

Operating Manual

FD39

Digital flow transmitter / switch

With pressure sensors

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1 Safety guidelines

1.1 General Information



This operating manual contains instructions fundamental to the installation, operation and maintenance of the instrument that must be observed unconditionally. It must be read by the assembler, operator and the specialized personnel in charge of the instrument before it is installed and put into operation.

This operating manual is part of the product and must be kept close by where it is easily accessible to the responsible specialized personnel.

The subsequent sections in particular the instructions on assembly, commissioning and maintenance contain important safety instructions, non-observance of which can endanger persons, animals, the environment and physical objects.

1.1 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 train-



ing, their skills and experience and their knowledge of the pertinent standards.

1.2 Risks due to Non-Observance of Safety Instructions

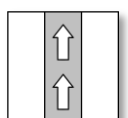
Non-observance of these safety instructions, the intended use of the instrument or the limit values given in the technical specifications can be hazardous or cause harm to persons, the environment or the system itself.

The manufacturer will not be liable for damage claims if this should happen.

1.3 Safety Instructions for the Operating Company and the Operator

The safety instructions on 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 media and incorrect installation of the instrument must be eliminated. For more information, please see the applicable national and international regulations.



1.4 Unauthorised Modification

Modifications of or other technical alterations to the instrument by the customer are not permitted. This also applies to replacement parts. Any modifications / alterations required must be carried out by Fischer Mess- und Regeltechnik GmbH only.

1.5 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.

1.6 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.

1.7 Symbol explanation



WARNING!

... indicates a potentially dangerous situation, non-observance of which could endanger persons, animals, the environment or objects.



INFORMATION!

... highlights important information for efficient and smooth operation.

2 Application purpose

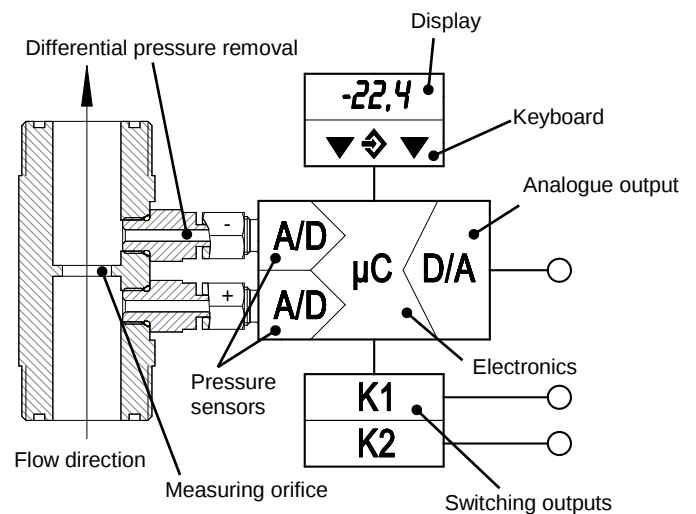
The device serves to measure the flow of non-aggressive fluid and gaseous media. It is imperative to consult the manufacturer before using the device for aggressive media because media-compatible materials need to be used for the measuring path.

The device may only be used for the application defined by the user and manufacturer.

Please also observe the data information sheet enclosed as an attachment to these operating instructions.

3 Description of the product and functional description

3.1 Function diagram



3.2 Design and mode of operation

The measuring path comprises a measuring panel with differential pressure removal boreholes and two independent pressure sensors. The differential pressure created at the measuring panel is measured by the pressure sensors and turned into a root extracted analogue output signal by the microprocessor-controlled electronics.

The standard signals 0/4...20 mA and 0...10V are available for the analogue output.

Optionally there are additional switch outputs available (cf. order code).

4 Installation and assembly

The device is designed for installation in pipes according to ISO 5167-1.

The measuring panel must be adapted to the inner diameter of the pipe.

4.1 Process connection

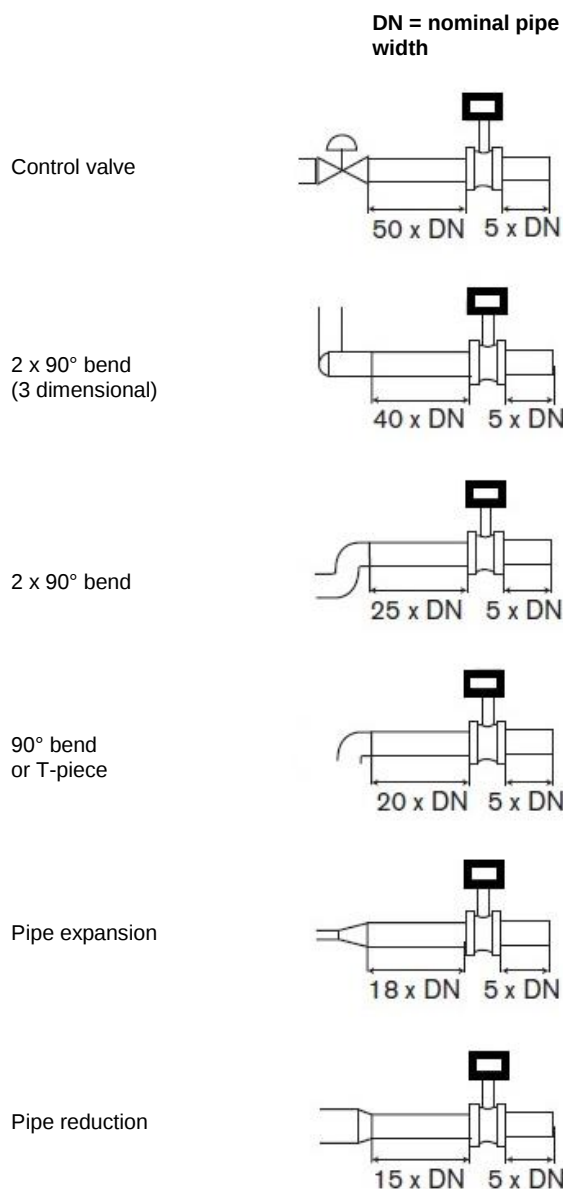
- By authorized and qualified specialized personnel only.
- This must be depressurized when connecting the pipes.
- Check the suitability of the device for the media that is to be measured.
- Maximum pressures must be observed.
- Check that all connections are tight before use.

Connection threads in the pipes must have O-ring seals. The flow transmitter must be fitted between two straight cylindrical pipes. Deposits, edges and offsets that protrude into the flow must be avoided. The pipe must be completely filled with the medium

being measured; avoid air bubbles in the fluid. Cavitation must be prevented.

The DIN ISO 5167-1 defines the stipulated feed and outlet paths for the various installation situations. These path dimensions must be observed to ensure smooth flow conditions.

The following shows the most common application cases.

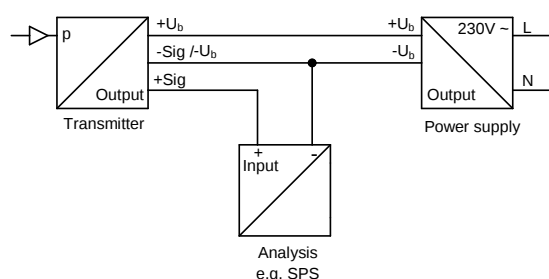


4.2 Electronic connection

- The electrical connection may only be realised by authorized and qualified specialized personnel.
- Isolate the installation before connecting the device.
- Do not remove the connecting plug while energized

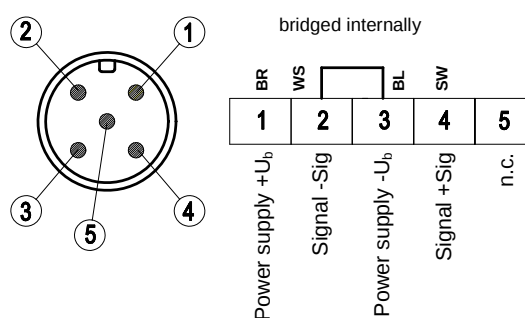
- The stated protection type only applies when connected and if a suitable connector is used.

3-conductor circuit

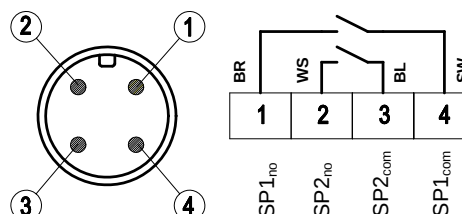


4.2.1 Version with M12 plug connectors

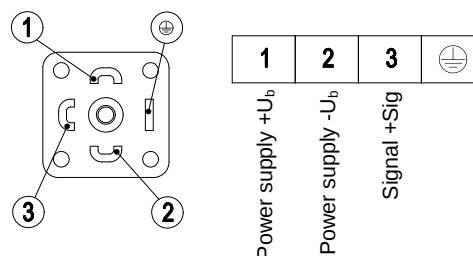
Connector 1: Power supply and output signal



OPTION connector 2: switch outputs



4.2.2 Version with rectangular connector



No switch outputs are possible in models with rectangular connectors.

5 Commissioning

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 instrument.

5.1 LED display



The 3½ digit LED display shows the current flow in normal mode. The unit selected according to the order code is shown on the right of the display. Above the display, two LEDs ❶ ❷ symbolise the status of the switch outputs.

Please note that the presentation of the figures is restricted to the range -1999 to +1999 in a 3½ digit display.

5.2 Operating keys

The operating keys have the following function:

- ▼ Page down menu
Reduce value
- ↔ Enter key
- ▲ Page up menu
Increase value

By using the middle ↔ key on the membrane keypad you can access the parameter menu (setting mode). The reading now shows the text **ESC**.

Press the right key ▲ to move upwards in the menu, where a number of parameters can be selected.

By pressing the left-hand key ▼ you can page downwards through the menu until you return the **ESC** parameter.

Press the middle key ↔ to call up a parameter.

You can set the parameter value using the keys ▼ and ▲.

To confirm a set parameter value, press the key ↔.

All set parameters are only saved once you leave the menu via the **ESC** parameter.

5.3 Configuration

The device parameters are set ex-works. To this end, the panel questionnaire (see attachment) needs to be completed.



Setting the parameters configures the device to the measuring path. Changing any of these parameters may limit or destroy the functional capability.

It may be necessary to display or modify some parameters on site.

Proceed as follows to set a parameter:

- Press the enter key ↔ to switch to the menu. **ESC** will appear on the display.
- Use the arrow keys ▼ ▲ to select a parameter from the list.
- Press the enter key ↔ to call up the parameter.
- Use the arrow keys ▼ ▲ to set the required value.
- Press the enter key ↔ to save the value.

After setting all parameters, leave the menu as follows:¹

- Use the arrow keys ▼ ▲ to set the **ESC** parameter. You will find these at the start and also at the end of the list of parameters.
- Press the enter key ↔ to leave to the menu.

5.3.1 Display setting

The flow is calculated from the differential pressure, i.e. by subtracting the differential pressure before and after the panel. In some cases it helps to look at these values individually. You can select the display value via the **dSP** parameter.

dSP = 0 shows P1 (Symbol P1 shines).

dSP = 1 shows P2 (Symbol P2 shines).

dSP = 2 shows the differential pressure (Symbols P1 and P2 shine). This is the default setting.

5.3.2 Display options

The parameter **dD** enables the reading to settle if the measuring value fluctuates heavily. This filter function is similar to the **dAN** function, but only impacts on the reading not on the output signal. At **dD** = -1 only the switch point LEDs are controlled. At **dD** = -2 these are switched off.

5.3.3 Zero point control and adjustment

Due to the fact that the differential pressure can be overlayed by static pressure depending on the two external pressure sensors, the differential pressure is not always zero when the system is idle.

¹ All set parameter values are only valid once you leave the menu via the **ESC** parameter.

The menu item **-0-** can now be used to set the current difference to zero. After **◆**, **▲** or **▼** are used to save the displayed value. Immediately, the saved value is subtracted from the measured differential pressure, i.e. the static differential pressure is eliminated (this display now shows zero).

Quit the menu by pressing **◆**.

5.3.4 Damping and zero-point stabilising

If there are unsteady pressure readings at this point of time or during operation, you can use parameters **dAN** and **nP** to stabilise the reading (and the output signal).

The effect of parameter **dAN** corresponds to a capillary throttle. However it only affects the display, output signal and switch points, not the measuring cell itself. This parameter can be used to set the response time for pressure jumps. The value range is 0.0 s to 100.0 s.



But with maximum damping, it will take more than 2 minutes for the reading also to reach zero after a pressure jump from nominal pressure (100 %) to zero!

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 zero (differential) pressure is expected.

This is precisely the purpose of parameter **nP**. Its value defines a measuring value range around zero. The measuring value is set to zero within this range.

Example:

A value of 0.08 mbar² is entered for **nP**. In this case all pressures within the range of -0.08 mbar to +0.08 mbar are set to zero. The reading will only not indicate zero any more if the pressure exceeds these limits. However the pressure value and display do not correspond to one hundred percent. The measuring pressure and reading match again when the double value, in this case 0.16 mbar, is reached again.

5.3.5 Switch points

The two switch outputs **①** **②** are configured by four parameters respectively.

The function of the switching output **①** is determined by the parameters **rIA**, **rIE**, **rId** and **rIF**.

The function of the switching output **②** is determined by the parameters **r2R**, **r2E**, **r2d** and **r2F**.

rIA defines the deactivation point, **rIE** defines the activation point of switch output 1. The values are set in the valid measurement unit (shown on the right).

Together, the two parameters **rIA** and **rIE** determine the switch function of switch output 1:

If **rIA** is smaller than **rIE**, the output switches on, if the measured value exceeds **rIE**. It is only switched off again if the measured value **rIA** is undercut (hysteresis function).

If **rIA** = **rIE**, the output switches on if the measured value exceeds **rIE** and off, if the measured value undercuts **rIA**.

If **rIA** is larger than **rIE**, the output switches on, if **rIE** < measured value < **rIA** applies (window function).

Both parameters can be set independently over the entire range.

If the measuring unit is switched over, the switching points are converted accordingly. Rounding errors may cause deviations in the last position.

rId allows the reaction of the switch output 1 to be delayed by between 0.0 and 100.0 s. This value applies equally for switching on and off.

rIF reverses the function of the switch output. If the value = 1, the switch output works as an NO contact, if the value = 2, the switch output works as a NC contact.

5.3.6 Reset to default

The function **rE5** allows all settings to be reset to default values. The default values can only be defined via a PC interface.

5.3.7 Password

The last menu item **-P-** is used to enter a password. A value between 001 and 999 can be selected for the password. The value 000 cancels the password function.

If a password has been issued, the text **PAS** appears after **ESC** and **◆** and you need to enter the correct value with **◆** and **▲**, **▼**. You can only go to all other menu items after this. In the event of an error, the display returns to the start of the menu **ESC**.



If the password is forgotten, it can only be reset by the manufacturer or overwritten via the PC adapter.

² 0.08 mbar $\triangleq$ 8 Pa

5.4 Parameter overview

After switching on the device, it will briefly indicate the software version number and before entering the normal operating mode. By using the middle **↕** key on the membrane keypad you can access the parameter menu. The reading now shows the text **ESC**. By using the right **▶** key, you can choose the parameters from the following list one by one:



Note:

The parameters marked in blue are set ex-works to the measuring path and may not be changed.

PAS	Password entry (only appears for an active password), value range 000...999 000 = deactivated	r2E	Activation point of switch output ②
-0-	Setting the input differential pressure to zero.	r2d	Switch delay from switch output ② value range 0.0 to 100.0s. The value applies equally for activation and deactivation.
dSP	Select the displayed measuring value	r2F	Switch function from switch output ① Value range 1,2 1 = switch output as NO contact, 2 = switch output as NC contact.
dAN	Damping (jump response time T90), value range 0.0...100.0s	on	Measuring range unit Don't change the factory setting
dD	Display damping -2...0...100. -2 = Display off, LED switch point off -1 = Display off, LED switch point on 0 = Display on, LED switch point on 1...100 Display damping	nr	Start of measuring range Don't change the factory setting
r1A	Deactivation point of switch output ①	ne	End of measuring range Don't change the factory setting
r1E	Activation point of switch output ①	narF	Start of measuring range (display value for free unit) Don't change the factory setting
r1d	Switch delay from switch output ① value range 0.0 to 100.0s. The value applies equally for activation and deactivation.	neF	Start of measuring range (display value for free unit) Don't change the factory setting
r1F	Switch function from switch output ① Value range 1,2 1 = switch output as NO contact, 2 = switch output as NC contact.	nP	Zero-point stabilisation. Value range 0 to 100 digits. The value works symmetrically around the real zero-point.
r2A	Deactivation point of switch output ②	dPF	Free Unit Decimal point position Don't change the factory setting
		F	Characteristic curve function Don't change the factory setting
		Lin	Menu jump Submenu table processing Don't change the factory setting
		oGI	Limit value minimum output signal Don't change the factory setting

oG2	Limit value maximum output signal Don't change the factory setting
oEr	Error signal (output signal in the event of a fault) Don't change the factory setting
rES	Reset all parameters to standard values (specify the standard values via the PC)
-P-	Password setting Value range 000 to 999 The value 000 means no password protection.

6 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 must be adapted to the operating and ambient conditions. If various instrument components interact, the operating instructions of all the other instruments also need to be observed.

7 Transport

The instrument must not be exposed to mechanical shocks. It may only be transported in packaging specifically intended for transport.

8 Service

All damaged or faulty instruments must be sent directly to our repair department. Please coordinate all shipments with our sales department.



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

9 Accessories

EU03 Transmitter PC Interface (on request).

10 Disposal

For the sake of the environment

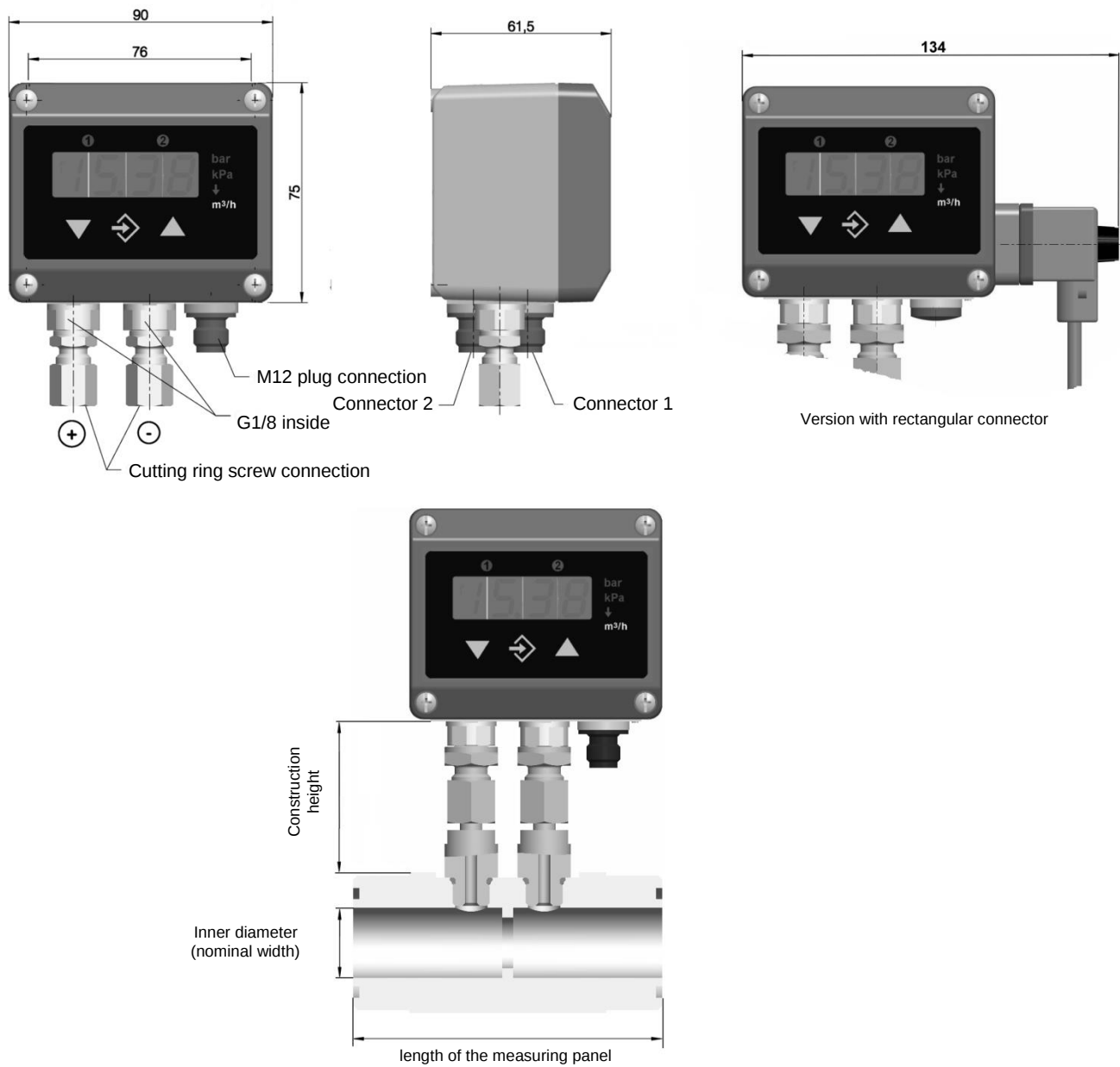


Please help to protect our environment and dispose of or recycle used instruments as required by the applicable regulations.

11 Technical Specification

	General			
Admissible ambient temperature	-10 ... 70 °C			
Admissible media temperature	-10 ... 80 °C			
Admissible storage temperature	-20 ... 70 °C			
Enclosure protection class	IP65			
	Electrical data			
Nominal voltage	24 V AC/DC			
Admissible operating voltage U _b	12 ... 32 V AC/DC			
Electrical connection type	Three-wire			
Characteristic curve	root extracted			
Output signal	0/4 ... 20 mA		0 ... 10 V	
Admissible apparent ohmic resistance	U _b ≤ 26V	R _L ≤ (U _b - 4V) /0.02A	U _b ≤ 15V	R _L ≥ 2 kΩ
	U _b > 26V	R _L ≤ 1100 Ω	U _b >15V	R _L ≥10 kΩ
Switch contacts	2 x potential-free relay contacts, One-pin activator NO/NC progr.		2 x potential-free semiconductor switch (MOSFET), One-pin activator NO/NC progr.	
	U _{max}	= 32 V AC/DC	U	= 3...32 V AC/DC
	I _{max}	= 2 A	I _{max}	= 0.25 A
	P _{max}	= 64 W/VA	P _{max}	= 8 W/VA
			R _{ON}	≤ 4 Ω
Power consumption	approx. 2 W / VA			
Display	3.5 character LED			
	Connections			
Process connection	On request (cf. order code)			
electr. connection	2 x round connectors M12			
	Connector 1 for supply and analogue output signal (5-pin)			
	Connector 2 for switch contacts (4-pin)			
	1 x rectangular connector DIN EN 175 301 -803-A			
	Materials			
Casing	Polyamide PA 6.6			
Media-contacting material	Stainless steel 1.4305, VITON®, ceramic (Al ₂ O ₃ . 96%)			
	Panel material on request (cf. order code)			
	Assembly			
	Installation in pipes acc. to ISO 5167-1			

12 Dimensional drawings (All dimensions in mm unless stated otherwise)



The dimensions of the measuring panel, in particular the construction height and overall length, are stated in the data information sheet and are recalculated for every application.

13 Order Codes

Digital flow transmitter / switch With pressure sensors

FD39

				0			K				
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Nominal width/connection thread

DN15 G1.....>	1	A
DN20 G1¼.....>	2	B
DN25 G1½.....>	3	C
DN32 G2.....>	4	D
DN40 G2¼.....>	5	E
DN50 G2¾.....>	6	F
DN63 G3.....>	7	G

Media-Contact Seal

EPDM.....>	E
NBR.....>	N
Viton.....>	V
Kalrez®.....>	K

Material used for the measuring panel

Polypropylene PP grey.....>	A
Polypropylene PP natural.....>	B
CrNi steel 1.4404.....>	C
Polyvinylidene fluoride PVDF.....>	D

Measuring medium

Gas.....>	G
Liquid.....>	F

Electrical output signal

0 ... 20 mA Three-phase root extracted.....>	E
4 ... 20 mA Three-phase root extracted.....>	F
0 ... 10 V Three-phase root extracted.....>	G

Operating voltage

24 V AC/DC (12...32 V AC/DC).....>	K
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Measuring unit

Without measuring unit>	0
Nm³/h (only for gases).....>	A
m³/h.....>	B
l/min.....>	F

Measured Value Display

Without measuring value display.....>	0
3½ digit LED measuring value display without contacts.....>	7
3½ digit LED measuring value display with 2 potential-free contacts.....>	3
3½ digit LED measuring value display with 2 potential-free semiconductor switches.....>	6

Electrical connection

Rectangular connector DIN EN 175 301 -803-A (only possible without contacts).....>	H
M12 plug connection.....>	M

Flow direction

Vertical.....>	A
Horizontal.....>	D

Customer information

Flow ratel/min
.....m³/h
.....Nm³/h

Max. static pressurebar

 A completed data information sheet is imperative in order to produce the measuring panel.

14 Data information sheet

FB/FD flow measuring paths

Installation position	Vertical from bottom to top	☐	
	Vertical from top to bottom	☐	
	Horizontal from left to right	☐	
	Horizontal from right to left	☐	
Nominal width/connection thread:	DN15 G1"	☐	
	DN20 G1½"	☐	
	DN25 G1½"	☐	
	DN32 G2"	☐	
	DN40 G2½"	☐	
	DN50 G 2¾"	☐	
	DN63 G3"	☐	
	Special: ☐ DN:	Connec- tion:	
In flange version:	Flange standard DIN:		
	Nominal width DN:		
	Pressure level PN:		
Pipe:	Inner diameter of the pipe:		
Pipe quality:	Pipe material:		
Corrosive components:	Rusted ☐	Smooth ☐	Seam- less ☐
	YES ☐		No ☐
Mechanical soiling:	YES ☐ ⇒		No ☐
Flow:	m³/h		
Required differential pressure:	mbar		
Static pressure:	mbar		
Max. allowed pressure loss:	mbar		
Medium:	Liquid: ☐	Gas: ☐	
	Designation:		
	Medium temp.: °C	Ambient temp.: °C	
	Norm density at 20°C:		
	Density at operating temperature:		
	Cinematic viscosity (v):	m²/s	
Panel material:	PP ☐	1.4305 ☐	
	PVDF ☐	1.4404 ☐	
	Special: ☐ ⇒	Material:	
Sealing material:	NBR: ☐	Viton: ☐	
	EPDM: ☐	Kalrez®: ☐	
	Special: ☐ ⇒	Material:	
Measuring unit:	Without:	Nm³/h: ☐	
	m³/h:	l/min: ☐	
	Special: ☐ ⇒	Unit:	
Display:	Without display (only transmitter)	☐	
	3½ digit LED measuring value display	☐	
Switch points: ³	None ☐	1 point ☐	2 points ☐
Required connection:	Round connect- or M12 ☐	Rectangular con- nector DIN 43 650 ☐	
	Special connec- tion ☐ ⇒		

³ Not possible for rectangular connectors

15 Manufacturer's Declarations and Certificates

EG-Konformitätserklärung

Wir erklären in alleiniger Verantwortung, dass nachstehend genannte Produkte

EC Declaration of Conformity

We declare under our sole responsibility that the products mentioned below

Digitaler Durchflusstransmitter /-schalter Digital Flow Transmitter / Switch

FD39 #####

gemäß gültigem Datenblatt DB_DE_FD39
übereinstimmen mit den

as spec. by the current data sheet DB_EN_FD39
complies with

EG-Richtlinien

2004/108/EG (EMV)

EC-directives

2004/108/EC (EMC)

Die Produkte wurden entsprechend der folgenden Normen geprüft (Störfestigkeit für Industriebereich, Störaussendung für Wohnbereich):

DIN EN 61326-1:2006-10
DIN EN 61326-2-3:2007-05
DIN EN 61010-1:2002-08

The products were tested in compliance with the following standard (Interference immunity for industrial environments, interface emission for residential environments)

DIN EN 61326-1:2006-10
DIN EN 61326-2-3:2007-05
DIN EN 61010-1:2002-08

Die Geräte werden gekennzeichnet mit:

The devices bear the following marking:



Bad Salzungen, 29.07.11
(Ort, Datum / Place, date)


(rechtsverb. Unterschrift / legally binding signature)

