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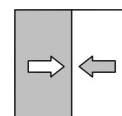


Operating manual

EA14D ... R

Differential pressure evaluation unit
with colour change LCD

Version for potentially explosive areas
Gas explosion protection Zone 2, gases and vapours



Masthead

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1 Safety instructions

1.1 General

This operating manual contains basic instructions for the installation, operation and maintenance of the device that must be followed without fail. It must be read by the installer, the operator and the responsible specialist personnel before installing and commissioning the device.

This operating manual is an integral part of the product and therefore needs to be kept close to the instrument in a place that is accessible at all times to the responsible personnel.

The following sections, in particular instructions about the assembly, commissioning and maintenance, contain important information, non-observance of which could pose a threat to humans, animals, the environment and property.

The instrument described in these operating instructions is designed and manufactured in line with the state of the art and good engineering practice.

1.2 Personnel Qualification

The instrument may only be installed and commissioned by specialized personnel familiar with the installation, commissioning and operation of this product.

Specialized personnel are persons who can assess the work they have been assigned and recognize potential dangers by virtue of their specialized training, their skills and experience and their knowledge of the pertinent standards.

For explosion-proof models the specialized personnel must have received special training or instruction or be authorized to work with explosion-proof instruments in explosion hazard areas.

1.3 Risks due to Non-Observance of Safety Instructions

Non-observance of these safety instructions, the intended use of the device or the limit values given in the technical specifications can be hazardous or cause harm to persons, the environment or the plant itself.

The supplier of the equipment will not be liable for damage claims if this should happen.

1.4 Safety Instructions for the Operating Company and the Operator

The safety instructions governing correct operation of the instrument must be observed. The operating company must make them available to the installation, maintenance, inspection and operating personnel.

Dangers arising from electrical components, energy discharged by the medium, escaping medium and incorrect installation of the device must be eliminated. See the information in the applicable national and international regulations.

Please observe the information about certification and approvals in the Technical Data section.

The instrument must be decommissioned and secured against inadvertent re-operation if a situation arises in which it must be assumed that safe operation is no longer possible. Reasons for this assumption could be:

- evident damage to the instrument
- failure of the electrical circuits
- longer storage outside the approved temperature range.
- considerable strain due to transport

Repairs may be carried out by the manufacturer only.

A professional single conformity inspection as per DIN EN 61010, section 1, must be carried out before the instrument can be re-commissioned. This inspection must be performed at the manufacturer's location. Correct transport and storage of the instrument are required.

1.5 Unauthorised Modification

Modifications of or other technical alterations to the instrument by the customer are not permitted. This also applies to replacement parts. Only the manufacturer is authorised to make any modifications or changes.

1.6 Inadmissible Modes of Operation

The operational safety of this instrument can only be guaranteed if it is used as intended. The instrument model must be suitable for the medium used in the system. The limit values given in the technical data may not be exceeded.

The manufacturer is not liable for damage resulting from improper or incorrect use.

1.7 Safe working practices for maintenance and installation work

The safety instructions given in this operating manual, any nationally applicable regulations on accident prevention and any of the operating company's internal work, operating and safety guidelines must be observed.

The operating company is responsible for ensuring that all required maintenance, inspection and installation work is carried out by qualified specialized personnel.

1.8 Pictogram explanation



DANGER

Type and source of danger

This indicates a **direct** dangerous situation that could lead to death or **serious injury** (highest danger level).

1. Avoid danger by observing the valid safety regulations.



WARNING

Type and source of danger

This indicates a **potentially** dangerous situation that could lead to death or **serious injury** (medium danger level).

1. Avoid danger by observing the valid safety regulations.



CAUTION

Type and source of danger

This indicates a **potentially** dangerous situation that could lead to slight or serious injury, damage or **environmental pollution** (low danger level).

1. Avoid danger by observing the valid safety regulations.



NOTICE

Note / advice

This indicates useful information of advice for efficient and smooth operation.

2 Product and functional description

2.1 Delivery scope

- 1 x differential pressure evaluation unit EA14D
- 2 x pressure transmitter incl. connection cable
- Operating Manual
 - Analysis unit
 - Pressure Transmitter

2.2 Function diagram

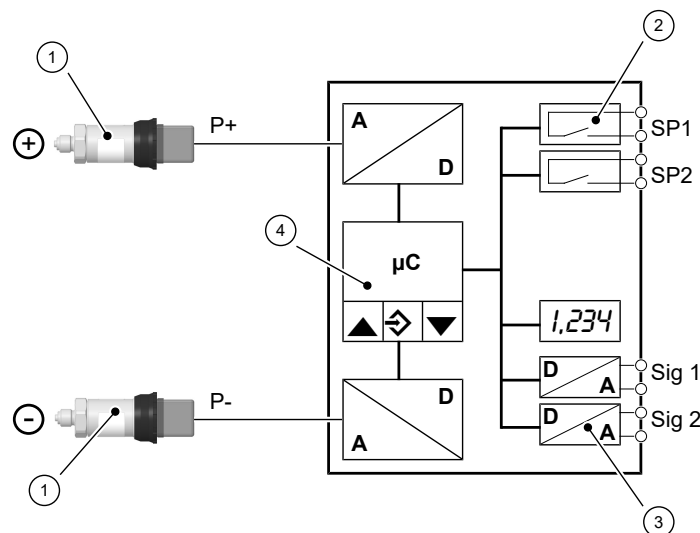


Fig. 1: Function diagram

1	External pressure sensor	2	Switch output
3	Optional analogue output	4	Micro-controller

2.3 Design and mode of operation

The device is based on an electronic evaluation circuit that analyses the measuring signals (P+, P-) of two external pressure transmitters. The main task is the calculation of the differential pressure that can be displayed and analysed. The signals of the external pressure transmitters can be shown separately for review. The evaluation unit allows two independent switching points to be set. Optionally two additional output signals can be made available.

The external pressure transmitters are connected to the differential pressure evaluation unit via flexible plug connection lines. Only the supplied pressure transmitters may be connected. The nominal pressures of the external sensors and the basic measuring range are set ex-works and stated on the type plate.

The unit works in two operating modes:

(a) Differential pressure

In this operating mode, both channels can be independently assigned to the input signals (P+) and (P-). In addition, the differential pressure (dP) or a function (Fct.) can also be assigned as desired. With the function, each output signal can be square rooted or a characteristic curve can be defined by means of a table.

(b) 2-channel

In this operating mode, the output (Sig1) is permanently assigned to the pressure (P+) and the output (Sig2) to the pressure (P-). The function is used to square root both output signals or to define a characteristic curve by means of a table.

2.4 Equipment versions

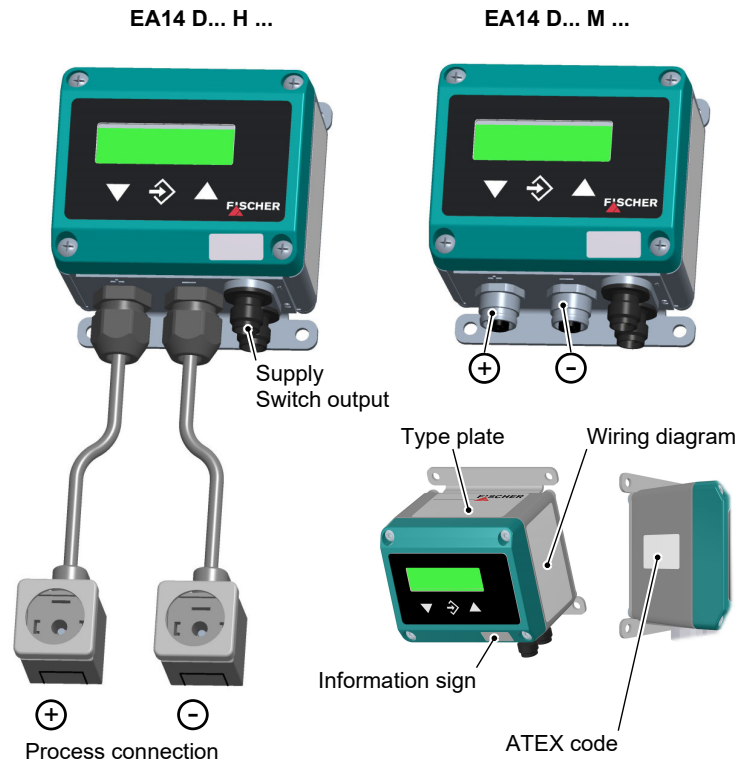


Fig. 2: Equipment versions

2.4.1 Assembly types



Fig. 3: Assembly types

2.4.2 Type plate

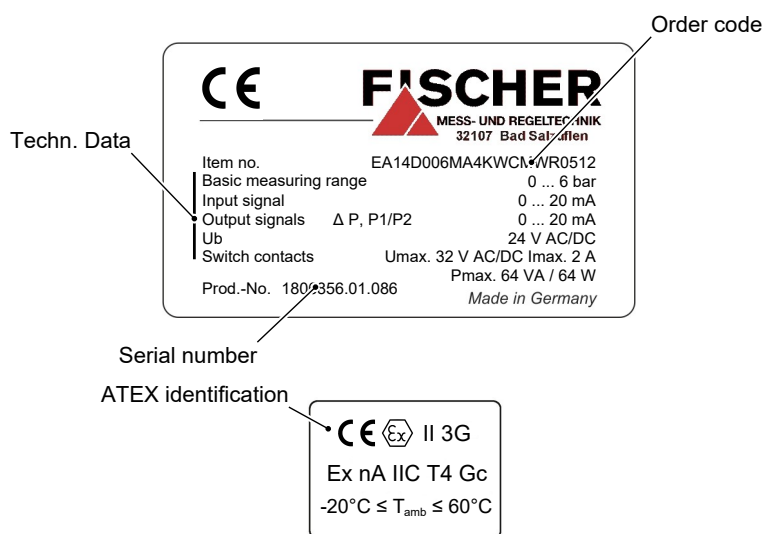


Fig. 4: Type plate

3 Assembly

3.1 General

The device is designed for installation onto flat assembly plates. For screw connection to the assembly plate, the device features four assembly bores on its back, which can be used for Ø 3.5 mm tapping screws. Optionally, the device can be delivered with a wall-mounting plate, a front-mounted panel set or an adapter for assembly of the support rail.

3.2 Process connection (external pressure transmitter)

- The process connection may only be realised by authorised and qualified specialists that have undergone additional training or briefings or have a permit to work on explosion-protected units in potentially explosive systems.
- Risks emanating from pressure on the instrument should be prevented by means of suitable action.
- The pipes need to be depressurized when the pressure transmitter is being connected.
- Appropriate steps must be taken to protect the pressure sensors from pressure surges.
- Check that the pressure transmitter is suitable for the medium being measured.
- Please observe the maximum pressure levels.

The information about the connection of the pressure lines are stated in the operating instructions for the pressure transmitters. The external connection of the two external pressure transmitters is realised with a 2 line connection. The supplied connection lines are manufactured accordingly.

3.2.1 M12 plug connection

The plug assignment is identical for both inputs. The plug connections are marked with (+) and (-) on the equipment.

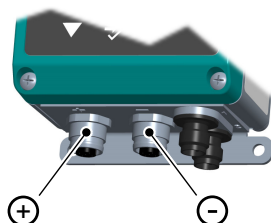
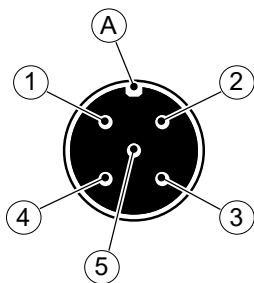


Fig. 5: Process connection



PIN	Signal (2L pressure transmitter)	
1	Pressure transmitter signal and supply (+)	+Sig _T /+U _T
2		
3	Pressure transmitter signal and supply (-)	-Sig _T /-U _T
4		
5	Functional earth	Fe
A	Coding	

Table 1: Connection for 2-wire pressure transmitter

3.2.2 Plug connector DIN EN 175301-803 A

The plug assignment is identical for both inputs. The plugs are marked with (+) and (-).

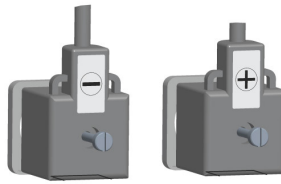
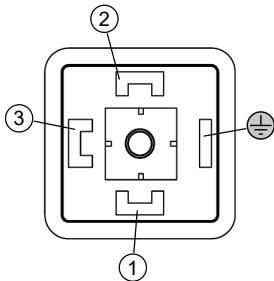


Fig. 6: Process connection



PIN	Signal (2L pressure transmitter)	
1	Pressure transmitter signal and supply (+)	+Sig _T /+U _T
2	Pressure transmitter signal and supply (-)	-Sig _T /-U _T
3		
⏏	Functional earth	Fe

Table 2: Connection for 2-wire pressure transmitter

3.3 Electrical connection (auxiliary energy, output signals)



⚠ WARNING

Operation in areas at risk of explosion

If operated in explosive areas, the electrical data of the unit and the valid local regulations and guidelines for the installation and operation of electrical systems in explosive areas must be observed. (e.g. DIN EN 60079)

The electrical connection may only be realised by authorised and qualified specialists that have undergone additional training or briefings or have a permit to work on explosion-protected units in potentially explosive systems.

Risks emanating from electrical current or voltage should be prevented by means of suitable action.

- When connecting the unit, the national and international electro-technical regulations must be observed.
- Disconnect the system from the mains, before electrically connecting the device.
- Do not connect the connector if strained.
- A CE-conform mains adapter with a slow 200 mA fuse only may be used in the power supply circuit.

The information about the approved operating voltage and the approved load for the analogue outputs are in the Technical Data section.

The M12 plugs are marked with (1) and (2) on the equipment.

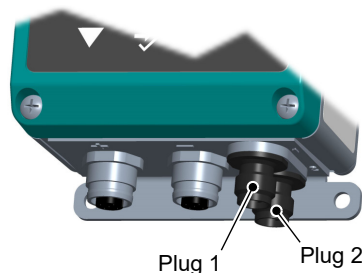


Fig. 7: Electrical connection

3.3.1 Plug 1: Auxiliary energy, analogue output

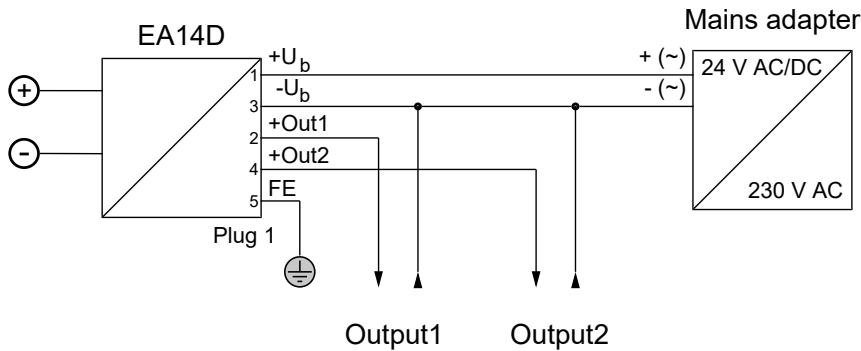
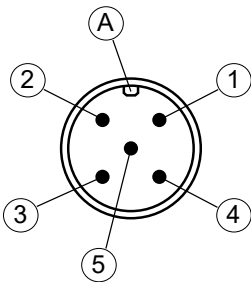


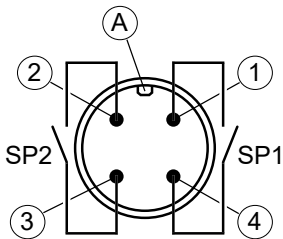
Fig. 8: Analogue output connection



PIN	Signal	
1	Operating voltage (+)	+U _b
2	Analogue output 2 (+)	+Out2
3	Operating voltage (-)	-U _b
4	Analogue output 1 (+)	+Out1
5	Functional earth	Fe
A	Coding	

Table 3: Auxiliary energy and analogue output connection

3.3.2 Connector 2: Switch output



PIN	Signal	
1	Switching output 1	SP1
2	Switching output 2	SP2
3	Switching output 2	SP2
4	Switching output 1	SP1
A	Coding	

Table 4: Connection of the switching outputs

4 Start-up

4.1 General

All electrical supply, operating and measuring lines, and the pressure connections must have been correctly installed before commissioning. All supply lines are arranged so that there are no mechanical forces acting on the device.

Check that the pressure connections do not leak before commissioning.

4.2 Configuration

During commissioning there are a number of setting options that allow the device to be adapted to the measuring point and measuring task. To facilitate the input, the individual parameters are placed into groups in so-called menu levels.

Depending on the device model some menu items are not available. For instance, no switch points can be set on a device without contacts.

All the device settings can be made easily on the PC using the PC adapter. You will need a Transmitter PC Interface and the associated software TransPara for this. For more details, please refer to the Accessories section. The TransPara software makes all parameters directly visible and accessible. Also, the entire configuration can be loaded, saved and documented as a printout.




WARNING

Parameters

The transmitter PC interface may not be operated in an ATEX area. Therefore, all configuration work with this device must be carried out outside the ATEX area.

4.3 LC display

In normal mode, the current measured value of an input channel is shown on a 4-digit LC display. To show very large values, it is possible to switch to a 5 or 6-digit presentation (see Parameter Decimal place MB).

In the one-line presentation of the measured value, the display can be 'switched' to the respective other channel using the arrow . As soon as the key is released, the originally display channel is shown again.

The unit is shown to the right of the measured value. If the device is equipped with contacts, a closed contact is always symbolised by an inverted text "**SP1**" or "**SP2**". One exception is the 1-channel bar chart diagram. Here, the switching points are symbolised with simple numbers "**12**".

Various colours can be selected for the back lighting. Depending on the measured value, the colour of the back lighting can automatically be changed. This can be used e.g. to depict good/poor differences. The back lighting can also be deactivated.

The measured value can also be shown in a bar chart. The measured value is also shown in smaller pictures as a number.

During the programming, the menu items and the associated parameters are shown on the display. The device continues to function whilst the parameters are being set; apart from one exception, the changes come into effect instantly. The exception here is a change of switching times - here the previously valid time must have run down.

SP1SP2

Fig. 9: LC display 2SP

(a) Differential pressure operating mode

In this operating mode, both channels with the **Assignment Out1** and **Assignment Out2** parameters can be configured. The following parameter values are available:

Value	Assignment	Representation
1. P+	Input signal	P+
2. P-	Input signal	P-
3. Function	Linear, square rooted, table	Fct.
4. delta P	$(dP) = (P+) - (P-)$	dP

(b) 2-channel operating mode

In this operating mode, both channels are permanently assigned.

P+	Channel 1	ch1
P-	Channel 2	ch2

The following applies to both operating modes:

The parameter **Channel selection** in the Display menu can be used to configure the measured value display. Some examples are given below.

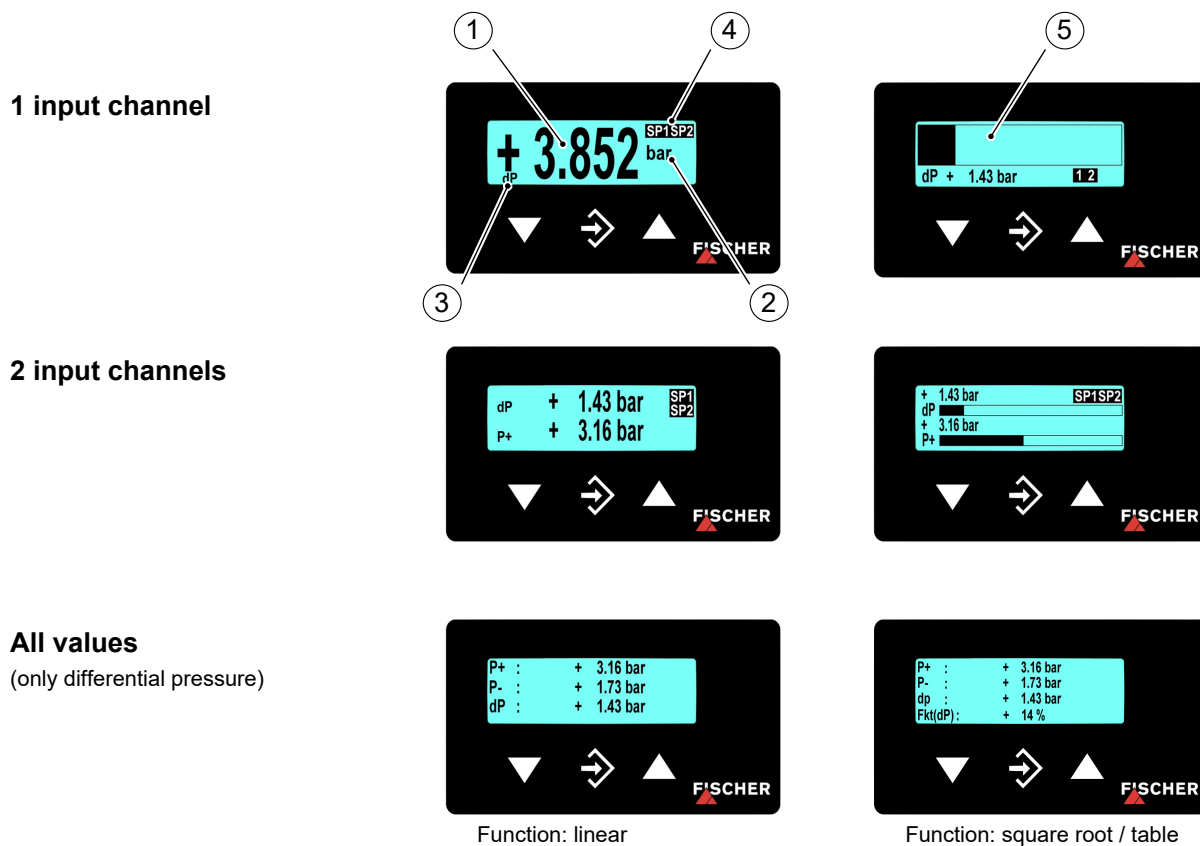


Fig. 10: LC display

1	Measured value	2	Unit
3	Input signal assignment	4	Status display of the switching points
5	Bar chart		

4.4 Keyboard

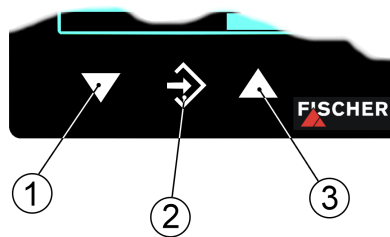


Fig. 11: Operating keys [LC display]

1	Page down menu	Reduce value
2	Call up menu	Save value
3	Page up menu	Increase value

The individual menu items and parameters can be displayed using the buttons ▲ and ▼. The respective menu item is selected or the parameters for making changes are called up via the button ⇨.

If a parameter can be changed, the display flashes. The change is made via the buttons ▲ and ▼. The value is saved with the button ⇨.

To leave a menu level or the entire menu, select the parameter "**Menu level Quit**" and press ⇨.

Example:

Switch-on point set switchpoint 1

In normal mode, press the button ⇨ to enter the menu. The **menu level Switch points** appears. Press the enter key ⇨ again to call up the display parameter.

The first parameter **SP 1 On** is displayed. To change this parameter, press the button ⇨ again.

The device jumps to the input:

- The parameter is stated in the 1st line.
- The value that is to be changed is shown in the 2nd line, the display flashes.
- The input limits are displayed in the 3rd line (if there is one).

The required value is set with the buttons ▲ and ▼ and then confirmed with ⇨.

4.5 Menu levels

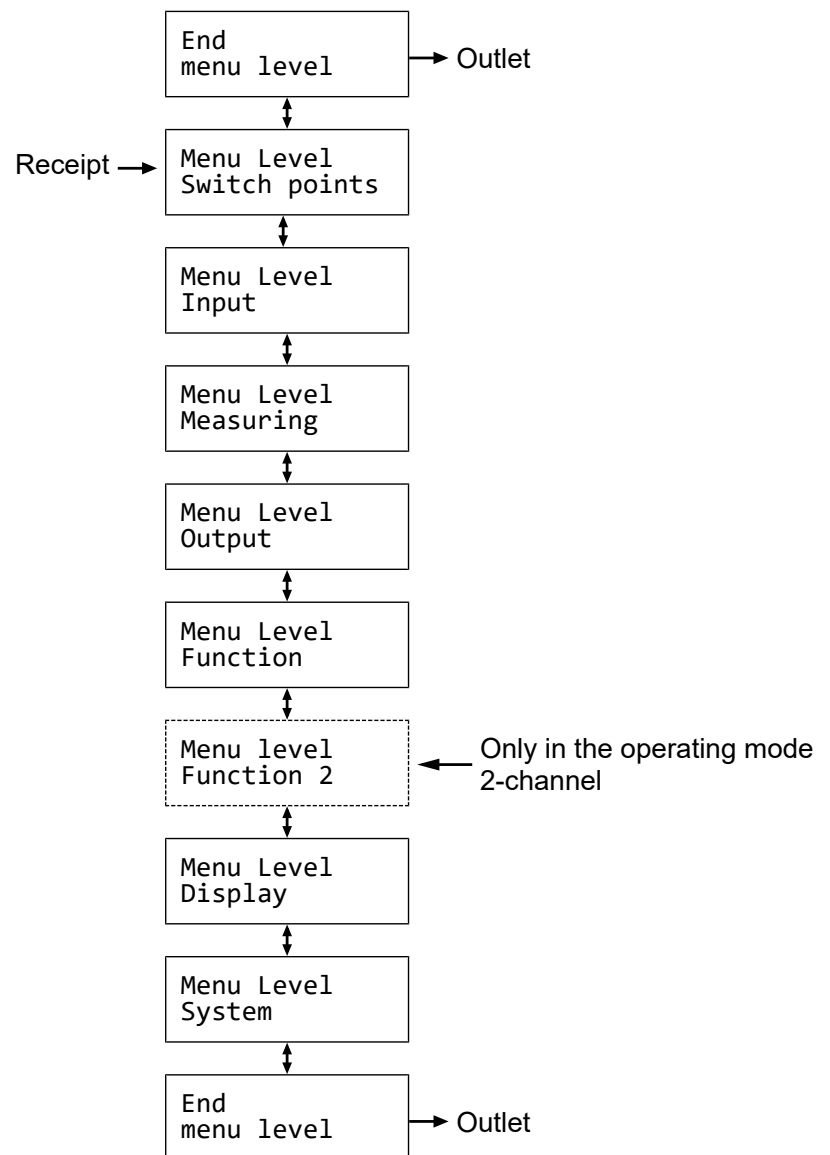


Fig. 12: Menu levels

4.5.1 Menu Level Switch points (2SP)

Parameter name	Description	Value range
SP1 On	Switching point 1 On	MBA-50% ... MBE+50%
SP1 Off	Switching point 1 Off	MBA-50% ... MBE+50%
SP1 delay	Switching point 1 delay	0...1800 s
SP1 function	Switching point 1 function	NO, NC
Assignment SP	Channel assignment	Channel 1, 2 and 1+2
SP2 On	Switching point 2 On	MBA-50% ... MBE+50%
SP2 Off	Switching point 2 Off	MBA-50% ... MBE+50%
SP2 delay	Switching point 2 delay	0...1800 s
SP2 Function	Switching point 2 function	NO, NC

The two switching outputs are configured by four parameters respectively.
For switching point 1 these are:

- **SP1 On**
- **SP1 Off**
- **SP1 delay**
- **SP1 function**

Accordingly for switching point 2:

- **SP2 On**
- **SP2 Off**
- **SP2 delay**
- **SP2 Function**

The function of the individual parameters is explained for both switching points using switching point 1 as an example.

SP1 On sets the activation point, **SP1 Off** sets the deactivation point of switching output 1. The values are shown in the valid unit and set accordingly. Both parameters can be set independently over the entire value range.

The value range ranges from MBA – 50% to MBE + 50%. MBA stands for start of measuring range and MBE for the end of the measuring range.

For example:

Measuring range = 0 ... 100 %

The value range for this measuring range is -50 % ... +150 %.

Function of the switching points

Together, the two parameters **SP1 On** and **SP1 Off** determine the switch function of switching output 1:

- If **SP1 On** > **SP1 Off**, the output switches on if the measured value exceeds SP1 On. It is only switched off again if the measured value SP1 Off is undercut (hysteresis function).
- If **SP1 On** = **SP1 Off** the output switches on if the measured value exceeds SP1 On and off if the measured value undercuts the same value (SP1 Off).
- If **SP1 On** < **SP1 Off**, the output switches if the measured value lies within these switching points: i.e.:
SP1 On < Measurement < **SP1 Off** (Window function).

SP1 delay allows the reaction of the switching output to be delayed by between 0 and 1800 s. This parameter applies equally for switching on and off.

SP1 function changes the function of switching output 1. It is possible here to set whether the contact should work as a open contact (NO) or a break contact (NC).

The parameter **Assignment SP** is used to define the channel to which the contacts are assigned. The following options are available:

- Channel 1
Both contacts are assigned to channel 1.
- Channel 1, channel 2
A contact is assigned to each channel.
Channel 1: SP1
Channel 2: SP2
- Channel 2
Both contacts are assigned to channel 2.

The unit and the input range are adapted accordingly when entering the switching points.

4.5.2 Menu Level Input

Operating mode	Channel 1	Channel 2
Differential pressure	Differential pressure (dP)	Pressure (P+)
2-channel	Pressure (P+)	Pressure (P-)

Channel 1:

Parameter name	Description	Value range
Absorption	Damping	0...100 s
Offset corr.	Offset correction	$\frac{1}{3}$ basic measuring range
Zero-pt. wind.	Zero-point window	$\frac{1}{3}$ basic measuring range

Channel 2:

Parameter name	Description	Value range
Absorption 2	Damping	0...100 s
Offset corr. 2	Offset correction	$\frac{1}{3}$ basic measuring range
Zero-pt. wind.2	Zero-point window	$\frac{1}{3}$ basic measuring range

The parameters for both channels are set in the same way. The following explains the parameters for the first channel as an example for both channels.

If there are unsteady measurement readings during operation, you can use the parameters **Absorption** and **Zero-pt. wind.** to stabilize the reading (and the output signal).

The parameter **Absorption** functions like a capillary throttle. However, it only acts on the display, output signal and switch points (if these exist) but not on the measuring cell itself.

You can set the response time to measuring value jumps in the range 0.0 to 100 s.



NOTICE

Response time

At maximum damping, it can take over 2 minutes until after a measurement jump from 100% to 0% is also shown as zero in the display.

In many cases, unsteady readings are not a problem during normal operating mode, but this is not true for the idle state, i.e. if a measured value of zero is expected. The parameter **Zero-pt. wind.** is designed to solve this. Its value defines a range around zero at which the measured value is set to zero (see fig.).

The display only stops showing zero when the measurement leaves the set window. When reaching double the value, the measured value and the reading match again. This avoids jumps in the display.

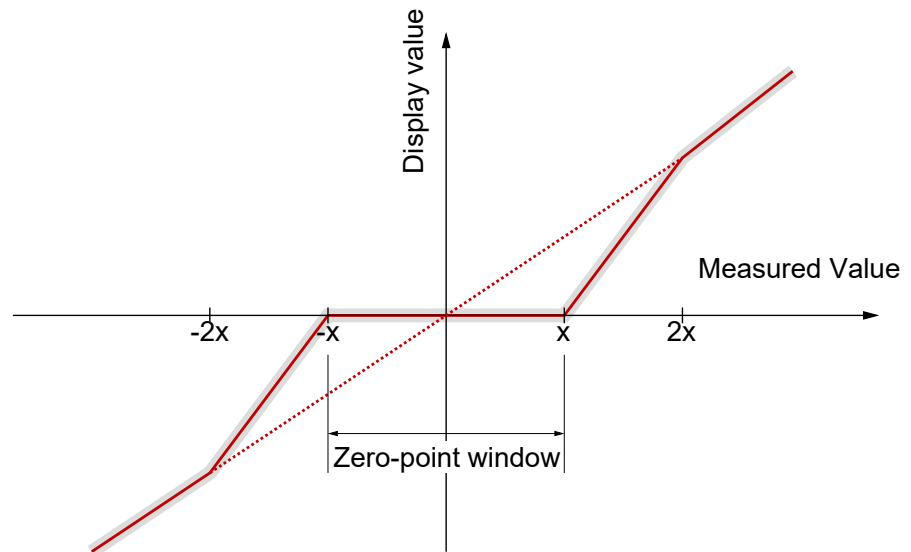


Fig. 13: Zero-point window

It may be necessary to set the offset to correct the impact of the installation position.

Select the **Offset corr.** parameter and correct the reading using the buttons ▲ or ▼ until zero is shown in the display.

When setting the offset, the current measured value is displayed. The zero-point window is not active during the offset setting.

4.5.3 Menu Level Measurement

Depending on the selected operating mode, the 'Measuring' menu is shown differently.

Differential pressure:

Parameter name	Description	Value range
MB start	Measuring range start	Basic measuring range
MB end	Measuring range end	Basic measuring range
Unit	Measuring range unit	
Limit	Measuring range limit	yes, no
Mode	Operating mode	Differential pressure 2-channel

2-channel:

Parameter name	Description	Value range
MB start	Measuring range start channel1	Basic measuring range
MB end	Measuring range end channel1	Basic measuring range
Unit	Measuring range unit channel1	
Limit	Measuring range limit channel1+2	yes, no
Mode	Operating mode	Differential pressure 2-channel
MB start 2	Measuring range start channel2	Basic measuring range
MB end 2	Measuring range end channel2	Basic measuring range
Unit 2	Measuring range unit channel2	

The output signals of the transmitter primarily depend on the measured input variables (channel 1 or channel 2). However, you have the option of adjusting the output signals to a large extent to suit your requirements.

The operating mode parameter can be used to switch between the differential pressure measuring and two-channel relative pressure measuring.



NOTICE

Change of the operating mode

After changing the operating type, some values (unit, spread, table function) are reset to the default values.

These values need to be checked by the user and corrected if necessary, or define the operating mode at the beginning of the configuration process.

The measuring range of channel 1 is configured by three parameters. In the 2nd channel operating mode, channel 2 is configured analogue to the first channel. The settings are more or less identical for both channels and are explained in the following using channel 1 as an example.



NOTICE

Adjustment of the output signal

The basic measuring range (indicated on the type label) and the type of output signal (voltage / current) are not variable.

The parameters **MB start** and **MB end** initially define the two measurements between which the output signal will change at all. Both values are adjustable across the entire basic measuring range. The set values also refer to the measurement in the respective unit. However, the signal values (current / voltage) for Start of measuring range and End of measuring range are fixed.

If **MB start** is smaller than **MB end**, this is called an increasing characteristic curve; the output signal increases as the measurement increases.

If **MB end** is smaller than **MB start**, this is a decreasing characteristic curve and the output signal decreases as the measurement increases.

The difference between the values **MB start** and **MB end** must be at least 10 % of the basic measuring range.

You can select a unit other than the unit of the basic measuring range with the parameter **Unit**. The user should remember however that not every unit is suitable. The conversion is automatic.

The parameter **Limit** allows the display, output and switching points to be limited to the range between Start of measuring range and End of measuring range. If Limit is set to "no", those measured values that are greater or smaller than the end values are shown. In the 2-channel operating mode, the limitation impacted on both channels.

4.5.4 Menu Level Output

The type of output signal (0/4...20 mA, 0...10V) must be stated on the order and cannot be changed.

(a) Differential pressure operating mode

There are two output signals available. Output 1 (Sig1) and output 2 (Sig2) can be configured with the **Assignment Out1** and **Assignment Out2** parameters. In this operating mode, the following menu is displayed:

Parameter name	Description	Value range
min. output	min. output 1	0.0 ... 21.0 mA or 0.0 ... 11.0 V
max. output	max. output 1	
Error signal	Error signal 1	
min. output 2	min. output 2	0.0 ... 21.0 mA or 0.0 ... 11.0 V
max. output 2	max. output 2	
Error signal 2	Error signal 2	
Assignment Out1	Output signal 1	P+, P-, function, delta P
Assignment Out2	Output signal 2	P+, P-, function, delta P

(b) 2-channel operating mode

There are two output signals available. Output 1 (Sig1) is permanently assigned to the pressure at input (P+) and output 2 (Sig2) is permanently assigned to the pressure at input (P-). In this operating mode, the following menu is displayed:

Parameter name	Description	Value range
min. output	min. output 1	0.0 ... 21.0 mA or 0.0 ... 11.0 V
max. output	max. output 1	
Error signal	Error signal 1	
min. output 2	min. output 2	0.0 ... 21.0 mA or 0.0 ... 11.0 V
max. output 2	max. output 2	
Error signal 2	Error signal 2	

Explanation

The parameters **min. output**, **max. output** and **Error signal** define the limits of the output signal that may not be undercut or exceeded regardless of the measured variable. These limit values take precedence over the range defined by the **Measuring range start** and **Measuring range end** parameters. These parameters primarily serve to prevent error messages in downstream systems caused by brief overstepping of measuring ranges.

The parameter **min. output** is usually only used for devices with an output signal 4...20 mA because frequently values of below 3.8 mA are evaluated as error signals.

The value **max. output** can be used for the voltage and current to limit the maximum value.

The value defined via the parameter **Error signal** is issued if the device detects an internal error and can no longer work correctly. It should be noted here that not all potential errors and faults can be detected by the device itself.

Only operating mode differential pressure:

The parameters **Assignment Out1** and **Assignment Out2** can be used to define which signal is assigned to the respective analogue output. The following parameter values are available:

P+	Pressure at positive pressure connection
P-	Pressure at negative pressure connection
Function	For the parameter value 'Function', the settings in the Function menu are adopted for the respective channel.
delta P	Differential pressure (P+) – (P-)

4.5.5 Menu Level Function

The Function menu level is a variable menu whose appearance depends on the value of the Function parameter. There are linear, square rooted and table functions.



NOTICE

Operating mode

Depending on the operating mode, the following menu levels are available for the function:

1. Differential pressure operating mode
Only the Function menu level is available. The parametrisation affects both analogue outputs equally.
2. 2-channel operating mode
In this operating mode, the function can be parametrised separately for each channel. The Function menu level affects analogue output 1 and the Function 2 menu level affects analogue output 2.

The parameters for Function menu level are explained below. The parameters for Function2 menu level are identical.

Linear function

The input signal is linear before being sent to the display and the output. The range defined in the menu "Measuring" serves as the measuring range. If the function LINEAR is active, the other menu items are cancelled.

Parameter name	Description	Value range
Function	Function	Value = linear

Square rooted function

Here, the input signal is square rooted before being sent to the display and the output. A free unit can be defined for the display. To do this, the start and end of the display range and the number of decimal points are defined. It is also possible to define the unit with 4 characters.

Parameter name	Description	Value range
Function	Function	Value = square rooted
MB decimal pl.	Measuring range decimal places	1234, 123.4, 12.34, 1,234, 12345, 123456
MB start	Measuring range start	-9999 ... +9999
MB end	Measuring range end	-9999 ... +9999
MB unit	Measuring range unit	4 characters

The following section contains descriptions of the parameters **MB decimal pl.**, **MB start**, **MB end** and **MB unit** to describe the table function.

Tables function

This function allows free adjustment of the input variable to the display and output via a table with up to 30 support points. A value pair comprising a measured value and display value is issued for every support point.



NOTICE

Change of parameter

When switching from TABLE to another function, the table is initialised again and the existing values are lost.

Parameter name	Description	Value range
Function	Function	Value = Table
MB decimal pl.	Measuring range decimal places	1234, 123.4, 12.34, 1,234, 12345, 123456
MB start	Measuring range start	-9999 ... +9999
MB end	Measuring range end	-9999 ... +9999
MB unit	Measuring range unit	4 characters
No. of pairs	Number of pairs	n = 3...30
Value pair1	Value pair 1	MB-start ... MB-end
Value pair2	Value pair 2	
Value pair3	Value pair 3	
	...	
Value pair30	Value pair 30	

The display range is defined with the parameters **MB decimal pl.**, **MB start** and **MB end**. The user can select the configuration freely.

Using the parameter **MB decimal pl.**, it is possible to select between a 5 or 6-digit presentation. The resolution is not increased. Only an extra zero or two zeros are added. This serves the correct display of larger values. The measuring range must be positive for the 6 digit presentation.

The **MB unit** gives the user the option of defining a completely independent unit. Letters, numbers or special characters can be used. The unit can be max. 4 characters long.

If the function TABLE is selected, then it is also necessary to state the **No. of pairs**. It is defined here how many pairs of values (support points) are used in the table. A table is made up of at least 3, max. 30 support points.



NOTICE

Number of value pairs

If the number of value pairs is changed, the table is initialised again and the existing values are deleted.

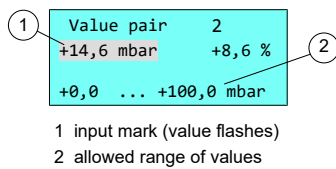


Fig. 14: Value pair

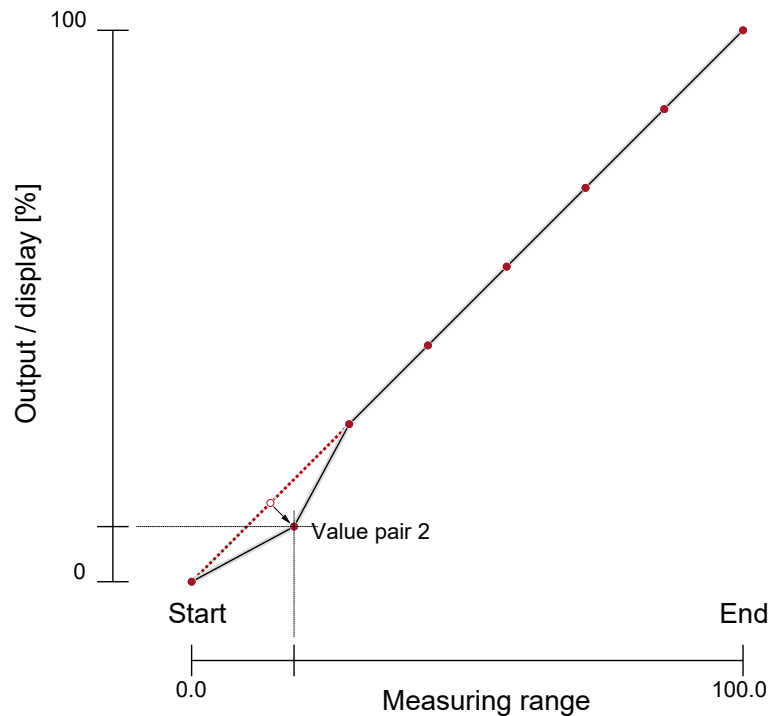


Fig. 15: Table function (example)

The individual value pairs can be seen and changed with the **Value pair1** to **Value pair30** parameters. A value pair comprises a measured value (left side) and a display value (right side). The measured value must lie within the measuring range and the display value must lie within the defined "free unit". The respective limits are shown during input. The table must contain either increasing or decreasing values. the table must contain either continuously increasing or continuously failing values. A change from an increasing to a decreasing characteristic curve within a support point table is not allowed.

4.5.6 Menu level function 2

This menu level only appears, if the 2-channel operating mode has been set. The parameters on this menu level are identical to the parameters on the function menu level. Therefore the parameters are not described again here.

4.5.7 Menu Level Display

The Display menu level is a variable menu whose appearance depends on the value of the colour parameter. In addition to the various colours for the background lighting, there are also two auto-functions with colour switching available.

Parameter name	Description	Value range
Assignm. switch.	Assignment of the colour switch	Channel 1, Channel 2
Colour	Colour	Off, Red, Green, Yellow, Blue, Pink, Turquoise, White, Auto1: Red-Green Auto2: Red-Yellow-Green
Lighting	Lighting time	0 s, 10 ... 600 s
Contrast	Contrast	15 ... 45
Bar chart	Bar chart display	yes, no
Channel select.	Channel selection	Channel 1, channel 2 both channels, altern. 3s, 6s, 9s. all values

The parameter **Assignm. switch.** is used to define an input channel to which the colour change refers.⁽¹⁾ However, the most important parameter is **Colour**. A fixed colour can be defined for the background colour here. There are also two auto-functions with colour switching available. Alternatively, the background illumination can be permanently deactivated.

If permanent lighting is not required, the parameter **Lighting** can be used to define when the lighting should be switched off after the last time a button is pressed. In addition to permanent lighting (0 s), automatic shut-down after 10... 600 s is also possible. The set time is only valid if the parameter **Colour** is not set to "Off".

Amongst other things, the legibility of the display depends on the temperature and the reading angle. To ensure optimised legibility, the display can be adjusted using the **Contrast** parameter. When the contrast is changed, it is possible that the display appears empty or almost completely black. In this case, the contrast must be turned up or down.

The parameter **Bar chart** can be used to switch between a measured value display with large digits and a display with smaller digits and an additional bar chart.

The parameter **Channel select.** offers the user the option of deciding which of the measured values need to be shown on the display. The following values can be entered for the parameter:

Channel 1	The selected output of the respective channel is displayed.
Channel 2	
Both channels	Both channels are displayed.
	Differential pressure (dP) and (P+) 2-channel (P+) and (P-)
Alternating 3s, 6s or 9s	Depending on the selected function, (P+) and (dP) or (P+) and (Fct.) are displayed.
All values	All values are displayed.

The time that a measurement is shown on the display can be set with the value 'alternating'. The channel is changed after this time.

⁽¹⁾ This parameter only appears if a colour change function has been selected.

Auto1: Colour-change red to green

If parameter **Colour** is set to Auto 1: red-green, the menu changes as follows:

Parameter name	Description	Value range
Assignm. switch.	Assignment switching	Channel 1, channel 2
Red-Gr. switch.	Red-green switching	MB-start - 50% ...
Gr-Red switch.	Green-red switching	MB-end + 50%
Hysteresis	Hysteresis	0.1 ... 10.0 %
Delay	Delay	0 ... 1800 s
Colour	Colour	Off, red, green, yellow, blue, pink, turquoise, white, Auto1: Red-green Auto2: Red-yellow-green
Lighting	Lighting time	0 s, 10 ... 600 s
Contrast	Kontrast (contrast)	15 ... 45
Bar chart	Bar chart display	yes, no
Channel select.	Channel selection	Channel 1, channel 2

The parameter **Assignm. switch.** is used to define an input channel to which the colour change refers.

In the Auto 1 mode with the automatic colour switchover, the parameters **Red-Gr. switch.** or **Gr-Red switch.** serve to enter the required thresholds. The colour change F1 and F2 can be moved anywhere within the measuring range. The series of colour changes however cannot be altered.

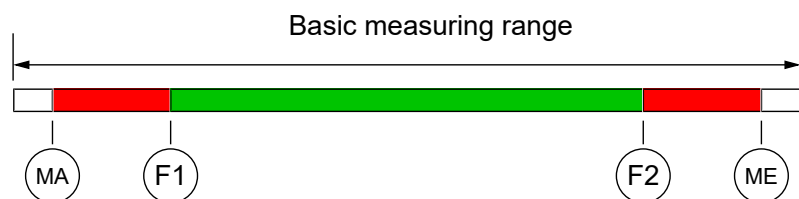


Fig. 16: Function Auto1

MA	MB-start	Measuring range start
F1	Red-Gr. switch.	Red-green switching
F2	Gr-Red switch.	Green-red switching
ME	MB-end	Measuring range end

The parameter **Hysteresis** can be used to prevent fast and unwanted colour changes. The hysteresis is set in the range 0.1... 10 %.



NOTICE

Overlapping colour areas

Note: In the case of large hysteresis values, steps must be taken to ensure that the ranges of the individual colours do not overlap. Otherwise it is possible that the colour change may not function in the desired way.

The parameter **Delay** offers a further option to prevent unwanted colour changes. The colour change here can be delayed between 0...1800 s.

The parameters **Lighting**, **Contrast**, **Bar chart** and **Channel select.** are explained in the previous section.

Auto2: Colour-change red-yellow-green

If the parameter Colour is set to Auto 2: red-yellow-green, the menu changes as follows:

Parameter name	Description	Value range
Assignm. switch.	Assignment switching	Channel 1, channel 2
Red-Yell.switch.	Red-yellow switchover	MB-start - 50% ... MB-end + 50%
Yell.-Gr.switch.	Yellow-green switchover	
Gr.-Yell. switch	Green-yellow switchover	
Yell.-Red switch	Yellow-red switchover	
Hysteresis	Hysteresis	0.1 ... 10.0 %
Delay	Delay	0 ... 1800 s
Colour	Colour	Off, red, green, yellow, blue, pink, turquoise, white, Auto1: Red-green Auto2: Red-yellow-green
Lighting	Lighting time	0 s, 10 ... 600 s
Contrast	Kontrast (contrast)	15 ... 45
Bar chart	Barchart display	yes, no
Channel select.	Channel selection	Channel 1, channel 2

In the Auto 2 mode with the automatic colour switchover, it is possible to enter the required switch thresholds via the parameters **Red-Yell.switch.**, **Yell.-Gr.switch.**, **Gr.-Yell. switch**, **Yell.-Red switch**. The colour change F1, F2, F3 and F4 can be moved anywhere within the measuring range. The series of colour changes however cannot be altered.

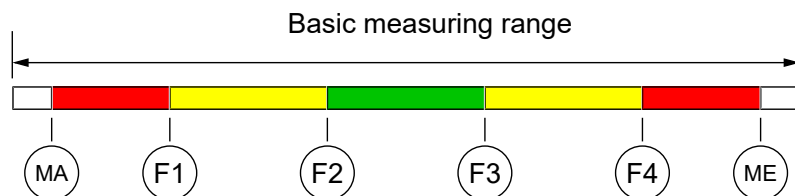


Fig. 17: Function Auto2

MA	MB-start	Measuring range start
F1	Red-Yell.switch.	Colour-change red to yellow
F2	Yell.-Gr.switch.	Colour-change yellow to green
F3	Gr.-Yell. switch	Colour-change green to yellow
F4	Yell.-Red switch	Colour-change yellow to red
ME	MB-end	Measuring range end



NOTICE

Unused range

If a range is not to be used, the associated switch thresholds (F1...F4) can be set to the same value.

Example

The parameter Colour is set to Auto2. Only the green, yellow and red ranges are required here. To fade out the lower ranges red and yellow, the switch thresholds "red-yellow switching" and "yellow-green switching" are set to the start of the measuring range.

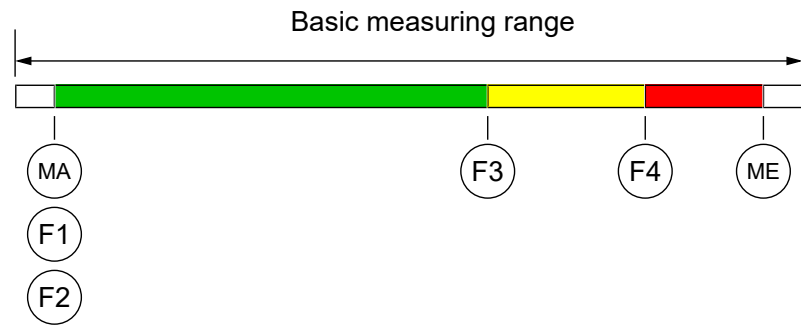


Fig. 18: Example Auto2

The parameters **Hysteresis**, **Delay**, **Lighting**, **Contrast**, **Bar chart** and **Channel select** are explained in the previous sections.

4.5.8 Menu Level System

Parameter name	Description	Value range
Language	Language change	DE, EN, FR, ES, IT, PT, HU
Software Info	Information about the software	Device type, serial number, firmware version
Config. Info	Information about the configuration	Basic measuring range, output signal, contacts
Statistics	Statistics	Operating time, switch cycles of the contacts
Password	Password	0/1...999
Load config.	Load configuration	
Save config.	Save configuration	

The user menu can be switched to German, English, French, Spanish, Italian, Portuguese or Hungarian using the parameter **Language**.

The menu items **Software Info** and **Config. Info** provide information about the device. This information helps to answer questions about the device quickly.

- The serial number and the firmware version is shown in **Software info**. If a 'designation' has been assigned, this is also issued. Please note that a 'designation' can only be entered with the PC software by remote configuration.
- The basic measuring range, the defined output signal and existing contacts are stated in the **Config. Info**.

The **Statistics** provide information about the operating time and the relay switching cycles from the time of delivery. The operating time is shown in days (d) and hours (h)

A **Password** can be used to protect the menu against unauthorised access. The password is a figure from 1 to 999. The input 0 means that no password is active.

The password needs to be set if the user presses the button in normal mode to enter the menu. If a wrong password is entered, the system automatically jumps back to normal mode again. If no password is active, the display immediately jumps to the menu.



NOTICE

Forgotten password

The user cannot restore a forgotten password. Please contact the manufacturer in this case.

The user can load a saved configuration via the menu item **Load config**. This means that a functional set of parameters can be loaded after trying out various settings.

The menu item **Save config** serves to save the existing parameters in a protected memory area. This is helpful if the settings of a functional device needs to be optimised. **Save config** and **Load config** can be used to quickly restore the initial status again.



NOTICE

Delivery condition

If the user has not yet saved a configuration, the default values (status on delivery) are loaded. In this case, any measuring range spreads or switch points are reset and the device needs to be newly configured.

5 Servicing

5.1 Maintenance

The instrument is maintenance-free. We recommend the following regular inspection to guarantee reliable operation and a long service life:

- Check the function in combination with downstream components.
- Check the leak-tightness of the pressure connection lines.
- Check the electrical connections.

The exact test cycles need to be adapted to the operating and environmental conditions. In combination with other devices, the operating instructions for the other devices also need to be observed.

5.2 Transport

The measuring device must be protected against impacts. It should be transported in the original packaging or a suitable transport container.

5.3 Service

All defective or faulty devices should be sent directly to our repair department. Please coordinate all shipments with our sales department.



WARNING

Process media residues

Process media residues in and on dismantled devices can be a hazard to people, animals and the environment. Take adequate preventive measures. If required, the devices must be cleaned thoroughly.

Return the device in the original packaging or a suitable transport container.

5.4 Disposal

Please help to protect the environment by always disposing of the work pieces and packaging materials in compliance with the valid national waste and recycling guidelines or reuse them.

6 Technical data

6.1 Generalities

The stated technical data only refer to the differential pressure evaluation unit EA14D and never take into account the properties of the connected pressure transmitter.

6.2 Input variables

Analogue input (Pressure transmitter signal)	Channel 1 and 2	Type of con- nection
Current signal in compliance with DIN IEC 60381-1	4 ... 20 mA	2-Wire
Measuring range		
0 ... 2.5 bar		
0 ... 6 bar		
0 ... 10 bar		
0 ... 16 bar		
0 ... 25 bar		
0 ... 40 bar		
0 ... 60 bar		
Other measuring ranges available on request		

6.3 Output sizes

Switch output	MOSFET
Progr. switching function	One-pin activator (NO) One-pin deactivator (NC)
Max. switching voltage	3 ... 32 V AC/DC
Max. switching current	0.25 A
Max. switching output	8 W(VA) $R_{ON} \leq 4 \Omega$

Optionally, the device can also be supplied with two analogue outputs.

Analogue output	0/4 ... 20 mA	0 ... 10 V
Type of connection	3-Wire	3-Wire
Apparent ohmic resistance	$U_b \leq 26 \text{ V}: R_L \leq (U_b - 4 \text{ V}) / 0.02 \text{ A}$ $U_b > 26 \text{ V}: R_L \leq 1100 \Omega$	$R_L > 2 \text{ k}\Omega$
Signal range	0.0 ... 21.0 mA	0.0 ... 11.0 V
Turn down	10:1	10:1

6.4 Measurement accuracy

		Maximal	Typical
Measurement deviation ^{*)}		0.1 % FS	<0.05 %
Temperature drift ^{*)}	Span	0.1 %FS/10K	<0.025 %FS/10K
	Zero point	0.1 %FS/10K	<0.025 %FS/10K

^{*)} Characteristic curve deviation (non-linearity and hysteresis) at 25°C and rated voltage basic measuring range with linear characteristic curve, not spread

^{x)} In relation to the basic measuring range with a linear, not spread, characteristic curve.

6.5 Auxiliary energy

A CE-conform mains adapter with a slow 200 mA fuse only may be used in the power supply circuit.

Rated Voltage	24V AC/DC
Admissible operating voltage	12 ... 32 V AC/DC
Absorbed power	Max. 2 W (VA)

6.6 Operating conditions

Ambient temperature range	-10 ... +60 °C
Storage temperature range	-20 ... +70 °C
Medium temperature range	see Pressure sensor data sheet
Protection class IP	IP65 acc. to DIN EN 60529
ATEX	EN 60079-0 EN 60079-15
EMC	EN 61326-1 EN 61326-2
RoHS	EN 50581

6.7 Display and operating interface

Annunciation, display, indication

4...6-digit LCD, full graphic, colour backlighting

Programming

Damping	0.0...100.0s (jump response 10/90%)
Switch output	Switch-off point, switch-on point, response time (0...1800s), function (NC / NO contact), channel assignment
Measuring range unit	bar, mbar, Pa, kPa, MPa, psi, InWc, mmWs, mmHg, 'free unit', starting value, end value and decimal point for 'free unit'
Output signal	User-definable within the basic measuring range ⁽¹⁾
Zero-point window	0... $\frac{1}{3}$ of the basic measuring range ⁽²⁾
Offset correction	$\pm\frac{1}{3}$ of the basic measuring range ⁽³⁾
Implementation of characteristic curve	linear, square rooted, table with 3...30 support points
Password	001 ... 999 (000 = no password protection)
Language (can be switched)	DE, EN, FR, ES, IT, PT, and HU

(1) Max. effective spread 10:1

(2) measured values around zero are set to zero.

(3) To compensate different installation positions.

6.8 Construction design

Process connection	2 x 5-pin round plugs M12 (female) for external pressure transmitters or 2 x 4-pin standard plug DIN EN 175 301-803-A (female) with 1 m cable
Electrical connection	2 x round plug connector M12 (male) 5-pin for supply and output signal 4-pin for switch contacts
Installation position	User-defined
Dimensions (LWH)	90 x 61.5 x 75 mm
Weight (without cables and pressure sensors)	300 g

6.8.1 Materials

Materials of the parts that come into contact with the medium

see Pressure sensor data sheet

Materials of the parts that come into contact with the surroundings

Housing	Polyamide PA 6.6
Foil keypad	Polyester
Process connection	Nickel-plated brass
Electrical connection	Polyamid

6.8.2 Dimensional drawings

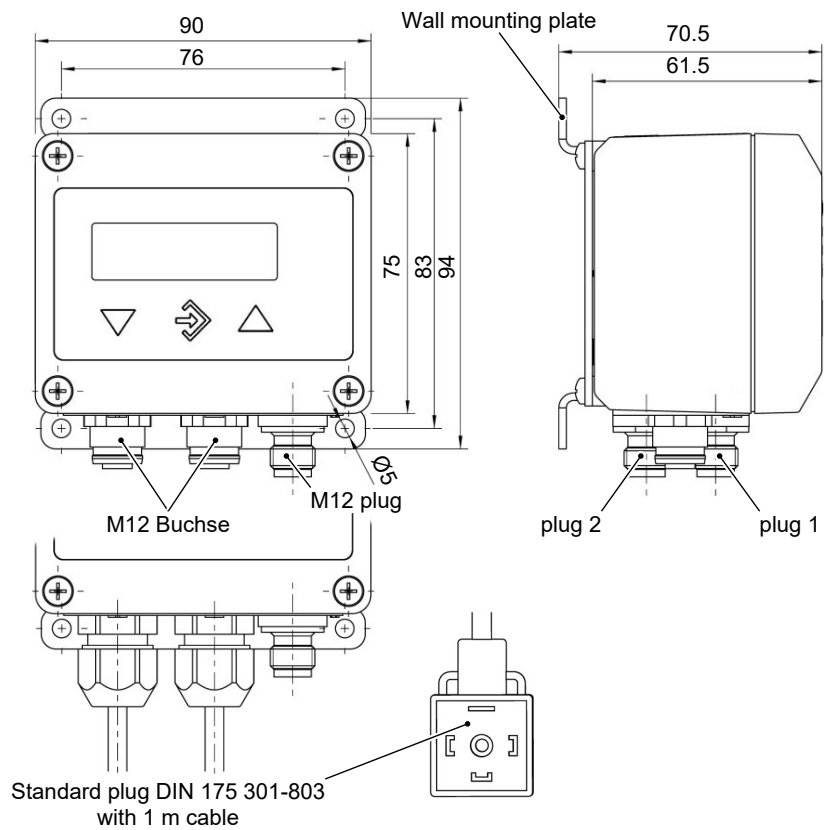


Fig. 19: Dimensional picture

6.8.3 Wall mounting

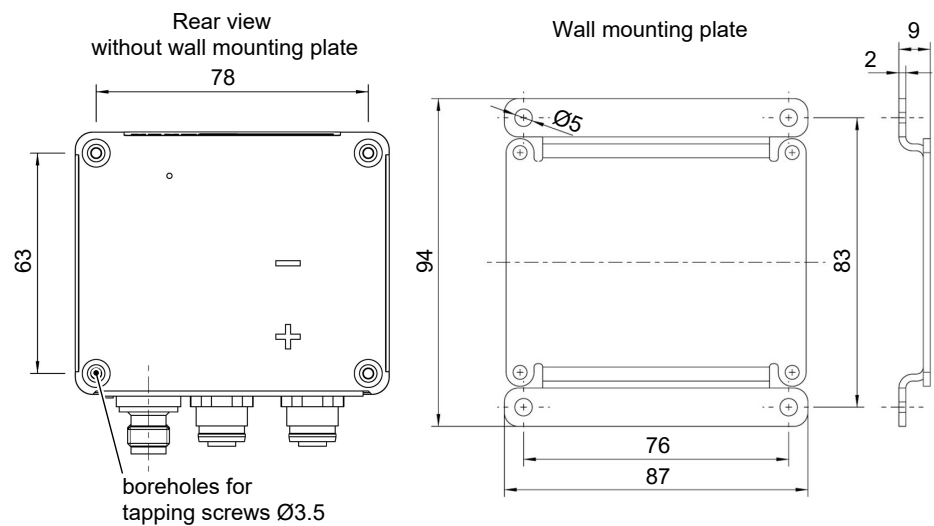


Fig. 20: Wall mounting

6.8.4 Assembly of the mounting rails

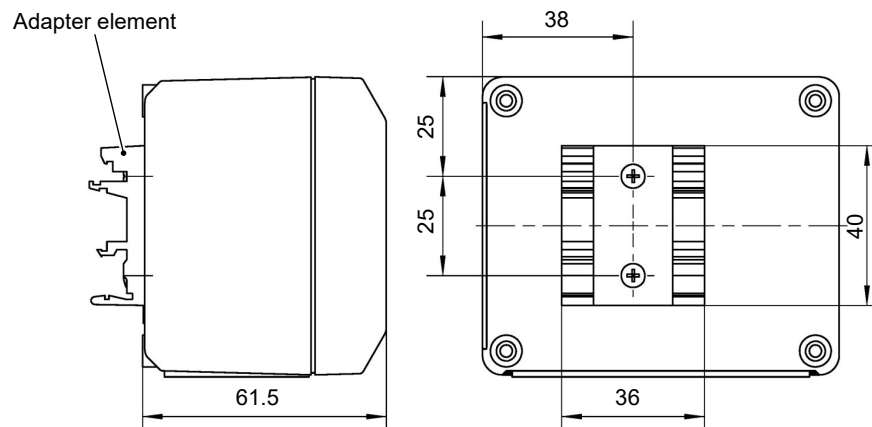


Fig. 21: Adapter element

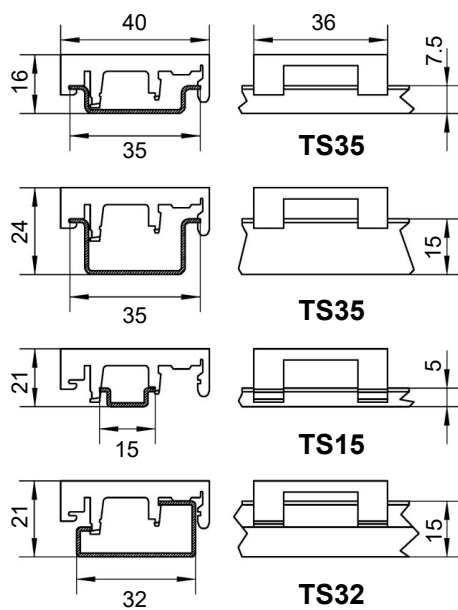


Fig. 22: Mounting rails options

6.8.5 Installation of front panel

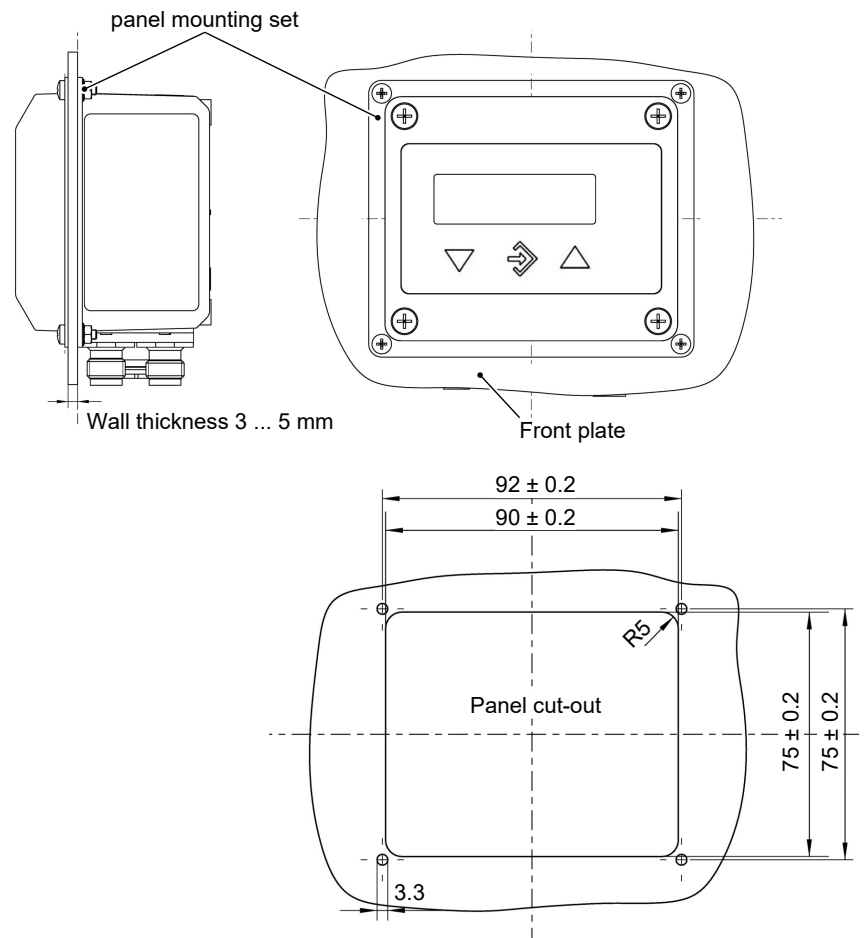
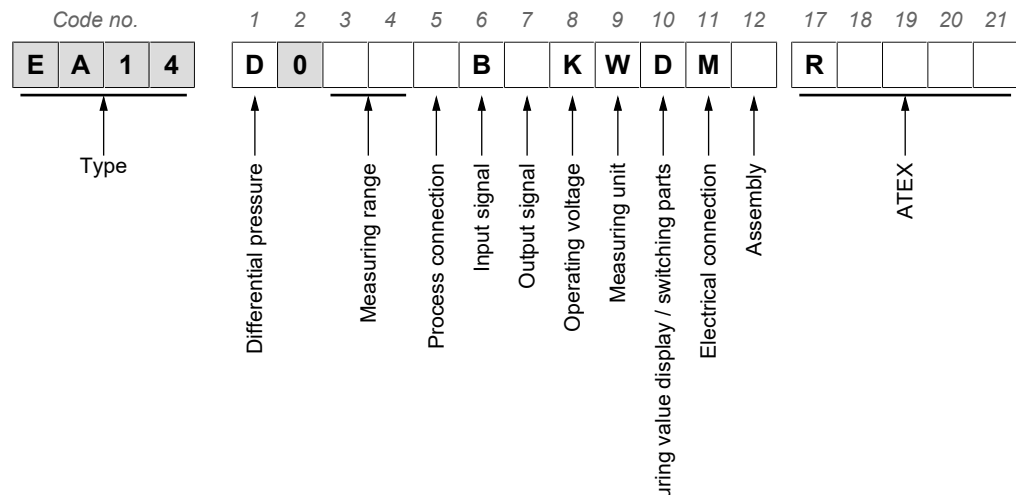


Fig. 23: Installation of front panel

7 Order codes



[3.4] Measuring range (differential pressure)

04	0 ... 2.5 bar
06	0 ... 6 bar
07	0 ... 10 bar
08	0 ... 16 bar
09	0 ... 25 bar
10	0 ... 40 bar
11	0 ... 60 bar
99	Other measuring ranges available on request

[5] Process connection (pressure transmitter)

M	2 x M12 plug connection
H	2 x plug connector DIN EN 175301-803 A with 1m cable

[6] Input signal (pressure transmitter) Type of connection

B	4 ... 20 mA	2-Wire
----------	-------------	--------

[7] Output signal Type of connection

0	Without analogue output signal	
4	0 ... 20 mA	3-Wire
5	0 ... 10 V	3-Wire
6	4 ... 20 mA	3-Wire

[8] Operating voltage

K	24 V AC/DC
----------	------------

[9] Measuring unit

W	Selectable pressure units
----------	---------------------------

[10] Measured value display / contact elements:

D	4-digit colour change LCD / 2 semiconductor contacts
----------	--

[11] Electrical connection

M	2 x M12 plug connection
----------	-------------------------

[12] Assembly

0	Attachment boreholes on rear side (standard)
W	Wall mounting

[12] Assembly	
T	Panel mounting set
S	Assembly of the mounting rails
[17] ATEX model	
R	Use in Zone 2 - Risk from gases and vapours C Ex II 3G Ex nA IIC T4 Gc
[18-21] ATEX model	
####	Device specification

7.1 Accessories

Order no.	length
4-pin M12 Connection cable for switching outputs	
06401993	2m
06401994	5m
06401563	7m
06401572	10m
5-pin M12 connection cable for auxiliary energy and analogue outputs	
06401995	2m
06401996	5m
06401564	7m
06401573	10m

Remote configuration

Order no.		
EU05 0001	Transmitter PC interface incl. PC software	With battery
EU03 F300		

A data sheet is available on our website www.fischermesstechnik.de or on request.

(Translation) **CE**

8 EU Declaration of Conformity

EU Declaration of Conformity

For the product described as follows

Product designation **Differential pressure evaluation unit**
Type designation **EA14 ... R #####**

it is hereby declared that it corresponds with the basic requirements specified in the following designated directives:

2014/34/EU	ATEX Directive
2014/30/EU	EMC Directive
2011/65/EU	RoHS Directive

The products were tested in compliance with the following standards.

Explosive atmospheres (ATEX)

DIN EN 60079-0:2014-06
 EN 60079-0:2012 + A11:2013
DIN EN 60079-15:2011-02
 EN 60079-15:2010

Explosive atmospheres - Part 0: Equipment - General requirements

Explosive atmospheres - Part 15: Equipment protection by type of protection "n"

Electromagnetic compatibility (EMC)

DIN EN 61326-1:2013-07
 EN 61326-1:2013
DIN EN 61326-2-3:2013-07
 EN 61326-2-3:2013

Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements

Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-3: Particular requirements - Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning

RoHS Directive (RoHS 2)

DIN EN 50581:2013-02
 EN 50581:2012

Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Also they were subjected to the conformity assessment procedure „**Internal production control**“.

The object of the declaration described above is in conformity with Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

Sole responsibility for the issue of this declaration of conformity in relation to fulfilment of the fundamental requirements and the production of the technical documents is with the manufacturer.

Manufacturer **FISCHER Mess- und Regeltechnik GmbH**
 Bielefelder Str. 37a
 32107 Bad Salzufflen, Germany
 Tel. +49 (0)5222 974 0

Documentation representative Mr. Torsten Malischewski
 B.Sc.
 Development department

The devices bear the following marking:

CE  **II 3G Ex nA IIC T4 Gc**

Bad Salzufflen
09 July 2018

G. Gödde
 Managing director

09010335 • CE_EN_EA14D_R • Rev. ST4-A • 07/18



1 / 1

Fig. 24: CE_DE_EA14D_R

Notes



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