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Flow-Meter DF 9648

Flow measurement with pulse sensors

Features

DIN 96x48 mm

- LED-Display 14.2 mm red
- Measuring range programmable
  -99999 ... 99999 Digit
- 0 ... 3 decimals programmable
- 2 totalizers programmable
  indicating range -99999 ... 999999 digit
- Additional 2nd measuring input
- Pulse output for external evaluation
- Max. 4 alarm outputs,
  relay (SPDT) or electronic voltage free
- Isolated analog output
  0/4 ... 20 mA, 0/2 ... 10 V DC (depends on burden)
- Front protection IP65

General

The Flow-Meter DF9648 is used in food technology, chemical and pharmaceutical industry and water technology. In connection with any type of pulse flow sensor the actual flow rate and total flow can be measured, displayed and converted to an analog output signal. Using the alarm outputs a dosage of quantity may be realized.

Short information

Programming	Parameters are programmed via front side membrane keypad
Flow rate measurement	The measured values are averaged continuously over a period of 0.1 ... 10 s (programmable). Please notice, for real measurement at least 2 positive pulses are needed within programmed time interval.
Totalizers	Totalizers can be reset manually or by external signal. While the daily totalizer is also reset with power-off, the overall totalizer is zero voltage protected
Alarm outputs	Switching performance min. or max., hysteresis, on-delay time and off-delay time are programmable in range from 1 s up to 9 h.
Analog output	Proportional to the display value an isolated analog output signal 0 ... 20 mA / 0 ... 10 V DC or 4 ... 20 mA / 2 ... 10 V DC can be generated. Start value and end value are programmable. Dependent on burden, the output switches from current to voltage.
Pulse output	Allows an external summation of flow quantity.

Technical data

Power supply

Supply voltage	:	230 V AC ±10 %; 115 V AC ±10 %; 24V AC ±10 % or 24 V DC ±15 %
Power consumption	:	max. 3.5 VA, with analog output 5 VA
Working temperature	:	-10 ... +55 °C
Rated voltage	:	250 V≃ acc to VDE 0110 between input/output/supply voltage degree of pollution 2, over voltage category III
Test voltage	:	4 kV=, between input/output/supply voltage
CE-Konformität	:	EN55022, EN60555, IEC61000-4-3/4/5/11/13

Measuring input

Type	:	Sensor with AC-output (coil), Namur-Sensor or e.g. Hall-Sensor (rectangular pulse) programmable. Alternative external pulses 0/5 ... 24 V DC
Input coil	:	Switching threshold programmable from ±5 ... ±2000 mV pull-down resistor 100 kΩ
Input NPN-sensor	:	Low level < 0.9 V, high level > 2.1 V, pull-up-resistor 20 kΩ
Input PNP-sensor	:	Low level < 0.9 V, high level > 2.1 V, pull-down-resistor 20 kΩ
Input Namur-sensor	:	Low level < 1.2 mA, high level > 2.1 mA, hysteresis 0.5 mA, pull-down-resistor 1 kΩ
Input relay	:	Pulse width min. 5 ms
Measuring frequence	:	Input A or B 0.1 Hz ... 15k Hz (relay max. 30 Hz) Input A and B together 0.1Hz ... 8 kHz (relay max. 30 Hz)
Reset-input	:	Low level < 0.9 V, high level > 2.1 V pull-down-resistor 20 kΩ, pulse width min. 5 ms, reset at rising edge
Accuracy	:	≤ 0.1 % ±1 Digit
Sensor supply	:	8 V DC stabilized (Namur), 24 V DC (coil, NPN, PNP, Push-Pull), Ri approx. 150 Ω, max.50 mA (25 mA with 4 relay outputs)

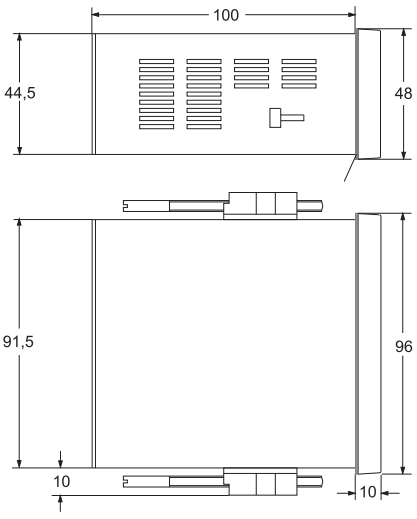
Display	:	LED 14.2 mm red
Parameter display	:	LED 2-digit red, 7 mm (parameter - and output indicator)
Display range	:	Flow = -99999 ... 999999 Digit, Totalizers = -99999 ... 0 ... 999999 Digit with leading zero suppression, max. 3 decimals daily totalizer is not voltage safe; overall totalizer is voltage safe

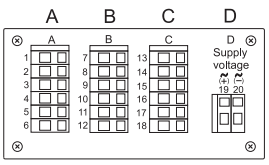
Output

Relay	:	SPDT <250 V AC <250 VA <2 A, <300 V DC <50 W<2 A
Transistor	:	max. 35 V AC/DC/100 mA, with short circuit protection and optical isolation
Analog output	:	0/4 ... 20 mA burden ≤500 Ω; 0/2 ... 10 V burden >500 Ω, isolated Automatic output changing (burden dependent)
-Accuracy	:	0.1 %; TK 0.01 %/K
Pulse output	:	Transistor ≤5 Hz, Relay ≤0,1 Hz (max 500,000 switching cycles) pulse-width 100 ms

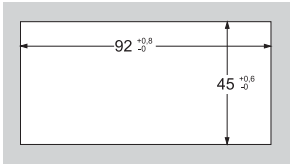
Panel case	:	DIN96x48 mm Material PA6-GF; UL94V-0
Weight	:	max. 390 g
Electrical connection	:	Clamp terminals, 2 mm² single wire, 1,5 mm² flexible wire, AWG14
Protection	:	Front IP65, terminals IP20, finger safe acc. BGV A3

Dimension





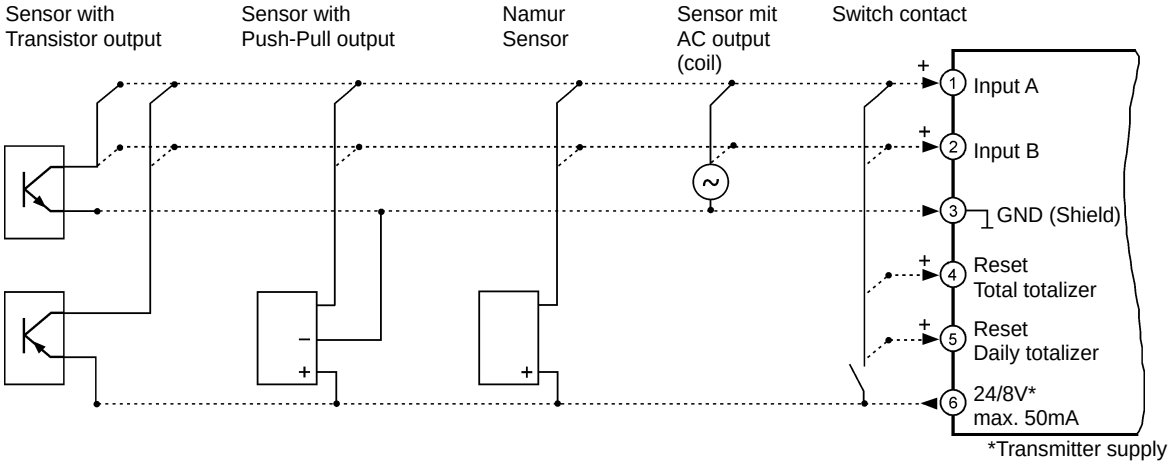
Positon terminal strips



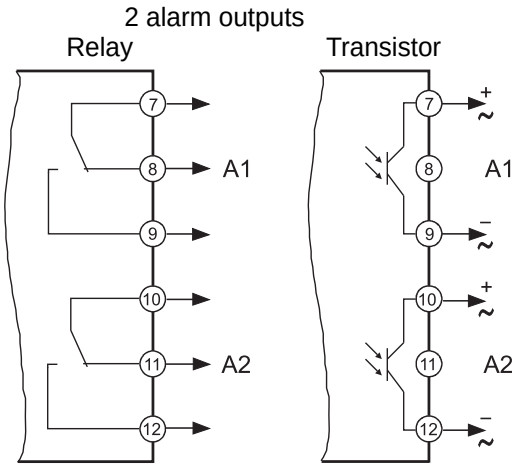
Panel cut-out acc. to
DIN 43700-96x48

Connection diagrams

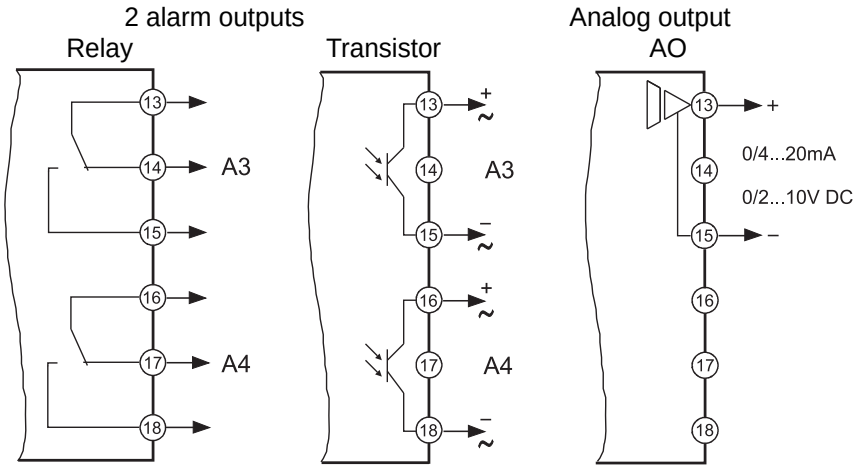
Terminal strip A



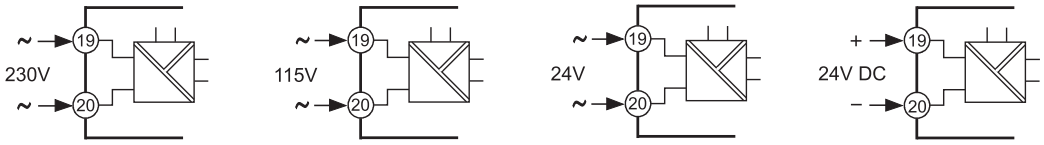
Terminal strip B (varies with version)



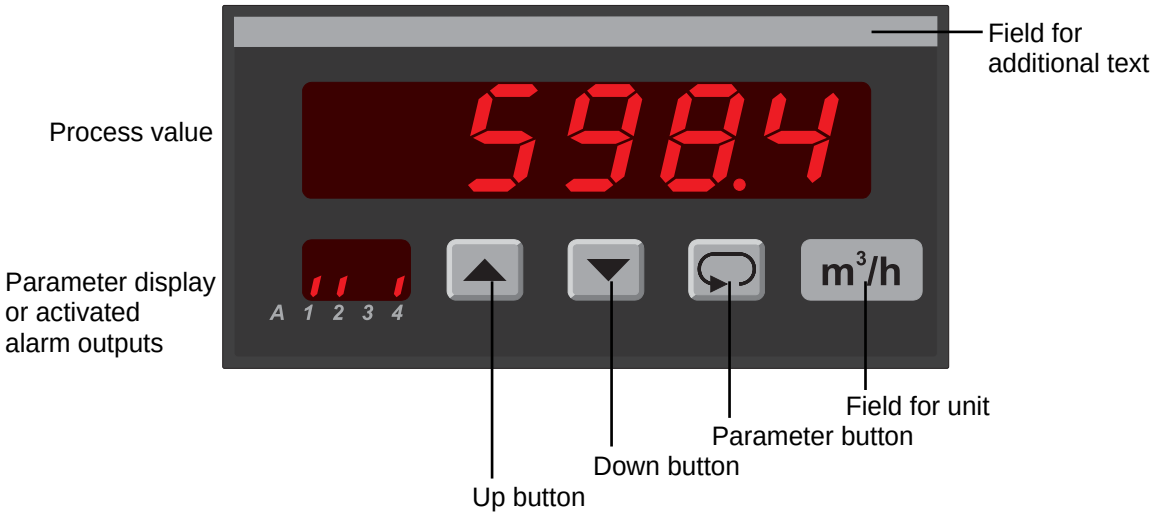
Terminal strip C (varies with version)



Terminal strip D supply voltage (varies with version)



Controls and indicators



Description

Operation of the device is arranged in 2 levels. While programming, pressing the button saves the current parameter and moves to the next programming step. For selection within a parameter or for entering data, use buttons and .

Button combinations:

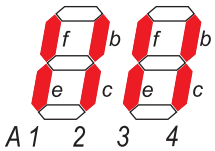
+ one parameter back.

+ setting parameter to zero or minimum value.

After powering up, the device is located in the **Working level**. The actual flow rate, daily and overall totalizers can be displayed and changed.
Pressing the button for more than 2 seconds, activates the **Configuration level**. Now all the parameters which defines the function of the panelmeter can be programmed. These are the measuring input, input configuration, totalizer, switching performance of the alarm outputs and the analog output signal.

After finishing the configuration or when no button was pushed for more than 2 minutes, the program returns to the working level. Leaving the configuration level is possible at any time by pressing the button for more than 2 seconds.

Parameter display as status indicator for the alarm outputs A1-A4.



Segments f (A1 / A3) and/or b (A2 / A4) are flashing with 2 Hz, when delay time is active.

Segments e (A1 / A3) or c (A2 / A4) are output indicators.

Error messages:

PE	When reading this message in the parameter display, a parameter failure has been occurred. The display flashes. When pushing one of the buttons the error code will be deleted and the device is running with factory settings. Configuration and function of the device must be checked. If the error occurs again, please ship the device to factory for repair service.
Loc	Programming lock active ⇒ see configuration page 10
Display flashes	Overflow of the display range

Start-up note:
Before setting into operation, the device must be configured for the intended use. ⇒ see page 6

Notes to representation

Parameter is only displayed if configured

Parameter is only displayed if included (see order code)

Note: All parameters can be called if they are not blocked by other programmed parameters and if they are available. Factory settings are shown at the configuration level in the **display graphic**.

Working level

Button	Display	Description
	23	**Primary process value** The standard version displays the flow rate as primary process value. With option 12 even the totalizer can be programmed as primary process value. Additional indication of the output state (only if installed and activated).
		Secondary process values If no button was pressed, the primary process value will be displayed automatically after 2 minutes. An overflow of a secondary process value will set display flashing with 999999 or -99999).
	12 dt	Daily totalizer (quantity of the day) Reset to "0" or programmed start value (parameter 15) by pressing buttons ▲ and ▼ simultaneous. Display will alternating between totalizer value and programmed measuring unit (see page 8, parameter 13).
	8515 ot	Overall totalizer (overall quantity) Reset not possible in working level Display will alternating between totalizer value and programmed measuring unit (see page 8, parameter 13).
	23 FL	Flow rate. If a totalizer is programmed as primary process value (see page 8, parameter 19). Display will alternating between flow rate and programmed measuring unit (see page 8, parameter 13).
	2125 A1	Setpoint alarm output A1 (acc. to configuration) Setting possible from -99999 ... 999999 digit with buttons ▲ and ▼.
		Note: Settings of alarm outputs A1 to A4 are identical.

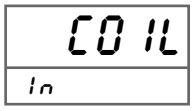
Configuration

Button **Display** **Description** (Display graphic shows factory settings)

Press 2s

Configuration level

1

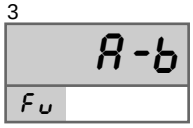


Measuring principle (sensor) input A and B
COIL : coil
NPN . PNP : transistor
NAmur : Namur
rELAIS : relay (external switch contacts)
Selection with buttons ▲ and ▼.
For sensors with push-pull output, PNP must be selected.
(e.g. flow sensor FS222, ⇒ see page 11).

2

Input sensitivity / switching level for AC-signal (COIL)
Setting possible from ± 5 ... 1999 mV with buttons ▲ and ▼.
Note: The switching level of the input should be programmed as high as possible. Please take into consideration that the amplitude of the output signal is getting lower, with less flow. Not used inputs should be connect to terminal 3 (gnd).

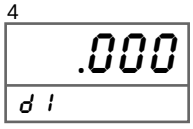
3



Input function
AuB addition of input A and B
A-b subtraction of input A and B
Selection with buttons ▲ and ▼.

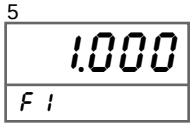
For K-factor see type label or data sheet of the used sensor.

4



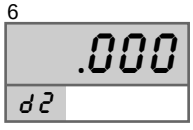
Decimals K-factor of flow sensor input A
0 ... 5 decimals
Selection with buttons ▲ and ▼.

5



K-factor of flow-sensor input A, stated in pulses/litre.
Other units must be converted to pulses/litre.
Setting possible from 1 ... 999999 digit with buttons ▲ and ▼.

6



Decimals K-factor of flow sensor input B
0 ... 5 decimals
Selection with buttons ▲ and ▼.

continue
page 7

Button **Display** **Description** (Display graphic shows factory settings)

7

K-factor from flow-sensor input B, stated in pulses/litre.
Other units must be converted to pulses/litre.
Setting possible from 1 ... 999999 digit with buttons ▲ and ▼.

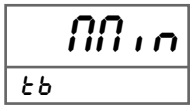
8

Measuring unit of flow

LitEr	: litre/time base
m3	: m³/time base
GALLON	: gallon (US)/time base
bArrEL	: barrel (US)/time base

Selection with buttons ▲ and ▼.
(Time base " tb " see parameter 9)

9

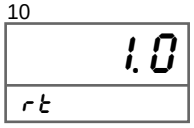


Time unit flow rate (e.g. L/s , m³/h)

SEC	: second
MMin	: minute
hour	: hour

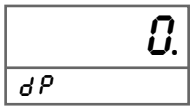
Selection with buttons ▲ and ▼.

10



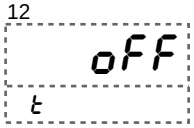
Refresh time (measuring interval)
Attention!
Within programmed refresh time at least 2 positive slopes of the input signal must be detected.
Setting possible from 0.1 ... 10.0 s with buttons ▲ and ▼.

11



Decimals of flow process value
0 ... 3 decimals
Selection with buttons ▲ and ▼.

12



Totalizers active / not active
Selection with buttons ▲ and ▼.

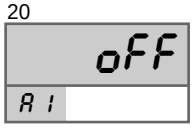
continue
page 8

Button	Display	Description (Display graphic shows factory settings)
↓	13 LitEr Ut	Measuring unit of totalizers L,tEr : litre/time base n-3 : m³/time base GALLON : gallon (US)/time base bArrEL : barrel (US)/time base Selection with buttons ▲ and ▼.
↻		
↓	14 0. td	Decimals for totalizers 0 ... 3 decimals Selection with buttons ▲ and ▼.
↻		
↓	15 0 tS	Start value of both totalizers Setting possible from -99999 ... 999999 digit with buttons ▲ and ▼.
↻		
↓	16 0 dt	Actual value of daily totalizer Reset to programmed start value (parameter 15) by pressing buttons ▲ and ▼ at the same time.
↻		
↓	17 0 ot	Actual value of overall totalizer Reset to programmed start value (parameter 15) by pressing buttons ▲ and ▼ at the same time.
↻		
↓	18 oFF Er	External reset of overall totalizer oFF : only internal reset in the configuration level allowed on : external reset signal connected to terminal 4 possible Selection with buttons ▲ and ▼.
↻		
↓	19 FL Pd	Selection of primary process value (option 12) FL : flow dt : daily totalizer ot : overall totalizer Not selected values can be displayed as secondary process values in the working level. Selection with buttons ▲ and ▼.
↻		

continue
page 9

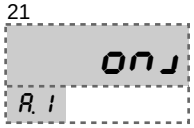
Button **Display** **Description** (Display graphic shows factory settings)

20



Alarm function of output A1
oFF : off
FL : flow
dt : daily totalizer
ot : total totalizer
Selection with buttons ▲ and ▼.

21



Switching performance of alarm output A1
on_ : (min) continuous contact: on-off
onJ : (max) continuous contact: off-on
Selection with buttons ▲ and ▼.

22

Set point of alarm output A1
Setting possible from -99999 ... 999999 digit
with buttons ▲ and ▼.

23

Hysteresis of alarm output A1
Setting possible from 1 ... 999999 digit
with buttons ▲ and ▼.

24

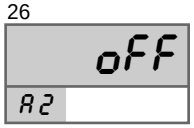
Switch-on delay time output A1
Setting possible from 0.00.00 ... 9.00.00 (h.mm.ss)
with buttons ▲ and ▼.

25

Switch-off delay time output A1
Setting possible from 0.00.00 ... 9.00.00 (h.mm.ss)
with buttons ▲ and ▼.

Note:
The switching delay time can be delaying additional to the measuring interval (parameter 10).

26

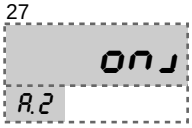


Alarm function of alarm output A2
oFF : off
FL : flow
dt : daily totalizer
ot : total totalizer
, P : pulse output
Selection with buttons ▲ and ▼.

continue
page 10

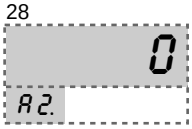
Button **Display** **Description** (Display graphic shows factory settings)

27



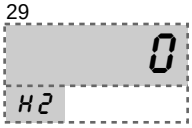
Switching performance of alarm output A2
onL : (min) continuous contact: on-off
onJ : (max) continuous contact: off-on
Selection with buttons ▲ and ▼.

28



Set point of alarm output A2
Setting possible from -99999 ... 999999 digit
with buttons ▲ and ▼.

29



Hysteresis of alarm output A2
Setting possible from 1 ... 999999 digit
with buttons ▲ and ▼.

30

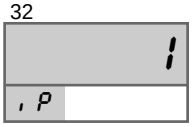
Switch-on delay time alarm output A2
Setting possible from 0.00.00 ... 9.00.00 (h.mm.ss)
with buttons ▲ and ▼.

31

Switch-off delay time alarm output A2
Setting possible from 0.00.00 ... 9.00.00 (h.mm.ss)
with buttons ▲ and ▼.

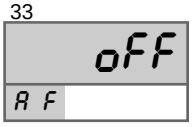
Note: The parameter settings for A3 ... A4 have to be configured the same way as A1

32



Pulse output
Volume per pulse in the programmed measuring unitof flow.
Please note the maximum output frequency (see technical data).
For indication of negative flow rates (via input B), it is possible to set an alarm output to "0".
Setting possible from 1 ... 99999 digit with buttons ▲ and ▼.
Example: measuring unit L,tEr/... , configuration 10. All 10 litres an impuls will be generated.

33

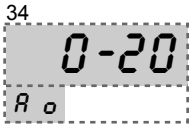


Assignment of the analog output
oFF : off
FL : flow
dt : daily totalizer
ot : total totalizer
Selection with buttons ▲ and ▼.

continue
page 11

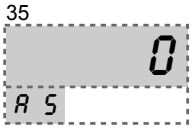
Button **Display** **Description** (Display graphic shows factory settings)

34



Configuration of analog output
0 - 20 mA (0 - 10 V DC)
4 - 20 mA (2 - 10 V DC).
Dependent on burden the output switches from current to voltage mode.
(≤ 500Ω = current output, > 500Ω = voltage output).
Selection with buttons ▲ and ▼.

35

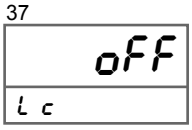


Start value for analog output
Setting possible from -99999 ... 999999 digit with buttons ▲ and ▼.

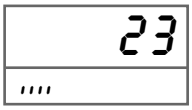
36

End value for analog output
Setting possible from -99999 ... 999999 digit with buttons ▲ and ▼.
If the start value AS > end value AE , the output works with decreasing characteristic.

37



Parameter lock
oFF : no lock
Conf. : configuration level locked
ALL : all parameters locked
CAL : only with analog output (for factory settings)
Selection with buttons ▲ and ▼.



Return to the working level.

Excerpt of available flow sensors (abridgement)

FS222

FS232

FS242

Martens Elektronik GmbH
Kiebitzhörn 18 • D-22885 Barsbüttel / Germany • www.martens-elektronik.de
☎ +49-(0)40-670 73-0 • Fax +49-(0)40-670 73-288 • ✉ info@martens-elektronik.de

Ordering code

	1.		2.		3.		4.		5.		6.		7.
DF9648 -		-		-		-		-		-		-	

1. Terminal strip A

1	Input for sensors with AC-signals (coil), pulse signal (Namur, NPN, PNP, Push-Pull) or switching contact	
2	as 1, but additional 2nd measuring input for addition / subtraction	

2. Terminal strip B

00	not installed		
2R	2 alarm outputs	Relay	
2T	2 alarm outputs	Transistor	(1 alarm / 1 pulse output Option11)

3. Terminal strip C

00	not installed	
2R	2 alarm outputs	Relay
2T	2 alarm outputs	Transistor
AO	analog output	0/4 ... 20 mA or 0/2 ... 10 V DC isolated

4. Terminal strip D supply voltage

0	230 V AC	± 10 %	50-60 Hz
1	115 V AC	± 10 %	50-60 Hz
4	24 V AC	± 10 %	50-60 Hz
5	24 V DC	± 15 %	

5. Options

00	without option
11	pulse output external applications (only in connection with terminal strip B)
12	primary process value programmable as flow, daily - or overall totalizer

6. Unit (appears in the unit field)

7. Additional text (appears in the field for additional text max. 3 x 90 mm, WxH)