Original Instruction Manual for Differential Pressure Transducer Type P29 for Natural Gas

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Revision overview

Version:	Date:	Author:	Amendments:
A		Re	Initial Revision
B	09/2014	Me	Screw terminal for output signal as 4-pole
C	07/2016	Me	New display/ user keys External zero-point calibration as option
D	10/2017	Me	Assembly information (heat/vibrations) Dimension drawings certificate of conformity
E	12/2018	MM	Chapter 2.1 Safety concept Chapter 3.1 Start-up New LCD(with colours);
F	12/2018	Ka	Change “flammable gases” to “natural gas” Chapter 2 Safety precautions Chapter 3 Start up
G	11/2020	Me	Output signal range Chapter 4.5 added Update technical data Dimension drawing
H	06/2022	Me	UKCA Chapter structure Chapter 7.3.6 added (Filter)
I	01/2023	Ts	Update technical data, Revision Overview; QR-Code 2.2 Notice of Responsibility. New 2.3 Changes to the device - loss of explosion protection, New 2.5 Services; 3.1 flush revised, New 3.3 leak test. 3.3 shipping now 3.4 chapter 10: problem added. All illustrations labelled New 10.1 Check fuse; New 10.2 Replace fuse 9. Specifications: overload capacity + checks updated
J	05/2023	Ts	Revision chapters 6+7

For additional specifications and dimension drawings, please visit our website at
www.halstrup-walcher.de/en/products/measurement-technology/

The instruction manual is part of the product. Please read this manual carefully, follow our instructions, and pay special attention to the safety information provided. This instruction manual should be available at all times. Please contact the manufacturer if you do not understand any part of the instructions.
The manufacturer reserves the right to continue developing this device model without documenting such development in each individual case. The manufacturer will be happy to determine whether this manual is up-to-date.

Table of Contents:

1 Purpose of instruction manual

This original instruction manual describes the features of the P29 and provides guidelines for its use. Improper use of this instrument or failure to follow these instructions may cause injury or equipment damage. Every person who uses this device must therefore read the manual and understand the possible risks. The instruction manual, and in particular the safety precautions contained therein, must be followed carefully.
It is especially important to read and follow the notes on starting up in systems that use flammable gases.
Contact the manufacturer if you do not understand any part of this instruction manual.

Handle this manual with care:

- It must be readily available throughout the lifecycle of the instrument.
- It must be provided to any individuals who assume responsibility for operating the instrument at a later date.
- It must include any supplementary materials provided by the manufacturer.

The manufacturer reserves the right to continue developing this instrument model without documenting such development in each individual case. The manufacturer will be happy to determine whether this manual is up-to-date.

Conformity

This device is state of the art.
It complies with the statutory requirements of the EC and UK-directives. This is documented by the CE and the UKCA mark being affixed.

2 Safety precautions

2.1 Safety concept

When using in systems with natural gas, the entire pressure system must be flooded with the gas before switching on the electrical power supply. This creates a non-explosive atmosphere in the gas-carrying system of the unit.
During operation, both pressure ports must be connected to the pressurized system.

The P29 has been subjected to an ignition hazard analysis according to DIN EN 1127-1:2019. Under normal operating conditions, there is no explosive atmosphere in the transducer. Consequently, it has no ATEX label, as it does not fall within the sphere of application covered by Directive RL 2014/34 /EU.

2.2 Appropriate use

The instrument may only be installed outside potentially explosive atmosphere.
The P29 is used to measure differential pressure, volumetric flow, mass flow and flow velocity using the orifice plate. It may be used in systems with natural gas provided that the commissioning rules described in Section 3 are observed.

The operator of the device is responsible for supplying a pure (oxygen-free) fuel gas atmosphere (natural gas). The manufacturer is not liable for damage resulting from improper or non-intended use.

Always observe the operating requirements – particularly the permissible supply voltage – indicated on the rating plate and in the “Technical data” section of this manual.

The instrument may only be handled as indicated in this manual. Modifications to the instrument are prohibited. The manufacturer is not liable for damages caused by improper use or failure to follow these instructions. Violations of this type render all warranty claims null and void.

2.3 Changing to the device

The device may only be handled in accordance with these operating instructions. Modifications to the device are not permitted. The manufacturer is not liable for damage resulting from improper or non-intended use. In this case, the warranty claims also expire.

If the device is used improperly or not for its intended purpose, there is a risk of the device losing its explosion protection effect.

2.4 Shipping, assembly, electrical connections and startup

Assembly and the electrical connections should only be handled by trained professionals. They should be given proper training and be authorised by the operator of the facility. This applies particularly to systems that work with natural gas. Special start-up rules (Section 3) apply in this area.

The following ignition hazards must be taken into account during installation:

- **“Hot gases”** The gas temperature of the natural gas must be within the permissible ambient temperatures of the unit. If necessary, ensure sufficient cooling or heating of the gas or mount the unit in a location where the natural gas has assumed the ambient temperature of the unit.

- **"Spontaneous ignition of dust"** The unit must not be mounted in a dust Ex zone (zone 20, 21 or 22). If heavy dust deposits are to be expected on the unit, please ensure regular cleaning with a damp cloth.
- **"Lightning"** Do not mount the unit and its supply lines outdoors. Ensure sufficient overvoltage protection of the supply voltage.

Although the P29 pressure transducer is highly robust, it is nevertheless a precision instrument and should be handled with care. Avoid mounting the P29 in the direct vicinity of any sources of heat or radiation. Ideally, the instrument should be mounted vertically on a wall not subject to vibration.

The instrument may only be operated by appropriately trained individuals who have been authorized by the operator of the facility.

Do not carry out a function test with compressed or breathable air. This would damage instruments with low measuring ranges.

Measurement errors may occur if the instrument is not kept protected from sunlight.
Specific safety precautions are given in individual sections of this manual.

2.5 Troubleshooting, maintenance, service, repairs, disposal

The individuals responsible for the electrical connections must be notified immediately if the instrument is damaged or if errors occur that cannot be corrected as indicated in Section 11

This individual must take the instrument out of service until the error has been corrected and ensure that it cannot be used unintentionally. In systems operating with flammable gases, the instrument must be separated from the gas supply lines.

Always switch off the power to the instrument before opening!

This instrument requires no maintenance. Only the manufacturer may perform repairs that require the housing to be opened.

The electronic components of the instrument contain environmentally hazardous materials and materials that can be reused. The instrument must therefore be sent to a recycling plant when you no longer wish to use it. The environment codes of your particular country must be complied with.

2.6 Symbols

The symbols given below are used throughout this manual to indicate instances when improper operation could result in the following hazards:

WARNING! This warns you of a potential hazard that could lead to bodily injury up to and including death if the corresponding instructions are not followed.

CAUTION: This warns you of a potential hazard that could lead to significant property damage if corresponding instructions are not followed.

INFORMATION: This indicates that the corresponding information is important for operating the instrument properly.

RISK OF EXPLOSION! This shows measures to prevent explosions, which must be observed.

3 Start-up, maintenance, shipping

Caution: Explosion hazard! Flush the system for the required period of time before start-up!

3.1 Start-up

Carefully read and follow the start-up instructions listed below. Failure to follow these instructions can lead to an explosion in the instrument and injury to persons. Installation and start-up of the instrument may only be performed by persons trained in handling equipment in areas with explosion hazards.

The instrument must be separated from the electrical power supply during the following steps:

- Install the instrument in the system (**only outside potentially explosive atmosphere**) - do **not** connect to the gas line **at this time**.
- Install all connecting electrical cables (powerless) in the instrument
- Test the functions
    - Check the flow between plus and minus pressure connection (check the preflush function)
    - Apply supply voltage
    - Briefly check pressure measurement function
    - Switch supply off again
- Tighten high strength cable glands
- Unused high strength cable glands must be sealed
- Close the housing
- Before connecting the instrument to the gas lines, both pressure lines should be flooded with gas otherwise the instrument itself must be flooded with gas for a longer period of time. Appropriate equipment must be installed for this purpose
- **Flushing process**
    - Close gas supply lines
    - Attach both pressure connections
    - **Tighten the terminals on the gas supply lines and check them**
    - Approve gas supply lines for use
    - **Flood the device with gas for at least 6 minutes when it is switched off. To do this, there must be a differential pressure at the pressure connections. Notice the maximum system pressure → see 10.Technical data.**
    - Only then may the electrical power supply to the instrument be switched on again

This start-up regulation has the purpose of flushing the oxygen required for combustion out of the instrument so that only a pure gaseous atmosphere is present. This gas atmosphere cannot ignite because no oxygen is present. This entire start-up procedure must be repeated if the instrument is separated from the gas supply line even for only a short period of time. Consequently, both pressure ports must be connected to the pressurized system during operation.

The device may not be used in systems with natural gas unless this startup regulation is observed.

3.2 Maintenance, repair

Maintenance and repair work may only be performed by trained professionals and on behalf of the operator of the plant.

The following steps must be performed before beginning maintenance work:

- Separate the instrument from the electrical power supply.
- Close gas supply lines.
- Detach the gas supply lines.
- Open the instrument.
- Detach electrical connections.
- Remove the instrument.
- **Flush the switched-off pressure system for at least 2 minutes with air (P = 100…1000mbar) to remove the gas.**
- Install and start-up the new instrument as described in Section 3.1.

3.3 Leak Test

If necessary, the user can carry out regular leak tests as a simple pressure test.
For the leak test, shut off the two pressure lines to the P29 and note the initial pressure (display or output signal). Observe the differential pressure for 1 minute. The differential pressure must not drop over this period. Please note that strong temperature fluctuations in the confined volume can also lead to changes in pressure.

3.4 Shipping

Instruments operated with natural gas can still contain remnants of these gas. These must be flushed out before packaging.

To ensure that there are no more gas residues in the device, once the device has been installed in a system that works with natural gas, it must be switched off for **at least 2 minutes and connected to the plus or minus pressure connection with air (P = 100…1000mbar)** in order to remove all traces of the gas. This is particularly important if several instruments are to be shipped in the same box.

4 Instrument description

4.1 Features

The P29 is controlled by a microprocessor and can perform the following tasks:

- Measurement of differential pressure
- Measurement of volumetric flow, mass flow and flow rate using the orifice plate
- Display of a measured value
- Monitoring of a variety of threshold parameters
- **The instrument may be used in systems with natural gas under strict observance of the methods stated in Section 3**

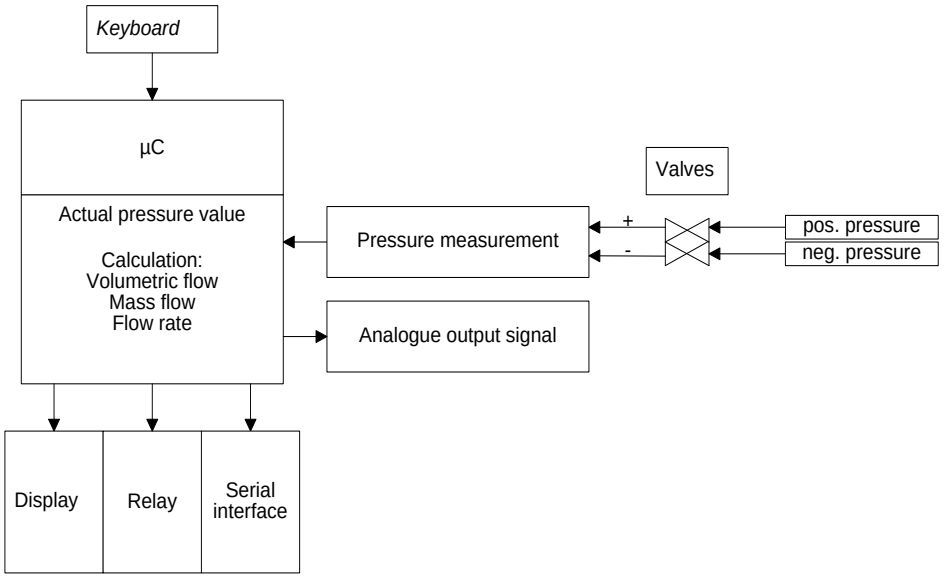


figure 4-1 functional description

4.2 User interfaces

The following four keys are available:

Menu UP Right Enter

Key	Meaning (Measurement Mode)	Meaning (Menu)
Menu	Start Menu	Go back a menu level
Enter	Start zero-point calibration	Confirm
Up arrow	Max. display	Increases a value or scrolls up
Right arrow	Min. display	Moves the arrow or scrolls down

In measurement mode, the keys perform the following functions:

The Enter key starts a zero-point calibration
▲- key shows the maximum (to reset: press Enter while the maximum is being displayed)
►- key shows the minimum (to reset: press Enter while the minimum is being displayed)

4.3 Internal ports and keys

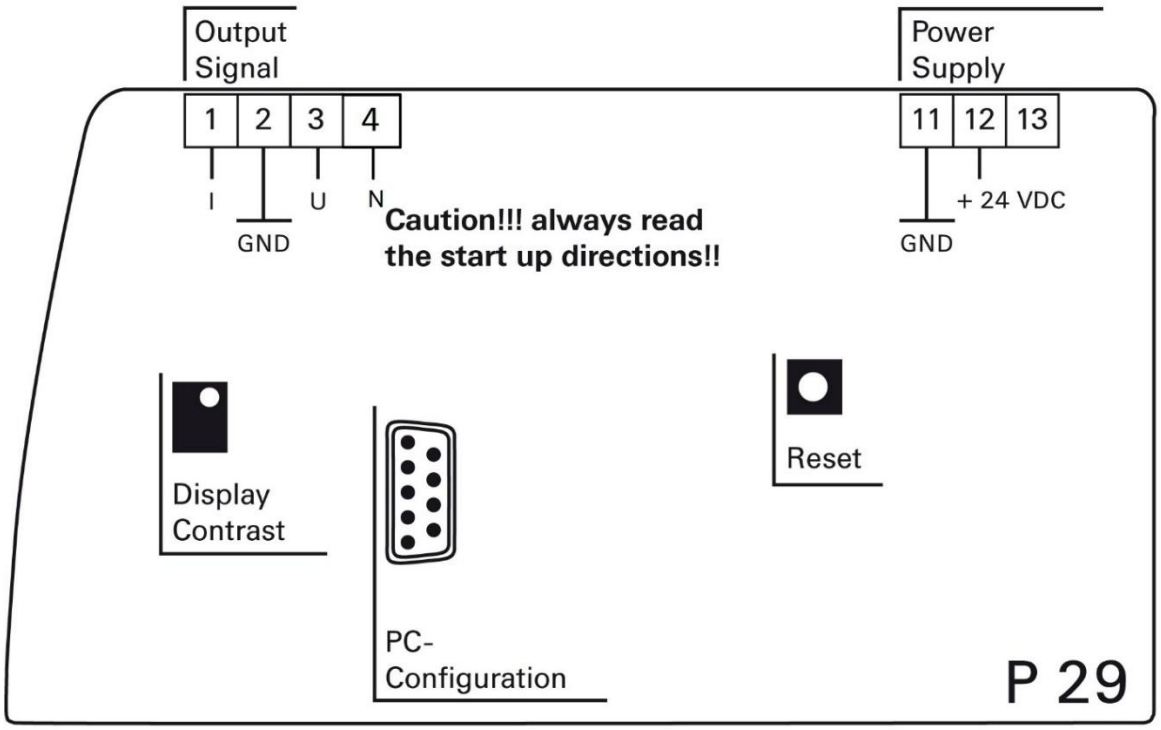


figure 4-2 Internal connectors and push buttons

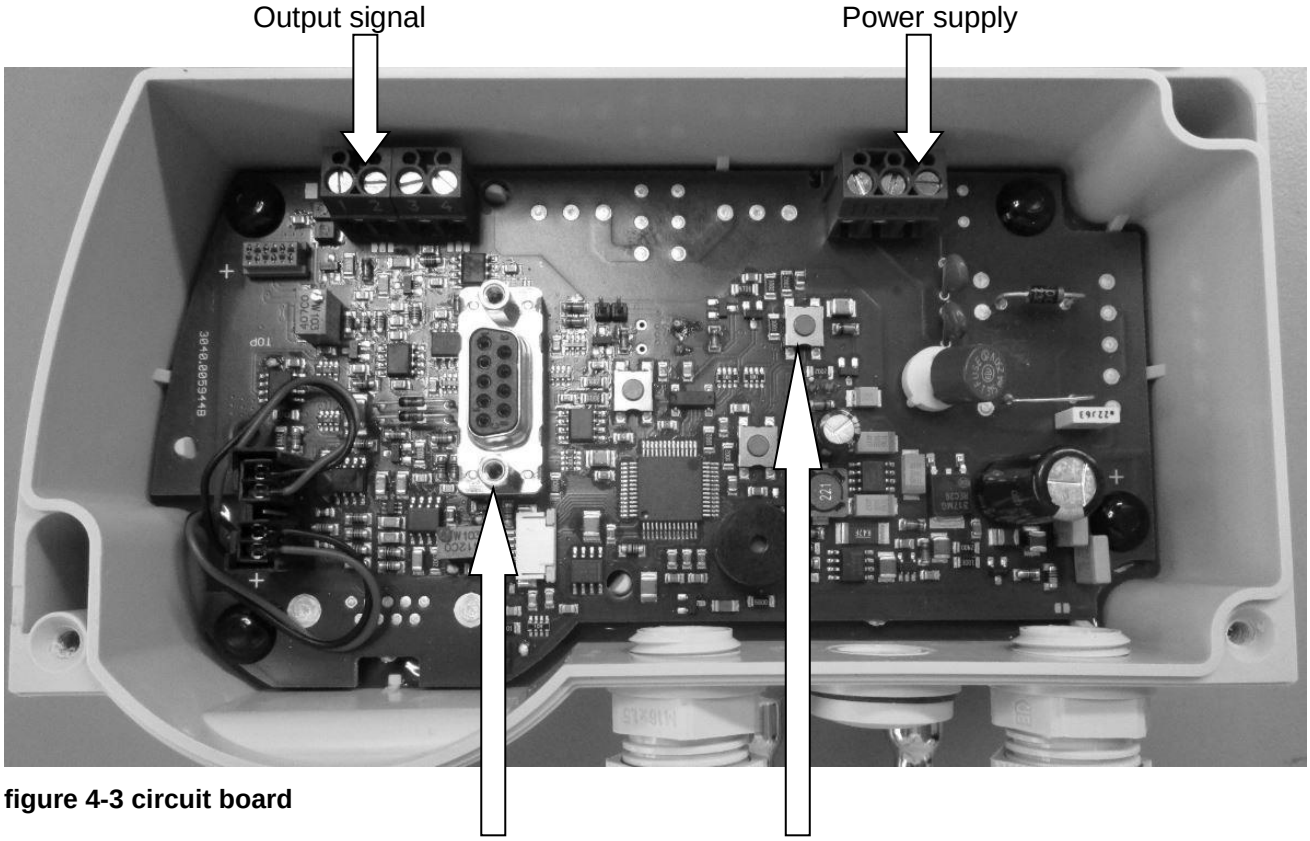


figure 4-3 circuit board

Output signal:

No.	Designation	Description	Signal range
1	I	current output 0 …20 mA current output 4 …20 mA	0,00 mA…20,75 mA 4,00 mA…20,00 mA
2	GND	earth	
3	U	voltage output 0 …10V voltage output -5V …+5V	-2,0V…+12,0V -5,0V…+7,0V
4	N	+24V starts external zero-point calibration	

Power supply:

No.	Designation	Description
11	GND	Ground
12	+24VDC	Power supply + 24VDC
13		

RS232 interface for PC:
RS232 interface for parameter settings

Reset:
The processor is restarted.

4.4 Front view

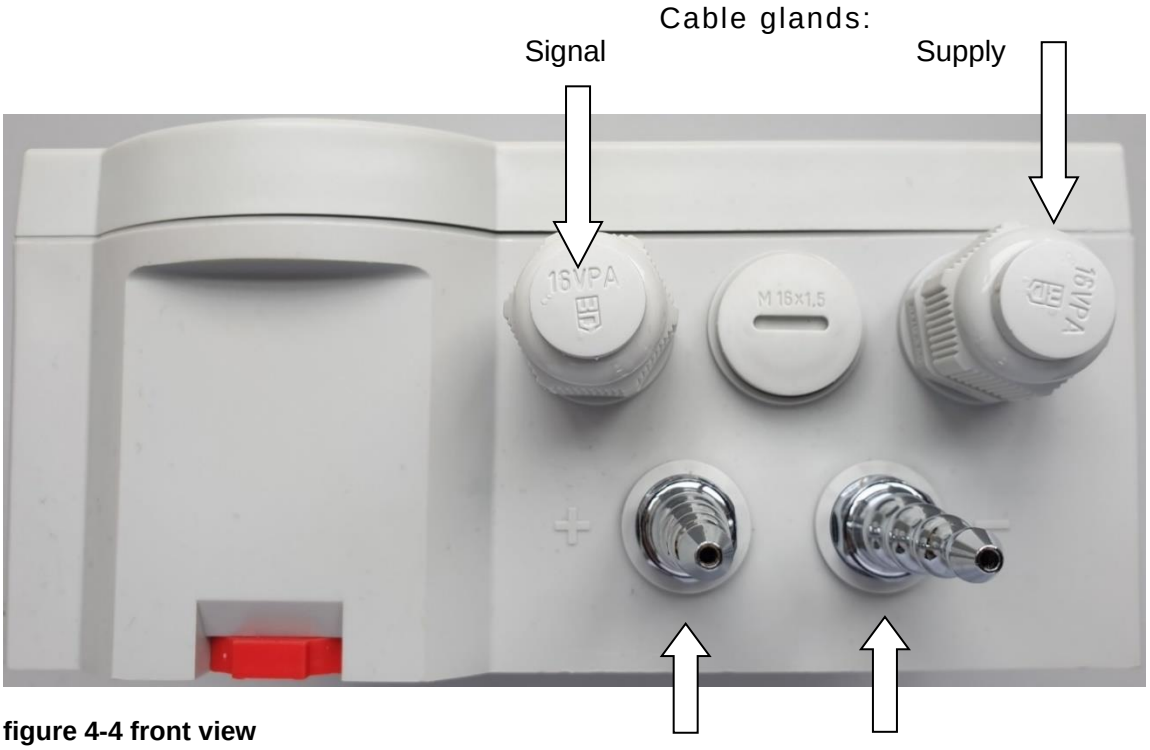


figure 4-4 front view

INFORMATION:

The best measuring accuracy is achieved at a room temperature of 20°C.

4.5 Readout of volume, mass flow and flow velocity

With square-root extracted output signal, the assignment of differential pressure volume, mass flow or flow velocity can be set via the serial interface with a PC software or, for instruments with display, via the menu using the four keys in the top cover.

The calculation of the analogue output and the display (for instruments with display) is done according to the following formulas:

Calculation of the analogue output 0 - 20 mA or 4 - 20 mA:

$$I_{out} = \frac{20\ mA}{\sqrt{\Delta p_{max}}} \cdot \sqrt{\Delta p} \quad \cdot \quad I_{out} = 4\ mA + \frac{16\ mA}{\sqrt{\Delta p_{max}}} \cdot \sqrt{\Delta p}$$

Calculation of the analogue output 0 - 10 V:

$$U_{out} = \frac{10\ V}{\sqrt{\Delta p_{max}}} \cdot \sqrt{\Delta p}$$

Calculation of the display for volume flow, mass flow or flow velocity:

$$\dot{V} = \frac{\dot{V}_{max}}{\sqrt{\Delta p_{max}}} \cdot \sqrt{\Delta p} \quad \cdot \quad \dot{m} = \frac{\dot{m}_{max}}{\sqrt{\Delta p_{max}}} \cdot \sqrt{\Delta p} \quad \cdot \quad \dot{v} = \frac{\dot{v}_{max}}{\sqrt{\Delta p_{max}}} \cdot \sqrt{\Delta p}$$

Thereby is:

Δp the (internal) measured value for the differential pressure (in the selected unit, e.g. Pa)

Δp_{max} the (adjustable) scaling end value of the differential pressure = "Scale Top" (in the selected unit, e.g. Pa).
"Scale Bottom" must always be 0 when the output is square-rooted.
Δp_{max} , for example, is the differential pressure value generated by a dynamic pressure probe at volume flow $\dot{V}_{max}$

I_{out} Analog current output signal (0 - 20 mA or 4 - 20 mA)

U_{out} Analog voltage output signal (0 - 10 V)

$\dot{V}_{max}$ the (adjustable) volume flow value to be displayed at a differential pressure of Δp_{max} = "Vol. flow. at max. scaling value" (in the selected unit, e.g. m³/h)

$\dot{V}$ the displayed volume flow value (in the selected unit, e.g. m³/h)

$\dot{m}_{max}$ the (adjustable) mass flow value to be displayed at a differential pressure of Δp_{max} = "Mass flow" at max. scaling value" (in the selected unit, e.g. kg/s)

$\dot{m}$ the displayed mass flow value (in the selected unit, e.g. kg/s)

$\dot{v}_{max}$ the (adjustable) flow velocity value to be displayed at a differential pressure of Δp_{max} = "Flow rate" at max. scaling value" (in the selected unit, e.g. m/s)

$\dot{v}$ the displayed flow velocity value (in the selected unit, e.g. m/s)

In addition, a low flow suppression (LFV) can be set as a percentage of the nominal pressure range. If the measured pressure value falls below this limit, the output is set to zero. This avoids strongly fluctuating (square-rooted) output values at very small pressure measuring values.

5 Zero-point calibration cycle

External influences such as temperature, position or ambient pressure can shift the instrument's zero point, i.e., the value displayed when the pressure ports are open. During calibration, the instrument automatically calculates this shift and takes it into account during the zero-point calibration. The zero-point calibration takes place in two steps, which are shown in the top line of the display (optional).
"→ 0" Measuring signal of the zero point is being determined.
"→ P" Pressure is being reconfigured
The interval between two zero-point calibrations can be adjusted in the Settings menu.
Zero-point calibration can also be started with the Enter key if the device is in Measurement mode.
The P29 does not respond to keys being pressed during calibration.

5.1 External zero-point calibration

In order to trigger an external zero-point calibration, connection 4 at the output connector must be briefly connected to +24V.

If a zero point adjustment is called up via the serial interface or the external zeroing input, it will be carried out in any case. It is irrelevant whether the zero point adjustment has been deactivated or the P29 is in the menu mode.

6 Overload capacity

The P29 has an internal overpressure safeguard that protects the precision pressure measurement capsule from damage:

- 100 kPa for measurement ranges ≥ 2,5 kPa
- 200 x for measurement ranges < 2,5 kPa

7 Display (optional)

The display shows the measured values and the menu. The top line of the display shows the current measured value or the status of the zero-point calibration.
If the current pressure is outside the permitted range, a corresponding message is displayed.
The unit of the measured value is displayed in the bottom line of the display on the right edge.
In the bottom line on the left edge, the status of the warning messages (chapter 7.4 Warning) is displayed in the first two digits.

8 Menu (optional)

If the P29 includes a display, you can use the menu to adjust various settings. Press the Menu key "⌂" to bring up the menu.
In Menu mode, the parent menu item always appears in the top display line. The middle line always shows the current sub-menu item or value to be changed. The bottom line displays units or other help texts.
Start the Menu mode by pressing the "Menu" key. It can be protected with a four-character password. At the main menu level, "Menu" is displayed in the top line and "Display" in the middle line. Select your desired sub-menu by pressing the "▲" and "►" keys. Press "Enter" to go to a sub-menu or enter a value. Press the "Menu" key to go to the next menu level or to stop entering values.

8.1 Display

The display unit can be selected with this menu item. Press the "▲" and "►" keys to select the unit you want and press "Enter" to confirm. The type of display (pressure, flow rate etc.) is selected automatically.

8.2 Scale

The P29 is usually supplied with standard measuring ranges. You can use the scale to adjust the measuring range for your own use. The output voltage or currents are then copied to this scaled range. The scaled range should always be more than 0.1 times of that of the P29's measuring range, because otherwise the resolution of the outputs and the accuracy will be poorer.
With this menu item, there are 4 sub-menu items:

- Pressure
- Volume flow
- Mass flow
- Flow rate

8.2.1 Pressure

This is an important menu item. It is used to specify the pressure range, which indicates the output value. This pressure range forms the basis for many other settings such as the limits for the relays (warnings) and factors for the flow display.
There are two default settings for the pressure scale:

- Top = Pressure at which the output has its maximum value (e.g. 5V, 10V or 20 mA)
- Bottom – Pressure at which the output has its minimum value (e.g. -5V, 0V, 0mA or 4mA)

Because the values can be freely assigned, settings such as 0V at 0Pa or 10V at -250Pa are also possible.

8.2.1.1 Top

With this menu item, you can set the pressure at which the output will achieve its maximum value. Any value within the measuring range can be selected. It can also be less than the lower scale value.

8.2.1.2 Bottom

With this menu item, you can set the pressure at which the output will achieve its minimum value. Any value within the P29's measuring range can be selected.

8.2.1.3 Units

Use this menu item to select the pressure unit. The following pressure units can be selected:

- Pa
- hPa
- kPa
- mbar
- mmH2O
- mmHg
- Psi
- inH2O
- inHg

8.2.2 Volume flow

This menu item is used to adjust the volume flow display values.
The following sub-menu items are available:

- Value
- Units

8.2.2.1 Value

This is used to set the volume flow value displayed at the maximum scaled pressure. 0 is always used as the lower scale value on the volumetric flow display (root-extracted measured value). The maximum pressure is the larger of the two scale values, which is used as a basic calculation.

8.2.2.2 Units

You can use this menu item to select the scaling unit of the volume flow value. This unit don't have to be identical to the selected display unit. The following volume flow units can be selected: m^3/s, m^3/h.

8.2.3 Mass flow

This menu item is used to adjust the mass flow display values.
The following sub-menu items are available:

- Value
- Units

8.2.3.1 Value

This is used to set the mass flow value displayed at the maximum scaled pressure. 0 is always used as the lower scale value on the mass flow display (root-extracted measured value). The maximum pressure is the larger of the two scale values, which is used as a basic calculation.

8.2.3.2 Units

You can use this menu item to select the scaling mass flow unit. This unit don't have to be identical to the selected display unit. The following mass flow units can be selected: kg/s, kg/min, kg/h

8.2.4 Flow rate

This menu item is used to adjust the flow rate display values.
The following sub-menu items are available:

- Value
- Units

8.2.4.1 Value

This is used to set the flow rate value displayed at the maximum scaled pressure. 0 is always used as the lower scale value on the flow rate display (root-extracted measured value). The maximum pressure is the larger of the two scale values, which is used as a basic calculation.

8.2.4.2 Units

Use this menu item to select the scaling flow rate unit. This unit don't have to be identical to the selected display unit. The following flow rate units can be selected: m/s, mph, f/s, f/min, km/h

8.3 Warning

Use this menu item to influence the behaviour of the relays. The first menu item that appears here is Select Relay. The settings for this relay should then be changed. Use the "▲" and "►" keys to select the number of the relay and press Enter to move to that relay's menu.
The following sub-menu items are available:

- Mode
- Value
- Hysteresis
- Tv
- Tn
- Warning signal
- Filter

INFORMATION:

For safety reasons, relay outputs are not possible with the P29. However, exceeding or falling below the switching thresholds can be signalled visually and acoustically.

8.3.1 Value

This item adjusts the pressure value at which the particular relay should switch. The pressure range defined by the scale can be used as the setting range. Select the pressure unit set for the display as the unit.

8.3.2 Hysteresis

This item can be used to select the hysteresis for the particular relay. If the volume flow, mass flow or flow rate (root-extracted display) is displayed, the pressure unit used will be the unit that was active at the time when the root-extracted display was activated. The hysteresis is always positive and can be set between 0% and 120% of nominal pressure value.

8.3.3 Tv delay time

The entry value of the relays is derived from the unfiltered pressure value. With this parameter, you can now specify how long the pressure value can be exceeded or not met until the relay switches. The adjustment is done in ms.

8.3.4 Tn stopping time (from Rev2.11)

The entry value of the relays is derived from the unfiltered pressure value. This parameter can now be used to specify how long the relay should remain active after the pressure value has returned to the range in which the relay is not activated. The adjustment is done in ms.

8.3.5 Warning signal

A warning signal sounds once every second when a threshold value is exceeded. With this parameter, you can set the duration of this warning signal for each warning. The maximum value here is 1000 ms (continuous tone). If both threshold parameters have been exceeded,

both warning tones will sound. In this case, the duration of the warning tone will be equal to the sum of the durations of the two separate tones but max. 1000 ms.
With firmware Rev 2.21 and later, the warning signal can be switched of by pressing any of the front key of the P26. It will be reactivated if the pressure will pass any of the the warning levels again.

8.3.6 Filter(from Rev2.14)

This item can be used to adjust whether the filtered or unfiltered pressure value is used as source for the relay. Depending on the filter time constants, the filtered pressure values can be used to filter out short-lived fluctuations in the pressure level.

8.4 Setting

With this menu item, you can adjust various parameters that affect the instrument's behaviour. The following sub-menu items are available:

- Language
- Output
- Filter
- Touchtone
- Resolution
- Zeroing
- CS (creep suppression)
- Lighting
- Colour change
- Brightness
- Contrast
- Read factory settings
- Code?

8.4.1 Language

The menu language can be selected with this menu item. You can choose from the following languages:

- English
- German
- Italian
- French

Make your choice with the “▲” or "►" keys. Press Enter to confirm your selection.

8.4.2 Output

With this parameter, you can select the output and output range. You can choose from the following options:

- 4…20 mA
- 0…20 mA
- -5V…+5V
- 0V…10V

8.4.3 Filter

The measured pressure values can be smoothened by a filter before they reach the display or analogue output. This parameter lets you set a time constant for this filter.

8.4.4 Touchtone

This parameter allows the user to switch-on or -off the touchtone.

8.4.5 Resolution

This parameter affects the display resolution. The display is changed according to the adjusted values. For example, if the setting is 1%, the display changes to showing the measuring range in 1% jumps. This can be used with severely fluctuating pressures to steady the display. However, this does not have any effect on the relays.

8.4.6 Zeroing

This parameter specifies the time interval for the automatic zero-point calibration. The entry is in min. The parameter “AutoNull” can be asingn to values from 0 to 2999. Setting the parameter to 0 deactivates automatic zero-point calibration.

8.4.7 SMU (creep suppression)

This parameter specifies the value for creep suppression as a percentage. If this value falls short of the measured pressure value, the display is set to zero. Creep suppression only works with volume flow, mass flow and flow rate (root-extracted measurement values).

8.4.8 Illumination

This parameter can be used to select the backlighting colour for the LCD display in the menu or when the colour change function has been switched off. You can choose from the following three options:

- Off The background lighting is shut-off
- White The background lighting is white
- Blue The background lighting is blue

8.4.9 Colour change

This parameter can be used to specify whether or not the display background should change colour when a threshold parameter has been exceeded. You can choose from the following two options:

- off The colour change function is deactivated
- on The colour change function is activated

When a value specified in the list of warnings is out of range, the display will turn yellow for the time Tv or Tn and then be backlit in red after the relay is triggered.

8.4.10 Brightness

This parameter lets you adjust the brightness of the background lighting. You can adjust the values from 0 (dark) to 16 (bright).

8.4.11 Contrast

This parameter is used to adjust the contrast of the display. This enables you to compensate for different temperatures or viewing angles. Values from 0 (low contrast) and
32 (high contrast) are possible.

8.4.12 Read factory settings

The factory settings are established in the instrument before delivery. With this menu item, they can be reactivated if required.

8.4.13 Code?

You can use this menu item to specify an access code for the menu. If this code is <>0, the access code will only be queried after the Menu key has been pressed. Only when the correct code has been entered can you proceed to the menu.
If the code = 0, this query will not be made.

9 List of commands

9.1 USB port (optional)

The USB interface incorporates a USB socket with an integrated USB-to-serial converter. For this, the driver from the manufacturer FTDI must be installed on the PC.
Please visit the manufacturer's website: **www.ftdichip.com**

Under DRIVERS / VCP DRIVERS, select the appropriate driver for your operating system. Once installed, the driver will set up an additional virtual COM port.

9.2 Serial interface (via internal connector)

The serial interface (RS 232) has the following settings:

- 9600 baud
- 8 data bits
- no parity
- one stop bit

Command	Description	Model	Rev.
?IP	Displays the current pressure in the selected unit (see command UnitD)	floating	
?ST	Displays the status: Bit6: Warning 1 activated Bit5: Warning 2 activated Bit5: Pressure overload Bit1: zeroing activated Reserve bits: 7, 4, 3, 0	8-digit	
?Rev	Query of the device revision	P26 Rev.: 2.xx	2.11
?DMB	Measurement range	floating	2.11
SaveSet	Saving parameters	-	
RecallWE	Load default settings	-	
MZ	Mode Zero-Point Calibration	-	

Parameters	Description	Model	Rev
Set: '>'par			
Query: '?'par			
ScalO	Scale top [Pa] (-120% .. 120% of the measurement range)	floating	
ScalU	Scale bottom [Pa] (-120% .. 120% of the measurement range)	floating	
ScalVS	Volume flow [m³/s] at max. scale value (ScalO) (Min: 0)	floating	
ScalMF	Mass flow [kg/s] at max. scale value (ScalO) (Min: 0)	floating	
ScalSG	Flow rate [m/s] at max. scale value (ScalO) (Min: 0)	floating	
PRelai1	Switching pressure relay 1 [Pa] (-120% .. 120% of the measurement range)	floating	
RRelai1	Switching direction for Relay 1 (-1 = decreasing, 0 = off, 1 = increasing, 2 = air consum.)	int	
SRelai1	Sound for Relay 1 [ms] (0 = Off, 0 ..) 1000)	unsigned int	
HRelai1	Hysteresis relay 1 [Pa] (0 .. 120% of the measurement range)	floating	
TRelai1	Response time for relay 1 [ms] (0 .. 30000)	unsigned int	
ARelai1	Dropout delay for relay 1[ms] (0 .. 30000)	unsigned int	2.11
RFilter1	Selects the input pressure for relay 1 (0 = unfiltered, 1 = filtered)		2.14
PRelai2	Switching pressure relay 2 [Pa] (-120% .. 120% of the measurement range)	floating	
RRelai2	Switching direction for relay 2 (-1 = decreasing, 0 = off, 1 = increasing, 2 = air consum.)	int	
SRelai2	Sound for relay 2 [ms] (0 = Off, 0 ..) 1000)	unsigned int	
HRelai2	Hysteresis relay 2 [Pa] (0 .. 120% of the measurement range)	floating	
TRelai2	Response time for relay 2 [ms] (0 .. 30000)	unsigned int	
RFilter2	Selects the input pressure for relay 2 (0 = unfiltered, 1 = filtered)		2.14
ARelai2	Dropout delay for relay 2 [ms] (0 .. 30000)	unsigned int	2.11
Filter	Time constant filter [ms] (25 .. 60000)	unsigned int	
Lang	Language (1=GB, 2=GER, 3=I, 4=F)	unsigned int	
AutoNull	Automatic zero-point calibration [min] (0=Off, 0 ..) 2999)	unsigned int	
Sound	Sound (0=Off, 1=On)	unsigned int	
TSound	Sound duration [ms] (0 .. 999)	unsigned int	
DAC Out	Analogue output signal (0 = 4 .. 20mA, 1 = 0 .. 20mA, 2 = -5 .. +5V, 3 = 0 … 10V)	unsigned int	
Res	Resolution (0=max., 1=0.01%, 2=0.1%, 3=0.2%, 4=0.5%, 5=1%)	unsigned int	

Parameters	Description	Model	Rev
UnitD	Unit display (0=Pa, 1=hPa, 2=kPa, 3=mbar, 4=mmH2O, 5=mmHg, 6=Psi, 7=inH2O, 8=inHg, 9=m³/s, 10=m³/h, 11=kg/s, 12=kg/min, 13=kg/h, 14=m/s, 15=mph, 16=f/s, 17=f/min, 18=km/h)	unsigned int	
>Code	Access code for the menu (no reading) (0 .. 9999)	unsigned int	
SMU	Creep suppression [%] (0.0 … 10.0)	floating	
C-Change	Colour change (0 = off,1 = on)	unsigned int	Lrg. disp
Contrast	Contrast setting (0 … 32)	unsigned int	Lrg. disp
Brightn.	Brightness of backlighting (0 … 16)	unsigned int	Lrg. disp
B-Light	Backlighting (0 = off, 1 = white, 2 = blue)	unsigned int	Lrg. disp
Ser.Nr	Serial number xxxx	int	3.0
P-Date	Date of production jjmm	int	3.0
SaveSet	Save settings		
RecallWE	Memorise default settings		

10 Technical data

Measurement data	
Measurement range	250 / 500 Pa 1 / 2.5 / 5 / 10 kPa (freely scalable from 10 to 100% within a measurement range)
Margin of error (at 20°C; ±2°C)	± 0.2 % FS or ± 0.5 % FS (0.3 Pa margin of error for the reference)
Temperature coefficient span	0.03% FS/K
Temperature coefficient zero-point	± 0.0 % (cyclical zero-point correction)
Resolution	Depends on the measuring range (max. 5 relevant places)
Overload capacity	at least 200 times, but a maximum of 100 kPa
Maximum system pressure	100 kPa for all measurement ranges
Ambient conditions	
Medium	Air, non-aggressive gases
Operating temperature	+10 °C to +50 °C
Storage temperature	-10 °C to +70 °C
Electrical data	
Rated input	approx. 6 VA
Supply voltage	24VDC+/-10%
Output signal	0 … +10 V (R_L ≥ 2 k Ω) or -5 … +5 V (R_L ≥ 2 k Ω) or 0 … 20 mA (R_L ≤ 500 Ω) or 4 … 20 mA (R_L ≤ 500 Ω)
Certification	CE / UKCA, EN1127-1:2019
Interface	
RS-232	9600 Baud, 8 data bits, no parity, one stop bit

Appendix A

Parts in contact with measurement medium	
Beryllium bronze CuBe2	UHU-Plus endfest 300 binder
Mu metal (nickel alloy)	PA (valve)
Brass CuZn39Pb3	PPS (valve)
Viton (tubing)	PAMXD6 (valve)
Ferrite material M33 (Epcos)	PC (valve)
Loctite 222	PVC (valve))
Wepuran Vu 4457/51	Enamelled copper wire

11 Trouble shooting / Servicing

Maintenance and repair work may only be performed by trained professionals and on behalf of the operator of the plant. It is essential to follow the instructions described in Section 3

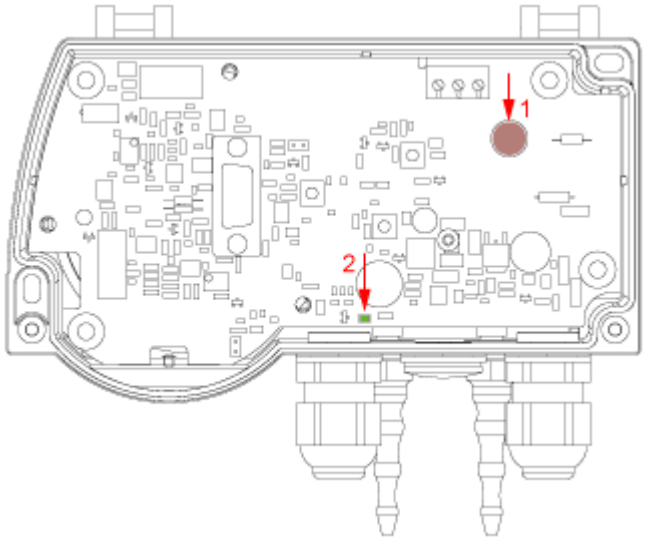
Problem	Cause	Corrective Action
Instrument does not work; nothing on display	No power	Check the terminal connections and supply voltage
Instrument does not work; nothing on display	No power	Check the fuse, see chapter: 11.1. Checking the fuse
No serial communication	No cable connection	Secure the connection
Instrument is beeping	Limits have been exceeded or not met	Use any key to acknowledge

11.1 Checking the fuse

If the device does not work and (in the case of devices with a display) nothing is shown on the display, the fuse may be defective.

To check the fuse, follow the steps below:

1. Open the device
2. Note the status LED (see figure 10-1 inside view P29) this does not light up during normal operation
3. Push the reset button (see figure 4-3 circuit board)
    a. After pressing the reset button, the status LED lights up for 1 second, in addition to the visual signal, an acoustic click can be heard (depending on the ambient noise, imperceptible)
4. If the status LED lights up after pressing the reset button, the fuse IS OK and does not need to be replaced.
5. If the status LED does not light up, please replace the fuse as described in 11.2 Replacing the fuse.



1. fuse
2. status-LED

figure 11-1 inside view P29

11.2 Replacing the fuse

You can replace the fuse to avoid unnecessary service and the associated device failure. The fuse can be removed by hand. See figure 10-1 inside view P29**Fehler! Verweisquelle konnte nicht gefunden werden.**.

The device must be disconnected from the power supply during the following steps.

To change the fuse, follow the steps below:

1. Make sure that the device is no longer connected to the power supply
2. Pull the fuse upwards.
3. Then reinsert the new fuse accordingly, only use the following fuse:

TR5 Fuse, Time-Lag type, Rated Current: 315mA, Voltage Rating: 250V

There is no further polarity to be considered here.

Servicing

The connecting hoses require monitoring and the seals must be inspected by the operator at regular intervals to ensure they are still intact. Leaks can lead to explosions.

12 Dimension drawing

P 29 with display

P 29 without display

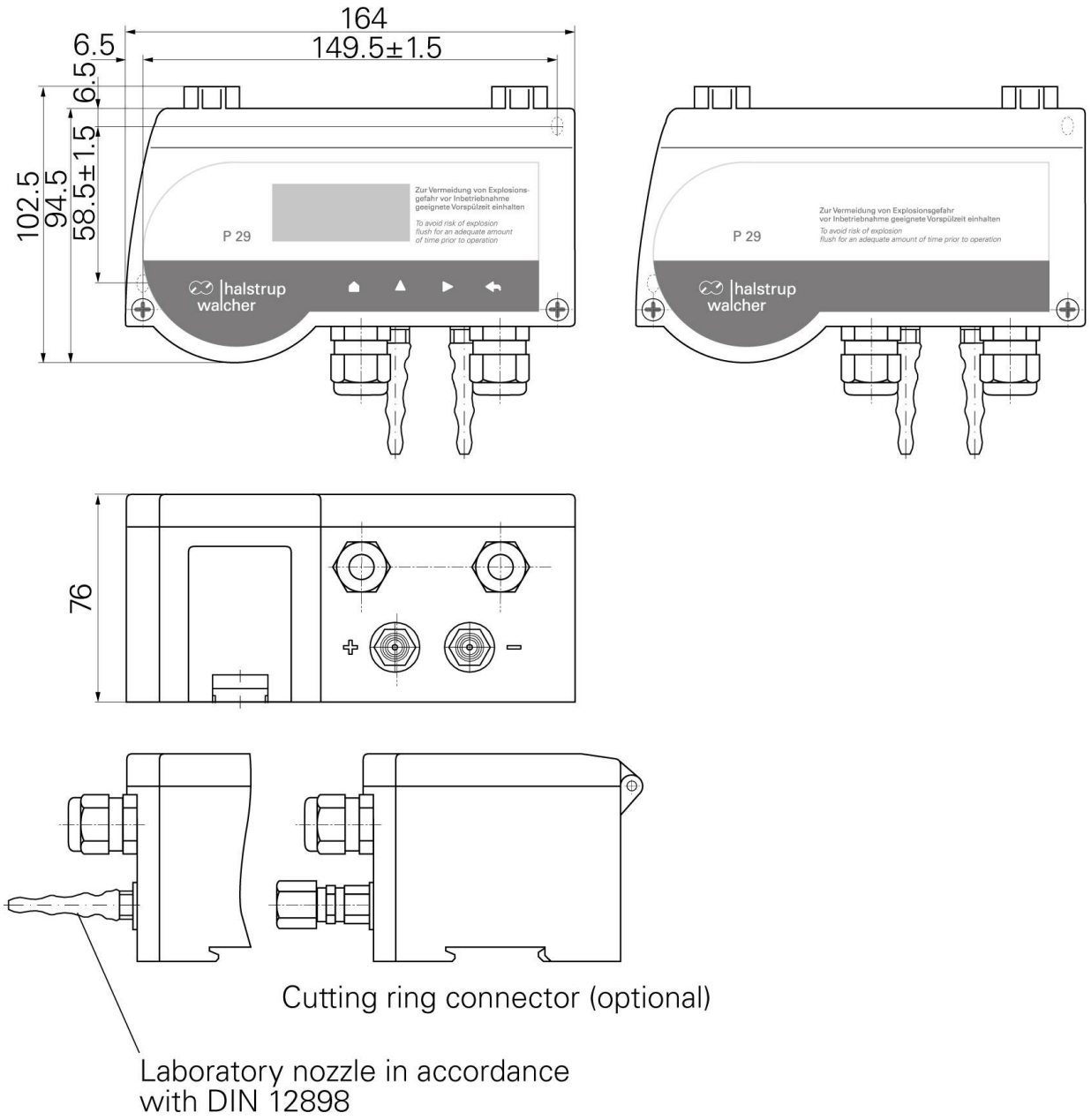


figure 12-1 dimensional drawing

13 Menu tree (display option)

Level 1	Level 2	Level 3	Level 4
Display	Pressure	Pa	
		hPa	
		kPa	
		mbar	
		mmH2O	
		mmHg	
		psi	
		inH2O	
		inHg	
		m^3/s	
		m^3/h	
		kg/s	
		kg/min	
		kg/h	
		m/s	
		mph	
		f/s	
		f/min	
		km/h	
Scaling	Pressure	Top	xxx.xx)*
		Bottom	xxx.xx)*
		Unit	Pa
			hPa
			kPa
			mbar
			mmH2O
			mmHg
			psi
			inH2O
			inHg
	Vol. Flow	Value	xxx.xxxx)*
		Unit	m^3/s
			m^3/h
	Mass flow	Value	xxx.xxxx)*
		Unit	kg/s
			kg/min
			kg/h
	Flow rate	Value	xxx.xxxx)*
		Unit	m/s
			mph
			f/s
			f/min
			km/h

Level 1	Level 2	Level 3	Level 4
Warning	Warning 1		
	Warning 2		
		Mode	increasing
			decreasing
			off
		Value	xxxx.x)*
		Hysteresis	xxxx.x)*
		Tv	xxxxx ms
		Tn(Rev2.11)	xxxx ms
		Warning signal	xxxxx ms
		Filter(Rev2.14)	On
			Off
Settings	Language	English	
		German	
		Italian	
		French	
	Output	4 … 20 mA	
		0 … 20 mA	
		-5 …+5V	
		0 … 10 V	
	Filter	xxxxx ms	
	key tone	on	
		off	
	Resolution	max.	
		0.01%	
		0.1%	
		0.2%	
		0.5%	
		1%	
	Zero-point calibration	xx min	
	CS	x.x%	
	Lighting	Off	
		White	
		Blue	
	Colour change	On	
		Off	
	Brightness	0 … 16	
	Contrast	0 … 32	
	Read factory settings	(Yes = Enter key)	
	Code?	xxxx	

)* Decimal point depending on selected unit

For additional specifications and dimension drawings, please visit our website at

www.halstrup-walcher.de/en/products/measurement-technology/

14 Certificate of Conformity

halstrup walcher

CE

EU-Konformitätserklärung
EU Declaration of Conformity

Company **halstrup-walcher GmbH, Stegener Str. 10, 79199 Kirchzarten**
erklärt als Hersteller in alleiniger Verantwortung, dass das Produkt
declares as manufacturer under sole responsibility, that the product

Product **Differenzdruck-Messumformer**
Differential Pressure Transmitter **P29**

Regulations den folgenden Europäischen Richtlinien entspricht:
conforms to following European Directives:

LVD	2014/35/EU
EMC	2014/30/EU
RoHS	2011/65/EU

Standards angewandte harmonisierte Normen:
applied harmonized standards:

EN 61010-1:2010 +A1:2019
EN IEC 61000-6-2:2019
EN IEC 63000:2018

Declaration EU Konformitätserklärung ausgestellt von
EC Type Examination Certificate issued by

Geschäftsführer Managing Director

Kirchzarten, 17. Nov. 2022

halstrup-walcher GmbH
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79199 Kirchzarten

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E-Mail: info@halstrup-walcher.de

Geschäftsführer: Jürgen Walcher, Christian Sura
Handelsregister Amtsgericht Freiburg HRB 2209
Umsatzsteuer-ID-Nr. DE 811169901

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UK CA

UK Declaration of Conformity

Company	**halstrup-walcher GmbH, Stegener Str. 10, 79199 Kirchzarten** declares as manufacturer under sole responsibility, that the product
Product	**Differential pressure transmitter type** **P29**
Regulations	is in conformity with relevant statutory requirements:

LVD	Electrical Equipment (Safety) Regulations 2016 No. 1101
EMC	Electromagnetic Compatibility Regulations 2016 No. 1091
RoHS	RoHS Regulations 2012 No. 3032

Standards applied standards:

EN 61010-1:2010/A1:2019
EN 61000-6-2:2005
EN IEC 63000:2018

Declaration signed for and on behalf of

Managing Director
Kirchzarten, 8. May 2023

halstrup-walcher GmbH
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Notes:

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