

Instruction Manual DS25

All metal variable area flowmeter, robust industrial design with large display



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Safety Information

General Instructions

To ensure safe operation, the device should only be operated according to the specifications in the instruction manual. The requisite Health & Safety regulations for a given application must also be observed. This statement also applies to the use of accessories.

Every person who is commissioned with the initiation or operation of this device must have read and understood the operating instructions and in particular the safety instructions!

The liability of the manufacturer expires in the event of damage due to improper use, nonobservance of this operating manual, use of insufficiently qualified personnel and unauthorized modification of the device.

Proper Usage

The variable area flow meter DS25 are designed to measure and monitore continuous flow rates of liquids or gases which do not attack the device materials. All other usage is regarded as being improper and outside the scope of the device.

In particular, applications in which shock loads occur (for example, pulsed operation) should be discussed and checked in advance with our technical staff.

The series DS25 flow meter devices should not be deployed as the sole agents to prevent dangerous conditions occurring in plant or machinery. Machinery and plant need to be designed in such a manner that faulty conditions and malfunctions do not arise that could pose a safety risk for operators.

Dangerous substances

For dangerous media such as e.g. Oxygen, Acetylene, flammable or toxic substances as well as refrigeration systems, compressors, etc. must comply with the relevant regulations beyond the general rules.

Qualified Personnel

The DS25 devices may only be installed by trained, qualified personnel who are able to mount the devices correctly. Qualified personnel are persons, who are familiar with assembling, installation, placing in service and operating these devices and who are suitably trained and qualified.

Inward Monitoring

Please check directly after delivery the device for any transport damages and deficiencies. Additional with reference to the accompanying delivery note the number of parts must be checked. Claims for replacement or goods which relate to transport damage can only be considered valid if the delivery company is notified without delay.



Explanations of specifications on flanges

- type of flange e.g. DIN
- size of flange e.g. DN15
- Pressure range of flange and measuring tube e.g. PN40
- Material of wetted parts e.g. 1.4404
- Manufacturing code of flange manufacturer
- Lot. No.



Scale example for Display



Scale example for Display with electronic transmitter



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- Be sure to remove the transport lock card-board strip from the measuring tube. Check that no cardboard remains in the tube.
- The DS25 flow rate meter must be installed in a vertical pipeline, in which the medium flows upwards. The vertical position has to be checked at the outer edge of the flanges.
- Bigger nominal diameters (DN 80 / DN 100) require straight pipe sections of at least 5D in front and behind the DS25.
- The nominal diameter of the DS25 should correspond to the nominal diameter of the pipeline.
- To avoid stress in the connecting pipes, the connecting flanges must be aligned in parallel and axial direction.
- Bolts and gaskets have to be selected according to the maximum operating pressure, the temperature range and corrosion conditions.
- Center gaskets and tighten nuts with a torque appropriate for the pressure range.
- If contamination or soiling of the DS25 is to be expected, a bypass should be installed to allow the removal of the instrument without interruption of the flow.

| | Nominal Size | | | Bolts | | | | Maximur | n Torque | |
|-----------|--------------|-------------|---------|-----------|----------------|----------|-------|---------|----------|---------|
| EN 1092-1 | | ASME B 16.5 | | EN 1092-1 | EN 1092-1 ASME | | EN 10 | 092-1 | ASME | 150 lbs |
| DN | PN | Inches | lbs | | 150 lbs | 300 lbs | Nm | ft*lbf | Nm | ft*lbf |
| 15 | 40 | 1/2 | 150/300 | 4 x M12 | 4 x ½″′′ | 4 x ½″ | 9.8 | 7.1 | 5.2 | 3.8 |
| 25 | 40 | 1 | 150/300 | 4 x M12 | 4 x ½″′′ | 4 x ½″ | 21 | 15 | 10 | 7.2 |
| 50 | 40 | 2 | 150/300 | 4 x M16 | 4 x 5/8″ | 8 x 5/8″ | 57 | 41 | 41 | 30 |
| 80 | 16 | 3 | 150/300 | 4 x M16 | 4 x 5/8″ | 8x%,″″ | 47 | 34 | 70 | 51 |
| 100 | 16 | 4 | 150/300 | 4 x M16 | 8 x 5/8″ | 8 x ¾″ | 67 | 48 | 50 | 36 |

Tightening of the flange threads for DS25 with PTFE- liner with the following torques:

Electrical Connection

Please regard the drawings on the following pages.

- On the rear of the DS25 are two cable glands for round cables with a diameter of 6 to 9 mm
- Unused glands must be closed with a blind plug M16x1.5.
- Wires should not be bent directly at terminal screws.
- Do not expose wires to mechanical pressure.
- Wires must be arranged according to common installation rules, especially signal and power lines must not be bundled together.
- Cables should not be bend directly after the cable gland. Do not fix cable at the measuring tube.
- The DS25 terminals accept wires with a maximum sectional area of 1.5 mm²

- The attached ferrite core must be mounted on the cable as shown on the below picture. Distance "L" < 2 cm.
- Measuring and indicating instruments, connected in series to the output of the electronic transmitter, must not exceed a load impedance of
 - RL = (U 13.5 V) / 20 mA

for 2-/3-wire or 500 Ω for 4-wire

- 2- or 3-wire units are connected to the terminals marked "+", "-" and "A" of the power connector.
- For 2-wire instruments the terminals "-" and "A" have to be shorted with a jumper. Take care not to loose that jumper when mounting wires.



• Wiring inside the case should be kept as short as possible to avoid that moving parts are blocked.

Attention: Hints for Unit Safety (according DIN EN 61010-1)

- Do not connect cables outdoors in wet weather in order to prevent damage from condensation and to protect the insulation, e.g. inside the terminal box of the flowmeter.
- Heed the nominal voltage indicated on the scale.
- Use the cables which fulfill specification and check before wiring.
- The electrical connections have to be executed according to VDE0100 "Errichten von Starkstromanlagen mit Nennspannungen bis 1000 V" (Installation of high current assemblies with nominal voltages of up to 1000 V) or equivalent national regulations.
- For units with a nominal voltage of 115 V or 230 V the correspondingly marked terminal has to be connected to protective earth (PE).
- Units with a nominal voltage of 24 V may only be connected to a protected low voltage circuit (SELV-E according to VDE0100/VDE 0106 or IEC 364/IEC 536).
- The DS25 indicator housing must be grounded to ensure electromagnetic interference protection. This can be done by grounding the pipeline.
- Once all wiring is complete, check the connections before applying power to the instrument. Improper arrangements or wiring may cause a unit malfunction or damage.
- This unit does not include a power switch. Therefore, a switch has to be prepared at the installation location in the vicinity of the unit. The switch should be marked as the power separation switch for the DS25.

2 wire unit:



Connection Diagrams

DS25, 2-wire unit with limit switches and transmitter relay:



Trennschaltverstarker

Anschluss einkanalig wie Grenzwert MAX

DS25, 3-wire unit with limit switches and transmitter relay:



Trennschaltverstarker

Anschluss einkanalig wie Grenzwert MAX

DS25, 4-wire unit with pulse output:









Transmitter Relay

One channel connection like limit MAX

Hints on flow rate measurement:

The measured fluid should neither consist of a multi-phase mixture nor contain ferrite ingredients or large solid mass particles.

Hints on scale:

The DS25 scale is adjusted to the state of operation/aggregation of the measured fluid by the manufacturer. If the state of operation changes, it might become necessary to establish a new scale.

This depends on several factors:

- If the DS25 is operated in the given viscosity independent range, only the density of the float as well as the operational density of the previous and new substance have to be considered.
- In case the operational density only changes marginally (≤ 0.5 %), the present scale can be used.
- If the DS25 is operated outside the given viscosity independent range, the viscosities at the previous and new state of operation as well as the mass and diameter of the float have to be taken into account.

Pulsation and pressure shock:

Pressure shock waves and pulsating flow influence measurement significantly or can destroy the meter. Surge conditions should be avoided. (open valves slowly, raise operating pressure slowly)

If float bouncing occurs in gases increase the line pressure until the phenomena stops. If this is not possible provide the float with a damper. A damping kit is available as spare part.

Start of operation of electronic transmitter:

Ensure that the device has been connected correctly and that the used power supply meets the requirements indicated on the scale.

Switch on the power supply.

The digital display gives the totalizer value in the measuring unit, indicated on the right side of the display.

The DS25 is now ready for operation.

Unit graduation, measuring unit, damping, etc. can be adjusted by an operating menu.

In case of an error, the bars beneath the 8 digits of the display will flash. The corresponding error message can be checked using the operating menu and then taking the appropriate counter measures (refer to section "Error Messages").

The transmitter has been prepared and calibrated according to the model code as a 2-, 3- or 4-wire unit.

In 2-wire units, a jumper connects "A" and "-". When switching from a 2- to a 3-wire configuration, this jumper should be removed. The current output should then be adjusted.

When changing from a 3- to 2-wire configuration, the jumper should be set in place, and the current output has to be adjusted.

Limit switches

The optional limit switches are available as maximum or minimum type switches. They are proximity switches according to EN 60947-5-6 (NAMUR). Maximum two switches can be installed. As transmitter relay we recommend our model P+F.

The limit switches have to be connected to the transmitter relays.

The terminals for the limit switches are on a small board on top of the transmitter case.

Use of 2 standard limit switches:

The MIN-MIN and MAX-MAX functions have been integrated at the factory as MIN-MAX switches in the DS25.

The MIN-MIN or MAX-MAX function is set by adjusting the switching direction of the transmitter relay.

The following table shows the assignment:

| Fu | nction | Switching direction | of transmitter relay |
|----------|----------|---------------------|----------------------|
| Chanel 1 | Chanel 2 | Chanel 1 | Chanel2 |
| MIN | MAX | S1 position I | S2 position I |
| MIN | MIN | S1 position I | S2 position II (ON) |
| MAX | MAX | S1 position II (ON) | S2 position I |

Adjusting the switching points:



To adjust the switching points, loosen set screws 1 and 2 and move them in the guide rail. The small red pointers (Limit switch MAX and Limit switch MIN) indicate the set value on the scale.



Electronic Transmitter



Operation principle:

The position of the float is magnetically transferred to a magnetic follow up system. The position angle of this magnetic rocker is detected by magnet sensors. A micro controller determines the angle by means of a combining reference value table in the memory and calculates the flow rate by the angle with calibration and operation parameters the calibration EEPROM.

The flow rate is given as a current, either 0-20 mA or 4-20 mA, and, in addition, indicated on the digital display (refer also to section 6-2). The electronic transmitters have been electronically adjusted before shipping and, therefore, are mutually exchangeable.

Calibration data of the metering tube as well as customer specific data are entered into a calibration EEPROM, inserted on the board. This calibration EEPROM and the indication scale are assigned to the respective metering tube.

When replacing an indicator (e.g. because of a defect) the scale and calibration EEPROM of the old unit have to be inserted in the new unit. Then, no calibrations or adjustments are necessary.

If an indicator with electronic transmitters is installed to a new metering tube, the calibration EEPROM of that tube has to be inserted into the transmitter and the indicator scale for that particular tube has to be mounted.

A change in the fluid data (e.g. specific gravity, pressure, etc.) requires the preparation and mounting of a new calibration EEPROM and scale.

Normally the range of the current output is equal to the rounded measuring range of the tube (end value on scale). The customer can position the 20 mA point between 60 % and 100 % of the end value on scale. The set of the 20 mA point is shown on the scale. The flow cut off is positioned at 5 % of the end value. Below 5 % flow the current output shows 0 mA (4 mA).

Parameter setting:

The displays allows indication of various parameters:

- Flow rate (8 mass or volume units in combination with 4 time units)
- Counter (8 mass or volume units)
- Flow rate indication in percent
- Special functions
- Setting of different damping times
- Switching of current output 0-20 mA / 4-20 mA or vice versa
- Indication of error messages
- Manual adjustment
- Service functions
- Detection of float blockage

The setting of these parameters is done by two buttons.



The buttons access three functions:



- upper button (\uparrow) : Exit setting mode
- lower button (\rightarrow): Scroll through menu/selection of parameters
- both buttons ($\uparrow + \rightarrow$) = Enter : Entering parameters/selecting setting mode

If no button is pressed for one minute while the operating menu is active, the indication reverts to the measuring indication. This does not apply to subfunctions F32, F33, F52, F63.

For indication of volume or mass values at maximum 6 digits in front of the decimal point and 7 decimals are used. This format allows an indication range for flow rates from 0.0000001 unit/time to 106000 unit/time.

Flow rate values exceeding 106000 are shown as '_____' on the display. In this case the next bigger flow rate unit (next smaller time unit) has to be selected.

For the indication of totalizers values 8 digits are used at maximum of which 7 digits can be assigned for decimal values. The decimal point setting is determined by selecting the unit. Therefore, possible totalizer offsets are:

Unit x 1 Unit x 1/10 Unit x 1/100

The totalizer counts up to 999999999 or 99999999.9 or 9999999.99 and is reset to zero.

The next page shows the operating menu.

The following describes selection and execution of functions.

Menu:

| Indication meas .val | F1- : Indication | F11: Selection | F11-1 : Flow rate |
|----------------------|------------------|------------------------|---|
| | | | F11-2 : Totalizer |
| | | | F11-3 : % |
| | | | F11-4 : Temperature |
| | | | |
| | | | Euro / US |
| | | F12 : Flow rate unit | F12-1 : m³ / m³ |
| | | | F12-2 : I / acf |
| | | | F12-3 : Nm ³ / Nm ³ |
| | | | F12-4:NL / scf |
| | | | F12-5:t /ton |
| | | | F12-6:kg /kg |
| | | | F12-7:scf / lb |
| | | | F12-8 : gal / usg |
| | | | |
| | | | Euro / US |
| | | F13 : Time unit | F13-1:h /h |
| | | | F13-2 : min / min |
| | | | F13-3:s /s |
| | | | F13-4 : day / day |
| | | | |
| | | F14 : Reset Totalizer | F14-1 : Execute |
| | | | |
| | | F15 : Temperature unit | F15-1 : degC |
| | | | F15-2 : DegF |
| | | 1 | |
| | F2- : Damping | F21 : Selection | F210:0s |
| | | | F211:1s |
| | | | F215:5s |
| | | | F21 10:10 s |

| F3- : Output | F31 : Selection | F31 0-20 : 0-20 mA |
|---|---------------------------|----------------------------|
| | | F31 4-20 : 4-20 mA |
| | | |
| | F32 : Offset adjustment | F32 00 |
| | | |
| | F33 : Span adjustment | F33 00 |
| | | |
| | F34 : Pulse output *) | F34-1 : not active |
| | | F34-2 : last digit |
| | | F34-3 : last but one digit |
| | | |
| F4- : Error messages | F41 : Indication | F41 Enn |
| | | |
| F5- : Manual adjustment | F51 : On/Off | F51-1 : off |
| | | F51-2 : on |
| | | · |
| | F52 : Adjustment table | F52 5: 5% point |
| | L | F52 15 : 15 % point |
| | | F52 25 : 25 % point |
| | | F52 35 : 35 % point |
| | | F52 45 : 45 % point |
| | | F52 55 : 55 % point |
| | | E52.65 : 65.% point |
| | | Eeo 75 , 75 % point |
| | | Een es : es et point |
| | | Eso os a construction |
| | | F52 95 : 95 % point |
| | | P52 105 : 105 % point |
| Francisco de la companya de la compa | For a Desiries indication | <u> </u> |
| P6-: Service | F61 : Revision indication | H., F., |
| | Fee - FERRON - minim | |
| | F62 : EEPROM revision | A., U., |
| | 500 0 | Fee et le contrat |
| | F63 : Current output test | F63 04 : 0 or 4 mA |
| | | F63 20 : 20 MA |
| | Exc. O. D. P. C. M. | E |
| | F64 : Calibration table | F64-1 : Standard |
| | | F64-2 : Remote version |
| | For New Press | [Fee 4 . Front |
| | F65 : Master Heset | F65-1 : EXecule |
| | 5 -1 0//0 | |
| F7- : Float Block, Ind. | F71:Off/On | F71-1 : Off/On |
| | | F71-2 : ON/Off |
| | The August State | [F =1 = 2 = 1 = 1 |
| | F72 : Lower limit | F72-1 : 5 % of Qmax |
| | | F72-2 : 15 % of Qmax |
| | | F72-3 : 30 % of Qmax |
| | | |
| | F73 : Supervision time | F73-1 : 5 Minutes |
| | | F73-2 : 15 Minutes |
| | | 1 |
| | F74 : Autozero | F74-1 : Execute |

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The function F11 selects the display's indication function. The following indications can be set: **flow rate, totalizer, % value or temperature.** At the factory the display is preset to totalizer indication.

| Description | Selection | Key | Indication |
|------------------------|-------------|----------------|---------------------|
| Change to setting mode | | Enter | Display mode F1- |
| Setting function | | Enter Enter | F11 F11 -1 |
| Selection | Flow rate | Enter | F11 |
| or | Totalizer | \rightarrow | F11 -2 |
| | | Enter | F11 |
| or | % | 2 x → | F11 -3 |
| | | Enter | F11 |
| or | Temperature | 3 x → | F11 -4 |
| | | Enter | F11 |
| Back to display mode | | ↑ | F1- |
| | | Ŷ | Display mode |

Note:

If you press "↑" instead of "Enter", you can return from the selected point to the previous menu without activating the displayed parameter.

When selecting "Flow rate" the measuring unit is set with function F12 and F13. When selecting "Totalizer" the measuring unit is set with F12. If % indication is selected, F12 and F13 have no effect. The internal totalizer is updated, if "Flow rate" or "Counter" is selected. In case of setting to "%" the internal counter is not updated and keeps its previous value.

If "Temperature" is selected the unit can be set by function F15. The indicated value is the temperature in the indication unit.

After changing the indicating function and measuring units the corresponding measuring unit label should be fixed on the right side next to the display.

When ordering the transmitter two sets of metering units are available. It is not possible to switch between them.

These two sets comprise the following metering units:

European unit set, Standard

| | Standard | Description | Unit | Menu / Index |
|----------------|----------|--------------------------------|-----------------|--------------|
| Flow rate unit | SI | Cubic meter | m ³ | -1 |
| | SI | Liter | I | -2 |
| | SI | Norm cubic meter | Nm ³ | -3 |
| | | (0 °C; 1 Atm.abs = 1.013 bar) | | |
| | SI | Norm Liter | N | -4 |
| | SI | Ton | t | -5 |
| | SI | Kilogram | kg | -6 |
| | | Standard cubic feet | scf | -7 |
| | | (60 °F; 1 Atm.abs = 14,69 psi) | | |
| | | Gallon (imperial, UK) | gal | -8 |
| Time unit | SI | Hour | h | -1 |
| | SI | Minute | min | -2 |
| | SI | Second | s | -3 |
| | | Day | d | -4 |

US unit set, Option /A12

| | Standard | Description | Unit | Menu / Index |
|----------------|----------|--|-----------------|--------------|
| Flow rate unit | SI | Cubic meter | m ³ | -1 |
| | | Actual cubic feet | acf | -2 |
| | SI | Norm cubic meter | Nm ³ | -3 |
| | | (0 °C; 1 Atm.abs = 1.013 bar) Standard cubic feet (60 °F; 1 Atm.abs = 14.69 psi) | scft | -4 |
| | | Long ton | ton | -5 |
| | SI | Kilogram | kg | -6 |
| | | Pound | lb | -7 |
| | | Gallon (US) | usg | -8 |
| Time unit | SI | Hour | h | -1 |
| | SI | Minute | min | -2 |
| | SI | Second | s | -3 |
| | | Day | d | -4 |

With functions F12 and F13, the measuring unit for displayed value is selected.

F12 selects volume and mass units, while F13 sets the corresponding time unit.

When selecting the indication function "totalizer" the set time unit is not taken into account and only the selected mass or volume unit is effective. When choosing the "%" indication F12 and F13 have no effect.

| Description | | Selection | Key | Indication |
|------------------------|---------|-----------|------------------------|--------------|
| | | | | Display mode |
| Change to setting mode | | | Enter | F1- |
| Setting | | | Enter | F11 |
| Masse/Volume unit | unit se | t | \rightarrow | F12 |
| | Euro | US | Enter | F12 -1 |
| Selection unit | m3 | m3 | Enter | F12 |
| or | 1 | acf | \rightarrow | F12 -2 |
| | | | Enter | F12 |
| or | Nm3 | Nm3 | 2 x → | F12 -3 |
| | | | Enter | F12 |
| or | NI | scf | 3 x → | F12 -4 |
| | | | Enter | F12 |
| or | t | ton | $4 \times \rightarrow$ | F12 -5 |
| | | | Enter | F12 |
| or | kg | kg | 5 x → | F12 -6 |
| | | | Enter | F12 |
| or | scf | lb | $6 x \rightarrow$ | F12 -7 |
| | | | Enter | F12 |
| | gal | usg | 7 x → | F12 -8 |
| | | | Enter | F12 |
| Setting | | | \rightarrow | F13 |
| Time unit | | | Enter | F13 -1 |
| Selection time unit | h | h | Enter | F13 |
| or | min | min | \rightarrow | F13 -2 |
| | | | Enter | F13 |
| or | s | s | 2 x → | F13 -3 |
| | | | Enter | F13 |
| or | day | day | 3 x → | F13 -4 |
| | | | Enter | F13 |
| Back to display mode | | | <u>↑</u> | F1- |
| | | | ↑ (| Display mode |

The selection of the measuring unit is performed as follows:

<u>Note:</u>

If you press "↑" instead of "Enter", you can return from the selected point to the previous menu without activating the displayed parameter.

After changing the measuring unit the corresponding measuring unit label should be fixed on the right side

next to the display. A sheet with stickers is included.

Attention:

When switching the mass/volume unit the totalizer is reset to zero. When changing the time unit the totalizer value remains unchanged.

Function F14 resets the totalizer to zero. The counter reset is performed as follows:

| Description | Selection | Key | Indication |
|------------------------|-----------|-------------------------|----------------------|
| Change to setting mode | | Enter | Display mode F1- |
| Setting mode | | Enter 3 x → Enter | F11 F14 F14 -1 |
| Selection | Reset | Enter | F14 |
| Back to display mode | | \uparrow | F1- Display mode |

Note:

If you press "[↑]" instead of "Enter", you can return from the selected point to the previous menu without activating the displayed parameter.

Selection of temperature unit (F15)

The function F15 sets the unit of temperature indication.

The following indications can be set: degC (Celsius) or degF (Fahrenheit).

At the factory the display is set to degC indication.

The selection of the indication is as follows:

| Description | Selection | Key | Indication |
|------------------------|--------------|-------------------------|----------------------|
| Change to setting mode | | Enter | Display mode F1- |
| Setting mode | | Enter 4 x → Enter | F11 F15 F15 -1 |
| Selection | degC degF | Enter → Enter | F15 F15 -2 F15 |
| Back to display mode | | \uparrow | F1- Display mode |

Note:

If you press "[↑]" instead of "Enter", you can return from the selected point to the previous menu without activating the displayed parameter.

Function F21 allows damping the output with a certain time constant (63 % value). Normally the time constant is set to 1 sec.

The selection of the time constant is as follows:

| Description | Selection | Key | Indication |
|------------------------|-----------|---------------|--------------|
| | | | Display mode |
| Change to setting mode | | Enter | F1- |
| Setting mode | | \rightarrow | F2- |
| - | | Enter | F21 |
| Selection damping | | Enter | F21 0 |
| constant | 0 s | Enter | F21 |
| or | 1 s | \rightarrow | F21 1 |
| | | Enter | F21 |
| or | 5 s | 2 x → | F21 5 |
| | | Enter | F21 |
| or | 10 s | 3 x → | F21 10 |
| | | Enter | F21 |
| Back to display mode | | ↑ (| F2- |
| | | ↑ | Display mode |

Note:

If you press "↑" instead of "Enter", you can return from the selected point to the previous menu without activating the displayed parameter.



Function F3- sets the current output to 4-20 mA or 0-20 mA. In addition, offset and span have to be readjusted. Offset compensation is for fine tuning the 0 or 4 mA point. Span or range compensation is for precise adjustment of the 20 mA point.

For compensating the output, an ampere metre (mA) should be connected to the circuit loop. For wiring refer to the diagrams in chapter 3.

The current output is set according to customer specifications at the factory.

Switching the output is executed as follows:

| Description | Selection | Key | Indication |
|--|-----------------------------------|-------------------------|---|
| Change to setting mode | | Enter | Display mode F1- |
| Setting mode Output selection | | 2 x → Enter Enter | F3- F31 F31 0-20 |
| Selection or | 0-20 4-20 | Enter → Enter | F31 F31 4-20 F31 |
| Setting function Offset-Adjustment | | → Enter | F32 F32 00 |
| Offset-Adjustment (Setting current to 0/4 mA) | Increase Decrease if 0/4 mA | ↑ → Enter | F32 in steps of +1 (+20 μA) F32 in steps of -1 (-20 μA) F32 |
| Setting function Span setting | | Enter | F33 F33 0 |
| Span setting (Setting current to 20 mA) | Increase Decrease if 20 mA | ↑ → Enter | F33 in steps of +1 (+20 μA) F33 in steps of -1 (-20 μA) F33 |
| Back to display mode | | ↑ ↑ | F3- Display mode |

An adjusting step corresponds to 20 μ A. The complete adjusting range is \pm 0.62 mA (31 steps).

If the adjusting range does not suffice, change to display F32 or F33 by pressing ENTER when display shows F32 31 or F33 31, press ENTER again and continue adjusting at F32 00 or F33 00.

3 wire connection:

At this the ranges 0-20 mA and 4-20 mA are possible.

At a switch over between the two ranges with F31 the current output is automatically adjusted at equipment as of firmware version 1.4 . (s.F 61). A perhaps necessary fine adjustment can be carried out with F32 or F33.

2 wire connection:

At this only the range of 4-20 mA is meaningful. The range of 0-20 mA is not closed however.

At the change to 0-20 mA with F31 the equipment assumes a remodelling on 3 wire connection and the current output is adjusted according to this. A perhaps necessary fine adjustment can be carried out with F32 or F33.

WARNING:

Since PKP doesn't have any influence on the custom-designed connection the current output is not automatically adapted, if the connection is changed from 2 wire to 3 wire or vice versa. This must be manually carried out with the functions F32 and F33.

Preset values :

| Connection | 2- wire | 3-wire |
|---------------|------------------------------------|--------------------------|
| Current range | | |
| 0 - 20 mA | | $I_0 = 0 \text{ mA}$ |
| | | $I_{20} = 20 \text{ mA}$ |
| 4 - 20 mA | l ₄ = 0.4 mA + 3.6 mA | $I_0 = 4 \text{ mA}$ |
| | I ₂₀ = 16.4 mA + 3.6 mA | $I_{20} = 20 \text{ mA}$ |
| Note | Do not use F31 | Use F31 for changing |

Error messages (F4-)

If the 8 bars beneath the digits start flashing, an error has occurred in the measuring transmitter/current output. Since the pointer indication is independent from the electric measuring transmitter, it may show the correct measuring value even if the transmitter is defective. Function F41 allows checking of assigned error codes.

Error codes are called onto the display as follows:

| Description | Selection | Key | Indication |
|------------------------|-----------|----------------------------------|------------------------------|
| Change to setting mode | | Enter | Display mode F1- |
| Setting mode | | 3 x → Enter Enter Enter | F4- F41 F41 Enn F41 |
| Back to display mode | | ↑ ↑ | F4- Display mode |

List of error massages:

| Code | Meaning | Remedy |
|------|-------------------------------------|--|
| 01 | RAM-error | Indication unit needs service |
| 02 | ADC-error | Indication unit needs service |
| 03 | Internal EEPROM faulty | Indication unit needs service |
| 04 | Calibration-EEPROM faulty | If EEPROM is missing insert, |
| | | -otherwise order new EEPROM |
| 05 | Wrong totalizer value in EEPROM | Reset totalizer |
| 06 | Overflow (flow rate too high) | Reduce flow rate |
| 07 | Internal EEPROM faulty | Indicator unit needs service |
| 08 | Float blocking indication realized, | Deactivate float-blocking-indication or run Autozero |
| | supervision time gone off | function |

In case of error the appropriate remedy has to be taken.

Manual adjustment (F5-)

During manufacturers adjustment and calibration process the relation between flow rate with water (or with air) and float position (indicated as angle on the mm-scale) is determined. Based on the properties of the customers fluid at expected operating conditions the flow scale and the corresponding EEPROM is then calculated.

If the fluid properties are changing (by change of the fluid or by change of the process conditions) the scale as well as the EEPROM has to be adapted. Easiest and recommended way to do this is to order new scale and EEPROM for the new properties from manufacturer and to replace both.

A second possibility is to readjust the meter by the user. This readjustment procedure will only adjust the current output and the display indication (but only in % of the new flow range), At least the readjustment by the user is possible by two different procedures:

1. Manual "dry" readjustment based on recalculated original scale:

The following steps have to be performed:

- a) Calculate the new of flow rate to mm (on scale) relation based on original manufacturers calibration certificate.
- b) Place the DS25 (with the measuring tube) horizontally on a table (Note: the distance to any ferromagnetic parts must be at least higher than 25 cm!).
- c) Go to menu function F51 and press ENTER to switch to manual adjustment mode. (Switching back to the original adjustment is possible by pressing ENTER again).
- d) Go to menu function F52 in order to start the manual adjustment.
- e) Move the float to a position where the pointer is indicating on mm-scale the mm-value belonging to 5 % of the new flow rate (Note: these values have to be calculated in step a first!)

- f) Press ENTER to adjust the first 5 % point.
- g) Repeat steps 1.e) to 1.f) for the 15 %; 25 %; 35 %; 45 %; 55 %; 65 %; 75 %; 85 %; 95 % and 105 % points. (Note: The whole loop from 5 % to 105 % has to be adjusted in the requested order without interruption. It is not possible to skip or stop and restart the adjustment.)
- h) The adjustment has to be finished and stored by pressing " \uparrow ".

After storage the new adjustment is permanently available and can be switched "on" or "off" by function F51.

Note:

When manually adjustment is active, the user is responsible for the measurement accuracy.

Activating/deactivating manual adjustment table (F51)

| Description | Selection | Key | Indication |
|------------------------|--------------|----------------|---------------------|
| Change to setting mode | | Enter | Display mode F1- |
| Setting mode | | 4 x → Enter | F5- F51 |
| Selection | | Enter | F51 -1 or -2 (*) |
| | Change state | \rightarrow | F51 -2 or -1 |
| | Take state | Enter | F51 |
| Back to display mode | | ↑ (| F5- |
| | | Ŷ | Display mode |

(*) -1 : manual adjustment OFF;

-2 : manual adjustment ON



Input of manual adjustment table (F52)

The manual adjustment table is input as follows:

| Description | Selection | Key | Indication |
|------------------------|---|---|--|
| Change to setting mode | | Enter | Display mode F1- |
| Setting mode | | 4 x → Enter → | F5- F51 F52 |
| Selection | 5 %- point 15 %- point 25 %- point 35 %- point 45 %- point 55 %- point 65 %- point 75 %- point 85 %- point 95 %- point 105 %- point | Enter Enter Enter Enter Enter Enter Enter Enter Enter Enter Enter Enter Enter | F52 F52 -5 F52 -15 F52 -25 F52 -35 F52 -35 F52 -45 F52 -55 F52 -65 F52 -65 F52 -75 F52 -85 F52 -95 F52 -105 |
| Back to display mode | | ↑ ↑ | F5- Display mode |

2. Manual "wet" adjustment by comparison to a reference master meter with the real process fluid at operating conditions:

This adjustment is useful under the following conditions:

- The original manufacturer's calibration is not available or needs to be renewed. Or
- The user is not able to recalculate the new mm to flow rate table. And
- The user has the possibility to compare the meter indication with a master meter with the process fluid at process conditions.

In these cases the following steps have to be performed:

- a) Place the DS25 in line with the master meter in an installation allowing controlled flow with the process fluid at process conditions in a flow range from 5 % to 105 % of the expected flow range.
- b) Go to menu function F51 and press ENTER to switch to manual adjustment mode. (Switching back to the original adjustment is possible by pressing ENTER again).
- c) Go to menu function F52 in order to start the manual adjustment.
- d) Set the flow to 5 % of the new flow rate indicated by the master.
- e) Press ENTER to adjust the first 5 % point.
- f) Repeat steps 2.d) to 2.e) for the 15 %; 25 %; 35 %; 45 %; 55 %; 65 %; 75 %; 85 %; 95 % and 105 % points. (Note: The whole loop from 5 % to 105 % has to be adjusted in the requested order without interruption. It is not possible to skip or stop and restart the adjustment.)
- g) The adjustment has to be finished and stored by pressing " \uparrow ".

After storage the new adjustment is permanently available and can be switched "on" or "off" by function F51.

For the manual adjustment procedure according to the two cases described the following remarks have to be taken into account:

- After manual adjustment the flow-scale of the indicator is no longer valid.
- The display will only indicate in % of the new flow range.
- Switching of units is impossible.
- The indicator can be always resetted to the original adjustment according to manufacturers calibration at any time.
- The given procedures will only adjust the current output and the display to the new measuring range for a different fluid and/or new process conditions.
- The result of this adjustment is NOT a calibration! If proof of the new adjustment is requested a real calibration by comparison to a standard has to be made after adjustment!
- The following interactions with other functions apply:

Interaction with other functions:

| | Action | Function | Effect |
|----|--|----------|---|
| 1. | Setting of manual adjustment values | F52 -5 | Manual adjustment table is overwritten |
| 2. | Activating of manual adjustment table | F51 -2 | Manual adjustment table active %-indication only Totalizer does not count No other flow rate unit selectable Function F64 for option /A2 has no effect, with manual adjustment |
| 3. | Deactivating of manual adjustment table | F51 -1 | Standard adjustment table active F11 is set to flow rate Flow unit is the same as before activating manual adjustment Totalizer value is the same as before activating manual adjustment |

Due to the limitations described it is strongly recommended to order a new scale and EEPROM from manufacturer (this gives a real new flow scale without new calibration) or to order a new calibration by the manufacturer together with a new scale and EEPROM for the new fluid and/or new process conditions (this gives new adjustment plus new calibration).



Functions F61 and F62 enable the indication of revision states for hardware, software of calibration EEPROM and internal EEPROM.

The indication is called up as follows:

| Description | Selection | Key | Indication |
|------------------------|-----------|---------------|-----------------------------------|
| | | | Display mode |
| Change to setting mode | | Enter | F1- |
| Setting mode | | 5 x → | F6- |
| Revision | | Enter | F61 |
| | | 2 x → | Hhh ¹ Fff ² |
| Setting mode | | ↑ | F61 |
| EEPROM Revision | | \rightarrow | F62 |
| | | Enter | Aaa ³ Ccc ⁴ |
| Back to display mode | | ↑ | F6- |
| | | ↑ | Display mode |

 1 H = Hardware 2 F = Firmware 3 A = Internal EEPROM 4 C = Calibration-EEPROM

Current output test (F63)

Function F63 sets the output current to 0/4 mA or 20 mA respectively.

With this you can determine whether output current correction by function F32 is required. The adjustment of the current output is as follows:

| Description | Selection | Key | Indication |
|------------------------|-------------------------------|-------------------------|--------------------------|
| Change to setting mode | | Enter | Display mode F1- |
| Setting mode | | 5 x → Enter Enter | F6- F61 F63 |
| Selection or | Output 0/4 mA Output 20 mA | Enter → Enter | F63 0/4 F63 20 F63 |
| Back to display mode | | ↑ ↑ | F6- Display mode |

Note:

During selection you can switch between 0/4 mA and 20 mA with the" \rightarrow "-key.

If you press "↑" instead of "Enter", you can return from the selected point to the previous menu item without activating the displayed parameter.

F64 allows switching between the standard calibration table and a calibration table of the remote version (option /A16 for high temperatures). The adjustment has to be performed according to the DS25 type (MS code).

This is done as follows:

| Description | Selection | Key | Indication |
|------------------------|----------------------------|-------------------------|-------------------------|
| Change to setting mode | | Enter | Display mode F1- |
| Setting mode | | 5 x → Enter 3 x → | F6- F61 F64 |
| Selection or | Standard Remote Version | Enter → Enter | F64 -1 F64 -2 F64 |
| Back to display mode | | ↑ ↑ | F6- Display mode |

Note:

If you press "[↑]" instead of "Enter", you can return from the selected point to the previous menu without activating the displayed parameter.

Master Reset (F65)

If the unit shows aberrant behavior or does not execute functions any longer, function F65 allows a master reset of the micro controller.

Attention:

All parameter settings are reset to factory settings (see operation menu).

The master reset is executed as follows:

| Description | Selection | Key | Indication |
|------------------------|-----------|-------------------------|---------------------|
| Change to setting mode | | Enter | Display mode F1- |
| Setting mode | | 5 x → Enter 4 x → | F6- F61 F65 |
| Selection | Reset | Enter Enter | F65 -1 F65 |
| Back to display mode | | ↑ ↑ | F6- Display mode |

Note:

If you press "[↑]" instead of "Enter", you can return from the selected point to the previous menu without activating the displayed parameter.

Function

Float

Pulsating movements of the flow medium (gasses, liquids) lead to fluctuations of the float and with that to fluctuations of the tap system/pointer. Therefore the electrical measuring signal permanently changes and with that the display value and the output current value.

The fluctuations can be reduced with the help of the damping function "F21". That shows however that the medium still flows and the float/the tap system is not blocked. This means that in most applications there is a permanently changing measuring signal which can be used for the recognition of the movement or the blockade of the float.

Basic noise

Since it is an electronic evaluation circuit, permanently minimal fluctuations of the measuring signal appear. The basic noise is caused by vibrations in the plant as well as by temperature influences or external magnetic fields. The basic noise also appears, if

- no medium flows through the measuring pipe
- the float and with that the tap system are in the rest position
- the float/the tap system is blocked.

Float-Blocking-Indication

The function of the Float-Blocking-Indication allows the electronic transmitter to distinguish the fluctuations, which are caused by a moving float, with the fluctuations of the basic noise to state a fault status. If the measuring signal does not exceed the autozero value during a defined supervision time, this is recognized as blockade and an error condition is shown.

Operation

Switching on

At delivery of the equipment the Float-Blocking-Indication is turned off. By the function "F71 2" the Float-Blocking-Indication can be activated.

Autozero function

The autozero function is called to find out the level of basic noise in the application. This is started with the function "F74 1" and lasts for 90 seconds. While the autozero function is running the value "0.000" is displayed and the 4 bars will flash below the numbers. After approx. 80 seconds the current autozero value appears on the display. This value gets stored and will not be lost after power off / on the DS25 or after switching off / on the Float-Move-Detection-function. The stored value is typed over first after a renewed autozero.

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Autozero without flow

To execute the autozero function the following expiry is recommended:

- Plant in operation (measuring tube filled with medium)
- Drive flow to zero (place float into rest position)
- Raise the pointer to 10 % to 20 % of the flow and fix it on the scale with adhesive tapes or underlayed paper stripe
- Start Autozero function by menu.
- Check Autozero value after approx. 80 seconds.

During the Autozero function it absolutely has to be respected that:

- the DS25 is not moved by touching or using the 2 buttons.
- the pointer is protected against slipping.
- the tube is not exposed to strong tremors

If these prerequisites are not adhered, it comes to the inquiry of too high autozero results. This leads that a relatively quiet flow can trigger the Float-Blocking-Indication.

Autozero with flow

The Autozero function can be carried out also under flow, if the flow cannot be switched off. To this the following expiry is recommended:

- Plant in operation (measuring tube filled with medium)
- Move flow to constant value (preferably between 10 % and 40 %)
- Fix pointer on the oriented scale factor with adhesive tapes or underlayed paper stripe
- Start Autozero function by menu.
- Check Autozero value after approx. 80 seconds.

It has to be respected on this absolutely, for this the flow is constant during the Autozero duration! Normally at this variant higher Autozero results must be expected !

Autozero range

The factory default autozero value is zero (0.000).

At the inquiry of the autozero value it has to be respected that the pointer / tap system are not in the rest position. In this case the autozero value is zero and the Float-Move-Detection does not work. Normally the autozero value is smaller than 0.200. If higher results should appear in the application, a multiple inquiry of the autozero value is recommended to confirm the value.

Supervision range (measuring range)

The measuring range in which Float-Move-Detection is active lies between 5 % and 105 % of the maximum flow Qmax (Factory Setting). With the help of the function "F72" this range can be reduced if a supervision is not possible or not desired in the lower flow range. The range can be restricted to 15 % or 30 % to 105 % (see point 3.1 to 3.3).

Supervision time (Time Out)

The supervision time of the measuring signal is 5 minutes (Factory Setting). If the measuring signal should not exceed the autozero value during this period, this is recognized as blockade and an error condition is shown. The supervision time can be increased with the function "F73" up to 15 minutes.

Indication of a blocking condition

After the recognition of the blockade the error code "08" is produced and the bars under the displayed measurement value are flashing (see fault behavior). Simultaneously the current output is set to a value, which enables a clear fault detection of a connected evaluation unit:

- 2 wire 4-20 mA: Error condition: IA (IG) \leq 3.6 mA
- 3 wire 4-20 mA: Error condition: IA < 0.0 mA
- 3 wire 0-20 mA: Error condition: IA = 0.0 mA

Unsuitable applications

It is possible, that the Float-Blocking-Indication - Function does not work satisfactory. This can be caused with different factors which are explained briefly here. In these cases the function of the Float-Blocking-Indication is not suitable for the respective application and it should be turned off.

Applications with gases

At applications with gases and float-damping it can happen, that the pulsating movements of the medium (and with that of the float) are damped so strongly in the measuring tube, that the measuring signal lies under the autozero value and a Float-Blocking-Indication is not possible.

Applications with high viscous media

If a high viscous medium should be used in the plant, the damping can get so high by the high viscosity of the flow that the measuring signal lies below the autozero value, and a Float-Blocking-Indication is not possible.

Applications with quiet flow

If the plant has an extremely quiet flow (gases or liquids) ,the supervision range can be limited in the lower flow range. Normally greater flow (> 30 %) causes greater medium flow deviations. The duration of the supervision can be put to 15 minutes to reach a longer supervision time.

Error message (F41)

| Code | Meaning | Remedy |
|------|---------------------------|--|
| 08 | Float blockage | Check float in tube, clean tube if necessary. |
| | Supervision time gone off | Deactivate float blocking indication or run Autozero function. |

Factory defaults / Master Reset (F65)

The DS25 is adjusted at delivery (Factory Setting):

- F71 1 Float-Move-Detection OFF
 F72 1 Lower limit value of the supervision area 5 %
 F73 1 Supervision time (Time Out) 5 min
- F74 Autozero inactive
 Autozero value = 0

After Master Reset the following attitudes are given:

- F71 1 Float-Blocking-Indication
- F72 1 Lower limit value of the supervision area 5 %
- F73 1 Supervision time (Time Out)
- F74 Autozero inactive Autozero value not changed

Damping (F21)

The selection of the damping value has no influence on the autozero value or the measurement value of the Float-Blocking-Indication!

OFF

5 min



Float-Blocking-Indication (F7x)

Function F71: On-/Off- switching of the float-blocking-indication

| Description | Selection | Key | Indication |
|------------------------|------------|---------------|--------------|
| | | - | Display mode |
| Change to setting mode | | Enter | F1- |
| Setting mode | | 6 x → | F7- |
| | | Enter | F71 |
| Selection | FBI OFF/ON | Enter | F71 |
| or | FBI ON/OFF | \rightarrow | F72 |
| | | Enter | F71 |
| Back to display mode | | Ŷ | F7- |
| | | Ŷ | Display mode |

Function F72: Selection of the lower limit value of the supervision range

| Description | Selection | Key | Indication |
|------------------------|--------------|---------------------|---------------------|
| Change to setting mode | | Enter | Display mode F1- |
| Setting mode | | 6 x → Enter → | F7- F71 F72 |
| Selection | 5 % of Qmax | Enter Enter | F72 -5 F72 |
| or | 15 % of Qmax | → Enter | F72 -15 F72 |
| or | 30 % of Qmax | → Enter | F72 -30 F72 |
| Back to display mode | | ↑ ↑ | F7- Display mode |

Function F73: Selection of the supervision time

| Description | Selection | Key | Indication |
|------------------------|------------|-------------------------|---------------------|
| Change to setting mode | | Enter | Display mode F1- |
| Setting mode | | 6 x → Enter 2 x → | F7- F71 F73 |
| Selection | 5 Minutes | Enter Enter | F73 -5 F73 |
| or | 15 Minutes | → Enter | F73 -15 F73 |
| Back to display mode | | ↑ ↑ | F7- Display mode |

Function F74: Start Autozero function and storage

| Description | Selection | Key | Indication |
|---|-----------|-------------------------|--------------------------|
| Change to setting mode | | Enter | Display mode F1- |
| Setting mode | | 6 x → Enter 3 x → | F7- F71 F74 |
| Selection Inquire autozero value (80 s) Display autozero value (10 s) | Autozero | Enter Enter | F74 -1 0.000 0.xxx |
| Back to display mode | | ↑ ↑ | F7- Display mode |

Function test

Checking free movement of pointer:

- Remove housing cover.
- After deflecting the pointer by hand, it must return to measurement value. If the pointer pivots to different values upon repeated deflections, there is too much friction in the bearings. In this case, send indication unit to service.

Checking free movement of float:

- First, free movement of pointer has to be ascertained.
- Check visually if pointer follows each flow rate change. If not, clean float and measuring tube.

Unit with electronic transmitter:

- The display must show values corresponding to indication function and measuring unit settings.
- The bars under the 8 digits must not flash. If an error occurs, the corresponding countermeasure (refer to chapter 6.2.8 error messages) has to be taken or the unit has to be sent to service.
- Without flow, the output current must be 0 or 4 mA. At a flow rate of 100 % the current must be 20 mA.

Measuring tube, float

The DS25 is maintenance-free. If contamination of the measuring tube impairs the mobility of the float, the tube and the float have to be cleaned. To do this, the DS25 has to be removed from the pipe.

Replacement or cleaning of the float:

- Remove DS25 from the pipe.
- Remove upper retainer from metering tube.
- Take float stopper and float out through the top of metering tube.
- Clean float and metering cone.
- Insert float and float stopper into the metering tube.
- Set retainer into tube.
- Check float for free movement.
- Install DS25 to the pipe.

Attention:

Do not expose float to strong alternating magnetic fields. The float and especially its measuring edge must not be damaged.

Electronic transmitter

The electronic transmitter is maintenance-free. The electronic section is sealed and cannot be repaired. Since the transmitter has been adjusted fully to the mechanical components at the factory, single components can only be replaced with a reduction of the accuracy.

Solely the display and operation unit (LCD PCB) can be replaced. For this the unit has to be sent to service.

The current output can be adjusted by means of software. The current output test in chapter "Current output test" determines whether an adjustment is necessary. The adjustment is carried out according to chapter "Selection / Adjustment 4-20 mA / 0-20 mA".

The power supply PCB of 4-wire units includes a fuse. For fuse replacement be sure to switch off the power supply. Only use fuses with the capacity and characteristic as imprinted on the fuse holder.

