff body) expands differently depending on the existing process temperature. This has a proportional effect on the accuracy of the measuring system since the device was calibrated at a fixed calibration temperature of 20 °C (293 K). However, this effect on the current measured value and the internal totalizer can be compensated by entering an average process temperature in this parameter. **User input:** 5-digit floating-point number **Factory setting:** 20°C / 293.16 K / 68 °F / 527.67 R ✎ Note! The appropriate unit is taken from the UNIT TEMPERATURE parameter (→ Page 107). ☝ Caution! This setting does not change the permitted temperature range of the measuring system. Please pay particular attention to the temperature application limits specified in the product specification (see Page 84).	X	X	O

Transducer Block (device matrix)					
Matrix text (Commuwin II)	Parameter (SLOT/INDEX)	Description	L	S	P
MATING PIPE DIAM. (V4H4)	**MATING PIPE DIAM**	The measuring device has diameter jump correction. This can be activated by entering the actual value of the mating pipe in this parameter (→ Fig. 36). If the mating pipe (d1) and the measuring pipe (d2) have different diameters, this alters the flow profile. A diameter jump can occur if: ■ The mating pipe has a different pressure rating to that of the measuring device. ■ The mating pipe has another schedule to that of the measuring pipe (e.g. 80 instead of 40), for ANSI. To correct any resulting shift in the calibration factor, enter the actual value of the mating pipe (d1) in this parameter. A0001982 *Fig. 36: Mating pipe/measuring tube* *d1 > d2* *d1 = Mating pipe diameter* *d2 = Measuring pipe diameter* **User input:** 5-digit floating-point number **Factory setting:** 0 ✎ Note! ■ Inlet correction is switched off if 0 is entered. ■ The appropriate unit is taken from the UNIT LENGTH parameter (see Page 107). ■ Only diameter jumps within the same nominal diameter class (e.g. DN 50 / 2") can be corrected. ■ If the internal diameter of the process mating flange is larger than the internal diameter ot the Vortex flange, you must reckon with an additional uncertainty of typically 0.1% (of the reading) per 1 mm deviation. ■ If the internal diameter of the process mating flange is smaller than the internal diameter ot the Vortex flange, you must reckon with an additional uncertainty of typically 0.2% (of the reading) per 1 mm deviation.	X	X	O

Transducer Block (device matrix)					
Matrix text (Commuwin II)	**Parameter** (SLOT/INDEX)	Description	L	S	P
ASSIGN LOW FLOW CUT OFF (V4H5)	**ASSIGN LOW FLOW CUT OFF**	For selecting the process variable on which low flow cut off should act. **Options:** OFF VOLUME FLOW CALCULATED MASS FLOW CORRECTED VOLUME FLOW **Factory setting:** VOLUME FLOW ✎ Note! If the low flow cut off should act on the OUT VALUE of the Analog Input function block, the identical option must be chosen in the CHANNEL parameter (see Page 144).	X	X	O
ON VAL LF CUTOFF (V4H6)	**ON VALUE LF CUTOFF**	For entering the on-value for low flow cut off. Low flow cut off is switched on if the value entered is not equal to 0. An inverted plus sign is shown on the display of the flow value as soon as the low flow cut off is active. Active low flow cut off has the following effect: ■ The OUT VALUE of the Analog Input function block (see Page 136) is set to the "zero flow" value. ■ The totalizer (TOTAL. VALUE) stops adding up. **User input:** 5-digit floating-point number **Factory setting:** Below the standard measuring range ✎ Note! ■ Depending on the option selected in the ASSIGN LOW FLOW CUT OFF parameter (see Page 116), the appropriate unit is taken from the UNIT VOL. FLOW (see Page 105), UNIT MASS FLOW (see Page 106) or UNIT CORR. VOL. (see Page 106) parameter. ■ The on-value can be set at a value corresponding to a Reynolds number of Re = 20000. This has the effect that measurements in the nonlinear range are not evaluated. The Reynolds number and the flow (at Reynolds number = 20000) can be determined using the Endress+Hauser "Applicator" software. The Applicator is software for selecting and planning flowmeters. The values required can be determined without having to connect the transmitter beforehand. The "Applicator" is available both via the Internet (www.applicator.com) and on a CD-ROM for local PC installation.	X	X	O

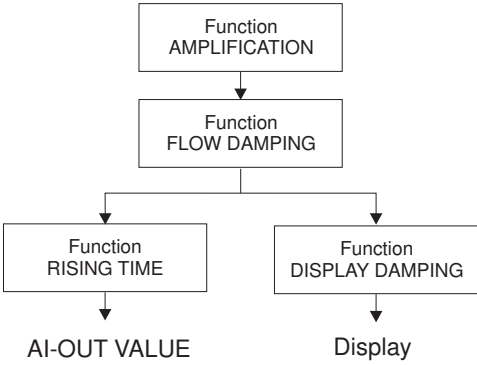| Transducer Block (device matrix)					
Matrix text	Parameter				
(Commuwin II)	(SLOT/INDEX)	Description	L	S	P
OFF VAL **LF CUTOFF** (V4H7)	**OFF VALUE** **LF CUTOFF**	For entering the off-value for low flow cut off. Enter the off-value as a positive hysteresis from the on-value. **User input:** Integer 0 to 100% **Factory setting:** 50% Example: *Fig. 37: Example for the on-value/off-value for low flow cut off* *Q = Flow [volume/time]* *t = Time* *a = ON-VALUE LOW FLOW CUT OFF = 20 m³/h* *b = OFF-VALUE LOW FLOW CUT OFF = 10%* *c = Low flow cut off active* *1 = Low flow cut off is switched on at 20 m³/h* *2 = Low flow cut off is switched off at 22 m³/h* *H = Hysteresis*	X	X	O
Not available in Commuwin II	**VELOCITY WARNING**	Activation of flow velocity supervision (→ ON). In the flow velocity exceeds the value entered in the LIMIT VELOCITY function (see Page 117), the device issues the error message "#421 FLOW RANGE". **Options:** OFF (function switched off) ON **Factory setting:** OFF	X	X	O

Not available in Commuwin II	**LIMIT VELOCITY**	For entering the maximum fluid velocity permitted (= limit speed). Once the VELOCITY WARNING function (Page 117) has been activated, a warning message is output when the limit velocity is exceeded.
		
		User input:
		5-digit floating-point number
		
		Factory setting:
		75 m/s
		
		✎ Note!
		The unit displayed in this function depends on the option selected in the UNIT LENGTH function (see Page 107):
		▪ UNIT LENGTH option = mm
		   → Unit in this function = m/s
		▪ UNIT LENGTH option = inch
		   → Unit in this function = ft/s
			X	X	O

Transducer Block (device matrix)					
Matrix text **(Commuwin II)**	**Parameter** **(SLOT/INDEX)**	**Description**	**L**	**S**	**P**
SYSTEM PARAMETER (V5…)					
POSITIVE ZERO RETURN (V5H0)	**POS. ZERO RETURN**	Use this parameter to interrupt evaluation of measured variables. This is necessary when a pipe is being cleaned, for example. The setting acts on all parameters and outputs of the measuring device. If positive zero return is active, the notice message #601 "POS. ZERO– RET." is displayed. **Options:** OFF ON (signal output is set to the value for zero flow). **Factory setting:** OFF	X	X	O
SYSTEM DAMPING (V5H1)	**SYSTEM DAMPING**	For setting the filter depth. This reduces the sensitivity of the measuring signal to interference peaks (e.g. in the event of high solids content, gas bubbles in the fluid, etc.). The measuring system reaction time increases with the filter setting. **User input:** 0 to 100 s **Factory setting:** 1 s ✎ Note! The damping acts on the following parameters and outputs of the measuring device: *Fig. 38: For setting the filter depth.*	X	X	O

Transducer Block (device matrix)					
Matrix text (Commuwin II)	Parameter (SLOT/INDEX)	Description	L	S	P
PROFIBUS DP/PA (V6…)					
WRITE PROTECT (V6H0)	**HW WRITE PROTECTION**	The status of the general write protection appears on the display. **Display:** – 0 → Write protection disabled, parameters can be changed. – 1 → Write protection enabled, parameters **cannot** be changed. **Factory setting:** 0 ✎ Note! Write protection is activated and deactivated by means of a DIP switch on the amplifier board (→ Page 44).	X		O
SELECTION GSD (V6H1)	**IDENT NUMBER SELECTOR**	✎ Note! In the configuration phase, each PROFIBUS device must check an ID number allocated by the PNO (PROFIBUS User Organization). Along with this device-specific ID number there are also PROFILE ID numbers that have to be accepted in the configuration phase as well, for the purposes of interchangeability between devices of different make. In this case the device might, under certain circumstances, reduce the functionality for cyclic data to a profile-defined scope. For selecting the configuration response. **Options:** MANUFACT.SPEC PROFILE GSD MANUFACT V2.0 PROWIRL 77 (→ Page 51) PROWIRL 72 PROFILE STANDARD PROFILE 1AI 1TOT AUTOMATIC **Factory setting:** AUTOMATIC ✎ Note! The option selected in this parameter can only be changed if the device is **not** in cyclic data exchange.	X	X	M

Transducer Block (device matrix)					
Matrix text (Commuwin II)	Parameter (SLOT/INDEX)	Description	L	S	P
SET UNIT TO BUS (V6H2)	SET UNIT TO BUS	For transmitting the set system units to the automation system. When transmission takes place, the OUT value in the Analog Input Block is automatically scaled to the set system unit and the OUT unit (output unit) is displayed in the OUT UNIT parameter. **Option** CANCEL YES (SET UNITS) **Factory setting:** CANCEL ☝ Caution! Activating this parameter can cause the OUT output value to change suddenly; this, in turn, can affect subsequent control routines.	X	X	O
CHECK CONFIG. (V6H3)	CHECK CONFIG	For checking whether the configuration of a Class 1 master has been accepted for cyclic data exchange in Prowirl 72. **Display:** ACCEPTED (configuration accepted) NOT ACCEPTED (configuration not accepted)	X		O
AI BLOCK SELECT (V6H4)	AI BLOCK SELECT	For selecting the Analog Input function block to which a process variable can be assigned in the CHANNEL (V6H5) parameter. **Options:** ANALOG INPUT 1 **Factory setting:** ANALOG INPUT 1 ✎ Note! The value and status of the assigned process variable is displayed in the OUT VALUE (V6H6) and OUT STATUS (V6H7) parameters.	X	X	O

Transducer Block (device matrix)					
Matrix text **(Commuwin II)**	**Parameter** **(SLOT/INDEX)**	**Description**	**L**	**S**	**P**
CHANNEL (V6H5)	CHANNEL	For selecting the process variable which should be assigned to the Analog Input function block selected in the AI BLOCK SELECT (V6H4) parameter. **Options:** VOLUME FLOW CALC. MASS FLOW CORRECTED VOLUME FLOW **Factory setting:** VOLUME FLOW ✎ Note! ■ The value and status of the assigned process variable is displayed in the OUT VALUE (V6H6) and OUT STATUS (V6H7) parameters. ■ The option selected in this parameter has an effect on the assignment between the logical hardware channel of the Transducer Block and the input of the Analog Input function block in question. The element assigned in this parameter is also taken over in the CHANNEL parameter of the Analog Input function block (see Page 144).	X	X	O
OUT VALUE (V6H6)	OUT VALUE	The OUT (output) value of the process variable selected in the CHANNEL (V6H5) parameter appears on the display.	X		O
OUT STATUS (V6H7)	OUT STATUS	Displays the OUT (output) status in hexadecimal values of the process variable selected in the CHANNEL (V6H5) parameter (status values → Page 61). ✎ Note! The parameter **cannot** be viewed on the local display.	X		O
PROFIBUS INFO (V7…)					
BUS ADDRESS (V7H0)	DEV BUS ADDR	The set bus address of the device appears on the display. **User input:** 0 to 126 **Factory setting:** 126 ✎ Note! This parameter is only for viewing the bus address. The bus address can be changed using a DDE server (via Commuwin II) for example.	X	X	O
PROFILE VERSION (V7H1)	—	The profile version appears on the display.	X		O
DEVICE ID (V7H2)	DEVICE ID	The manufacturer-specific device ID appears on the display. **Display:** 0x153B (Proline Prowirl 72 PROFIBUS PA)	X		O

Transducer Block (device matrix)					
Matrix text	Parameter				
(Commuwin II)	(SLOT/INDEX)	Description	L	S	P
TOT BLOCK SELECT (V7H4)	**ASSIGN TOT BLOCK**	For selecting the Totalizer function block to which a process variable can be assigned in the CHANNEL (V7H5) parameter. **Options:** TOTALIZER 1 **Factory setting:** TOTALIZER 1 ✎ Note! The value and status of the assigned process variable is displayed in the OUT VALUE (V7H6) and OUT STATUS (V7H7) parameters.	X	X	O
CHANNEL (V7H5)	**CHANNEL**	For selecting the process variable which should be assigned to the Totalizer function block selected in the TOT BLOCK SELECT (V7H4) parameter. **Options:** VOLUME FLOW CALC. MASS FLOW CORRECTED VOLUME FLOW **Factory setting:** VOLUME FLOW ✎ Note! ▪ The value and status of the assigned process variable is displayed in the OUT VALUE (V7H6) and OUT STATUS (V7H7) parameters. ▪ The option selected in this parameter has an effect on the assignment between the logical hardware channel of the Transducer Block and the input of the Totalizer function block in question. The element assigned in this parameter is also taken over in the CHANNEL parameter of the Totalizer function block (see Page 155).	X	X	O

Transducer Block (device matrix)					
Matrix text (Commuwin II)	**Parameter** (SLOT/INDEX)	Description	L	S	P
OUT VALUE (V7H6)	**TOT-OUT VALUE**	For displaying the process variable of the totalizer totalized since measuring began and the total overflow, if present. If overflow is present, the display alternates between the totalized process variable and the overflow. The CHANNEL (V7H5) parameter is used to select which process variable is displayed. **Display (totalized process variable):** Max. 7-digit floating-point number **Display (overflows):** Integer with exponent, including sign and unit, e.g. 2 E7 kg ✎ Note! The totalized process variable is represented by a floating–point number consisting of max. 7 digits. You can use this parameter to view higher numerical values (>9,999,999) as overflows. The effective quantity is thus the total of this parameter plus the value displayed in the OUT VALUE parameter. Example Display: – totalized process variable = 196,845.7 kg – for 2 overflows: 2 E7 kg (= 20,000,000 kg). → Effective total quantity = 20,196,845.7 kg	X		O
OUT STATUS (V7H7)	**TOT-OUT STATUS**	Displays the TOT-OUT (output) status in hexadecimal values (status values → Page 61). The CHANNEL (V7H5) parameter is used to select which process variable is displayed. ✎ Note! The parameter **cannot** be viewed on the local display.	X		O
SENSOR DATA (V9…)					
K-FACTOR (V9H0)	**CALIBR FACTOR**	The current calibration factor of the sensor appears on the display. **Display:** e.g. 100 P/l (pulse per liter) ✎ Note! The K-factor is also given on the nameplate, the sensor and the calibration report under "K-fct.". ☝ Caution! Do not change this value, because a change will inevitably affect the accuracy of the measuring device.	X		O

| Transducer Block (device matrix) | | | | | |
| Matrix text | Parameter | | | | |
(Commuwin II)	(SLOT/INDEX)	Description	L	S	P
K-FACTOR COMPENS (V9H1)	**K FACTOR COMPENS**	The current compensated calibration factor of the sensor appears on the display. The temperature-dependent expansion of the sensor (Page 114) and diameter jumps in the inlet of the device (see P. 115) are compensated. **Display:** e.g. 102 P/l (pulse per liter) ☞ Caution! Do not change this value, because a change will inevitably affect the accuracy of the measuring device.	X		O
NOMINAL DIAMETER (V9H2)	**NOMINAL SIZE**	The nominal diameter of the sensor appears on the display. **Display:** e.g. DN 25 ☞ Caution! Do not change this value, because a change will inevitably affect the accuracy of the measuring device.	X		O
METER BODY MB (V9H3)	**METER BODY MB**	The type of meter body (MB) of the sensor appears on the display. Use this parameter to specify the nominal diameter and the sensor type. **Display:** e.g. 2 ✎ Note! The meter body type (MB) is also indicated on the nameplate ☞ Caution! Do not change this value, because a change will inevitably affect the accuracy of the measuring device.	X		O
T-COEFF. SENSOR (V9H5)	**T-COEFF.SENSOR**	The temperature effect on the calibration factor appears on the display. Due to changes in temperature, the meter body expands differently, depending on the material. The expansion has an effect on the K-factor. **Display:** $4.8800*10^{-5}$ / K (stainless steel) $2.6000*10^{-5}$ / K (Alloy C-22) ☞ Caution! Do not change this value, because a change will inevitably affect the accuracy of the measuring device.	X		O

| Transducer Block (device matrix) | | | | | | |
Matrix text (Commuwin II)	Parameter (SLOT/INDEX)	Description	L	S	P
AMPLIFICATION (V9H6)	DAMPING	Devices are always optimally configured for the process conditions you specified. Under certain process conditions, however, interference signals (e.g. strong vibrations) can be suppressed or the measuring range extended by adjusting the amplification. The amplification is configured as follows: ■ A larger value can be entered for the amplification if the fluid is slow-flowing, the density is low and there are minor disturbance influences (e.g. plant vibrations). ■ A smaller value can be entered for the amplification if the fluid is fast-flowing, the density is high and there are strong disturbance influences (e.g. plant vibrations). ☞ Caution! Incorrectly configured amplification can have the following effects: ■ The measuring range is limited in such a way that small flows cannot be recorded or displayed. In this instance, the value for the amplification must be increased. ■ Undesired interference signals are registered by the device which means that a flow is recorded and displayed even if the fluid is at a standstill. In this instance, the value for the amplification must be reduced. **Options:** 1 to 5 (1 = smallest amplification, 5 = largest amplification) **Factory setting:** 3	X	X	O
MEASURING POINT (VA…)					
TAG NAME (VAH0)	TAG DESC	For entering a tag name for the device. You can edit and read this tag name using a Class 2 master. **User input:** Max. 32-character text, permitted characters are: A-Z, 0-9, +,–, punctuation marks **Factory setting:** "– – – – – – – – – – – – – – – – – –" (no text)	X	X	O
MATRIX SELECTION (VAH5)	—	For switching from one matrix page to another. ✎ Note! This parameter is only relevant for Commuwin II.	X	X	O
DEVICE NAME (VAH6)	—	The device type appears on the display. ✎ Note! This parameter is only relevant for Commuwin II.	X	X	O

Transducer Block (Service & Analysis)					
Matrix text	Parameter				
(Commuwin II)	(SLOT/INDEX)	Description	L	S	P
SUPERVISION (V0…)					
ACTUAL.SYS.COND (V0H0)	ACTUAL ERROR CODE	The current system status appears on the display. **Display:** "SYSTEM OK" or the fault/notice message with the highest priority.	X		O
PREV. SYS. COND (V0H1)	PREV.SYS.COND	The last fault and notice message appears on the display.	X		O
ALARM DELAY (V0H4)	ALARM DELAY	For entering the time span for which the criteria for an error have to be satisfied without interruption before a fault or notice message is generated. Depending on the setting and the type of error, this suppression acts on: ■ Display ■ AI 1 OUT-VALUE ■ TOT-OUT VALUE **User input:** 0 to 100 s (in steps of one second) **Factory setting:** 0 s ☞ Caution! If this parameter is used, fault and notice messages are delayed by the time corresponding to the setting before being forwarded to the higher-level controller (PCS, etc.). It is therefore imperative to check in advance whether a delay of this nature could affect the safety requirements of the process. If fault and notice messages may not be suppressed, a value of 0 seconds must be entered here.	X	X	O
SYSTEM RESET (V7H4)	SYSTEM RESET	Use this parameter to reset the measuring system. **Options:** NO RESTART SYSTEM Restart without disconnecting main power RESET DELIVERY Restart without disconnecting main power, the saved settings of the delivery status (factory settings) are applied. **Factory setting:** NO	X	X	O

Transducer Block (Service & Analysis)					
Matrix text (Commuwin II)	Parameter (SLOT/INDEX)	Description	L	S	P
OPERATION (V2…)					
LANGUAGE (V2H0)	**LANGUAGE**	This parameter is described on Page 108.			
ACCESS CODE (V2H1)	**ACCESS CODE**	This parameter is described on Page 108.			
DEFINE PRIVATE CODE (V2H2)	**DEFINE PRIVATE CODE**	This parameter is described on Page 109.			
STATUS ACCESS (V2H3)	**STATUS ACCESS**	This parameter is described on Page 109.			
SIMULATION (V4…)					
SIM. MEASURAND (V4H0)	**SIMULATION MEASURAND**	Simulation of the Transducer Block output to check the behavior. During this time, the message "SIMULATION MEASURAND" appears on the local display. Simulation affects the Analog Input and Totalizer function block. **Options:** VOLUME FLOW CALCULATED MASS FLOW CORRECTED VOLUME FLOW **Factory setting:** OFF ✎ Note! If the unit of the simulated measured value should also be displayed, the selected system unit can be transmitted to the automation system via the SET UNIT TO BUS parameter (see Page 120). This is also possible in the Totalizer function block via the TOTAL. UNIT parameter (see P. 150). In the Analog Input Block, you can use the OUT UNIT parameter (Page 138) to select a unit which, however, does not have any effect on measured value scaling. ☞ Caution! • The measuring device can only be used for measuring to some degree while this simulation is in progress. • The setting is not saved if the power supply fails.	X	X	O
VALUE SIM. MEAS (V4H1)	**VALUE SIMULATION MEASURAND**	✎ Note! This parameter is not displayed unless the SIM. MEASURAND parameter is active. For specifying a freely selectable value (e.g. 12 m³/s) to check the assigned parameters in the device itself and downstream signal circuits. **User input:** 5–digit floating–point number **Factory setting:** 0 ☞ Caution! The setting is not saved if the power supply fails.	X	X	O

Transducer Block (Service & Analysis)					
Matrix text	Parameter				
(Commuwin II)	(SLOT/INDEX)	Description	L	S	P
SIM. FAILSAFE (V4H2)	SIM FSAFE MODE	Simulation of the Transducer Block's failsafe mode. **Options:** OFF NO **Factory setting:** OFF ✎ Note! The failsafe mode must be defined in the appropriate Analog Input or Totalizer function block.	X	X	O
SENSOR INFO (V6…)					
SERIAL NUMBER (V6H0)	SERIAL NUMBER	The serial number of the sensor appears on the display.	X		O
SENSOR TYPE (V6H1)	SENSOR TYPE	The sensor type appears on the display.	X		O
SN DSC SENSOR (V6H2)	SN DSC SENSOR	The serial number of the DSC sensor appears on the display.	X		O
AMPLIFIER INFO (V7…)					
SW REV. AMP. (V7H2)	SW REV. AMP.	The software revision number of the amplifier appears on the display.	X		O
I/O MODULE INFO (V8…)					
SW REV. I/O (V8H2)	SW REV. I/O	The software revision number of the I/O module appears on the display.	X		O
MEASURING POINT (VA…)					
TAG NAME (VAH0)	TAG DESC	This parameter is described on Page 125.			
MATRIX SELECTION (VAH5)	—	This parameter is described on Page 125.			
DEVICE NAME (VAH6)	—	This parameter is described on Page 125.			

Transducer Block (Using the profile parameters)					
Matrix text (Commuwin II)	Parameter (SLOT/INDEX)	Description	L	S	P
VOLUME FLOW (V0…)					
VOLUME FLOW (V0H0)	**VOLUME FLOW**	The current measured value of the first process variable (volume flow) appears on the display. The process variable is made available to the Analog Input function block as an input variable. **Display:** 5-digit floating point number, incl. unit and sign (e.g. 5.5445 dm^3/min; 1.4359 m^3/h; etc.)	X		M
STATUS (V0H1)	**VOLUME FLOW STATUS**	The current status of the first process variable (volume flow) appears on the display, status values → Page 61.	X		M
UNIT (V0H2)	**VOLUME FLOW UNIT**	For selecting the unit for the volume flow. ✎ Note! Only the units defined in the Profiles 3.0 are available.	X	X	M
LOWER RANGE VAL. (V0H3)	**VOLUME FLOW LO LIMIT**	For entering the device's lower measuring range limit for volume flow.	X	X	M
UPPER RANGE VAL. (V0H4)	**VOLUME FLOW HI LIMIT**	For entering the device's upper measuring range limit for volume flow.	X	X	M
VORTEX (V5…)					
VORTEX FREQ (V5H0)	**VORTEX FREQ**	The vortex frequency currently measured appears on the display.	X		M
STATUS (V5H1)	**VORTEX FREQ STATUS**	The current status of the vortex frequency appears on the display, status values → Page 61.	X		M
UNIT (V5H2)	**VORTEX FREQ UNIT**	For selecting the unit for the vortex frequency. ✎ Note! Only the units defined in the Profiles 3.0 are available.	X	X	M
LOWER RANGE VAL. (V5H3)	**VORTEX FREQ LO LIMIT**	For entering the device's lower measuring range limit for vortex frequency.	X	X	M
UPPER RANGE VAL. (V5H4)	**VORTEX FREQ HI LIMIT**	For entering the device's upper measuring range limit for vortex frequency.	X	X	M

Transducer Block					
(Using the profile parameters)					
Matrix text (Commuwin II)	Parameter (SLOT/INDEX)	Description	L	S	P
SYSTEM PARAMETER (V7…)					
LOW FLOW CUTOFF (V7H2)	**LOW FLOW CUTOFF**	This parameter is described on Page 116.			
CALIBR FACTOR (V7H6)	**CALIBR FACTOR**	The current calibration factor of the sensor appears on the display. **Display:** e.g. 100 P/l (pulse per liter) ✎ Note! The K-factor is also given on the nameplate, the sensor and the calibration report under "K-fct.". ☞ Caution! Do not change this value, because a change will inevitably affect the accuracy of the measuring device.	X	X	M
NOMINAL SIZE (V7H7)	**NOMINAL SIZE**	The nominal diameter of the sensor appears on the display. **Display:** e.g. DN 25 ☞ Caution! Do not change this value, because a change will inevitably affect the accuracy of the measuring device.	X	X	M
UNIT (V7H8)	**NOMINAL SIZE UNIT**	For entering the unit of the nominal diameter. ✎ Note! If a setting is changed in this parameter, the setting in the UNIT LENGTH parameter (see Page 107) is changed simultaneously.	X	X	M
BLOCK MODE (V8…)	**General information on the MODE BLK parameter group:** There are three elements in this parameter group: ■ The current operating mode of the block (Actual Mode) ■ The modes supported by the block (Permitted Mode) ■ The normal operating mode (Normal Mode) A distinction is drawn between "automatic operation" (AUTO), manual user intervention (MAN), local override (LO) and the "out-of-service" mode (O/S). A function block generally offers a choice of operating modes, whereas the other block types only work in the AUTO mode, for example.			
TARGET MODE (V8H0)	**TARGET MODE**	For selecting the desired operating mode. Only the automatic mode can be selected in the Transducer Block. **Options:** AUTO **Factory setting:** AUTO	X	X	M
ACTUAL (V8H1)	—	The current operating mode appears on the display. **Display:** AUTO	X		M

Transducer Block					
(Using the profile parameters)					
Matrix text (Commuwin II)	Parameter (SLOT/INDEX)	Description	L	S	P
NORMAL (V8H2)	—	The operating mode for normal operation appears on the display. **Display:** AUTO	X		M
PERMITTED (V8H3)	—	The permissible operating modes appear on the display. **Display:** AUTO	X		M
UNIT MODE (V8H7)	—	Use this parameter to select the form in which you want the units displayed. In the **list** mode, the units are displayed with the conventional abbreviations, for example: L/s. In the **number** mode, the units are displayed in the numerical code defined in the Profiles 3.0, e.g. 1351 (L/s).	X	X	O
ALARM CONFIG (V9…)	General information on the ALARM CONFIG parameter group: The Active Block Alarm is supported which flags a change in a parameter with static parameters (Static attribute) for 10 seconds and indicates that a warning limit or an alarm limit has been violated in the Analog Input function block.				
CURRENT (V9H0)	ALARM SUM (CURRENT)	The current alarms of the device appear on the display.	X		M
DISABLE (V9H1)	ALARM SUM (DISABLE)	The acknowledged alarms of the device appear on the display.	X		M
UNACKNOWLEDGED (V9H2)	ALARM SUM (UNACKNOWLEDGED)	✎ Note! Parameter is not available in this profile version.			
UNREPORTED (V9H3)	ALARM SUM (UNREPORTED)	✎ Note! Parameter is not available in this profile version.			
ST REVISION (V9H5)	ST REV	A block has static parameters (Static attribute) that are not changed by the process. Static parameters whose values change during optimization or configuration increment the ST REVISION parameter by 1. This supports parameter-revision management. The Static Revision Counter can show a higher value if several parameters change within a very short period of time, for example when parameters are loaded to the device from Commuwin II. This counter can never be reset, nor does it return to a default setting even after a device reset. If the counter overflows (16 bits), it starts again at 1.	X		M

Transducer Block					
(Using the profile parameters)					
Matrix text **(Commuwin II)**	**Parameter** **(SLOT/INDEX)**	**Description**	**L**	**S**	**P**
BLOCK PARAMETER (VA…)					
TAG (VAH0)	**TAG DESC**	For entering a user-specific text of max. 32 characters for unique identification and assignment of the block. **Factory setting:** "– – – – – – – –" no text	X	X	M
STRATEGY (VAH1)	**STRATEGY**	Parameter for grouping and thus faster evaluation of blocks. Grouping is carried out by entering the same numerical value in the STRATEGY parameter of each individual block. **Factory setting:** 0	X	X	M
ALERT KEY (VAH2)	**ALERT KEY**	For entering the identification number of the plant unit. This information can be used by the control system for sorting alarms and events. **User input:** 1 to 255 **Factory setting:** 0	X	X	M
PROFILE VERSION (VAH3)	—	The profile version implemented in the device appears on the display.	X		M

11.4 Function blocks, general

The function blocks contain the basic automation functions of the measuring device. We distinguish between different function blocks, e.g. Analog Input function block, Analog Output function block, Totalizer Block, etc.

Each of these function blocks is used to execute different application functions. This means that device errors such as amplifier errors can be reported to the automation system automatically.

The function blocks process the input values in accordance with their specific algorithm and their parameters which are internally available. They generate output values that are then made available to the automation system for further processing.

11.5   Analog Input function block

The device has an Analog Input function block. In the Analog Input function block, the device's process variables (volume flow, calculated mass flow and corrected volume flow) are prepared for subsequent automation functions (e.g. scaling and limit value processing).

11.5.1   Signal processing
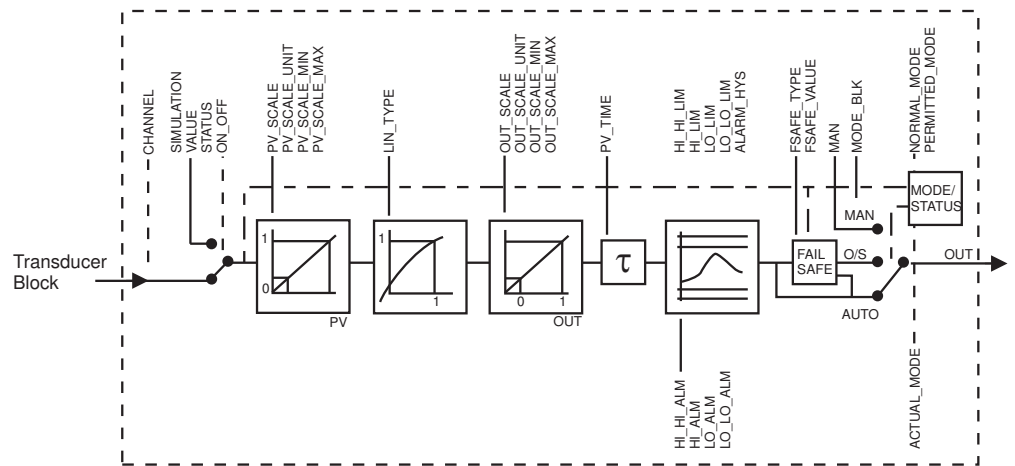
Fig. 39:   *Schematic illustration of the internal structure of an Analog Input function block*

The Analog Input function block receives three process variables as input values from the Transducer Block. The CHANNEL parameter is used to specify which process variable should be used:

Process variables available:	Entry in the CHANNEL parameter (see P. 144)
Volume flow	→ 273
Calculated mass flow	→ 277
Corrected volume flow	→ 398

The SIMULATION parameter group (see Page 143) allows you to replace the input value with a simulation value and activate simulation. By specifying the status and the simulation value, the reaction of the automation system can be tested.

In the RISING TIME parameter (see Page 139), a filter time can be specified for damping the converted input value (PV). If a time of 0 seconds is specified, the input value is not damped.

The BLOCK MODE parameter group (see Page 143) is used to select the operating mode of the Analog Input function block. If the MAN (manual) operating mode is selected, the OUT output value and the OUT STATUS (see Page 136) can be specified directly.

The OUT output value is compared against warning and alarm limits (e.g. HI LIM, LO LO LIM, etc.) that can be entered via various parameters. If one of these limit values is violated, a limit value process alarm (e.g. HI ALM, LO LO ALM, etc.) is triggered.

The most important functions and parameters of the Analog Input function block are listed below. You will find an overview of all the parameters available from Page 136 onwards.

11.5.2 Selecting the operating mode

The operating mode is set by means of the BLOCK MODE parameter group (see Page 143). The Analog Input function block supports the following operating modes:
- AUTO (automatic mode)
- MAN (manual mode)
- O/S (out of service)

11.5.3 Selecting the units

The system unit for volume flow can be changed using Commuwin II in the Transducer Block profile and the manufacturer-specific device block.

Changing the unit does not initially have any effect on the measured value transmitted to the automation system. This ensures that there are no sudden changes in the measured values that could have an effect on the subsequent control routine.

If the change of unit should affect the measured value, the SET UNIT TO BUS parameter (manufacturer-specific, see Page 120) can be activated using Commuwin II.

Another way of changing the unit is to use the PV SCALE and OUT SCALE parameters ($\rightarrow$ Page 135 "Rescaling the input value").

11.5.4 Status of the OUT output value

The status of the Analog Input function block and the validity of the OUT output value are relayed to the downstream function blocks by means of the status of the OUT parameter group.

Status of the OUT output value:	Meaning The output value:
GOOD NON CASCADE	$\rightarrow$ OUT is valid and can be used for further processing.
UNCERTAIN	$\rightarrow$ OUT can only be used for further processing to a limited extent.
BAD	$\rightarrow$ OUT is not valid.

✎ Note!
The BAD status value occurs when the Analog Input function block is switched to O/S (out-of-service) or in the event of serious errors (see status code and system/process error messages, $\rightarrow$ Page 68).

11.5.5 Simulation of input/output

Various parameters of the Analog Input function block allow simulation of the input and output of the function block:

Simulating the input of the Analog Input function block:
The input value (measured value and status) can be specified by means of the SIMULATION parameter group (see Page 143). Since the simulation value runs through the entire function block, all the parameter settings of the block can be checked.

Simulating the output of the Analog Input function block:
Set the operating mode in the MODE BLK parameter group (see Page 143) to MAN and directly specify the desired output value in the OUT parameter (see Page 136).

11.5.6 Failsafe mode FAILSAFE TYPE

If an input or simulation value has the status BAD, the Analog Input function block uses the failsafe mode defined in the FAILSAFE TYPE parameter. The FAILSAFE TYPE parameter (see Page 137) offers the following options:

Option in FAILSAFE TYPE parameter:	Failsafe mode:
FSAFE VALUE	The value specified in the FAILSAFE VALUE parameter (see Page 137) is used for further processing.
LAST GOOD VALUE	The last good value is used for further processing.
WRONG VALUE	The current value is used for further processing, despite the BAD status.

✎ Note!
The factory setting is the default (FSAFE VALUE) with value "0".

✎ Note!
Failsafe mode is also activated if the Analog Input function block is set to the "OUT OF SERVICE" operating mode.

11.5.7 Rescaling the input value

In the Analog Input function block, the input value or input range can be scaled in accordance with the automation requirements.

Example:
The system unit in the Transducer Block is m³/h. The measuring device has a measuring range of 0 to 30 m³/h. The output range to the automation system should be 0 to 100%.
The measured value from the Transducer Block (input value) is rescaled linearly via the input scaling PV SCALE to the desired output range OUT SCALE:

PV SCALE parameter group (see Page 138)		OUT SCALE parameter group (see Page 138)	
PV SCALE MIN (V1H0)	→ 0	OUT SCALE MIN (V1H3)	→ 0
PV SCALE MAX (V1H1)	→ 30	OUT SCALE MAX (V1H4)	→100
		OUT UNIT (V1H5)	→ %

The result is that with an input value of, for example, 15 m³/h a value of 50% is output via the OUT parameter.
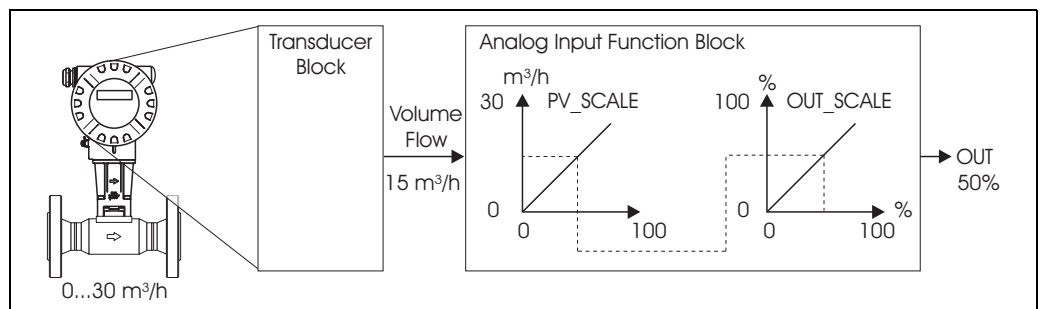
Fig. 40:   Rescaling the input value

✎ Note!
The "OUT UNIT" does not have any effect on the scaling. It should be set nevertheless for the purposes of viewing on the local display, for example.

11.5.8 Limit values

You can set two warning limits and two alarm limits for monitoring your process. The status of the measured value and the parameters of the limit-value alarms are indicative of the measured value's relative situation. You also have the option of defining an alarm hysteresis in order to avoid frequent changes of the limit-value flags and frequent enabling/disabling of alarms (see Page 140).

The limit values are based on the OUT output value. If the output value OUT exceeds or undershoots the defined limit values, an alarm is sent to the automation system via the limit value process alarms.

The following limit values can be defined:

| HI HI LIM | → Page 141 | LO LO LIM | → Page 142 |
| HI LIM | → Page 141 | LO LIM | → Page 142 |

11.5.9 Alarm detection and processing

The following process alarms are generated by the Analog Input function block:

Limit value process alarms
The status of the limit value process alarms is communicated to the automation system by means of the following parameters:

| HI HI ALM | → Page 141 | LO LO ALM | → Page 142 |
| HI ALM | → Page 141 | LO ALM | → Page 142 |

11.5.10 Analog Input function block parameters

The following table shows all the parameters available for the Analog Input function block.
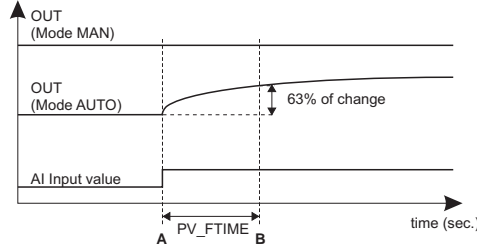
Abbreviations used in the table:
- R = Read
- W = Write
- P = Parameter, with a distinction between M = mandatory parameters and O = optional parameters

Analog Input function block						
Matrix text (Commuwin II)	Parameter (SLOT/INDEX)	Description	L	S	P
OUT (V0…)					
OUT VALUE (V0H0)	**OUT** (VALUE)	The output value with alarm weighting appears on the display. ✎ Note! If MAN (manual) is selected for the operating mode in the MODE BLK parameter group, the OUT output value can be specified manually here.	X	X	M
OUT STATUS (V0H1)	**OUT** (STATUS)	The current status of the output value appears on the display. ✎ Note! If MAN (manual) is selected for the operating mode in the MODE BLK parameter group, the status of the OUT output value can be specified manually here.	X	X	M

Analog Input function block						
Matrix text (Commuwin II)	Parameter (SLOT/INDEX)	Description	L	S	P
OUT STATUS (V0H2)	OUT (STATUS BIT 0–1)	The quality of the output status appears on the display. **Display:** GOOD UNCERTAIN BAD	X		M
OUT SUB STATUS (V0H3)	OUT (STATUS BIT 2–5)	The sub-status in plain text appears on the display.	X		M
OUT LIMIT (V0H4)	OUT (LIMITS BIT 6–7)	The limit overshoot/undershoot in plain text appears on the display. **Display:** ■ O.K. → no limit overshoot/undershoot ■ HIGH LIMIT → HI LIMIT or/and HI HI LIMIT overshot ■ LO LIMIT → LO LIMIT or/and LO LO LIMIT undershot	X		M
FAILSAFE ACTION (V0H6)	FAILSAFE TYPE	For selecting the failsafe mode in the event of an instrument error or bad measured value. The ACTUAL MODE (the block's current operating mode) remains in AUTO MODE (automatic mode). **Options:** ■ FSAFE VALUE If you select this option, the value entered in the FSAFE VALUE parameter is displayed in OUT (output value). The status changes to UNCERTAIN - SUBSTITUTE VALUE. ■ LAST GOOD VALUE The last good value prior to the failure is used. The status is set to UNCERTAIN – LAST USABLE VALUE. If no previous valid value is available, the initial value is returned with the status UNCERTAIN – INITIAL VALUE (for values that are not saved when the device is reset). The initial value of Proline Prowirl 72 PROFIBUS PA is "0". ■ WRONG VALUE The value is used for processing, despite the bad status. **Factory setting:** FSAFE VALUE	X	X	O
FAILSAFE VALUE (V0H7)	FAILSAFE VALUE	Use this parameter to enter a default value that will be displayed in OUT (output value) in the event of an error (see FAILSAFE TYPE). **Factory setting:** 0	X	X	O

Analog Input function block					
Matrix text (Commuwin II)	Parameter (SLOT/INDEX)	Description	L	S	P
SCALING (V1…)	In this PV SCALE parameter group, the process variable is normalized to a value with the unit of the Transducer Block, with the aid of the EU OF 0 and EU OF 100 parameters. The change of unit in the Transducer Block also causes an automatic change in the scaling for the EU OF 0 and EU OF 100 parameters. This prevents OUT jumping. An example of rescaling the input value is provided on Page 135.			
PV SCALE MIN (V1H0)	PV SCALE EU OF 0	Use this parameter to enter the lower value for input scaling. **Factory setting:** 0	X	X	M
PV SCALE MAX (V1H1)	PV SCALE EU OF 100	Use this parameter to enter the upper value for input scaling. **Factory setting:** 100	X	X	M
TYPE OF LIN (V1H2)	LIN TYPE	Use this parameter to select a characteristic curve to be used in characteristic-curve transformation. ✎ Note! Linearization cannot be set with Prowirl 72.	X	X	M
OUT SCALE	The measuring range (lower and upper limits), and the physical unit for the output value (OUT) are defined in the OUT SCALE parameter group. ✎ Note! Defining the measuring range in this parameter group does not restrict the OUT output value. If the OUT output value is outside the measuring range, this value is transferred nonetheless.			
OUT SCALE MIN (V1H3)	OUT SCALE EU OF 0%	For entering the lower value for output scaling. **Factory setting:** 0	X	X	M
OUT SCALE MAX (V1H4)	OUT SCALE EU OF 100%	For entering the upper value for output scaling. **Factory setting:** 100	X	X	M
OUT UNIT (V1H5)	OUT SCALE	For selecting the output unit. **Factory setting:** Analog Input function block 1 = m³/h ✎ Note! OUT UNIT (output unit) has no effect on measured-value scaling.	X	X	M

Analog Input function block						
Matrix text (Commuwin II)	Parameter (SLOT/INDEX)	Description	L	S	P
USER UNIT (V1H6)	OUT UNIT TEXT	For entering an ASCII text if the unit you want is not available in the OUT UNIT (output unit) parameter. **Factory setting:** (– – – –) no text ✎ Note! Note that you cannot enter text here unless USER UNIT is selected in the OUT UNIT parameter.	X	X	M
DEC POINT OUT (V1H7)	OUT SCALE	For specifying the decimal places of the OUT output value. ✎ Note! Parameter is not supported by the device.	X	X	M
RISING TIME (V1H8)	PV FTIME	For entering the filter time constant (in seconds) of the digital filter of the 1st order. This time is required in order for 63% of a change in the Analog Input (input value) to have an effect on OUT (output value). The diagram shows the signal curves of the Analog Input function block over time: *Fig. 41: Filter time constant* **A** → *The Analog Input changes.* **B** → *The OUT has reacted 63% to the change in the Analog Input.* **Factory setting:** 0 s	X	X	M
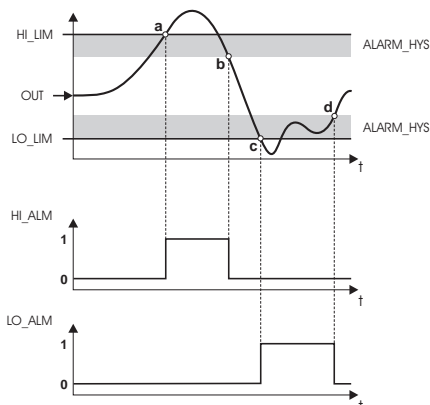
Analog Input function block					
Matrix text (Commuwin II)	Parameter (SLOT/INDEX)	Description	L	S	P
ALARM LIMITS (V2…)					
ALARM HYSTERESIS (V2H0)	**ALARM HYS**	For entering the hysteresis value for the upper and lower warning or alarm limit values. The alarm conditions remain active as long as the measured value is within the hysteresis. The hysteresis value affects the following warning and alarm limit values of the Analog Input function block: HI HI ALM → Upper limit value alarm HI ALM → Upper limit value warning LO LO ALM → Lower limit value alarm LO ALM → Lower limit value warning **User input:** 0 to 50% **Factory setting:** 0.5% ✎ Note! ■ The hysteresis value relates to a percentage of the range of the OUT SCALE parameter group in the Analog Input function block (see P. 138). ■ If limit values are entered in Commuwin II, it is important to make sure that absolute values can be entered and displayed. **Example:** ■ The top diagram shows the limit values defined for the LO LIM and HI LIM warnings with their respective hystereses (gray background) and the signal curve of the OUT output value. ■ The two diagrams below illustrate the behavior of the related alarms HI ALM and LO ALM to the changing signal (0 = No alarm, 1 = Alarm is output). A0004811-EN *Fig. 42: Limit values and behavior of alarm levels* ***a***→ *OUT output value exceeds the HI LIM limit value, HI ALM is activated.* ***b***→ *OUT output value undershoots the hysteresis value of HI LIM, HI ALM is deactivated.* ***d***→ *OUT output value undershoots the LO LIM limit value, LO ALM is activated.* ***e***→ *OUT output value exceeds the hysteresis value of LO LIM, LO ALM is deactivated.*	X	X	M

Analog Input function block					
Matrix text (Commuwin II)	Parameter (SLOT/INDEX)	Description	L	S	P
HI HI ALARM (V3…)					
HI HI LIM (V3H0)	**HI HI LIM**	For entering the alarm limit value for the upper alarm (HI HI ALM). If the OUT output value exceeds this limit value, the alarm status parameter HI HI ALM is output. **User input:** Range and unit of OUT SCALE **Factory setting:** 3402823466 x 10^{38}	X	X	M
VALUE (V3H1)	**HI HI ALM (VALUE)**	Alarm status parameter for the upper alarm limit. Content includes the value that violated the limit.	X		O
ALARM STATE (V3H2)	**HI HI ALM (ALARM STATE)**	The current HI HI ALARM state appears on the display.	X		O
SWITCH-ON POINT (V3H3)	**HI HI ALM (SWITCH-ON POINT)**	The switch-on point as a function of the hysteresis value appears on the display.	X		O
SWITCH-OFF POINT (V3H4)	**HI HI ALM (SWITCH-OFF POINT)**	The switch-off point as a function of the hysteresis value appears on the display.	X		O
HI ALARM (V4…)					
HI LIM (V4H0)	**HI LIM**	For entering the alarm limit value for the upper warning (HI ALM). If the OUT output value exceeds this limit value, the alarm status parameter HI ALM is output. **User input:** Range and unit of OUT SCALE **Factory setting:** 3402823466 x 10^{38}	X	X	M
VALUE (V4H1)	**HI ALM (VALUE)**	Alarm status parameter for the upper warning limit. Content includes the value that violated the limit.	X		O
ALARM STATE (V4H2)	**HI ALM (ALARM STATE)**	The current HI ALARM state appears on the display.	X		O
SWITCH-ON POINT (V4H3)	**HI ALM (SWITCH-ON POINT)**	The switch-on point as a function of the hysteresis value appears on the display.	X		O
SWITCH-OFF POINT (V4H4)	**HI ALM (SWITCH-OFF POINT)**	The switch-off point as a function of the hysteresis value appears on the display.	X		O

Analog Input function block					
Matrix text (Commuwin II)	Parameter (SLOT/INDEX)	Description	L	S	P
LO ALARM (V5...)					
LO LIM (V5H0)	**LO LIM**	For entering the alarm limit value for the lower warning (LO ALM). If the OUT output value undershoots this limit value, the alarm status parameter LO ALM is output. **User input:** Range and unit of OUT SCALE **Factory setting:** $3402823466 \times 10^{38}$	X	X	M
VALUE (V5H1)	**LO ALM (VALUE)**	Alarm status parameter for the lower warning limit. Content includes the value that violated the limit.	X		O
ALARM STATE (V5H2)	**LO ALM (ALARM STATE)**	The current LO ALARM state appears on the display.	X		O
SWITCH-ON POINT (V5H3)	**LO ALM (SWITCH-ON POINT)**	The switch-on point as a function of the hysteresis value appears on the display.	X		O
SWITCH-OFF POINT (V5H4)	**LO ALM (SWITCH-OFF POINT)**	The switch-off point as a function of the hysteresis value appears on the display.	X		O
LO LO ALARM (V6...)					
LO LO LIM (V6H0)	**LO LO LIM**	For entering the alarm limit value for the lower alarm (LO LO ALM). If the OUT output value undershoots this limit value, the alarm status parameter LO LO ALM is output. **User input:** Range and unit of OUT SCALE **Factory setting:** $3402823466 \times 10^{38}$	X	X	M
VALUE (V6H1)	**LO LO ALM (VALUE)**	Alarm status parameter for the lower alarm limit. Content includes the value that violated the limit.	X		O
ALARM STATE (V6H2)	**LO LO ALM (ALARM STATE)**	The current LO LO ALARM state appears on the display.	X		O
SWITCH-ON POINT (V6H3)	**LO LO ALM (SWITCH-ON POINT)**	The switch-on point as a function of the hysteresis value appears on the display.	X		O
SWITCH-OFF POINT (V6H4)	**LO LO ALM (SWITCH-OFF POINT)**	The switch-off point as a function of the hysteresis value appears on the display.	X		O

Analog Input function block						
Matrix text (Commuwin II)	Parameter (SLOT/INDEX)	Description	L	S	P
SIMULATION (V7…)						
SIMULATION VALUE (V7H0)	**SIMULATE**	Simulation of the input value and input status. Since this value runs through the entire algorithm, the behavior of the Analog Input function block can be checked. **Factory setting:** Simulation Disabled (simulation not active)	X	X	O
SIMULATION STATUS (V7H1)	**SIMULATE (STATUS)**	Simulation of the status of the Analog Input function block.	X	X	O
SIMULATION MODE (V7H2)	**SIMULATE (MODE)**	For activating/deactivating simulation. **Options:** OFF ON **Factory setting:** OFF	X	X	O
BLOCK MODE (V8…)	**General information on the MODE BLK parameter group:** There are three elements in this parameter group: • The current operating mode of the block (Actual Mode) • The modes supported by the block (Permitted Mode) • The normal operating mode (Normal Mode) A distinction is drawn between "automatic operation" (AUTO), manual user intervention (MAN), local override (LO) and the "out-of-service" mode (O/S). A function block generally offers a choice of operating modes, whereas the other block types only work in the AUTO mode, for example.				
TARGET MODE (V8H0)	**TARGET MODE**	For selecting the desired operating mode. **Options:** AUTO MAN O/S **Factory setting:** AUTO	X	X	M
ACTUAL (V8H1)	**MODE BLK (ACTUAL)**	The current operating mode appears on the display. **Display:** AUTO	X		M
NORMAL (V8H2)	**MODE BLK (NORMAL)**	The operating mode for normal operation appears on the display. **Display:** AUTO	X		M
PERMITTED (V8H3)	**MODE BLK (PERMITTED)**	The permissible operating modes appear on the display. **Display:** AUTO	X		M

Analog Input function block					
Matrix text (Commuwin II)	Parameter (SLOT/INDEX)	Description	L	S	P
CHANNEL (V8H5)	CHANNEL	Assignment between the logical hardware channel of the Transducer Block and the input of the Analog Input function block. The Transducer Block of Prowirl 72 makes three process variables available to the input channel of the Analog Input function block. Options: 273 → Volume flow 277 → Calculated mass flow 398 → Corrected volume flow	X	X	M
UNIT MODE (V8H7)	—	For selecting the format in which the units should be displayed. In the **list** mode, the units are displayed with the conventional abbreviations, for example: L/s. In the **number** mode, the units are displayed in the numerical code defined in the Profiles 3.0, e.g. 1351 (L/s).	X	X	O
ALARM CONFIG (V9…)	General information on the ALARM CONFIG parameter group: The Active Block Alarm is supported which flags a change in a parameter with static parameters (Static attribute) for 10 seconds and indicates that a warning limit or an alarm limit has been violated in the Analog Input function block.				
CURRENT (V9H0)	ALARM SUMMARY (CURRENT)	The current alarms of the device appear on the display.	X		M
DISABLE (V9H1)	ALARM SUMMARY (DISABLE)	The acknowledged alarms of the device appear on the display.	X		M
UNACKNOWLEDGED (V9H2)	ALARM SUMMARY (UNACKNOWLEDGED)	✎ Note! Parameter is not available in this profile version.			
UNREPORTED (V9H3)	ALARM SUMMARY (UNREPORTED)	✎ Note! Parameter is not available in this profile version.			
ST REVISION (V9H5)	ST REV	A block has static parameters (Static attribute) that are not changed by the process. Static parameters whose values change during optimization or configuration increment the ST REV parameter by 1. This supports parameter-revision management. The Static Revision Counter can show a higher value if several parameters change within a very short period of time, for example when parameters are loaded to the device from Commuwin II. This counter can never be reset, nor does it return to a default setting even after a device reset. If the counter overflows (16 bits), it starts again at 1.	X		M

Analog Input function block					
Matrix text (Commuwin II)	Parameter (SLOT/INDEX)	Description	L	S	P
BLOCK PARAMETER (VA…)					
TAG (VAH0)	**TAG DESC**	For entering a user-specific text of max. 32 characters for unique identification and assignment of the block. **Factory setting:** "– – – – – – – –" no text	X	X	M
STRATEGY (VAH1)	**STRATEGY**	Parameter for grouping and thus faster evaluation of blocks. Grouping is carried out by entering the same numerical value in the STRATEGY parameter of each individual block. **Factory setting:** 0	X	X	M
ALERT KEY (VAH2)	**ALERT KEY**	For entering the identification number of the plant unit. This information can be used by the control system for sorting alarms and events. **User input:** 1 to 255 **Factory setting:** 0	X	X	M
PROFILE VERSION (VAH3)	—	The profile version implemented in the device appears on the display.	X		O
BATCH (VAH4-7)	The Batch parameter is a structured parameter consisting of four elements. This parameter is used in batch applications compliant with EC 61512 Part 1 (ISA S88). Only function blocks have this parameter. There is no algorithm linked to this parameter within a function block. The batch parameter is necessary in a distributed automation system as a means of flagging the input channels that are used. In addition, the errors that have occurred in the current batch process can be displayed.					
BATCH ID (VAH4)	**BATCH (ID)**	ID of a batch application as a means of assigning device messages (alarms, errors).	X	X	M
BATCH RUP (VAH5)	**BATCH (RUP)**	For entering the code required for the batch application, the formula or the unit, such as reactors.	X	X	M
BATCH PHASE (VAH6)	**BATCH (PHASE)**	For writing or displaying the current formula phase.	X	X	M
BATCH OPERATION (VAH7)	**BATCH (OPERATION)**	For writing or displaying the current formula phase.	X	X	M

11.6   Totalizer function block

The Totalizer function block is used whenever a physical measured variable, generally flow, has to be totaled over a certain period of time.
This is volume flow in the case of Prowirl 72. Like the Analog Input function block, the totalizer also receives its input value from a Transducer Block.

11.6.1   Signal processing
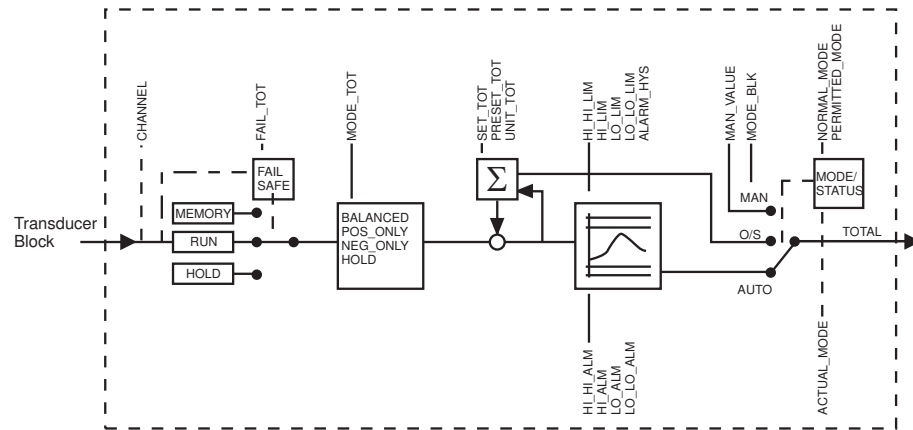
A0003916

Fig. 43:   Schematic illustration of the internal structure of a Totalizer function block

The Totalizer function block receives three process variables as input values from the Transducer Block. The CHANNEL parameter is used to specify which process variable should be used:

Process variables available:	Entry in the CHANNEL parameter (see Page 155)
Volume flow	→ 273
Calculated mass flow	→ 277
Corrected volume flow	→ 398

The MODE–BLK parameter group (Page 155) is used to select the operating mode of the Totalizer function block. If the MAN (manual) operating mode is selected, the TOTAL output value and the TOTAL. STATUS can be specified directly.

✎ Note!
The block algorithm is not run through in the MAN (manual) operating mode. This, in turn, means that limit values are not calculated or displayed.

The TOTAL output value is compared with warning and alarm limits (e.g. HI LIM, LO LO LIM, etc.) that can be entered by means of various parameters.
If one of these limit values is violated, a limit value process alarm (e.g. HI ALM, LO LO ALM, etc.) is triggered.

The most important functions and parameters of the Totalizer function block are listed below. You will find an overview of all the parameters available from Page 149 onwards.

11.6.2   Selecting the operating mode

The operating mode is set by means of the BLOCK MODE parameter group (see Page 155). The Totalizer function block supports the following operating modes:
- AUTO (automatic mode)
- MAN (manual mode)
- O/S (out of service)

11.6.3   Unit of the totaled measured value UNIT TOT

Unit change has a direct effect on the measured value.
There is no scaling similar to that in the Analog Input function block.
The manufacturer–specific SET UNIT TO BUS function is also not necessary.

11.6.4   Status of the TOTAL output value

The status of the Totalizer function block and the validity of the TOTAL output value are relayed to the downstream function blocks by means of the status of the TOTAL parameter group.

Status of the TOTAL output value:	Meaning The output value:
GOOD NON CASCADE	→ OUT is valid and can be used for further processing.
UNCERTAIN	→ OUT can only be used for further processing to a limited extent.
BAD	→ OUT is not valid.

✎ Note!
The BAD status value occurs when the Totalizer function block is switched to O/S (out-of-service) or in the event of serious errors (see status code and system/process error messages, Page 68).

11.6.5   Failsafe mode FAIL TOT

If an input value has the status BAD, the Totalizer function block uses the failsafe mode defined in the FAILSAFE MODE parameter. The FAILSAFE MODE parameter (see Page 150) offers the following options:

Option in FAILSAFE TYPE parameter:	Failsafe mode:
RUN	The totalizer continues to total despite the BAD input value.
HOLD	The totalizer stops; BAD input values are not totaled.
MEMORY	The totalizer continues to total with the last valid input value (not statused BAD).

✎ Note!
RUN is the factory setting for the FAILSAFE TYPE parameter.

11.6.6   Selecting the direction for totaling, MODE TOT

Use the TOTALIZER MODE parameter (see Page 151) to define the direction in which the totalizer totals. The options are totaling only positive values, only negative values*, or all values (positive and negative*), or stop the totalizer. The totaled integral is formed in the Totalizer function block. For this, the totalizer needs a time reference that is called up equidistantly in time.

* Prowirl 72 cannot measure any negative flow.

Option in MODE TOT parameter:	Behavior:
BALANCED	→ Positive and negative measured values are totaled.
POS ONLY	→ Only positive values are totaled.
NEG ONLY *	→ Only negative values are totaled.
HOLD	→ Totalizer is stopped.

✎ Note!
In the factory setting, BALANCED is used in the MODE TOT parameter.

* Prowirl 72 cannot measure any negative flow.

You will find information on integration into an automation system in the examples dealing with system integration and configuration on Page 48 ff.

11.6.7 Initial setting of the totalizer SET TOT

Use the SET TOTALIZER parameter (see Page 151) to start totaling (TOTALIZE), to reset the totalizer to 0 (RESET) or set it to a preset value (PRESET).

Option in SET TOT parameter:	Behavior:
TOTALIZE	→ Start the totalizer, total the input value.
RESET	→ Reset the totalizer to 0.
PRESET	→ The totalizer is set to the value defined in the PRESET TOT parameter.

✎ Note!
- Note that selecting RESET or PRESET resets the totalizer to 0 or sets it to the preset value, respectively, but does not stop the totalizer. This means that it immediately recommences totaling from the new setting. If you want to stop the totalizer you must select HOLD in the MODE TOT parameter.
- In the factory setting, TOTALIZE is used in the SET MODE parameter.

You will find information on integration into an automation system in the examples dealing with system integration and configuration on Page 48 ff.

11.6.8 Limit values

You can set two warning limits and two alarm limits for monitoring your process. The status of the measured value and the parameters of the limit-value alarms are indicative of the measured value's relative situation. You also have the option of defining an alarm hysteresis in order to avoid frequent changes of the limit-value flags and frequent enabling/disabling of alarms (see Page 152).

The limit values are based on the TOTAL output value. If the TOTAL output value exceeds or undershoots the defined limit values, an alarm is sent to the automation system via the limit value process alarms.

The following limit values can be defined:

HI HI LIM	→ see Page 153		LO LO LIM	→ see Page 154
HI LIM	→ see Page 153		LO LIM	→ see Page 154

11.6.9   Alarm detection and processing

The following process alarms are generated by the Totalizer function block:

Limit value process alarms
The status of the limit value process alarms is communicated to the automation system by means of the following parameters:

HI HI ALM	→ see Page 153		LO LO ALM	→ see Page 154
HI ALM	→ see Page 153		LO ALM	→ see Page 154

11.6.10 Totalizer function block parameters

The following table shows all the parameters available for the Totalizer function block.

Abbreviations used in the table:
- R = Read
- W = Write
- P = Parameter, with a distinction between M = mandatory parameters and O = optional parameters

Totalizer function block					
Matrix text (Commuwin II)	**Parameter (SLOT/INDEX)**	**Description**	**L**	**S**	**P**
TOTAL (V0…)					
TOTAL. VALUE (V0H0)	**TOTAL** (Value)	The output value (TOTAL) with alarm weighting appears on the display. ✎ Note! If MAN (manual) is selected for the operating mode in the MODE BLK parameter group, the TOTAL output value can be specified manually here.	X	X	M
TOTAL. STATUS (V0H1)	**TOTAL** (Status)	The current output status (TOTAL) appears on the display. ✎ Note! If MAN (manual) is selected for the operating mode in the MODE BLK parameter group, the status of the TOTAL output value can be specified manually here.	X	X	M
TOTAL. STATUS (V0H2)	**TOTAL** (Status bit 0–1)	The quality of the output status appears on the display. **Display:** GOOD UNCERTAIN BAD	X		M
TOTAL. SUB STATUS (V0H3)	**TOTAL** (Status bit 2–5)	The sub-status in plain text appears on the display.	X		M

Totalizer function block					
Matrix text (Commuwin II)	Parameter (SLOT/INDEX)	Description	L	S	P
TOTAL. LIMIT (V0H4)	**TOTAL** (Limits bit 6-7)	The limit overshoot/undershoot in plain text appears on the display. **Display:** O.K. → no limit overshoot/undershoot HIGH LIMIT → HI LIMIT or/and HI HI LIMIT overshot LO LIMIT → LO LIMIT or/and LO LO LIMIT undershot	X		M
FAILSAFE MODE (V0H6)	**FAIL TOT**	For selecting the failsafe mode in the event of an instrument error or bad measured value. The ACTUAL MODE (the block's current operating mode) remains in AUTO MODE (automatic mode). **Options:** RUN → The totalizer continues to total despite the BAD input value. HOLD → The totalizer stops; BAD input values are not totaled. MEMORY → The totalizer continues to total with the last valid input values (not statused BAD). **Factory setting:** RUN			
CONFIGURATION (V1...)					
TOTAL. UNIT (V1H0)	**UNIT TOT**	For selecting the unit for the measured variable. **Options:** (with CHANNEL function = Volume flow (→ Page 144)) Metric → cm³; dm³; m³; ml; l; hl; Ml US → cc; af; (cft) ft³; (flo) ozf; gal; Mgal; bbl (normal fluids); bbl (beer); bbl (petrochemicals); bbl (filling tanks) Imperial → gal; Mgal; bbl (beer); bbl (petrochemicals) **Factory setting (volume):** Depends on country (→ Page 165 ff.) **Options:** (with CHANNEL function = Calculated mass flow (→ Page 144)) Metric → g; kg; t US → oz; lb; ton **Factory setting:** Depends on country (→ Page 165 ff.) **Options:** (with CHANNEL function = Corrected volume flow (→ Page 144)) Metric → Nl; Nm³ US → Sm³; Scf; ton **Factory setting:** Depends on country (→ Page 165 ff.)	X	X	M

Totalizer function block					
Matrix text (Commuwin II)	Parameter (SLOT/INDEX)	Description	L	S	P
SET TOTALIZER (V1H1)	**SET TOT**	Use this parameter to assign various statuses to the totalizer. This parameter is level-triggered. **Options:** TOTALIZE → Total the measured variable RESET → Reset the totalizer to zero PRESET → The totalizer is set to the value defined in the PRESET TOT parameter. **Factory setting:** TOTALIZE	X	X	M
PRESET TOTALIZER (V1H2)	**PRESET TOT**	For specifying a (start) value for the totalizer. The totalizer does not accept this value unless "PRESET" was selected in the SET TOT parameter. **Factory setting:** 0	X	X	M
TOTALIZER MODE (V1H3)	**MODE TOT**	For selecting how the totalizer totals the flow components. **Options:** BALANCED → Positive and negative flow components. The positive and negative flow components are balanced. In other words, net flow in the flow direction is registered. POS ONLY → Positive flow components only. NEG ONLY → Negative flow components only. HOLD → The totalizer stops at the last value. No further flow components are totaled. **Factory setting:** BALANCED	X	X	M

Totalizer function block					
Matrix text (Commuwin II)	Parameter (SLOT/INDEX)	Description	L	S	P
ALARM LIMITS (V2…)					
ALARM HYSTERESIS (V2H0)	ALARM HYS	For entering the hysteresis value for the upper and lower warning or alarm limit values. The alarm conditions remain active as long as the measured value is within the hysteresis. The hysteresis value affects the following warning and alarm limit values of the Totalizer function block: HI HI ALM → Upper limit value alarm HI ALM → Upper limit value warning LO LO ALM → Lower limit value alarm LO ALM → Lower limit value warning **User input:** 0 to 50% **Factory setting:** 0.5% **Example:** ■ The top diagram shows the limit values defined for the LO LIM and HI LIM warnings with their respective hystereses (gray background) and the signal curve of the OUT output value. ■ The two diagrams below illustrate the behavior of the related alarms HI ALM and LO ALM to the changing signal (0 = No alarm, 1 = Alarm is output). A0004811-EN *Fig. 44: Limit values and behavior of alarm levels* *a→ OUT output value exceeds the HI LIM limit value, HI ALM is activated.* *b→ OUT output value undershoots the hysteresis value of HI LIM, HI ALM is deactivated.* *d→ OUT output value undershoots the LO LIM limit value, LO ALM is activated.* *e→ OUT output value exceeds the hysteresis value of LO LIM, LO ALM is deactivated.*	X	X	M

Totalizer function block					
Matrix text (Commuwin II)	Parameter (SLOT/INDEX)	Description	L	S	P
HI HI ALARM (V3…)					
HI HI LIM (V3H0)	**HI HI LIM**	For entering the alarm limit value for the upper alarm (HI HI ALM). If the OUT output value exceeds this limit value, the alarm status parameter HI HI ALM is output. **User input:** Range and unit of OUT SCALE **Factory setting:** 3402823466 x 10^{38}	X	X	M
VALUE (V3H1)	**HI HI ALM (VALUE)**	Alarm status parameter for the upper alarm limit. Content includes the value that violated the limit.	X		O
ALARM STATE (V3H2)	**HI HI ALM (ALARM STATE)**	The current HI HI ALARM state appears on the display.	X		O
SWITCH-ON POINT (V3H3)	**HI HI ALM (SWITCH-ON POINT)**	The switch-on point as a function of the hysteresis value appears on the display.	X		O
SWITCH-OFF POINT (V3H4)	**HI HI ALM (SWITCH-OFF POINT)**	The switch-off point as a function of the hysteresis value appears on the display.	X		O
HI ALARM (V4…)					
HI LIM (V4H0)	**HI LIM**	For entering the alarm limit value for the upper warning (HI ALM). If the OUT output value exceeds this limit value, the alarm status parameter HI ALM is output. **User input:** Range and unit of OUT SCALE **Factory setting:** 3402823466 x 10^{38}	X	X	M
VALUE (V4H1)	**HI ALM (VALUE)**	Alarm status parameter for the upper warning limit. Content includes the value that violated the limit.	X		O
ALARM STATE (V4H2)	**HI ALM (ALARM STATE)**	The current HI ALARM state appears on the display.	X		O
SWITCH-ON POINT (V4H3)	**HI ALM (SWITCH-ON POINT)**	The switch-on point as a function of the hysteresis value appears on the display.	X		O
SWITCH-OFF POINT (V4H4)	**HI ALM (SWITCH-OFF POINT)**	The switch-off point as a function of the hysteresis value appears on the display.	X		O

Totalizer function block					
Matrix text (Commuwin II)	Parameter (SLOT/INDEX)	Description	L	S	P
LO ALARM (V5...)					
LO LIM (V5H0)	**LO LIM**	For entering the alarm limit value for the lower warning (LO ALM). If the OUT output value undershoots this limit value, the alarm status parameter LO ALM is output. **User input:** Range and unit of OUT SCALE **Factory setting:** 3402823466 x 10^{38}	X	X	M
VALUE (V5H1)	**LO ALM (VALUE)**	Alarm status parameter for the lower warning limit. Content includes the value that violated the limit.	X		O
ALARM STATE (V5H2)	**LO ALM (ALARM STATE)**	The current LO ALARM state appears on the display.	X		O
SWITCH-ON POINT (V5H3)	**LO ALM (SWITCH-ON POINT)**	The switch-on point as a function of the hysteresis value appears on the display.	X		O
SWITCH-OFF POINT (V5H4)	**LO ALM (SWITCH-OFF POINT)**	The switch-off point as a function of the hysteresis value appears on the display.	X		O
LO LO ALARM (V6...)					
LO LO LIM (V6H0)	**LO LO LIM**	For entering the alarm limit value for the lower alarm (LO LO ALM). If the OUT output value undershoots this limit value, the alarm status parameter LO LO ALM is output. **User input:** Range and unit of OUT SCALE **Factory setting:** 3402823466 x 10^{38}	X	X	M
VALUE (V6H1)	**LO LO ALM (VALUE)**	Alarm status parameter for the lower alarm limit. Content includes the value that violated the limit.	X		O
ALARM STATE (V6H2)	**LO LO ALM (ALARM STATE)**	The current LO LO ALARM state appears on the display.	X		O
SWITCH-ON POINT (V6H3)	**LO LO ALM (SWITCH-ON POINT)**	The switch-on point as a function of the hysteresis value appears on the display.	X		O
SWITCH-OFF POINT (V6H4)	**LO LO ALM (SWITCH-OFF POINT)**	The switch-off point as a function of the hysteresis value appears on the display.	X		O

Totalizer function block					
Matrix text (Commuwin II)	Parameter (SLOT/INDEX)	Description	L	S	P
BLOCK MODE (V8…)	**General information on the MODE BLK parameter group:** There are three elements in this parameter group: • The current operating mode of the block (Actual Mode) • The modes supported by the block (Permitted Mode) • The normal operating mode (Normal Mode) A distinction is drawn between "automatic operation" (AUTO), manual user intervention (MAN), local override (LO) and the "out-of-service" mode (O/S). A function block generally offers a choice of operating modes, whereas the other block types only work in the AUTO mode, for example.			
TARGET MODE (V8H0)	**TARGET MODE**	For selecting the desired operating mode. **Options:** AUTO MAN O/S **Factory setting:** AUTO	X	X	M
ACTUAL (V8H1)	**MODE BLK (ACTUAL)**	The current operating mode appears on the display. **Display:** AUTO	X		M
NORMAL (V8H2)	**MODE BLK (NORMAL)**	The operating mode for normal operation appears on the display. **Display:** AUTO	X		M
PERMITTED (V8H3)	**MODE BLK (PERMITTED)**	The permissible operating modes appear on the display. **Display:** AUTO	X		M
CHANNEL (V8H5)	**CHANNEL**	Use this parameter for assignment between the logical hardware channel of the Transducer Block and the input of the Totalizer Block. The Transducer Block of Prowirl 72 makes three process variables available to the input channel of the Totalizer function block. **Options:** 273 → Volume flow 277 → Calculated mass flow 398 → Corrected volume flow	X	X	M
UNIT MODE (V8H7)	—	For selecting the format in which the units should be displayed. In the **list** mode, the units are displayed with the conventional abbreviations, for example: L/s. In the **number** mode, the units are displayed in the numerical code defined in the Profiles 3.0, e.g. 1351 (L/s).	X	X	O

Totalizer function block					
Matrix text (Commuwin II)	Parameter (SLOT/INDEX)	Description	L	S	P
ALARM CONFIG (V9...)	General information on the ALARM CONFIG parameter group: The Active Block Alarm is supported which flags a change in a parameter with static parameters (Static attribute) for 10 seconds and indicates that a warning limit or an alarm limit has been violated in the Analog Input function block.				
CURRENT (V9H0)	ALARM SUMMARY (CURRENT)	The current alarms of the device appear on the display.	X		M
DISABLE (V9H1)	ALARM SUMMARY (DISABLE)	The acknowledged alarms of the device appear on the display.	X		M
UNACKNOWLEDGED (V9H2)	ALARM SUMMARY (UNACKNOWLEDGED)	✎ Note! Parameter is not available in this profile version.			
UNREPORTED (V9H3)	ALARM SUMMARY (UNREPORTED)	✎ Note! Parameter is not available in this profile version.			
ST REVISION (V9H5)	ST REV	A block has static parameters (Static attribute) that are not changed by the process. Static parameters whose values change during optimization or configuration increment the ST REV parameter by 1. This supports parameter-revision management. The Static Revision Counter can show a higher value if several parameters change within a very short period of time, for example when parameters are loaded to the device from Commuwin II. This counter can never be reset, nor does it return to a default setting even after a device reset. If the counter overflows (16 bits), it starts again at 1.	X		M
BLOCK PARAMETER (VA...)					
TAG (VAH0)	TAG DESC	For entering a user-specific text of max. 32 characters for unique identification and assignment of the block. Factory setting: "–––––––" no text	X	X	M
STRATEGY (VAH1)	STRATEGY	Parameter for grouping and thus faster evaluation of blocks. Grouping is carried out by entering the same numerical value in the STRATEGY parameter of each individual block. Factory setting: 0	X	X	M
ALERT KEY (VAH2)	ALERT KEY	For entering the identification number of the plant unit. This information can be used by the control system for sorting alarms and events. User input: 1 to 255 Factory setting: 0	X	X	M
PROFILE VERSION (VAH3)	—	The profile version implemented in the device appears on the display.	X		O

Totalizer function block						
Matrix text (Commuwin II)	Parameter (SLOT/INDEX)	Description	L	S	P	
BATCH (VAH4-7)		The Batch parameter is a structured parameter consisting of four elements. This parameter is used in batch applications in accordance with IEC 61512 Part 1 (ISA S88). Only function blocks have this parameter. There is no algorithm linked to this parameter within a function block. The batch parameter is necessary in a distributed automation system as a means of flagging the input channels that are used. In addition, the errors that have occurred in the current batch process can be displayed.				
BATCH ID (VAH4)	BATCH (ID)	ID of a batch application as a means of assigning device messages (alarms, errors).	X	X	M	
BATCH RUP (VAH5)	BATCH (RUP)	For entering the code required for the batch application, the formula or the unit, such as reactors.	X	X	M	
BATCH PHASE (VAH6)	BATCH (PHASE)	For writing or displaying the current formula phase.	X	X	M	
BATCH OPERATION (VAH7)	BATCH (OPERATION)	For writing or displaying the current formula phase.	X	X	M	

11.7   Slot/Index lists

11.7.1   General explanatory remarks

Abbreviations used in the Slot/Index lists:
- Endress+Hauser matrix → The number of the page on which you will find the explanation of the parameter. A gray background indicates the manufacturer-specific parameters.

- Object Type:
  - Record → Contains data structures (DS)
  - Simple → Contains only single data types (e.g. float, integer, etc.)

- Parameters:
  - M → Mandatory parameter
  - O → Optional parameter

- Data Types:
  - Boolean → True = 0xFF, false = 0x00
  - DS → Data structure, contains data types such as Unsigned8, OctetString, etc.
  - Float → IEEE 754 format
  - Integer → 8 (range of values –128 to 127), 16 (-327678 to 327678), 32 (-2^{31} to 2^{31})
  - Octet String → Binary coded
  - Unsigned → 8 (range of values 0 to 255), 16 (0 to 65535), 32 (0 to 4294967295)
  - Visible String → ISO 646, ISO 2375

- Storage Class:
  - Cst → Constant parameter
  - D → Dynamic parameter
  - N → Nonvolatile parameter
  - S → Static parameter

11.7.2   Device management slot 1

Name	Endress+Hauser matrix	Index	Read	Write	Object Type	Parameter	Data Type	Byte Size	Storage Class
Device management slot 1									
Directory Header/ Composite Directory Entries	–	0	X		Record	M	Unsigned 16	12	C
Composite Directory Entry/ Composite Directory Entries	–	1	X		Record	M	Unsigned 16	28	C
Not used	–	2 –15	–	–	–	–	–	–	–

11.7.3   Physical Block slot 0

Name	Endress+Hauser matrix	Index	Read	Write	Object Type	Parameter	Data Type	Byte Size	Storage Class
Physical Block slot 0									
Not used	–	0 - 15	–	–	–	–	–	–	–
BLOCK OBJECT	–	16	X	–	Record	M	DS–32	20	C

Name	Endress+Hauser matrix	Index	Read	Write	Object Type	Parameter	Data Type	Byte Size	Storage Class
ST REV	P. 100	17	X	–	Simple	M	Unsigned16	2	N
TAG DESC	P. 101	18	X	X	Simple	M	Octet String	32	S
STRATEGY	P. 101	19	X	X	Simple	M	Unsigned 16	2	S
ALERT KEY	P. 101	20	X	X	Simple	M	Unsigned 8	1	S
TARGET MODE	P. 100	21	X	X	Simple	M	Unsigned 8	1	S
MODE BLK	P. 100	22	X	–	Record	M	DS-37	3	D
ALARM SUM	P. 100	23	X	–	Record	M	DS-42	8	D
SOFTWARE REVISION	P. 96	24	X	–	Simple	M	Octet String	16	Cst
HARDWARE REVISION	P. 96	25	X	–	Simple	M	Octet String	16	Cst
DEVICE MAN ID	P. 96	26	X	–	Simple	M	Unsigned 16	2	Cst
DEVICE ID	P. 96	27	X	–	Simple	M	Octet String	16	Cst
DEVICE SER NUM	P. 96	28	X	–	Simple	M	Octet String	16	Cst
DIAGNOSIS	P. 99	29	X	–	Simple	M	Octet String	4	D
DIAGNOSIS EXT	P. 99	30	X	–	Simple	O	Octet String	6	D
DIAGNOSIS MASK	P. 99	31	X	–	Simple	M	Octet String	4	Cst
DIAGNOSIS MASK EXTENS	P. 99	32	X	–	Simple	O	Octet String	6	Cst
DEVICE CERTIFICATION	P. 97	33	X	–	Simple	O	Octet String	32	Cst
WRITE LOCKING	P. 98	34	X	X	Simple	O	Unsigned 16	2	N
FACTORY RESET	P. 97	35	X	X	Simple	O	Unsigned 16	2	S
DESCRIPTOR	P. 97	36	X	X	Simple	O	Octet String	32	S
DEVICE MESSAGE	P. 97	37	X	X	Simple	O	Octet String	32	S
DEVICE INSTAL DATE	P. 97	38	X	X	Simple	O	Octet String	16	S
Not used	–	39	–	–	–	–	–	–	–
IDENT NUMBER SELECTOR	P. 98	40	X	X	Simple	O	Unsigned 8	1	S
HW WRITE PROTECTION	P. 98	41	X	–	Simple	O	Unsigned 8	1	D
Not used	–	42 - 48	–	–	–	–	–	–	–
ACTUAL ERROR CODE	P. 126	49	X	–	Simple	O	Unsigned 16	2	D
Not used	–	50	–	–	–	–	–	–	–
UPDOWN FEAT SUPP	–	51	X	–	Simple	M	Octet String	1	Const
UPDOWN CONT PARA	–	52	X	X	Simple	O	Unsigned 8	1	D
UPDOWN PARA	–	53	X	X	Record	O	UpDowData	20	D
DEV BUS ADDR	P. 121	54	X	–	Simple	O	Unsigned 8	1	D
Not used	–	55	–	–	–	–	–	–	–
SET UNIT TO BUS	P. 120	56	X	X	Simple	O	Unsigned 8	1	N
Not used	–	57 - 64	–	–	–	–	–	–	–
VERSIONINFODEVICEPRODID	–	65	X	–	Simple	O	OctetString	16	N
VERSIONINFOAMPHWREV	–	66	X	–	Simple	O	OctetString	16	N
VERSIONINFOAMPHWID	–	67	X	–	Simple	O	OctetString	16	N
VERSIONINFOAMPSWREV	P. 128	68	X	–	Simple	O	OctetString	16	N
VERSIONINFOAMPSWID	–	69	X	–	Simple	O	OctetString	16	N
VERSIONINFOAMPPRODID	–	70	X	–	Simple	O	OctetString	16	N
VERSIONINFOINPOUTPHWREV	–	71	X	–	Simple	O	OctetString	16	N
VERSIONINFOINPOUTPHWID	–	72	X	–	Simple	O	OctetString	16	N
VERSIONINFOINPOUTPSWREV	P. 128	73	X	–	Simple	O	OctetString	16	N
VERSIONINFOINPOUTPSWID	–	74	X	–	Simple	O	OctetString	16	N
VERSIONINFOINPOUTPPRODID	–	75	X	–	Simple	O	OctetString	16	N
Not used	–	76 - 81	–	–	–	–	–	–	–
DEV BUS ADDR CONFIG	–	82	X	X	Simple	O	Unsigned 8	1	D
IDENTNUMBER	–	83	X	–	Simple	O	Unsigned 16	2	D

Name	Endress+Hauser matrix	Index	Read	Write	Object Type	Parameter	Data Type	Byte Size	Storage Class
CHECK CFG	–	84	X	–	Simple	O	Unsigned 8	1	D
DEVICETYPESTORED	–	85	X	–	Simple	O	Unsigned 16	2	D
VIEW PHYSICAL BLOCK	–	86	X	X	Simple	M	Unsigned16,DS-37, DS-42, OctetString[4]	17	D
Not used	–	87 – 92	–	–	–	–	–	–	–
DEVICE SOFTWARE	P. 96	93	X	–	Simple	O	OctetString	16	N
Not used	–	94 – 148	–	–	–	–	–	–	–
WARN_VELOCITY	P. 117	149	X	X	Simple	O	Unsigned 16	2	S
SET_MAX_VELOCITY	P. 117	150	X	X	Simple	O	Float	4	S

11.7.4 Transducer Block slot 1

Name	Endress+Hauser matrix	Index	Read	Write	Object Type	Parameter	Data Type	Byte Size	Storage Class
BLOCK OBJECT	–	70	X	–	Record	M	DS-32	20	C
ST REV	P. 131	71	X	–	Simple	M	Unsigned16	2	N
TAG DESC	P. 132	72	X	X	Simple	M	Octet String	32	S
STRATEGY	P. 132	73	X	X	Simple	M	Unsigned 16	2	S
ALERT KEY	P. 132	74	X	X	Simple	M	Unsigned 8	1	S
TARGET MODE	P. 130	75	X	X	Simple	M	Unsigned 8	1	S
MODE BLK	P. 130	76	X	–	Record	M	DS-37	3	D
ALARM SUM	P. 131	77	X	–	Record	M	DS-42	8	D
CALIBR FACTOR	P. 130	78	X	X	Simple	M	Float	4	S
LOW FLOW CUTOFF	P. 130	79	X	X	Simple	M	Float	4	S
MEASUREMENT MODE	–	80	X	X	Simple	M	Unsigned 8	1	S
FLOW DIRECTION	–	81	X	X	Simple	M	Unsigned 8	1	S
ZERO POINT	–	82	X	X	Simple	M	Unsigned 8	2	S
ZERO POINT ADJUST	–	83	X	X	Simple	M	Unsigned 16	2	S
ZERO POINT UNIT	–	84	X	X	Simple	M	Unsigned 16	2	S
NOMINAL SIZE	P. 124	85	X	X	Simple	M	Float	4	S
NOMINAL SIZE UNITS	P. 107	86	X	X	Simple	M	Unsigned 16	2	S
VOLUME FLOW	P. 129	87	X	–	Record	M	DS-33	5	D
VOLUME FLOW UNITS	P. 129	88	X	X	Simple	M	Unsigned 16	2	S
VOLUME FLOW LO LIMIT	P. 129	89	X	X	Simple	M	Float	4	S
VOLUME FLOW HI LIMIT	P. 129	90	X	X	Simple	M	Float	4	S
MASS FLOW	–	91	X	–	Record	M	DS-33	5	D
MASS FLOW UNITS	–	92	X	X	Simple	M	Unsigned 16	2	S
MASS FLOW LO LIMIT	–	93	X	X	Simple	M	Float	4	S
MASS FLOW HI LIMIT	–	94	X	X	Simple	M	Float	4	S
Not used	–	95	–	–	–	–	–	–	–
DENSITY UNITS	P. 107	96	X	X	Simple	O	Unsigned 16	2	S
Not used	–	97 - 99	–	–	–	–	–	–	–
TEMPERATURE UNITS	P. 107	100	X	X	Simple	O	Unsigned 16	2	S
Not used	–	101 -102	–	–	–	–	–	–	–
VORTEX FREQ	P. 129	103	X	–	Record	M	DS-33	5	D

Name	Endress+Hauser matrix	Index	Read	Write	Object Type	Parameter	Data Type	Byte Size	Storage Class
VORTEX FREQ UNITS	P. 129	104	X	X	Simple	M	Unsigned 16	2	S
VORTEX FREQ LO LIMIT	P. 129	105	X	X	Simple	M	Float	4	S
VORTEX FREQ HI LIMIT	P. 129	106	X	X	Simple	M	Float	4	S
Not used	–	107 - 126	–	–	–	–	–	–	–
SYSUNITARBITRARYVOL	–	127	X	X	Simple	O	Octet String	16	N
SYSUNITARBITRARYVOLFACTOR	–	128	X	X	Simple	O	Float	4	N
HMILANGUAGE	P. 108	129	X	X	Simple	O	Unsigned 16	2	N
HMIACCESSCODE	P. 108	130	X	X	Simple	O	Float	4	N
HMIPRIVATECODE	P. 109	131	X	X	Simple	O	Float	4	N
HMISTATELOCKING	P. 109	132	X	X	Simple	O	Unsigned 16	2	N
HMIASSIGNLINE	P. 109	133	X	X	Simple	O	Unsigned 16	2	N
HMIASSIGNLINE2	P. 110	134	X	X	Simple	O	Unsigned 16	2	N
HMIHUNDREDPERCENTVAL	P. 110	135	X	X	Simple	O	Float	4	N
HMIFORMAT	P. 111	136	X	X	Simple	O	Unsigned 16	2	N
HMIDAMPING	P. 111	137	X	X	Simple	O	Float	4	N
HMILCDCONTRAST	P. 111	138	X	X	Simple	O	Float	4	N
HMITST	P. 112	139	X	X	Simple	O	Unsigned 16	2	N
PROCPARAGASMODE	P. 112	140	X	X	Simple	O	Unsigned 16	2	N
PROCPARAFIXOPNDENSITY	P. 113	141	X	X	Simple	O	Float	4	N
PROCPARAFIXREFDENSITY	P. 113	142	X	X	Simple	O	Float	4	N
PROCPARAFIXOPNTEMPERATURE	P. 114	143	X	X	Simple	O	Unsigned 16	2	N
PROCPARAMATINGPIPE	P. 115	144	X	X	Simple	O	Float	4	N
PROCPARAASSIGNLOWFLOW	P. 116	145	X	X	Simple	O	Unsigned 16	2	N
PROCPARALOWFLOWCUTONVAL	P. 116	146	X	X	Simple	O	Float	4	N
PROCPARALOWFLOWCUTHYST	P. 117	147	X	X	Simple	O	Unsigned 16	2	N
SYSPARAPOSITIVEZERORETURN	P. 118	148	X	X	Simple	O	Unsigned 16	2	N
SYSPARAFLOWDAMPING	P. 118	149	X	X	Simple	O	Float	4	N
SENSVORTEXPARACALFACTOR	P. 123	150	X	X	Simple	O	Float	4	N
SENSVORTEXPARA-COMPENSATEDCALF	P. 124	151	X	X	Simple	O	Float	4	N
SENSVORTEXPARA-SENSORBODYTYPE	P. 124	152	X	X	Simple	O	Float	4	N
SENSVORTEXPARA-CALIBDIAMETER	–	153	X	X	Simple	O	Float	4	N
SENSVORTEXPARA-MATERIALTEMPCOEFF	P. 124	154	X	X	Simple	O	Float	4	N
SENSVORTEXPARA-AMPLIFIERDAMPING	P. 125	155	X	X	Simple	O	Float	4	N
SENSVORTEXPARA-FILTERLOWPASSVALFREQ	–	156	X	X	Simple	O	Float	4	N
SENSVORTEXPARA-FILTERHIGHPASSVALFREQ	–	157	X	X	Simple	O	Float	4	N
SUPERVISIONPRESENT-SYSCONDITION	P. 126	158	X	X	Simple	O	OctetString	16	N
SUPERVISIONPREVIOUS-SYSCONDITION	P. 126	159	X	X	Simple	O	OctetString	16	N
SUPERVISIONASSIGNSYSERROR	–	160	X	X	Simple	O	Unsigned 16	2	N
SUPERVISIONCATEGORY-SYSERROR	–	161	X	X	Simple	O	Unsigned 16	2	N
SUPERVISIONASSIGNPROCERROR	–	162	X	X	Simple	O	Unsigned 16	2	N
SUPERVISIONCATEGORY-PROCERROR	–	163	X	X	Simple	O	Unsigned 16	2	N

Name	Endress+Hauser matrix	Index	Read	Write	Object Type	Parameter	Data Type	Byte Size	Storage Class
SUPERVISIONALARMDELAY	P. 126	164	X	X	Simple	O	Float	4	N
SUPERVISIONRST	P. 126	165	X	X	Simple	O	Unsigned 16	2	N
SUPERVISIONRSTFCT-BLOCKFAILURE	–	166	X	X	Simple	O	Unsigned 16	2	N
SUPERVISIONOPERATIONHOURS	–	167	X	X	Simple	O	Float	4	N
SUPERVISIONOPERATIONHOURS-SINCERESET	–	168	X	X	Simple	O	Float	4	N
SUPERVISIONSIMFAILSAFEMODE	–	169	X	X	Simple	O	Unsigned 16	2	N
SUPERVISIONSIMMEASVAR	P. 127	170	X	X	Simple	O	Unsigned 16	2	N
SUPERVISIONSIMVAL	P. 127	171	X	X	Simple	O	Float	4	N
VERSIONINFOSENSTYPE	P. 128	172	X	X	Simple	O	OctetString	16	N
VERSIONINFODSCSENSNR	P. 128	173	X	X	Simple	O	OctetString	16	N
SERVICEVORTEXCURRENTSV1	–	174	X	X	Simple	O	Float	4	N
SERVICEVORTEXCURRENTSV2	–	175	X	X	Simple	O	Float	4	N
SERVICEVORTEXCURRENTDIFFSV	–	176	X	X	Simple	O	Float	4	N
SERVICEVORTEXMAXSV1-CHANGE	–	177	X	X	Simple	O	Float	4	N
SERVICEVORTEXMAXSV2-CHANGE	–	178	X	X	Simple	O	Float	4	N
SERVICEVORTEXMAXDIFFSV	–	179	X	X	Simple	O	Float	4	N
SERVICEVORTEXWARNLEVEL	–	180	X	X	Simple	O	Unsigned 16	2	N
SERVICEVORTEXDSC-RESONANCEFREQALARM	–	181	X	X	Simple	O	Unsigned 16	2	N
SERVICEVORTEXMAXFREQ	–	182	X	X	Simple	O	Float	4	N
SERVICEVORTEXRESETMAXFREQ	–	183	X	X	Simple	O	Unsigned 16	2	N
HMIHUNDREDPERCENTVAL-MULTMAIN	–	184	X	X	Simple	O	Float	4	N
Not used	–	185 – 206	–	–	–	–	–	–	–
MEASVARFLOWVELOCITY	117	207	X	–	Simple	O	Float	4	N
Not used	–	208 – 211	–	–	–	–	–	–	–
STDVOLFLOW	–	212	X	X	Simple	O	Float	4	N
STDVOLFLOW_UNIT	–	213	X	X	Simple	O	Unsigned 16	2	S
STDVOLFLOW_LO_LIM	–	214	X	X	Simple	O	Float	4	N
STDVOLFLOW_HI_LIM	–	215	X	X	Simple	O	Float	4	N
Not used	–	216 – 219	–	–	–	–	–	–	–
VIEW_TRANSDUCER BLOCK	–	220	X	X	Simple	M	Unsigned16,DS-37, DS-33, DS-42	23	D
Not used	–	221 – 223	–	–	–	–	–	–	–

11.7.5 AI 1 Volume Flow Block slot 1

Name	Endress+Hauser matrix	Index	Read	Write	Object Type	Parameter	Data Type	Byte Size	Storage Class
AI1 – Volume Flow Block – slot 1									
Not used	–	0 – 15	–	–	–	–	–	–	–
BLOCK OBJECT	–	16	X	–	Record	M	DS-32	20	C
ST REV	P. 144	17	X	–	Simple	M	Unsigned 16	2	N
TAG DESC	P. 145	18	X	X	Simple	M	Octet String	32	S
STRATEGY	P. 145	19	X	X	Simple	M	Unsigned 16	2	S
ALERT KEY	P. 145	20	X	X	Simple	M	Unsigned 8	1	S
TARGET MODE	P. 143	21	X	X	Simple	M	Unsigned 8	1	S
MODE BLK	P. 143	22	X	–	Record	M	DS-37	3	D
ALARM SUM	P. 144	23	X	–	Record	M	DS-42	8	D
BATCH	P. 145	24	X	X	Record	M	DS-67	10	S
Not used	–	25	–	–	–	–	–	–	–
OUT	P. 136	26	X	–	Record	M	DS-33	5	D
PV SCALE	P. 138	27	X	X	Array	M	Float	8	S
OUT SCALE	P. 138	28	X	X	Record	M	DS-36	11	S
LIN TYPE	P. 138	29	X	X	Simple	M	Unsigned 8	1	S
CHANNEL	P. 144	30	X	X	Simple	M	Unsigned 16	2	S
Not used	–	31	–	–	–	–	–	–	–
PV FTIME	P. 139	32	X	X	Simple	M	Float	4	S
FSAFE TYPE	P. 137	33	X	X	Simple	O	Unsigned 8	1	S
FSAFE VALUE	P. 137	34	X	X	Simple	O	Float	4	S
ALARM HYS	P. 140	35	X	X	Simple	M	Float	4	S
Not used	–	36	–	–	–	–	–	–	–
HI HI LIM	P. 141	37	X	X	Simple	M	Float	4	S
Not used	–	38	–	–	–	–	–	–	–
HI LIM	P. 141	39	X	X	Simple	M	Float	4	S
Not used	–	40	–	–	–	–	–	–	–
LO LIM	P. 142	41	X	X	Simple	M	Float	4	S
Not used	–	42	–	–	–	–	–	–	–
LO LO LIM	P. 142	43	X	X	Simple	M	Float	4	S
Not used	–	44 – 45	–	–	–	–	–	–	–
HI HI ALM	P. 141	46	X	–	Record	O	DS-39	16	D
HI ALM	P. 141	47	X	–	Record	O	DS-39	16	D
LO ALM	P. 142	48	X	–	Record	O	DS-39	16	D
LO LO ALM	P. 142	49	X	–	Record	O	DS-39	16	D
SIMULATE	P. 143	50	X	X	Record	O	DS-50	6	S
OUT UNIT TEXT	P. 138	51	X	X	Simple	O	Octet String	16	S
Not used	–	52 – 64	–	–	–	–	–	–	–
VIEW_AI1	–	65	X	–	Record	M	Unsigned16,DS-37, DS-42, DS-33	18	D
Not used	–	66 – 69	–	–	–	–	–	–	–

11.7.6 Totalizer 1 Block slot 2

Name	Endress+Hauser matrix	Index	Read	Write	Object Type	Parameter	Data Type	Byte Size	Storage Class
Totalizer 1 Block – slot 2									
Not used	–	0 – 15	–	–	–	–	–	–	–
BLOCK_OBJECT	–	16	X	–	Record	M	DS-32	20	C
ST_REV	P. 156	17	X	–	Simple	M	Unsigned16	2	N
TAG_DESC	P. 156	18	X	X	Simple	M	Octet String	32	S
STRATEGY	P. 156	19	X	X	Simple	M	Unsigned16	2	S
ALERT_KEY	P. 156	20	X	X	Simple	M	Unsigned8	1	S
TARGET_MODE	P. 155	21	X	X	Simple	M	Unsigned8	1	S
MODE_BLK	P. 155	22	X	–	Record	M	DS-37	3	D
ALARM_SUM	P. 156	23	X	–	Record	M	DS-42	8	D
BATCH	P. 157	24	X	X	Record	M	DS-67	10	S
Not used	–	25	–	–	–	–	–	–	–
TOTAL	P. 149	26	X	–	Record	M	DS-33	5	N
UNIT_TOT	P. 150	27	X	X	Simple	M	Unsigned16	2	S
CHANNEL	P. 155	28	X	X	Simple	M	Unsigned16	2	S
SET_TOT	P. 151	29	X	X	Simple	M	Unsigned8	1	N
MODE_TOT	P. 151	30	X	X	Simple	M	Unsigned8	1	N
FAIL_TOT	P. 150	31	X	X	Simple	M	Unsigned8	1	S
PRESET_TOT	P. 151	32	X	X	Simple	M	Float	4	S
ALARM_HYS	P. 152	33	X	X	Simple	M	Float	4	S
HI_HI_LIM	P. 153	34	X	X	Simple	M	Float	4	S
HI_LIM	P. 153	35	X	X	Simple	M	Float	4	S
LO_LIM	P. 154	36	X	X	Simple	M	Float	4	S
LO_LO_LIM	P. 154	37	X	X	Simple	M	Float	4	S
HI_HI_ALM	P. 153	38	X	–	Record	O	DS-39	16	D
HI_ALM	P. 153	39	X	–	Record	O	DS-39	16	D
LO_ALM	P. 154	40	X	–	Record	O	DS-39	16	D
LO_LO_ALM	P. 154	41	X	–	Record	O	DS-39	16	D
Not used	–	42 – 64	–	–	–	–	–	–	–
VIEW_TOT1	–	65	X	–	Record	M	Unsigned16,DS-37, DS-42, DS-33	18	D
Not used	–	66 – 68	–	–	–	–	–	–	–

12   Factory settings

12.1   Metric units (not for USA and Canada)

Flow unit

Flow	Units factory setting	Units Profile version 3.0
Volume flow (see Page 105)	m³/h	m³/h
Calculated mass flow (see Page 106)	kg/h	kg/s
Corrected volume flow (see Page 106)	Nm³/h	Nm³/h

Density, length, temperature units

	Units factory setting	Units Profile version 3.0
Density (see Page 107)	kg/m³	kg/l
Length (see Page 107)	mm	mm
Temperature (see Page 107)	°C	K

100% value line 1 and line 2 (see Page 110)
The factory settings in the table are given in the unit dm³/s. If another unit is selected in the UNIT VOL. FLOW parameter (Page 105), the corresponding value is converted and displayed in the selected unit.

Nominal diameter DN		Flange		Wafer	
DIN [mm]	ANSI [inch]	Gas [dm³/s]	Liquid [dm³/s]	Gas [dm³/s]	Liquid [dm³/s]
15	½"	7.2	1.4	8	2
25	1"	32	4	48	6
40	1½"	80	10	80	16
50	2"	160	16	160	20
80	3"	320	40	400	48
100	4"	560	64	640	80
150	6"	1280	160	1600	160
200	8"	2400	320	–	–
250	10"	4000	480	–	–
300	12"	5600	640	–	–

Totalizer unit (see Page 150)

Flow	Unit
Volume flow	m³
Calculated mass flow	kg
Corrected volume flow	Nm³

Language (see Page 108)

Country	Language	Country	Language
Australia	English	Norway	Norsk
Belgium	English	Austria	Deutsch
Denmark	English	Poland	Polski
Germany	Deutsch	Portugal	Portugues
England	English	Sweden	Svenska
Finland	Suomi	Switzerland	Deutsch
France	Francais	Singapore	English
The Netherlands	Nederlands	Spain	Espanol

Hong Kong	English	South Africa	English
India	English	Thailand	English
Italy	Italiano	Czech	Cesky
Luxembourg	Francais	Hungary	English
Malaysia	English	Other countries	English

12.2   US units (only for USA and Canada)

Flow unit

Flow	Units factory setting	Units Profile version 3.0
Volume flow (see Page 105)	US gal/h	m³/h
Calculated mass flow (see Page 106)	lb/min	kg/s
Corrected volume flow (see Page 106)	Sm³/h	Nm³/h

Density, length, temperature units

	Units factory setting	Units Profile version 3.0
Density (see Page 107)	lb/ft³	kg/l
Length (see Page 107)	Inch	mm
Temperature (see Page 107)	°F	K

Language (see Page 108)

Country	Language
USA	English
Canada	English

100% value line 1 and line 2 (see Page 110)
The factory settings in the table are given in the unit US gal/min (GPM). If another unit is selected in the UNIT VOL. FLOW parameter (Page 105), the corresponding value is converted and displayed in the selected unit.

Nominal diameter DN		Flange		Wafer	
DIN [mm]	ANSI [inch]	Gas [US gal/min]	Liquid [US gal/min]	Gas [US gal/min]	Liquid [US gal/min]
15	½"	110	22	120	32
25	1"	550	63	760	95
40	1½"	1300	160	1300	250
50	2"	2500	250	2500	310
80	3"	5100	630	6300	760
100	4"	8900	1000	10000	1300
150	6"	20000	2500	25000	2500
200	8"	38000	5100	–	–
250	10"	60000	7600	–	–
300	12"	89000	10000	–	–

Totalizer unit (see Page 150)

Flow	Unit
Volume flow	US gal
Calculated mass flow	lb
Corrected volume flow	Sm³

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Declaration of Hazardous Material and De-Contamination
Erklärung zur Kontamination und Reinigung

RA No. ⬚⬚⬚⬚⬚⬚⬚⬚

Please reference the Return Authorization Number (RA#), obtained from Endress+Hauser, on all paperwork and mark the RA# clearly on the outside of the box. If this procedure is not followed, it may result in the refusal of the package at our facility.
Bitte geben Sie die von E+H mitgeteilte Rücklieferungsnummer (RA#) auf allen Lieferpapieren an und vermerken Sie diese auch außen auf der Verpackung. Nichtbeachtung dieser Anweisung führt zur Ablehnung ihrer Lieferung.

Because of legal regulations and for the safety of our employees and operating equipment, we need the "Declaration of Hazardous Material and De-Contamination", with your signature, before your order can be handled. Please make absolutely sure to attach it to the outside of the packaging.

Aufgrund der gesetzlichen Vorschriften und zum Schutz unserer Mitarbeiter und Betriebseinrichtungen, benötigen wir die unterschriebene "Erklärung zur Kontamination und Reinigung", bevor Ihr Auftrag bearbeitet werden kann. Bringen Sie diese unbedingt außen an der Verpackung an.

Type of instrument / sensor   **Serial number**
Geräte-/Sensortyp _____   *Seriennummer* _____

☐ **Used as SIL device in a Safety Instrumented System /** *Einsatz als SIL Gerät in Schutzeinrichtungen*

Process data/*Prozessdaten*   Temperature / *Temperatur*_____ [°F] _____ [°C]   Pressure / *Druck* _____ [psi] _____ [Pa]
                        Conductivity / *Leitfähigkeit* _____ [μS/cm]   Viscosity / *Viskosität* _____ [cp] _____ [mm^2/s]

Medium and warnings
Warnhinweise zum Medium

	Medium /concentration *Medium /Konzentration*	Identification CAS No.	flammable *entzündlich*	toxic *giftig*	corrosive *ätzend*	harmful/ irritant *gesundheits- schädlich/ reizend*	other * *sonstiges**	harmless *unbedenklich*
Process medium *Medium im Prozess*								
Medium for process cleaning *Medium zur Prozessreinigung*								
Returned part cleaned with *Medium zur Endreinigung*								

* explosive; oxidising; dangerous for the environment; biological risk; radioactive
* *explosiv; brandfördernd; umweltgefährlich; biogefährlich; radioaktiv*

Please tick should one of the above be applicable, include safety data sheet and, if necessary, special handling instructions.
Zutreffendes ankreuzen; trifft einer der Warnhinweise zu, Sicherheitsdatenblatt und ggf. spezielle Handhabungsvorschriften beilegen.

Description of failure / *Fehlerbeschreibung* _____
_____
_____

Company data / *Angaben zum Absender*

Company / *Firma* _____   Phone number of contact person / *Telefon-Nr. Ansprechpartner:*
_____   _____

Address / *Adresse*   Fax / E-Mail _____
_____
_____   Your order No. / *Ihre Auftragsnr.* _____

"We hereby certify that this declaration is filled out truthfully and completely to the best of our knowledge.We further certify that the returned parts have been carefully cleaned. To the best of our knowledge they are free of any residues in dangerous quantities."
"Wir bestätigen, die vorliegende Erklärung nach unserem besten Wissen wahrheitsgetreu und vollständig ausgefüllt zu haben. Wir bestätigen weiter, dass die zurückgesandten Teile sorgfältig gereinigt wurden und nach unserem besten Wissen frei von Rückständen in gefahrbringender Menge sind."

_____   _____   _____
(place, date / *Ort, Datum*)   Name, dept./*Abt.* (please print / *bitte Druckschrift*)   Signature / *Unterschrift*

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