BOPP & REUTHER
MESSTECHNIK

Universal Flow Computer UR06

Operating Manual

Bopp und Reuther Messtechnik GmbH
Am Neuen Rheinhafen 4 – D-67346 Speyer
Phone +49 6232 657 - 0
Fax +49 6232 657 - 505
Internet: http://www.bopp-reuther.de
E-Mail : info@bopp-reuther.de

Dimensions, weights and other technical details subject to change.

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1 Identification

Manufacturer: Bopp & Reuther Messtechnik GmbH
Am Neuen Rheinhafen 4
67346 Speyer, Germany
Phone : +49 6232 657-0
Fax : +49 6232 657-505

Type of product: Universal flow computer

Product name: UR06

Version no.: A-EN-08728-UR Rev.D (UR06; hardware: HV4; software: V0.57 or higher)

2 Area of Application

2.1 Intended use

UR06 is designed to measure energy and flow rates for gaseous, vaporous and liquid media. Various types of volume, mass, flow, pressure, temperature and density transmitters can be connected. The measured values and the set parameters are used according to generally acknowledged rules of technology to form the media data. In order to further process the measured and calculated values, it is possible to transfer the data via variably configurable standard interfaces.

2.2 Warning signs

At the time of delivery, the universal flow computer UR06 meets the highest technical specifications and is generally safe to operate. It has been tested and left the factory in perfect working order. However, careless or incorrect usage of the universal flow computer can result in hazardous situations.

Therefore, always observe the warning signs.

2.3 Operational safety

UR06 must not be used in explosive areas.

The universal flow computer UR06 meets the following safety criteria:

- Safety requirements in accordance with EN 61010-1:2001
- Interference stability in accordance with EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-4-8
- Interference emit in accordance with EN 61326 Class A
- Heat meters in accordance with EN 1434-4 Class C
- Degree of protection provided by the housing IP 65 in accordance with EN 60529

Parameter and counter data is saved in the EEPROM during a power failure.

2.4 Personnel for installation, start-up and operation

- Only trained personnel who have received authorization from the system owner are allowed to carry out assembly, electrical installation, start-up, maintenance, and operation. They should have read and understood the operating instructions and always follow the information contained therein. Incorrect installation and start-up can result in significant measuring errors or damage to the device.
- Always adhere to national regulations.
- Danger of death if the power supply is connected incorrectly.

2.5 Factory setting

The universal flow computer UR06 is supplied with a default configuration or set to the operating conditions specified in the order.

See the enclosed configuration data sheet for the set values.
Incorrect alterations to the parameters can result in measuring errors.

2.6 Technical modifications

In view of technical developments, Bopp & Reuther Messtechnik GmbH reserves the right to make appropriate technical modifications without prior notice.

3 System Design

The universal flow computer UR06 is a state-of-the-art flow computer. UR06 has a graphical display, which allows users to view all the relevant measuring and calculation values. Using the menu guidance, it is possible to alter the configuration and parameters via the respective keys. Optional input and output cards are available to enhance device functioning.

The universal flow computer consists of the following components:

- Calculation unit with integrated inputs and outputs (basic module)
- LC display unit with 4 keys
- Input cards (optional)
- Output cards (optional)

4 Input

4.1 Measured variable

Electrical measured variables:
Current, pulse, frequency, resistance, contact (status)
Physical measured variables:
Temperature, pressure, differential pressure, volume (flow), mass (flow), density

Special feature:
2 independent 24 Bit AD converters for resistance (temperature) and current.

Measured variable	**Input parameter**
Resistance	Model: PT 100, PT500, PT1000 4-wire measurement Measuring ranges: -100 °C ... 600 °C PT100: -100 °C ... 600 °C PT500: -100 °C ... 500 °C PT1000: -100 °C ... 300 °C Overload protection: ± 24 V Measuring uncertainty T: 0.1% of MV ± 0.1 K Measuring uncertainty ΔT: 0.1% of MV ± 0.02 K Temperature influence T: 0.0025% / K Temperature influence ΔT: 0.0010% / K Resolution: 24 Bit Measuring rate: approx. 16 / s Sensor break monitoring Sensor current PT 100: approx. 1.8 mA Sensor current PT 500 / 1000: approx. 0.7 mA
Current	Measuring range: 0...22 mA Overload protection: ± 24 V Error detection 3.6 mA according to Namur NE43 Measuring uncertainty: 0.01% of MV ± 0.001 mA Temperature influence: 0.0025% / K Resolution: 24 Bit Measuring rate: approx. 16 / s
Frequency pulse Status	Frequency measurement: 0.1 Hz ...15 kHz Metering: 0 ... 15 kHz Min. measuring time can be set: (0.1…10s) Measuring uncertainty: 0.01% of MV Temperature influence: 0.0025% / K Resolution: 0.001% of MV

	Switchable hardware filter: Without, 50 Hz (for suppressing contact bounces) Active signals: Passive signals: O.C, relay, Namur (U_0 approx. 8.5 V; I_S approx. 1.4/1.8 mA)

5 Output

5.1 Output signal

Current, pulse, switching output/status, measuring transducer supply

Output variable	Output parameter
Current	Range: 0...22 mA, active Max. load: 500 Ω (U0 approx. 12V) Galvanic isolation among each other and to the basic device Error signals: 3.5 mA and 22 mA according to NAMUR NE43 Accuracy: 0.02% of MV ± 0.002 mA Temperature influence: 0.005% / K Resolution: 16 Bit
Pulse / Status	Type: Open collector, passive, galvanic isolated Frequency range: 0 ... 100 Hz Min. pulse width: 5 ms 500 ms Overload protection: ± 24 V Internal resistance 70 Ω Residual voltage < 1.2 V I_{max}: 20 mA U_{max}: 24 V

5.2 Measuring transducer supply and auxiliary power

Output variable	Output parameter
Measuring transducer supply (MUS)	Voltage: 24 V DC Current: Max. 30 mA, short circuit proof
Auxiliary power	Voltage: 24 V DC Current: Max. 250 mA, short circuit proof

6 Characteristic Values

6.1 Reference conditions

Voltage supply: 230 VAC ±10%, 50 Hz ±0.5 Hz
Warm-up time: 10 min
Ambient temperature: 25°C ±5°C
Humidity: 39% ±10% r. h.

6.2 Measuring uncertainty

see 4.1

7 Operating Conditions

7.1 Installation conditions

7.1.1 Installation instructions

Please read the operating instructions carefully prior to installation and start-up.

7.1.2 General information

Observe operating data marked on the housing. Also observe data in the order confirmation and on the data sheet. If you wish to use the device under different operating conditions, consult the manufacturer in advance, and always state the serial number.

7.1.3 Installation

Various installations are possible:

- Housing with LCD for wall installation
- Housing without LCD for wall installation and separate LCD housing
- Housing for cabinet installation and separate installation of the LCD in the cabinet door
- Plug-in unit design

7.2 Ambient conditions

7.2.1 Ambient temperature

0°C to +55°C

7.2.2 Storage temperature

-30°C to +70°C

7.2.3 Climate class

In accordance with EN 1434 Class C

7.2.4 Mechanical class

In accordance with EU directive 2004/22/EC Class M1

7.2.5 Degree of protection

IP65	IEC 529 / EN 60529 (wall installation in plastic housing) IP65 for separate flow computer installation (with closed additional cover), IP20 for cover with display and keys.
IP20	19” plug-in unit

7.2.6 Electromagnetic compatibility

Interference emit:

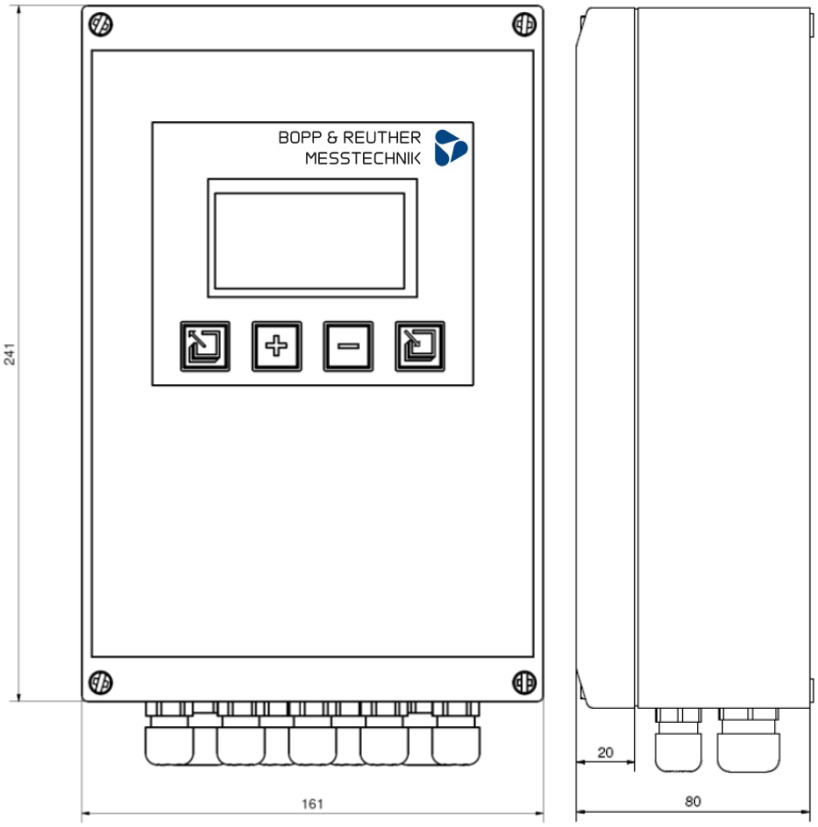
- EN 61326 Class A

- Interference stability:
- Power failure: 20 ms, no influence
- Electromagnetic fields: 10 V/m (80 ... 2700 MHz) in accordance with EN 61000-4-3
- Electromagnetic fields: 30 V/m (800 ... 2,000 MHz) in accordance with EN 61000-4-3
- Conducted HF: 0.15 to 80 MHz, 10 V in accordance with EN 61000-4-6
- Electrostatic discharge: 6 kV contact / 8 kV indirect in accordance with EN 61000-4-2
- Burst (AC and DC supply): 4 kV in accordance with EN 61000-4-4
- Burst (signal): 1 kV / 2 kV in accordance with EN 61000-4-4
- Surge (AC and DC supply): 1 kV / 2 kV in accordance with EN 61000-4-5
- Surge (signal): 500 V / 1 kV in accordance with EN 61000-4-5
- EN1434-4 Class C
- In accordance with EU directive 2004/22/EC Class E2

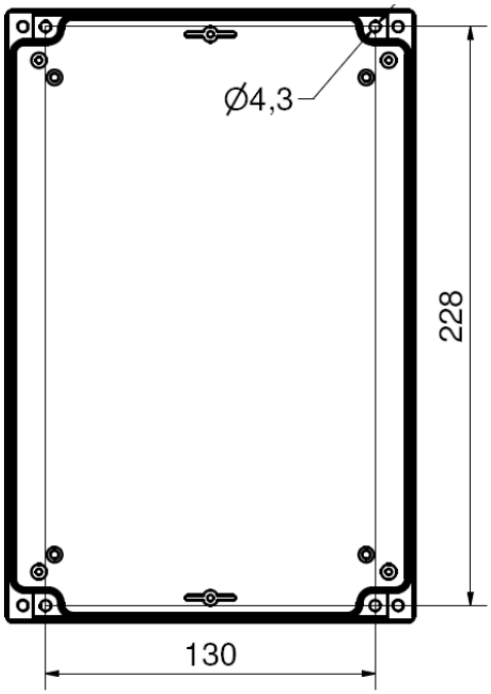
8 Constructive Design

8.1 Model / Dimensions

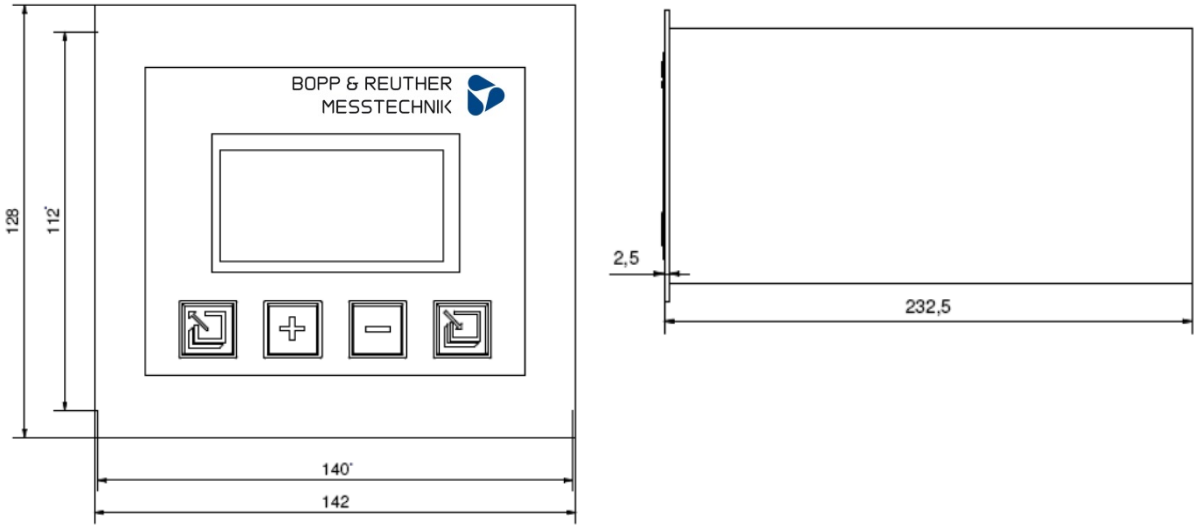
1. Standard plastic housing
Front view:



Wall installation:



2. Plug-in unit
Front view:



All dimensions in mm

8.2 Weight

Standard: Approx. 1 kg
Plug-in unit: Approx. 1.5 kg

8.3 Material

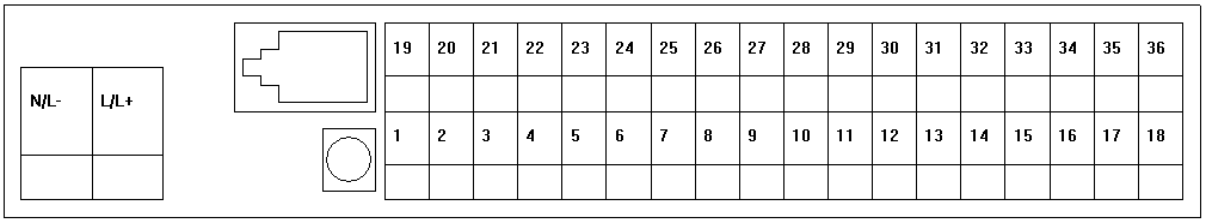
Standard: ABS -40°C to 80°C, halogen-free
Plug-in unit: Aluminum

9 Terminal Assignment

9.1 Standard housing

UR06 in the standard housing has 36 double-row terminals; connection to the display occurs via a western plug. All terminal descriptions relate to hardware version HV3.

Terminals of the basic device

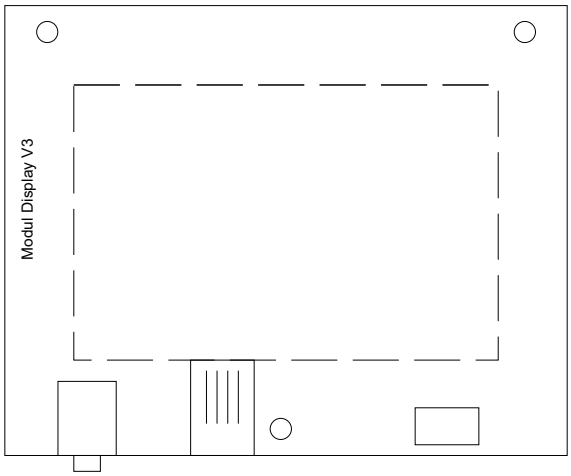


Designation	No.	Function
N \ L-		Neutral conductor 230 V AC Minus 24 V DC
L \ L+		Phase 230 V AC Plus 24 V DC
Disp. 24V	Western	Display supply voltage
Disp. GND	Western	Display supply voltage
Disp. RxD	Western	Serial interface to the display; receive
Disp. TxD	Western	Serial interface to the display; transmit

M-Bus	1	M-Bus interface
M-Bus	2	M-Bus interface
	3	Not occupied
RS232 RxD	19	Serial interface (Modbus); receive
RS232 TxD	20	Serial interface (Modbus); transmit
RS232 GND	21	Serial interface (Modbus); ground
OC 1 +	4	Digital output, open collector
OC 1 -	5	Digital output, open collector
OC 2 +	6	Digital output, open collector
OC 2 -	7	Digital output, open collector
OC 3 +	8	Digital output, open collector
OC 3 -	9	Digital output, open collector
Iout 1 +	22	Current output, galvanic isolated, active
Iout 1 -	23	Current output, galvanic isolated, active
Iout 2 +	24	Current output, galvanic isolated, active
Iout 2 -	25	Current output, galvanic isolated, active
DI 1 +	26	Digital input, (pulse, frequency, status)
DI 1 -	27	Digital input, (pulse, frequency, status)
DI 2 +	28	Digital input, (pulse, frequency, status)
DI 2 -	29	Digital input, (pulse, frequency, status)
Ex 24 V +	10	Auxiliary power for measuring head, galvanic isolated, 24 V
Ex 24 V -	11	Auxiliary power for measuring head, galvanic isolated, 24 V
MUS 1	12	Measuring transducer supply, 24 V, 30 mA
I1	13	Current input
GND	14	Current input 1 ground
MUS 2	30	Measuring transducer supply, 24 V, 30 mA
I2	31	Current input
GND	32	Current input 2 ground
PT1 ++	15	PT 100/500/1000 input, supply
PT1 +	16	PT 100/500/1000 input, Sense
PT1 -	17	PT 100/500/1000 input, Sense
PT1 --	18	PT 100/500/1000 input, supply
PT2 ++	33	PT 100/500/1000 input, supply
PT2 +	34	PT 100/500/1000 input, Sense
PT2 -	35	PT 100/500/1000 input, Sense
PT2 --	36	PT 100/500/1000 input, supply

Terminal assignment display

The connection between the basic device and the display occurs via a cable with a western plug RJ10 at each end.



Terminal assignment modules

Module I-OUT

Designation	No.	Function
OC 1 +	1	Digital output, open collector
OC 1 -	2	Digital output, open collector
OC 2 +	3	Digital output, open collector
OC 2 -	4	Digital output, open collector
Iout 1 +	5	Current output, galvanic isolated, active
Iout 1 -	6	Current output, galvanic isolated, active
Iout 2 +	7	Current output, galvanic isolated, active
Iout 2 -	8	Current output, galvanic isolated, active

Module I-IN

Designation	No.	Function
MUS 3	1	Measuring transducer supply, 24 V, 30 mA
I3	2	Current input
GND	3	Current input 3 ground
MUS 4	4	Measuring transducer supply, 24 V, 30 mA
I4	5	Current input
GND	6	Current input 4 ground

Module pulse input

Designation	No.	Function
DI 3 +	1	Digital input, (pulse, frequency, status)
DI 3 -	2	GND
DI 4 +	3	Digital input, (pulse, frequency, status)
DI 4 -	4	GND
DI 5 +	5	Digital input, (pulse, frequency, status)
DI 5 -	6	GND
DI 6 +	7	Digital input, (pulse, frequency, status)
DI 7 -	8	GND

Module M-Bus

Designation	No.	Function
Tx	1	Serial interface; transmit
Rx	2	Serial interface; receive
GND	3	Serial interface; ground (internal connected)
	4	
M +	5	M-Bus +
M +	6	Connected to terminal 5
M -	7	M-Bus -
M -	8	Connected to terminal 7

Module RS485

Designation	No.	Function
Tx	1	Serial interface; transmit
Rx	2	Serial interface; receive
GND	3	Serial interface; ground (internal connected)
	4	
	5	
A	6	RS485 galvanic isolated
B	7	RS485 galvanic isolated
GND*	8	GND galvanic isolated

Module Ethernet

Designation	No.	Function
Tx	1	Serial interface; transmit
Rx	2	Serial interface; receive
Ethernet	RJ45	Ethernet

9.2 Plug-in unit

The UR06 plug-in unit has 3 - 4 removable 12-pole terminal blocks at the rear for the signal inputs and outputs. Energy is supplied via an IEC connector (230 V). There is an additional socket (3.5 mm jack) at the front for communication.

Terminal assignment:

J4

1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		

J3

1	OC 1+	4
2	OC 1-	5
3	OC 2+	6
4	OC 2-	7
5	OC 3+	8
6	OC 3-	9
7		
8	M-Bus	1
9	M-Bus	2
10	RS RxD	19
11	RS TxD	20
12	RS GND	21

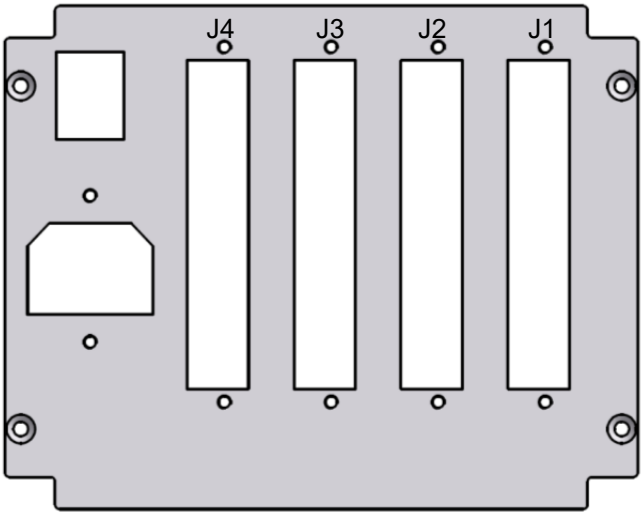
J2

1	MUS1	12
2	I1	13
3	GND	14
4	MUS2	30
5	I2	31
6	GND	32
7	Iout1 +	22
8	Iout1 -	23
9	Iout2 +	24
10	Iout2 -	25
11	24 V+	10
12	24 V-	11

J1

1	DI 1 +	26
2	DI 1 -	27
3	DI 2 +	28
4	DI 2 -	29
5	PT1 ++	15
6	PT1 +	16
7	PT1 -	17
8	PT1 --	18
9	PT2 ++	33
10	PT2 +	34
11	PT2 -	35
12	PT2 --	36

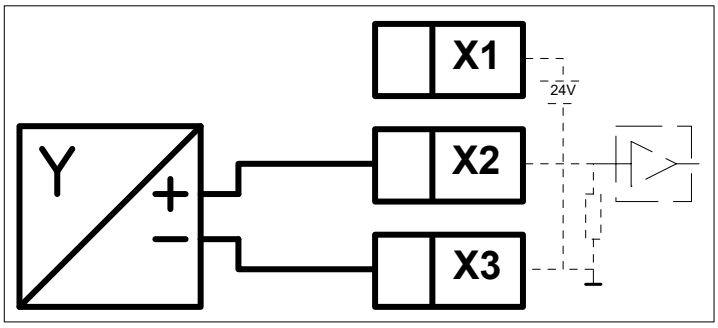
The numbers in the 3rd terminal block column relate to the terminal assignment of the standard version. Terminal designations that start with the letter M relate to the module terminals.



10 Connection of External Sensors

10.1 Active sensors

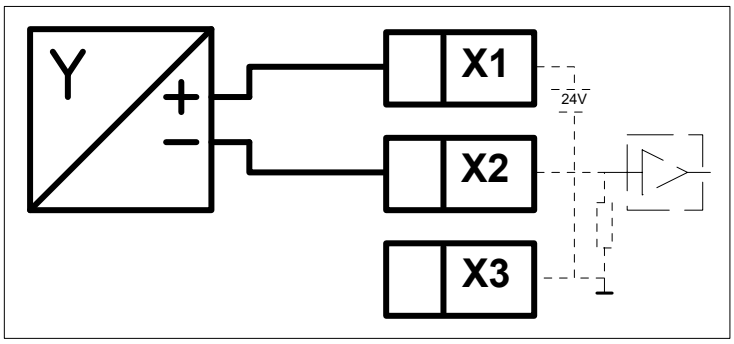
Connection of sensors which have an individual power supply and an active output.



	Terminal	Alternative terminals
X2	13	31
X3	14	32

10.2 Passive sensors

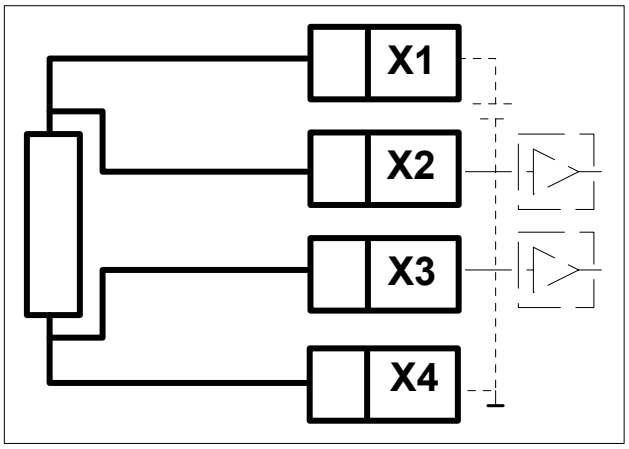
Connection of sensors which do not have a power supply (2-wire transmitter).



	Terminal	Alternative terminals
X1	12	30
X2	13	31

10.3 Temperature sensors

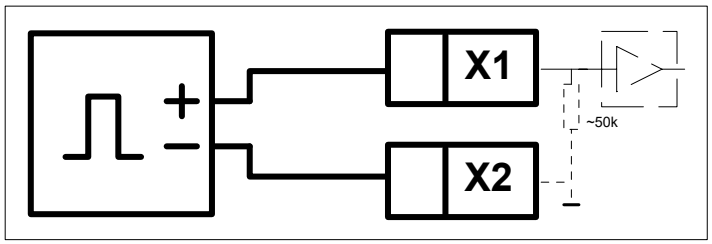
Connection of temperature sensors (PT100, PT500, PT1000). The terminals X1-X2 and X3-X4 must be bridged when connecting 2-wire sensors.
The input has to be configured via the software.



	Terminal	Alternative terminals
X1	15	33
X2	16	34
X3	17	35
X4	18	36

10.4 Active digital sensors

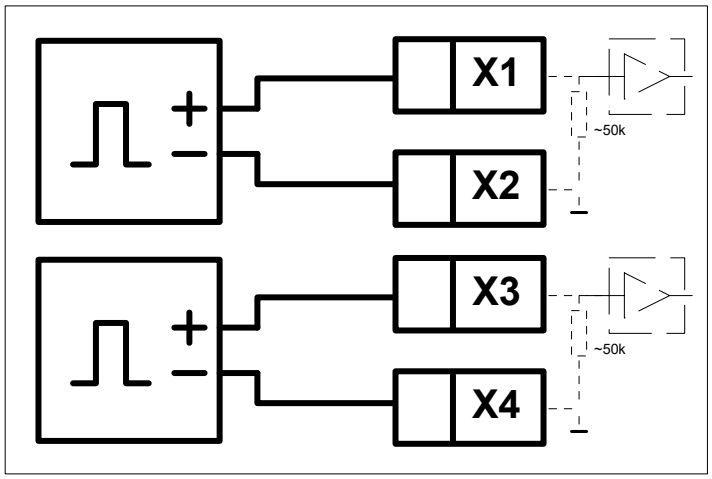
Connection of digital sensors which provide a voltage signal.
The input has to be configured via the software.



	Terminal	Alternative terminals
X1	26	28
X2	27	29

10.5 2-channel active digital sensors (dual pulse)

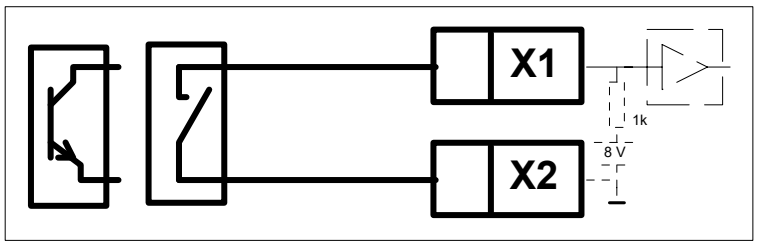
Connection of digital sensors which provide a voltage signal.
The input has to be configured via the software.



	Terminal	Alternative terminals
X1	26	1, 5
X2	27	2, 6
X3	28	3, 7
X4	29	4, 8

10.6 Passive digital sensors

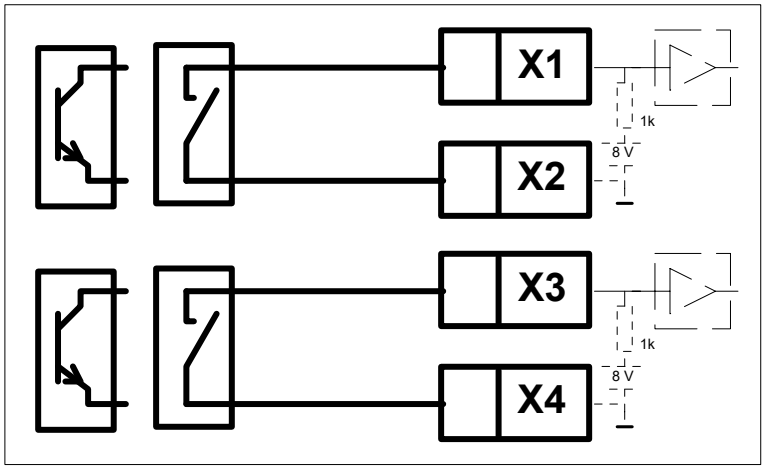
Connection of digital sensors which have a passive output (relay, open collector, NAMUR).
The input has to be configured via the software.
Caution: The sensor must be able to switch a current of at least 2.2 mA.



	Terminal	Alternative terminals
X1	26	28
X2	27	29

10.7 2-channel passive digital sensors (dual pulse)

Connection of digital sensors which have a passive output (relay, open collector, NAMUR).
The input has to be configured via the software.

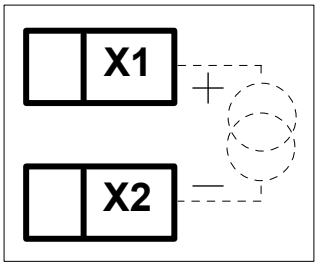


	Terminal	Alternative terminals
X1	26	1, 5
X2	27	2, 6
X3	28	3 ,7
X4	29	4, 8

11 Output Connection

11.1 Current outputs

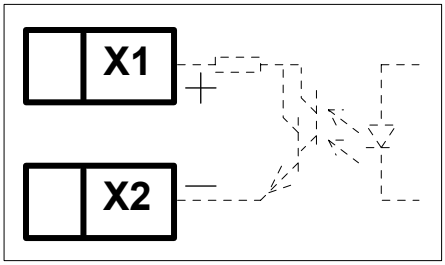
Active current output



	Terminal	Alternative terminals	Alternative module terminals
X1	22	24	5, 7
X2	23	25	6, 8

11.2 Digital outputs

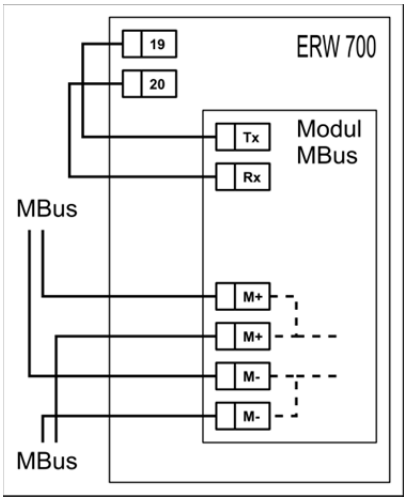
Optocoupler.



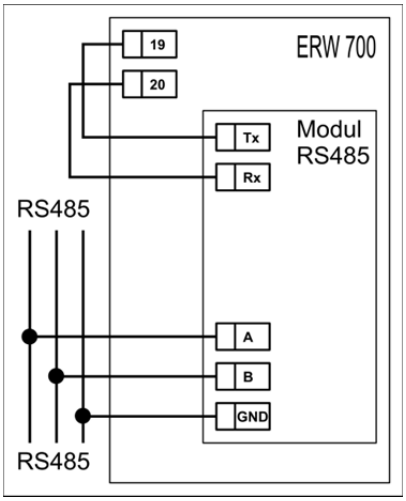
	Terminal	Alternative terminals	Alternative module terminals
X1	4	6, 8	1, 3
X2	5	7, 9	2, 4

11.3 Interfaces

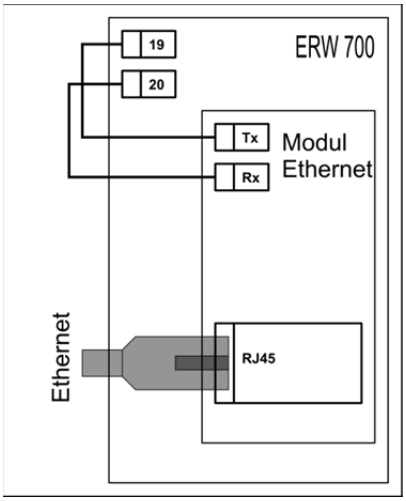
Module M-Bus



Module RS485



Module Ethernet



12 Display and User Interface

12.1 General information

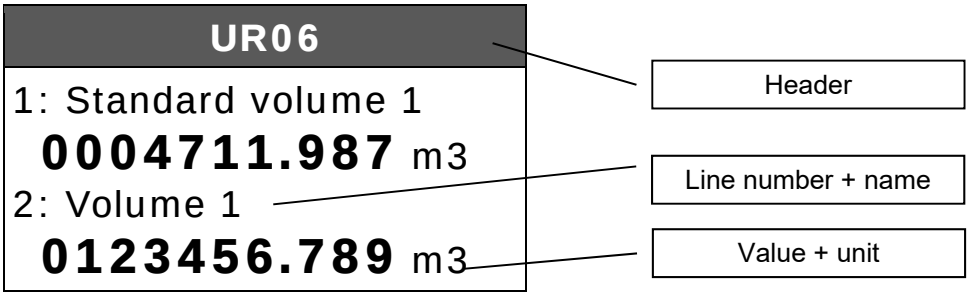
The universal flow computer UR06 is supplied with a factory default setting. Optionally, it can be set to the operating conditions specified in the order. See the enclosed configuration data sheet for the set values.

The meter can be configured or operated in two different ways:
1. Programming via Modbus interface
2. On-site operation via membrane keys

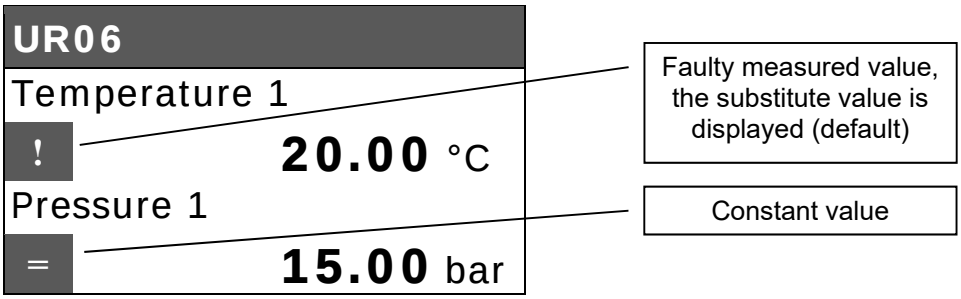
12.2 LC display

The graphical LC display allows users to view all the parameters, counters as well as input and output variables. Display selection is carried out via keys. The backlight of the display is activated via the respective key. The backlight is set to go off 10 minutes after the last keypress and the device switches to the standard display.

12.2.1 Display of measured values



With faulty measured values or constant default values, an additional symbol appears to make it easier to differentiate between these values and real measured values.

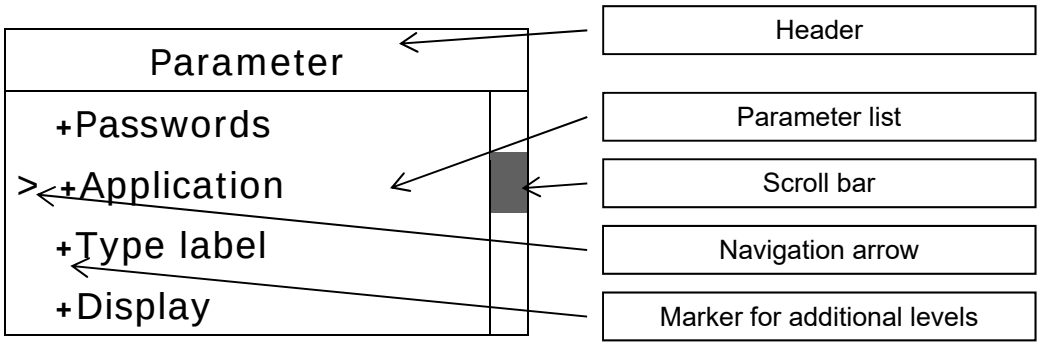


Header:
The display alternates between the programmable TAG number and the error messages.

Line number + name:
The name of the displayed value and also the line number are shown for better orientation. The line number is hidden after approx. 5 s.

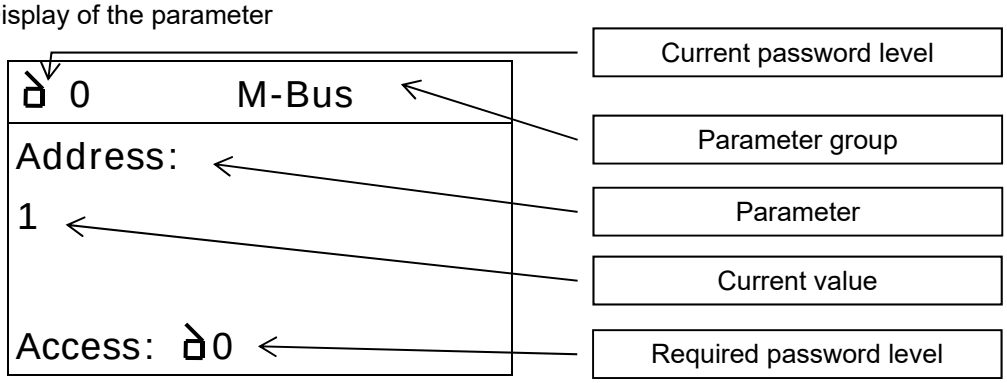
Value + unit:
The value with decimal places and the unit are displayed. The number of decimal places and the unit can be parameterized. The decimal places of the counters can be additionally highlighted by a frame.

12.2.2 Display of parameter navigation

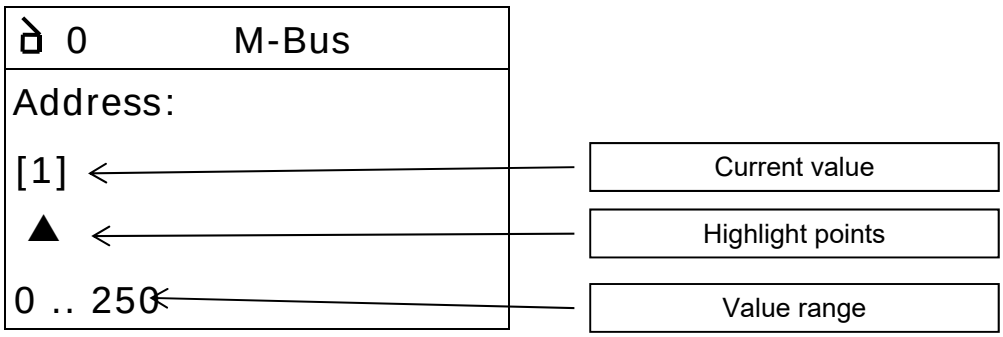


12.2.3 Display of parameters

Display of the parameter

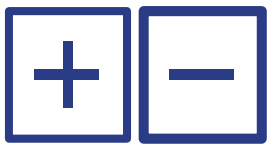


Displayed when editing the parameter



12.3 Operation

12.3.1 Key functions

Key symbol	Name	Key function
	Back	• Press this key to jump one level higher in the level structure. • If a parameter has been altered, press this key to save the displayed value and to exit programming mode. The saved value is shown on the display.
	Plus	• Press this key to access the next higher level step. • If you are in programming mode, a numerical value increases by +1 or you move one place up a value list.
	Minus	• Press this key to access the next lower level step. • If you are in programming mode, a numerical value decreases by -1 or you move one place down a value list.
	Next	• Press this key to jump one level lower in the level structure. • Once you have reached the desired level, press the key again to activate programming mode and to alter the set values. • With parameters which represent a numerical value, press this key to jump to the next decimal point.
		• Press + and – simultaneously to acknowledge error messages. • An entry can be cancelled in programming mode.

12.3.2 Switching on the universal flow computer

The universal flow computer does not have an on/off switch. Basic initialization is carried out once the universal flow computer is connected to the power supply.
The following information is displayed:

```
        UR06
(c) 2010 B&R MT GmbH
SW version:   1.00
checksum  :   4711h
```

The universal flow computer subsequently jumps to the set application mode.

12.3.3 Input examples

Example: Calling display values

The data shown below is only an example. Depending on the configuration, the number of values and their sequence may vary.

Current display

UR06
Standard volume 1 **0012345678.5** m3 Volume 1 **0009833823.4** m3

1xMinus

UR06
1: Standard volume 1 **0012345678.5** m3 2: Volume 1 **0009833823.4** m3

1xMinus

UR06
3: St. vol. flow rate **123.50** m3/h 4: Vol. flow rate 1: **209.833** m3/h

1xMinus

UR06
5: Temperature 1 **72,58** °C 6: Pressure 1 **14.34** bar

1xMinus

UR06
7: Frequency 1 **10.005** Hz

Example: Password Level1 = enter 0009

Current display

```
        UR06
Standard volume 1
      001234567.5 m3
Volume 1
      000983382.4 m3
```

1 ... 2xWeiter

```
        Menu
► +  Information
  +  Logbook
  +  Parameters
```

2xPlus

```
        Menu
  +  Information
  +  Logbook
► +  Parameters
```

1xNext

```
      Parameters
► +  Password
  +  Application
  +  Type label
  +  Display
```

1xNext

```
      Parameters
►    Password Level1
     Password Level2
     Password Level3
     Password Level4
```

1xNext

```
#0      Passwords
Password Level1:
****

Access: #0
```

1xNext

```
#0      Passwords
Password Level1:
****
▲
0 ... 9999
```

1xPlus

```
#0      Passwords
Password Level1:
0***
▲
0 ... 9999
```

1xNext

```
#0      Passwords
Password Level1:
0***
 ▲
0 ... 9999
```

1xPlus

```
#0      Passwords
Password Level1:
00**
 ▲
0 ... 9999
```

1xNext

```
#0      Passwords
Password Level1:
00**
  ▲
0 ... 9999
```

1xPlus

```
#0      Passwords
Password Level1:
000*
  ▲
0 ... 9999
```

1xMinus

```
#0      Passwords
Password Level1:
0009
   ▲
0 ... 9999
```

1xBack

```
#1      Passwords
Password Level1:
Level enabled

0 ... 9999
```

5xBack

```
        UR06
Standard volume 1
       001234567.5 m3
Volume 1
       020983382.4 m3
```

Finished!!

Example: Changing the date from 28.6.07 to 18.07.07

Current display

```
        UR06
Standard volume 1
      001234567.5 m3
Volume 1
      000983382.4 m3
```

1 ... 2xNext

```
        Menu
▶   + Information
    + Logbook
    + Parameters
```

2xMinus

```
        Menu
    + Information
    + Logbook
▶   + Parameters
```

1xNext

```
      Parameters
▶   + Passwords
    + Application
    + Type label
    + Display
```

13xMinus

```
      Parameters
    + Temperature
    + Thresholds
    + Outputs
▶   + Clock
```

1xNext

```
      Parameters
    + Temperature
    + Thresholds
    + Outputs
▶   + Clock
```

1xNext

```
        Clock
▶     Date
      Time
      Clock adjustment
```

1xNext

```
#1          Clock
Date:
28.06.07

Access: #1
```

1xNext

```
#1          Clock
Date:
[28.06.07]
 ▲
01.01.00...31.12.99
```

1xMinus

```
#1          Clock
Date:
[18.06.07]
 ▲
01.01.00...31.12.99
```

3xNext

```
#1          Clock
Date:
[18.06.07]
     ▲
01.01.00...31.12.99
```

1xPlus

```
#1          Clock
Date:
[18.07.07]
     ▲
01.01.00...31.12.99
```

1xBack

```
#1          Clock
Date:
18.07.07

Access: #1
```

6xBack

```
        UR06
Standard volume 1
     001234567.5 m3
Volume 1
     020983382.4 m3
```

Finished!!

13 Display Parameters

The function and availability of the display parameters depends on the actual configuration of the universal flow computer.

Counters
- Energy 1
- Energy 1 event 2)
- Energy 1 subset
- Energy 1 event subset
- Energy 2
- Energy 2 event
- Energy 2 subset
- Energy 2 event subset
- Mass 1
- Mass 1 event
- Mass 1 subset
- Mass 1 event subset
- Mass 2
- Mass 2 event
- Mass 2 subset
- Mass 2 event subset
- Volume 1
- Volume 1 event
- Volume 1 subset
- Volume 1 event subset
- Volume 2
- Volume 2 event
- Volume 2 subset
- Volume 2 event subset
- Standard volume 1
- Standard volume 1 event
- Standard volume 1 subset
- Standard volume 1 event subset
- Standard volume 2
- Standard volume 2 event
- Standard volume 2 subset
- Standard volume 2 event subset
- AUX 1 4)
- AUX 2 4)
- AUX 3 4)
- AUX 4 4)

Instant. values
- Power 1
- Mass flow rate 1
- Volume flow rate 1
- Standard volume flow rate 1
- Temperature 1
- Temperature 1 subset 1)
- Temperature 2
- Temperature 2 subset 1)
- Temperature difference 1
- Pressure 1
- Pressure 1 subset 1)
- Density 1
- Density 1 subset 1)
- Concentration 1
- dp 1
- dp 1A
- dp 1B
- PT 1 3)
- PT 2 3)
- Current 1 6)
- Current 2 6)
- Current 3 6)
- Current 4 6)
- Frequency 1
- Frequency 2
- Pulse 1
- Pulse 2
- Board temperature
- Power 2
- Power 3 5)
- Mass flow rate 2
- Mass flow rate 3 5)
- Volume flow rate 2
- Volume flow rate 3 5)
- Standard volume flow rate 2
- Standard volume flow rate 3 5)
- Temperature 3
- Temperature difference 2
- Pressure 2
- Pressure 2 subsets 1)
- Pressure 3
- Density 2
- Density 2 subsets 1)
- Concentration 2
- dp 2
- dp 2A
- dp 2B

1) Weighted mean value via the subset
2) For example, error quantity
3) Resistance of the temperature sensor
4) Sum or difference of the allocated counters with index 1 and 2
5) Sum or difference of values with Index 1 and 2
6) Current input

14 Information

14.1 Time recording

Time and date, as well as the operating, downtime, measuring, error and saturated steam hours can be displayed.

Time	Current time (no automatic summertime/wintertime changeover).
Date	Current date
Operating hours	Time during which the universal flow computer was connected to the power supply
Downtime hours	Time during which the universal flow computer was not connected to the power supply
Measuring hours	Time during which the flow rate was above the leak flow rate
Error hours	Time during which an error occurred
Saturated steam hours	Time during which the steam was below the saturated steam line

Example:

```
Time recording
Measuring hours:
             2072.04 h
Error hours:
               52.46 h
```

14.2 Flow computer

Displays the software version and the check sums for values which require and do not require calibration.

Example:

```
   Calculation unit
SW version  :   v1.00
SW CRC      :   6097h
EEprom CRC 1:   9745h
EEprom CRC 2:   7521h
```

14.3 Modules

The type and status, as well as the software and hardware version are displayed.

Example:

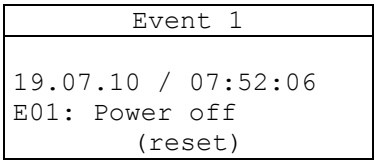
```
        Slot 1
Module : 2*Iaus/2*DA
Status: active
SW    : 1.1
HV    : 1.0
```

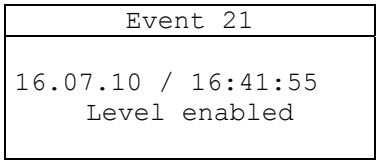
15 Logbook

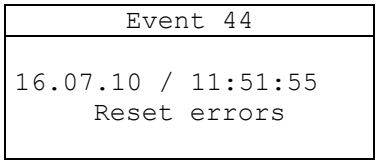
15.1 Event log

Error messages, password inputs and other events are stored in the event log. Up to 100 entries are listed in chronological order; all error messages are listed with the time of their occurrence and elimination. Use “+” and “-“ to navigate through the list.

Example:



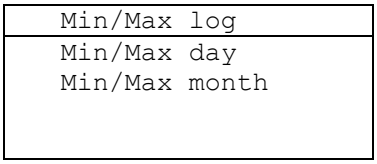


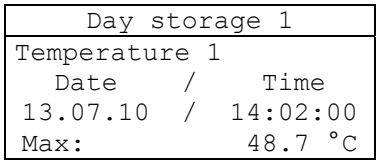


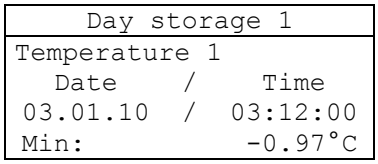
15.2 Min/Max log

The min and max values are saved per day for 31 days and per month for 12 months of the primary measured values (temperature, pressure, etc.).
Use “+” and “-” to select days or months, use “next” and “back” to select values.

Example:



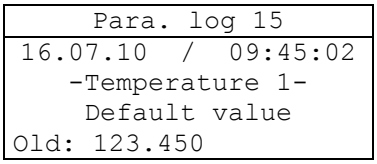


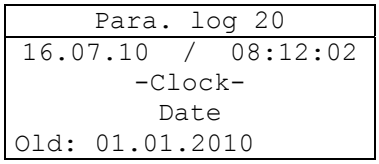


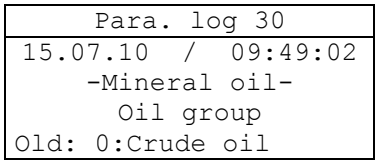
15.3 Parameter log

Changes to the parameters are saved together with the old value.
Use “+” and “-” to select entries.

Example:







15.4 Log book

The log book will depend on the configuration, counters and minimum and maximum values of the main variables (flow values) are stored. Depending on the configuration up to 8000 records are possible. With "+" and "-" is chosen between the memory slots, with "next" and "back" between the values.

15.4.1 Information

Information on size and occupancy of the log book.

15.4.2 Selection of displayed values

For easier navigation within the records, the display can be configured.
It can there be chosen if all entries or only the entries of a certain type to be displayed, e.g. only the monthly values.

15.4.3 Search for date

For faster finding an entry to a specific date, a date can be entered here. By completing the entry, the closest log entry is displayed.

15.4.4 Search for batch No.

For faster finding an entry to a specific batch number, the batch number can be entered. By completing the entry, the closest log entry is displayed.

Example:

```
   log memory 2/296
   * period log *
Batch No.: ---
Values: 14
Checksum: 8B39h
```

```
   log memory 2/296
start time:
03.05.12 / 15:15:00
stop time:
03.05.12 / 15:30:00
```

```
   log memory 2/296
Error:
00000000b (00h)
Status:
00000000b (00h)
```

```
   log memory 2/296
1: Energy 1:
       000299924.7 kWh
2: Energy 1 Teilm.
       000000000.0 kWh
```

```
   log memory 2/296
3: Mass 1:
        5183532.000 kg
4: Mass 1 subset
        0000000.000 kg
```

```
   log memory 2/296
5: Volume 1:
        00075611.72 m3
6: Volume 1 subset
        0000000.000 m3
```

```
   log memory 2/296
7: Temp.1 subset:
             210.00 °C
8: Density1 subset
          8,976 kg/m3
```

```
   log memory 2/296
9: Power 1 min:
                0.0 kW
10: Power 1 max:
                0.0 kW
```

```
   log memory 2/296
11: Mass flow 1 min:
              0.0 kg/h
12: Mass flow 1 max:
              0.0 kg/h
```

```
   log memory 2/296
13: Vol. flow 1 min:
              0.0 m3/h
14: Vol. flow 1 max:
              0.0 m3/h
```

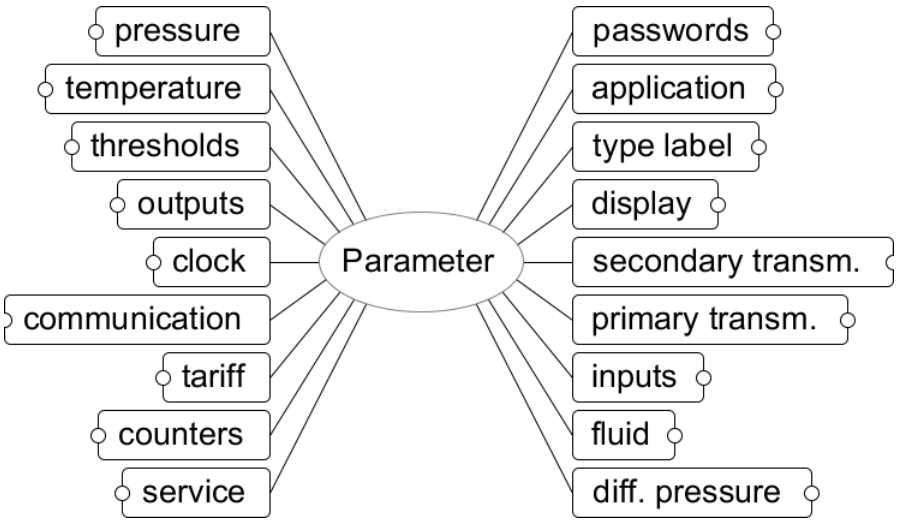
16 Parameters

16.1 Parameter menu structure

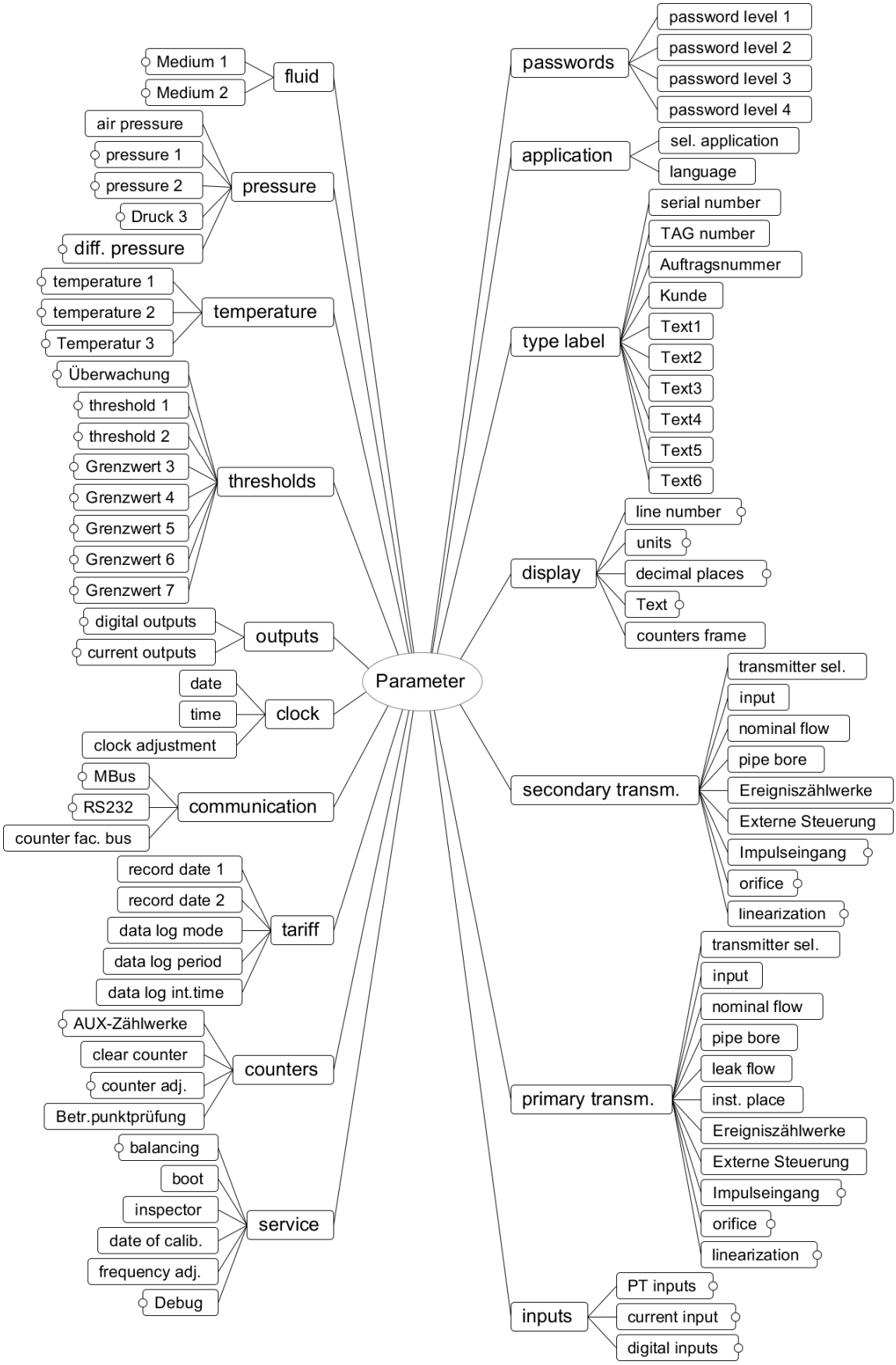
The operating menu is arranged as a tree structure. To illustrate the structure, certain levels are displayed below as a mind map. Branches without a dot are end branches, branches with a dot at the end continue to the next lower level. The data shown below is only an example. Depending on the configuration and released password level, only a part of the menu tree is visible.

16.1.1 Level 1

16.1.2 Level 2



16.1.3 Level 2 and 3



17 Parameter Description

If necessary, default settings are highlighted in **bold** type.

17.1 Passwords

17.1.1 Password L1 … L4

Range: 1 … 9999, 0 = password deleted

	KL0	KL1	KL2	KL3	KL4
Default password	without	0009	0099	0999	9999

5 password levels are supported for accessing the set values via keys or the communication interfaces. If a set value is to be altered, the respective password level must be released first. This occurs by entering or sending a valid password. Higher password levels include all the lower ones. A password level can be deactivated via a respective command or once a defined period has expired (3 min). The password can also be deleted, i.e. to ensure there is no further access via this password level. If all the passwords have been deleted, it is no longer possible to access the set values. This can also be used as a calibration seal by deleting the passwords of the L3 and L4 level. New passwords can then only be entered if the leaded seal has been opened and the calibration jumper has been inserted.

To delete or alter a password, the respective password level must be released first via the current valid password.

Password level L0, no password:
Only the communication parameters for M-Bus and Modbus can be altered here.
Password level L1:
Access for end customers. Configuration of the current output, etc.
Password level L2:
Access for the operator.
Password level L3:
Access for the test center.
The electronics has a defined interface at this level. The set values only depend on the connected sensors and applications.
Password level L4:
Access for the electronics manufacturer. All the calibration values of the electronics are saved here.
Default passwords:
Default passwords are loaded for the various password levels during the factory test. The person responsible for each respective level must ensure that these passwords are replaced by secret passwords or the passwords are deleted in order to prevent unauthorized access. The password L4 is deleted at the end of the factory test.

Name	KL
Passwords	0
Application	
Sel. application	3
Language	1
Addit. counters	3
Type label	1
Display	
Counters	3
Instant. values	2
Primary transmitter	3
Secondary transmitter	3

Name	KL
Inputs	3
Fluid	3
Diff. pressure	3
Pressure	3
Air pressure	2
Temperature	3
Thresholds	1
Outputs	1
Clock	1
Logbook	2

Name	KL
Communication	0
M-Bus	0
Modbus	0
Counter fac. bus	2
Counters	3
Subsets	2
Service	4

Values printed in **bold** type include whole groups of set data.

17.2 Application

17.2.1 Basic application

The application specifies the basic characteristics. It is generally used to selectively control the parameter list, i.e. many of the parameters which are not required are hidden. At the same time, some functions in the device are (de-)activated, e.g. mass-relevant values are only calculated if mass has been selected.

Selection:

ERW700	Mass	Linearization
UR06	Standard volume	Special
2-channel	Event cnt (event counters)	Batch
Energy	Subset. cnt (Subset counters)	Min/Max

ERW700	Activates the functions which are more relevant for energy distribution.
UR06	Activates the functions which are more relevant for the mineral oil industry.
2-channel	Activates functions which are relevant for applications with 2 more or less independent units, e.g. fuel (gas)/heating oil switchover, steam-condensate measurement
Energy	Activates functions which are required for energy calculation.
Mass	Activates functions which are required for mass calculation.
Standard volume	Activates functions which are required for standard volume calculation.
Event counters	Activates counters which are used to count events, e.g. fault counters, overload counters, measured-value dependent counters
Special	Activates special functions.
Batch	Activates batch function
Min/Max	Min und Max-values for flow and power are stored

17.2.2 Language

Setting the dialog language

Selection: **German**, English, French, Spanish

17.3 Error external

Set the handling of external error contacts.

17.3.1 Selection

When set to "message" only an error message is generated, the reaction corresponds to the not relevant for measurement errors. When set to "stop" the count is stopped or counted in fault counters.

Selection: **without**, message, stop

17.3.2 Input

Digital Input

Selection: DI1, DI1 inv, DI2, DI2 inv, DI3, DI3 inv, DI4, DI4 inv, DI5, DI5 inv, DI6, DI6 inv

17.4 Type label

17.4.1 Serial number

The factory-defined serial number is for information purposes only.

17.4.2 TAG number

A measuring point number (TAG) can be entered. This is shown in the header of the display. If no text is entered, the header is not displayed.

Range: 15 alphanumerical digits

17.4.3 Order number

Input of the order number.

Range: 15 alphanumerical digits

17.4.4 Customer

Input of the customer's name.

Range: 15 alphanumerical digits

17.4.5 Text 1 … 6

6 lines of text can be entered. These are for information purposes only and do not have any further functions. The serial number of the allocated transmitters can, e.g., be entered here.

Range: 15 alphanumerical digits

17.5 Display

The display can be freely configured within broad limits. All the measuring values and relevant calculation values can be displayed. The format and unit can be selected. Several values can be compiled as pages; it is then possible to leaf through the pages.

17.5.1 Counters frame

A frame can be shown to specifically indicate the decimal places for counters.

123456.789 m3

Selection: **No**, Yes

17.5.2 Line number

Assignment of list values to a line in the display. If 0 is entered, the value is not displayed. If the same line number is assigned to several values, they are displayed alternately. The available display parameters are listed in the appendix. The list provides all the possible display parameters, but the currently available values depend on the configuration of the universal flow computer.

17.5.3 Decimal places

Selection of the display format

17.5.4 Units

Various units can be selected for the display (see appendix). The selected unit does not influence the calculations. The internal calculation is always in basic units. Conversion only takes place for display purposes. The units can be selected for the parameters energy, mass, volume, pressure, temperature, density and time. The units for power, mass and volume flow rate are derived from the units for energy, mass, volume and time, e.g. mass [kg] and time [min] equals mass flow rate [kg/min].

17.5.5 Text

A standard text in the set language is stored for each value that can be displayed. The standard text can be replaced by a freely selectable one for the most important values, e.g. "V15 fuel (gas)" can be displayed instead of "standard volume 1".

UR06
Standard volume 1
001234567.5 m3
Volume 1
000983382.4 m3

UR06
V15 fuel (gas)
001234567.5 m3
Vt fuel (gas)
000983382.4 m3

17.6 Primary transmitter / Secondary transmitter

The secondary transmitter basically has the same menu items as the primary transmitter. Only the parameters “leak flow mode”, “calibration threshold”, “residence time”, “total pulses”, “error pulses” and “min measuring period” are used for both the primary and the secondary transmitter.

17.6.1 Transmitter selection

Selection of the volume / mass transmitter.

Selection:

Orifice dp 0/4-20mA	Volume pulse	Vol. Dual pulse
Volume 0/4-20mA	Mass pulse	Mass dual pulse
Mass 0/4-20mA		

17.6.2 Input

Electrical assignment of the transmitter to the input. If an orifice is selected as the transmitter, assignment takes place via the differential pressure input. Select a current input for volume / mass transmitters with current signal (I1 ... I4), a digital input for transmitters with a pulse (DI1 ... DI2) and a double pulse input for transmitters with a dual pulse (DI1/2).

Range: I1, I2, I3, I4, DI1, DI2, DI1/2

17.6.3 Nominal flow

The nominal flow determines the measuring range (maximum value) of the connected volume / mass transmitter. It is the 100% point for calculating the leak flow shut-off and flow-dependent linearization. If the transmitter is a volume transmitter, the unit is m3/h. If the transmitter is a mass transmitter or an orifice, the unit is kg/h.

Range: 0.001 m3/h ... 1e9 m3/h (or kg/h)

17.6.4 Pipe diameter

Internal diameter of the supply pipe. The input of the correct diameter is required for orifices. With other volume transmitters, the pipe diameter is only used to calculate the Reynolds number. (Input of the pipe diameter is also required if linearization via Reynolds number is selected.)

Range: 10 ... 1,500 mm

17.6.5 Leak flow

Set the leak flow shut-off in % of the nominal flow rate. The flow rate and the resulting parameters are set to 0 below the leak flow. Depending on the “leak flow mode” settings, volumes are, if necessary, added up. Leak flow operation is activated when the flow rate is below the set percentage of the nominal flow rate (e.g. 3.0%); it is deactivated when the flow rate is at least 1.2 times the set percentage of the nominal flow rate (e.g. 3.6%).

Range: 0.1 ... 10%

17.6.6 Place of installation

In energy mode, the volume / mass transmitters can be installed in the supply and return. In flow meter mode (no energy), “Warm” is automatically set as the place of installation.

Selection: Cold, **Warm**

17.6.7 Event counters

Additional counters (event counters) which are activated in the case of an event – error, threshold, control signal. Threshold dependent switching occurs via threshold 2 and threshold 3 for the primary transmitter and the secondary transmitter respectively.

Selection:

Without	Saturated steam	D2 inv.
Error	Sum/Sat. steam	Threshold 2 (3)
Sum/Error	D2	Threshold 2 (3) inv.

17.6.8 External control

The respective channel can be switched on and off via the external control. When the channel is switched off, the flow rate is 0 and the counters are inactive, irrespective of the measured values. The function can also be used to toggle between the primary and secondary channel. The primary channel and the secondary channel are controlled via threshold 2 and threshold 3 respectively. One channel must be controlled directly and the other inversely (inv.) for switching.

Selection: **without,** threshold 2 (3), threshold 2 (3) inv.

17.6.9 Pulse value

If a pulse pick-up (volume or mass) is selected as the volume transmitter, the pulse value is set here.

Range: 0.001 pulse/m3 ... 1e8 pulse/m3 (or pulse/kg)

17.6.10 Ratio X:Y

The ratio of the two channels can be set for measurements with a dual pulse. With a ratio of 1:1, the two channels are compared to the exact pulse and according to their ratio; with a ratio that does not equal 1:1, only the ratio can be compared.

Range: 0.001 ... **1** … 1000

17.6.11 Leak flow mode

Here it is set whether the volumes below the leak flow rate are counted or not. In “Count” mode, all pulses are counted and converted, even if the instant. value of the flow rate is below the leak flow rate. In “Not count” mode, pulses are not counted below the leak flow rate.

Selection: **Not count**, count

17.6.12 Calibration threshold

The calibration threshold is set above the leak flow rate for measurements as permitted by the German Board of Weights and Measures. If the set calibration threshold is below the leak flow rate, the setting is not considered. Error pulses for a dual pulse input are not counted below the leak flow rate.

Range: 0 ... 10%

17.6.13 Residence time

If the calibration threshold is set to a greater value than the leak flow rate, the measurement can only remain in this flow range during the residence time. If the residence time is exceeded, an error message is displayed.

Range: 0 s ... 600 s

17.6.14 Basic pulses

For the monitoring of the function of the dual pulse inputs. Number of volume pulses during which a certain number of interfering pulses are evaluated. If the basic number of pulses is achieved, the previous error pulses are deleted.

Range: 0 ... 50000

17.6.15 Error pulses

The number of maximum error pulses within the basic pulses. If the number of set error pulses within the basic pulses is exceeded, an error message is displayed. The volumes are then added up in the fault counters. The error message is displayed until the number of set error pulses is no longer exceeded for a full basic pulse interval.

Range: 1 ... 100

17.6.16 Minimum measuring time

The minimum measuring time for the frequency measurement is set here. This way it is possible to adapt the measuring time to the behavior of pulse pick-ups which do not output equidistant pulses. Ideal values for: Kamstrup 1000 ms, hydrometer 2000 ms.

Range: 100 ms …10000 ms

17.7 Orifice

17.7.1 Orifice type

Selection of the orifice (differential pressure device).

Selection:

Cross probe	Orifice D-D/2 tap	Venturi nozzle
Orifice Corner tap	ISA-nozzle	Venturi tube
Orifice flange tap	Quad edge orifice	Pitot tube
V-Cone	ILVA	

17.7.2 Flow coefficient

The flow coefficient determines the measuring range for autarkon transmitters (cross probe), Pitot tube and ILVA (Gilflo).

Range: 0.00 m3/h ... 10000.00 m3/h

17.7.3 Flow rate factor

Determined flow rate correction factor, deviation from the standard.
If the orifice is a Venturi tube, it is possible to enter the flow rate coefficient here. Characteristic line corrections are carried out via linearization.

Range: 0.5000 ... **1.000** … 2.000

17.7.4 Bore diameter

Internal diameter of the bore

Range: 3 ... 1500 mm

17.7.5 TC pipe

Temperature coefficient of the supply pipe, e.g. tc(V2A)=16 E-6 1/K

Range: 1 ... 100 E-6 1/K

17.7.6 TC bore

Temperature coefficient of the bore.

Range: 1 ... 100 E-6 1/K

17.8 Linearization

17.8.1 Linearization

Selection of the characteristic line correction of the flow sensor or orifice.

Selection: **without**, Re polynomial, Q polynomial, Q table

The parameters are used for linearizing the flow rate characteristic line. Wet calibration has to be carried out to determine the parameters. Linearization can occur as a function of the Reynolds number (Re) as well as proportional to the flow rate (q). Linearization only occurs within the Reynolds number or the flow rate thresholds determined via Q/Re-Lin 6 and 7. Outside the area, the correction occurs with the next threshold.

$$f = K_{-2} \cdot Re^{-2} + K_{-1} \cdot Re^{-1} + K_0 + K_1 + Re^1 + K_2 \cdot Re^2$$

$$f = K_{-2} \cdot q^{-2} + K_{-1} \cdot q^{-1} + K_0 + K_1 + q^1 + K_2 \cdot q^2$$

$$q_L = q \cdot (1 + f)$$

f = error, deviation of the characteristic line
q_L = linearized flow rate
K_n = polynominal coefficients, (K_{-2} … K_2 = Q/Re-Lin Par 1 … Q/Re-Lin Par 5)

Range: According to the parameter

17.8.2 Table

The flow rate characteristic line can be linearized via up to 15 table points. The flow rate in % of the nominal flow and the deviation to the ideal characteristic line in % are entered.
The sequence of the measuring points is freely selectable. If the flow rate is outside the maximum and minimum measuring point, the next measuring point is used for the correction. Linear interpolation occurs between the measuring points. Flow rate 0 is entered for unoccupied points.

Range: Flow rate 0 … 120%
Error -999 … +99%

17.9 Inputs

17.9.1 PT inputs

Selection of the temperature sensor type.

Selection: PT100, PT500, PT1000

17.9.2 Current input level

Selection of the current input level.

Selection: 0 ... 20 mA, **4 ... 20 mA**

17.9.3 Digital input level

Selection of the digital input level. U Lo is for voltage signals with a low level (e.g. 5 V), U Hi is for voltage signals with a high level (e.g. 24 V) and O.C. is for passive signals (e.g. Open Collector, NAMUR, relay). For details about the levels see “Measured variable input”.

Selection:

U Lo	U Hi	**O.C.**
U Lo low pass	U Hi low pass	O.C. low pass

17.10 Fluid

17.10.1 Fluid

Selection of the fluid. The density, enthalpy and dynamic viscosity for standard media are calculated according to internally defined methods. The polynominal coefficient for the relevant measuring range has to be determined and entered separately for special media. Saturated steam can be pressure (P) or temperature (T) controlled.

Selection:

Water	Steam	Natural gas
Saturated steam T	Air / Gas	Special fluid
Saturated steam P	Air / Gas ReKw	Mineral oil

17.10.2 Standard density

The standard status density (T=273.15 K and P=1.01325 bar) is entered here for air or other gaseous media. Water and steam are calculated internally with the respective fixed values. The setting in the menu “Mineral oils” is used for mineral oils.

Range: 0.5 kg/m3 ... 2,000.0 kg/m3

17.10.3 Base pressure

The pressure for the status on which the conversion is to be based is entered here.
This is of interest where, depending on the application, various “standard statuses” are common (e.g. air 1 bar). The calculation is carried out for all the media.
The base pressure and base temperature are used to internally calculate the base density.

Range: 0.5 bar ... **1.01325** … 20.0 bar

17.10.4 Base temperature

The temperature for the status on which the conversion is to be based is entered here.
This is of interest where, depending on the application, various “standard statuses” are common (e.g.

mineral oil 15°C). The calculation is carried out for all the media.
The base pressure and base temperature are used to internally calculate the base density.

Range: **0°C** ... 100.0°C

17.10.5 Isentropic exponent

If the primary or secondary transmitter is an orifice, the isentropic exponent is entered here. Refer to the literature for the values of various media.

Range: 1.1 ... 3

17.10.6 Compressibility

A fixed correction value can be entered here for media (fluids) for which the stored density calculations do not consider the compressibility.
The pressure dependence of the density is considered internally for water, steam and air.
The compressibility for hydro carbonates is calculated according to MPMS 11.2.1M or 11.2.2M (the selection is made automatically according to the density at 15 °C) or can be specified as a constant.

Range: 0.5 ... 2

17.10.7 Saturated pressure monitor

The saturation status can be monitored for steam, NGL and LPG measurements.
Steam: If activated and the pressure exceeds the vapor pressure a vapor pressure fault is reported.
LPG / NLG: If activated and the pressure falls below the vapor pressure a vapor pressure and volume fault is reported.
Selection: **No**, Yes

17.10.8 Pressure reserve

The switching point of the vapor pressure monitor can be controlled via the pressure reserve.
Steam: switching point = pressure > (vapor pressure – pressure reserve)
LPG / NLG: switching point = pressure < (vapor pressure + pressure reserve)

Range: 0.0 … 10.0 bar

17.10.9 Dynamische Viskosität 0°C

Die dynamische Viskosität wird bei Gasen nach der Gleichung von Sutherland berechnet.

Bereich: 1E-6 ... 1E-3 Pa s

17.10.10 Sutherland-Konstante

Die dynamische Viskosität wird bei Gasen nach der Gleichung von Sutherland berechnet.

Bereich: -100 ... 1000

17.11 Redlich Kwong

17.11.1 Critical pressure

The compressibility for gas can be calculated according to Redlich Kwong. The critical pressure is a parameter and is entered here. Refer to the literature for the values of various media.

Range: 1.0 bar ... 2,000.0 bar

17.11.2 Critical temperature

The compressibility for gas can be calculated according to Redlich Kwong. The critical temperature is a parameter and is entered here. Refer to the literature for the values of various media.

Range: 1 K ... 2,000 K

17.12 Density

17.12.1 Density determination

Control of density determination. If set to default calculation is done with a constant density. With P-T (default), the fluid as well as the pressure and temperature are used to calculate the density. The density can also be handled as a measured value via current or frequency.

Selection: Default
P-T
0/4..20mA
Frequency

17.12.2 Density input

Electrical assignment of the transmitter to the input signals. Select a current input for density transmitters with a current signal (I1 ... I4) and a digital input for transmitters with a frequency (DI1 ... DI2).

Range: I1, I2, I3, I4, DI1, DI2

17.12.3 Density measuring parameter 0 … 1

Polynomial coefficients for calculating the density from the measured values current / frequency.

Range: -1e37 ... +1e37

17.12.4 Density default

Default value for the density.

Range: 0.1 ... 2,000 kg/m³

17.12.5 Density end

Maximum value (end value) of the density transmitter at 20 mA.

Range: 0.0 kg/m3 ... 10,000.0 kg/m3

17.12.6 Density start

Minimum value (start value) of the density transmitter at 0/4 mA.

Range: 0.0 kg/m3 ... 10,000.0 kg/m3

17.12.7 Temperature

Allocation of a measured temperature to the density meter.

Selection: Temperature 1, temperature 2, temperature 3

17.12.8 Oscillation fork

Input of density transmitter parameters. The data can be taken from the calibration protocol of the density meter.

Density KB0 [kg/m³]
Density KB1 [kg/m³/s]
Density KB2 [kg/m³/s²]
Density KBT0 [kg/m³/K]
Density KBT1 [1/K]
Density TK [°C]

17.13 Special fluid

17.13.1 Parameter special fluid density

Polynomial coefficients for calculating the density (spec. volume) of special fluid SO1- SO2.

Density [kg/m³] = SO1 + SO2 * T
Density SO1 [kg/m³] = density at 0°C
Density SO2 [kg/(m³K)] = linear density development

Range: -1e37 ... +1e37

17.13.2 Parameter special fluid dynamic viscosity

Polynomial coefficients for calculating the dynamic viscosity of special fluid SO1 – SO3.
dyn. viscosity [Ns/m³] = 1 / (SO1 + SO2 * T + SO3 * T²)
dyn. viscosity SO1 [m²/(Ns)]
dyn. viscosity SO2 [m²/(NsK)]

dyn. viscosity SO3 [m²/(NsK²)]
T [°C] = temperature

Range: -1e37 ... +1e37

17.13.3 Parameter special fluid enthalpy

Polynomial coefficients for calculating the enthalpy of special fluid SO1- SO2.
Enthalpy [kWh/kg] = SO1 * T + SO2 * T²
Enthalpy SO1 [kWh/(kgK)] = specific thermal capacity
Enthalpy SO2 [kWh/(kgK²)] = slope of the specific thermal capacity
T [°C] = temperature

Range: -1e37 ... +1e37

17.14 Special fluid concentration

17.14.1 Mode

Control of the concentration determination. In default is expected with a constant concentration. In mode current the concentration is provided by an external measuring device. In mode density the concentration is calculated as a function of density.

Selection: without, default, 0/4..20mA, Density

17.14.2 Input

Electrical assignment of the current input to the measured value.

Range: I1, I2, I3, I4

17.14.3 Default

Default value for the concentration.

Range: 0 ... 100 %

17.14.4 End value

Value of the concentration at 20 mA.

Range: 0 ... 100 %

17.14.5 Start value

Value of the concentration at 0/4 mA.

Range: 0 ... 100 %

17.14.6 Parameter

Additional polynomial coefficients to respect the concentration.
Density SO3, Density SO4, Enthalpy SO3, Enthalpy SO4, dyn. Viscosity SO4, dyn. Viscosity SO5.

Range: -1e37 ... +1e37

17.15 GERG

17.15.1 GERG parameter

The compressibility or status number of natural gas can be calculated according to GERG 88.

Calorific value	Ho [kWh/m³]	Range: 5 ... 15
Carbon dioxide	CO2 [mol %]	Range: 0 ... 30
Hydrogen	H2 [mol %]	Range: 0 ... 10

17.16 Mineral oils

17.16.1 Oil group

Oil group selection according to DIN 51575 (PTB-A5, OIML 63, API-ASTM-IP, ASTM D4311). The fluid is automatically selected in the product group B, XG and XB setting using the measured or specified density. Depending on the density, the respective fluid is used for internal calculation. Crude oil and lubricant are not listed under product group B and cannot be automatically detected, as the

density areas overlap with other media. With the settings B.1 to B.4 calculation is done with linear equation (PTB-A5, Method 1), in other settings according to the procedures described in the relevant standards.

Selection:

Crud Oil	610,5 … 1075 kg/m³	Group XG	500 … 650 kg/m³
Fuel (Gas)	600,0 … 770,4 kg/m³	XG1	500 … 600 kg/m³
Naphtha	770,5 … 787,5 kg/m³	XG2	600 … 620 kg/m³
Jet	787,6 … 838,5 kg/m³	XG3	620 … 640 kg/m³
Heating Oil	838,6 … 1200 kg/m³	XG4	640 … 650 kg/m³
Lubricant	750,0 … 1164 kg/m³	Group XB	950 … 1200 kg/m³
Group B	600,0 … 1200 kg/m³	XB1	950 … 1000 kg/m³
B.1 Benzin	600,0 … 770,4 kg/m³	XB2	1000 … 1100 kg/m³
B.1 Ethanol	600,0 … 770,4 kg/m³	XB3	1100 … 1200 kg/m³
B.3	787,6 … 838,5 kg/m³	Asphalt A	>= 966 kg/m³
B.4	838,6 … 1200 kg/m³	Asphalt B	850 … 965 kg/m³
		K0E	
		Method X	
		Method Y	

For assignment of parameters see special fluid.

Parameter	K0E	Method X	Method Y
Density SO1	K0E	P1	alpha0
Density SO2		P2	K
Density SO3		P3	
Density SO4		P4	

17.16.2 Density 15°C

Input of the density at 15°C. An error is displayed if the entered density does not match the oil group.

Range: 100 ... 2,000.0 kg/m3

17.16.3 Compressibility mode

Mode for calculating the compressibility.
The compressibility for hydro carbonates is calculated according to MPMS 11.2.1M or 11.2.2M (the selection is made automatically according to the density at 15 °C) or can be specified as a constant.

Selection: Constant, MPMS 11.2.xM

17.16.4 vapor pressure mode

Selection of the vapor pressure calculation mode.

Selection: without, Constant, Antoine

17.16.5 vapor pressure

Vapor pressure (pressure equilibrium) for calculating the compressibility.

Range: 0.0 bar ... 10.0 bar

17.16.6 Antoine A, B, C

Parameter of the Antoine equation to calculate the vapor pressure. Proper values can be taken from literature. Parameter Antoine A without unit, Antoine B and C in °C, result in bar abs.
Pe [bar abs] = exp(A-(B/(T+C))

Range: depend on parameter

17.17 Differential pressure

The differential pressure measurement can be carried out with one (Index A) or with two (Index B) transmitters. Switching from the first to the second transmitter occurs when the current of the first

transmitter is > 19.5 mA. If a transmitter fails, calculation continues with the unaffected transmitter if it is in its measuring range.

17.17.1 dp mode

Operating mode for the differential pressure transmitter.

Selection:	Default	Calculation with default value (only for test purposes)
	ST	Measurement with 1 transmitter
	ST rad	Measurement with 1 transmitter square rooted
	DT	Measurement with 2 transmitters
	DT rad	Measurement with 2 transmitters square rooted
	EWZ211	Connection of a WZ200 transmitter
	DT31x.1	Connection of a DT31x.1 with balancing
	DT31x.1 rad	Connection of a DT31x.1 with balancing square root
	DT31x.1 + ST	Connection of a DT31x.1 with balancing + ST
	DT31x.1 + ST rad	Connection of a DT31x.1 with balancing + ST square root

17.17.2 dp default

Default value for the differential pressure. Only for test purposes.

Range: -3000.0 ... +3000.0 mbar dp

17.17.3 dp averaging

Factor for the average determination of the differential pressure.

Range: **1** … 255

17.17.4 dp offset

Use the dp offset to correct static offset of the differential pressure caused by the transmitter or installation. The set value is subtracted from the measured value.

Range: -10.0 mbar ... **0.0** … +10.0 mbar

17.17.5 dp1A/1B end

Maximum value (end value) of the dp transmitter at 20 mA.

Range: 1.0 mbar ... 10000.0 mbar

17.17.6 dp1A/1B input

Electrical assignment of the current input to the measured value.

Range: I1, I2, I3, I4

17.18 Pressure

17.18.1 Air pressure

Air pressure for correcting the relative pressure sensors.

Range: 0.500 ... **1.000** … 1.200 bar

17.18.2 Pressure Q correction

Flow rate dependent pressure correction.
P_k = P + pressure Q correction * density * Qb²

Range: -1e37 ... +1e37

17.18.3 Pressure mode 1 ... 3

Operating mode for the pressure transmitter. The absolute pressure is corrected with –50% of the dp for the cross probe (CP). In the Q correction setting, the pressure is corrected in a flow rate dependent manner.

Selection:

without	0/4..20 mA rel	0/4..20 mA abs. KS
default	0/4..20 mA abs.	0/4..20 mA abs. Qkorr.

		vapor pressure

17.18.4 Default pressure 1 … 3

Default value for the pressure. If the "Absolute pressure mode" is set to "Default", all calculations are carried out with this default value. If a pressure transmitter is connected, this value is only used for calculation if a measuring fault has occurred.

Range: -1 bar ... 300 bar

17.18.5 End pressure 1 … 3

Pressure at which the pressure transmitter supplies 20 mA.

Range: -1 ... 300 bar

17.18.6 Start pressure 1 … 3

Pressure at which the pressure transmitter supplies 0/4 mA.

Range: -1 ... 300 bar

17.18.7 Offset pressure 1 … 3

Offset value of the pressure measurement. This way it is possible to compensate for hydrostatic pressure caused by the installation.

Range: 0.00 bar ... 2.00 bar

Example:
In case of a separate installation and a height difference of 4.5 m between the tube center (with steam: condensate level) and the transmitter center, a value of 0.45 bar has to be set.

17.18.8 Pressure input

Electrical assignment of the current input to the measured value.

Range: I1, I2, I3, I4

17.19 Temperature

17.19.1 Temperature mode 1 … 3

Operating mode for the temperature sensor (PTxxxx).

Selection:	Default	Calculation with default value
	PT100..1000	Measurement PT100, PT500, PT1000
	0/4..20mA	Measurement via current input 1 ... 4
	boiling temperature	calculated from pressure

17.19.2 Default temperature 1 … 3

Default value for the temperature. If the "Temperature mode" is set to "Default", all calculations are carried out with this default value. If a temperature sensor is connected, this value is only used for calculation if a measuring fault has occurred.

Range: -100°C ... 1500 °C

17.19.3 Temperature input

Electrical assignment of the input to the measured value.

Range: PT1, PT2, I1, I2, I3, I4

17.19.4 End temperature 1 ... 3

Scaling of the temperature input in current input mode.
Temperature at which the transmitter supplies 20 mA.

Range: -100°C ... 1500°C.

17.19.5 Start temperature 1 ... 3

Scaling of the temperature input in current input mode.
Temperature at which the transmitter supplies 0/4 mA.

Range: -100°C ... 1500°C.

17.20 Thresholds

Thresholds incorporate two function groups.
The first function group has a monitoring function only. It is possible to monitor whether relevant measured values remain within their thresholds. An error message is displayed and a substitute value is generated if thresholds are exceeded.
In the second function group, measured and calculation values can be used to trigger a control function, e.g. to switch a contact or counters.

17.20.1 Monitoring mode

In this mode, it is possible to determine whether relevant measured values should be monitored in terms of their thresholds. The specific thresholds and / or the rate of change (gradient) of the measured values can be monitored.

Selection: **Off,** Min/Max, Gradient, Min/Max + gradient

17.20.2 Grace period monitoring

The time period after which a threshold violation also generates an error message. The temperature 1..3, pressure 1..3, density 1..2 and frequency 1..2 can be monitored.

Range: 0 … 60 s

17.20.3 Upper/Lower limit monitoring

The threshold of the allocated measured variable whose violation generates an error message once the grace period has expired. The measured value then changes to the default value of the respective measured variable. The upper/lower limits of temperatures, pressures, densities and frequencies can be monitored.

Range: Depends on the measured variable

17.20.4 Gradient monitoring

Monitoring the rate of change of the respective measured variable.

Range: Depends on the measured variable

17.20.5 Threshold selection 1 ... 7

Selection of the variable for threshold monitoring.

Selection:

Off	Density 2 [kg/m³]	Qn 1 [m3/h]
dp 1 [mbar]	Concentration 1 [%]	Qm 1 [t/h]
dp 2 [mbar]	Concentration 2 [%]	Power 1 [kW]
Pressure 1 [bar]	Base density 1 [kg/m³]	Qb 2 [m3/h]
Pressure 2 [bar]	Base density 2 [kg/m³]	Qn 2 [m3/h]
Pressure 3 [bar]	Density meas. val. 1 [kg/m³]	Qm 2 [t/h]
Temperature 1 [°C]	Density meas. val. 2 [kg/m³]	Power 2 [kW]
Temperature 2 [°C]	Current input 1	Qb 3 [m3/h]
Temperature 3 [°C]	Current input 2	Qn 3 [m3/h]
Temp.Diff. 1 [°C]	Current input 3	Qm 3 [t/h]
Temp.Diff. 2 [°C]	Current input 4	Power 3 [kW]
Density 1 [kg/m³]	Qb 1 [m3/h]	

17.20.6 Top/Bottom threshold 1 ... 7

Switching point for the threshold. Ensure that the upper value is not the same as the lower value. The hysteresis results from the difference.

Range: - 1e-37 ... +1e37

17.21 Digital outputs

The digital outputs are universal digital outputs. They can be used for status messages (error, threshold, leak flow rate) as well as for pulse output of the counters.

17.21.1 Min. pulse width

Determination of the minimum pulse / pause width of the pulse outputs. The setting applies to all the pulse outputs. The smallest value is 5 ms; for the module outputs 1 ms.

17.21.2 Digital output 1-3 mode 1-3

There are 2 operating modes if the digital outputs 1 to 3 are used to output pulses. In “Pulse” mode, pulses are output to the electronic counters in a rigidly coupled manner. The minimum pulse width corresponds to the set value. In “DDS” mode, pulses are coupled to the instant. values. There may be deviations between the counters and the output pulses when starting and stopping the measurement. The advantage of “DDS” mode is that it provides a very uniform pulse output. In “Pulse” mode, pulses can be output in a bundled structure.
Functioning of the digital outputs 4 to 7 is not related to the setting in “Pulse” mode.

Selection: DDS, pulse

17.21.3 Digital output 1 ... 3(7)

Selection of the digital output operating mode. Sums or differences can be output via AUX 1..4. The function is defined under AUX counters.

Selection:

Off	Operating point test	Energy 2 [kWh]
Error	Bus	VB 2 Event [m3
Error inv.	VB 1 [m3]	VN 2 Event [m3]
Threshold 1..7	VN 1 [m3]	Mass 2 Event [t]
Threshold 1..7 inv.	Mass 1 [t]	Energy 2 Event [kWh]
Leak flow 1	Energy 1 [kWh]	AUX 1
Leak flow 1 inv.	VB 1 Event [m3]	AUX 2
Leak flow 2	VN 1 Event [m3]	AUX 3
Leak flow 2 inv.	Mass 1 Event [t]	AUX 4
Zero balance 1	Energy 1 Event [kWh]	1 Hz
Zero balance 2	VB 2 [m3]	
saturation 1	VN 2 [m3]	
saturation 2	Mass 2 [t]	

17.21.4 Pulse value digital output 1 ... 3(7)

Value of the output pulse. The unit always corresponds to the selected variable.

Range: 0.001 pulse/unit ... 10000 pulse/unit

17.22 Current output

17.22.1 Selection current output 1 ... 2(6)

Selection of the current output.

Selection:

Off	Temp.Diff. 1 [°C]	Qb 1 [m3/h]
0 mA	Temp.Diff. 2 [°C]	Qn 1 [m3/h]
4 mA	Density 1 [kg/m³]	Qm 1 [t/h]
20 mA	Density 2 [kg/m³]	Power 1 [kW]
Default	Concentration 1 [%]	Qb 2 [m3/h]
dp 1 [mbar]	Concentration 2 [%]	Qn 2 [m3/h]
dp 1 rad [mbar]	Base density 1 [kg/m³]	Qm 2 [t/h]
dp 2 [mbar]	Base density 2 [kg/m³]	Power 2 [kW]
dp 2 rad [mbar]	Density meas. val. 1 [kg/m³]	Qb 3 [m3/h]
Pressure 1 [bar]	Density meas. val. 2 [kg/m³]	Qn 3 [m3/h]
Pressure 2 [bar]	Current input 1	Qm 3 [t/h]

Pressure 3 [bar]	Current input 2	Power 3 [kW]
Temperature 1 [°C]	Current input 3	Vapor pressure 1
Temperature 2 [°C]	Current input 4	Vapor pressure 2
Temperature 3 [°C]		

17.22.2 Default current output 1 ... 2(6)

Default value for checking the current transmission and for test purposes.

Range: 0 ... 22 mA

17.22.3 End current output 1 ... 2(6)

Scaling of the current output.

Range: -50 ... 100000.

17.22.4 Start value current output 1 ... 2(6)

Scaling of the current output.

Range: -50 ... 100000.

17.22.5 Time constant current output 1 ... 2(6)

Damping factor for the current output. Tau ~ n * 125 ms.

Range: n = 1 ... 255

17.22.6 Error behavior current output 1 ... 2(6)

Behavior of the current output if an error occurs. Depending on the setting, the current output retains its value or changes to the set constant current. This can be used for remote transmission of the error message, if supported by the evaluation device.

Selection: **Without**
Default
0 mA (equivalent to min. or line break)
3.5 mA
4 mA (equivalent to min.)
20 mA (equivalent to max.)
22 mA

17.22.7 Level current output 1 ... 2(6)

Selection of the current output level.

Selection: 0 ... 20 mA, **4 ... 20 mA**

17.23 Clock

17.23.1 Date

Display and setting of the date.

Range: 01.01.00 ... 31.12.99

17.23.2 Time

Display and setting of the time.

Range: 00:00:00 ... 23:59:59

17.23.3 Clock adjustment

Adjustment of the real time clock.

Range: 0.999005 ... 1.00019

17.24 Data logger

17.24.1 Log events

Several log events can be chosen.

Selection: off, Error comes, Error goes, Batch, Period, Day, Month, Record date, Modbus

17.24.2 Record date 1 .. 2

Enter the day on which the counters are to be recorded. If month = 0, then data are stored every month at selected day.

Range: 01.00. ... 31.12.

17.24.3 Data log period

Time interval during which the values defined under the data log mode are saved.

Selection: 15 mins, 30 mins, 1 hour

17.24.4 Data log integration time

Integration time for determining the min. and max. values. If the setting is “0”, no mean value is generated; the min/max of each value is tested. If the setting is > 0, the mean value is determined for all measured values during the integration time; the min/max of this value is then tested and, if necessary, saved.

Range: 0 ... **15** … 255 min

17.24.5 Data log configuration error comes/goes

Several log errors can be chosen to trigger a log event.

Selection: All, Energy 1, Volume 1, Energy 2, Volume 2, EEPROM, EEPROM Parameter, EEPROM CRC

17.24.6 Data log history days

Number of day to keep at least in the log book.

Range: 0 … 100

17.24.7 Data log delete old entries

Old entries can be manually deleted from the log book.

Range: 0 … 8000

17.25 Communication

Additional and extensive information about M-Bus and Modbus is available separately.

17.25.1 Bus address M-Bus

Primary address for reading via the M-Bus protocol.

Range: 0 … **1** ... 250

17.25.2 M-Bus baud rate

Baud rate for the M-Bus interface. The baud rate can be altered without a password.

Selection: 300, 600, 1200, **2400**, 4800, 9600

17.25.3 Secondary M-Bus address

Secondary address for reading via the M-Bus protocol.

Range: 00000000 ... 99999999 (see M-Bus description)

17.25.4 M-Bus manufacturer

Manufacturer code on the M-Bus .
METRA = MET = 8372_D,
Bopp & Reuther = BUR = 2738_D

Selection: Unknown, **METRA**, B&R

17.25.5 Modbus address

Primary address for reading via the Modbus protocol.

Range: 0 … **1** ... 250

17.25.6 RS232 mode

Selection of the Modbus protocol. In the mode = M-Bus, the settings of the first M-Bus are accepted.

Selection: OFF, **ASCII**, RTU, M-Bus

17.25.7 Modbus baud rate

Baud rate for the Modbus interface. The baud rate can be altered without a password.

Selection: 2400, 4800, **9600**, 19200

17.25.8 Modbus data bit

Number of data bits.

Selection: 7-bit, **8-bit**

17.25.9 Modbus parity

Type of parity.

Selection: **NO**, EVEN, ODD

17.25.10 Profibus

See separate documentation.

17.25.11 Counter factor bus

Counter factor for the transfer of counter readings via M-Bus or Modbus. The counter readings are transferred in LONG format (2^32). The smallest counter step is equivalent to the counter factor. The basic units for internal calculation are l, kg, Wh. A decade overflow of the displayed counters occurs for each 10^{12} of the basic unit. A decade overflow of the transferred counters occurs for each 10^{9} of the Cnt factor.

Range:

0,0001 [m3-t-kWh]*10	0,1 [l-kg-Wh]*10	100 [ml-mg-mWh]*10
0,001 [m3-t-kWh]	1 [l-kg-Wh]	1000 [ml-mg-mWh]
0,01 [l-kg-Wh]*100	10 [ml-mg-mWh]*100	

17.26 Counters

17.26.1 AUX counters

Four auxiliary counters can be configured in addition to the default counters. These counters are only calculated from the allocated counters at the display time. They are not available as independent counters.

17.26.2 AUX mode

Selection of the operating mode of the AUX counters. The sum or the difference of the allocated channel 1 and channel 2 counters can be established. The sums or differences can also be output as pulses.

Selection: **Without**, sum channel 1 + 2, difference channel 1 - 2, difference channel 2 - 1

17.26.3 AUX selection

Allocation of the counters whose sum or difference should be displayed as an AUX counter.

Selection:

Volume	Standard volume subset	Energy
Volume event	St. vol. event subset	Energy event
Volume subset	Mass	Energy subset

Volume event subset	Mass event	Energy event subset
Standard volume	Masse subset	
Standard volume event	Mass event subset	

17.26.4 Clear counters

All the counters are reset to 0. Alternatively, only counter groups can be cleared.

Commands:

Clear all counters	(All counters are cleared)
Clear all counters1	(All counters of group 1, primary transmitter are cleared)
Clear all counters2	(All counters of group 2, secondary transmitter are cleared)
Clear subsets1	(All subsets of group 1, primary transmitter are cleared)
Clear subsets 2	(All subsets of group 2, secondary transmitter are cleared)
Clear event 1	(All event counters of group 1, primary transmitter are cleared)
Clear event 2	(All event counters of group 1, secondary transmitter are cleared)

17.26.5 Set value counter

Changing and saving the new value.
(When selecting the parameter, the current counter status is displayed and frozen. Use “Next” to accept the possibly changed value in the counter.)

Range: Counter range

17.27 Balancing

17.27.1 PT100 balancing offset / slope 1 ... 2

Calibration values for the PT100 input.

Range: According to the parameter

17.27.2 PT500/1000 balancing offset / slope 1 ... 2

Calibration values for the PT500/1000 input.

Range: According to the parameter

17.27.3 Current input balancing offset / slope 1 ... 2 (6)

Calibration values for the current input.

Range: According to the parameter

17.27.4 Current output balancing offset / slope 1 ... 2 (6)

Calibration values for the current output.

Range: According to the parameter

18 Connection of the Universal Flow Computer

Energy supply:

Supply voltage:	180 V ... 264 V AC, 18 V ... 36 V DC (optional)
Cable gland:	1x M20, 3x M16 and 5x M12
Cable diameter:	3.5 to 12 mm
Terminals:	Externally tensioned plug-in terminals
Wire cross section:	0.5 … 1.5 mm² rigid and flexible Modules 0.4 … 0.8 mm² rigid and flexible
Cable type:	We recommend LiYY (stranded pair, without shielding)
Cable length:	For sensors in accordance with EU directive 2014/32/EU Annex MI-004 to 100 m. For outputs and other installations up to 500 m, depends on the ambient conditions.

The application of cables stranded in pairs is recommended. Shielded cables are not required. However, if shielded cables are used, for example if recommended by the transmitter manufacturer, the shielding should not be connected to UR06.

Example:

Temperature sensor	4-wires, stranded in pairs	e.g. LiYY (TP) 4*0.5 mm²
Pressure transmitter	2-wires, stranded in pairs	e.g. LiYY (TP) 2*0.5 mm²
DT31x (up to 45 m)	6-wires, stranded, shielded	e.g. LiYCY 6*0.5 mm²

19 Certificates and Approvals

- DIN-EN 9001 certified production
- Type examination according to EU Directive 2014/32/EU Annex MI-004.
  DE-08-MI004-PTB004 (different software version)
- Type examination according to German Eichordnung EO 22 as calculator for cold-meters and combined heat- and cold-meters. **PTB Z 22.75 / 09.02 (different software version)**
- Type examination according to EU directive 2014/32/EU Annex MI-005 (OIML test report)
- CE mark:
  The measuring system fulfills the legal requirements of the EC Directives 2014/30/EU (EMC Directive) and 2014/35/EU (Low Voltage Directive). We confirm successful device testing by affixing of the CE mark.

20 Appendix

20.1 Error and warning messages

Active errors and warnings are displayed with the error number and a text.
After eliminating the cause of the error, the messages are automatically deleted. Only pulse errors have to be acknowledged. If all the errors have been eliminated, a message appears stating that new errors have been listed in the logbook. The last 100 error messages are listed in the logbook with the time of their occurrence and elimination.
If a measured value is unavailable, the default value (substitute value) is used for further calculations, but not if the main measured value is affected (dp, flow rate). Flow rate, power and current outputs are calculated with the default values, the counters are inactive. If fault counters have been configured, they continue to operate.

Code	Designation	Possible reason	Effect
E01	Power off	No power supply, defective fuse	No functions Display is black Message only in the logbook
E02	AD converter I	AD converter for current measuring defective	Measured value fails or calculation is carried out with default values Error can only be eliminated by the manufacturer.
E03	AD converter PT	AD converter for temperature measuring defective	Measured value fails or calculation is carried out with default values Error can only be eliminated by the manufacturer.
E04 E05 E06 E07	AD-I1 AD-I2 AD-I3 AD-I4	Measured variable outside the measuring range Wiring error	Measured value fails or calculation is carried out with default values
E08 E09	AD-PT1 AD-PT2	Measured variable outside the measuring range Wiring error	Measured value fails or calculation is carried out with default values
E10	EEPROM	Error when writing in the internal EEPROM	

E11	EEprom Para.	Parameter after device restart outside the permissible range	Default value is used for the affected parameter.
E12	EEprom count.	Incorrect check sum of the counters saved in the EEPROM	
E13	Pulses>max	Buffer overflow. Pulse value or minimum pulse width has been set incorrectly.	Output pulses are lost. No influence on the displayed counters.
E14	Mathematics	Incorrect configuration, incorrect parameters	No re-evaluation
E15	Timeout LCD	Communication between the basic device and the display interrupted	No influence on the re-evaluation
E16	CRC EEPROM	Log (EEPROM) defective or not installed	
E17	Time setting	Clock defective	Incorrect time, tariff values incorrect. No influence on the re-evaluation
E33 E65 E97	Config. temp. 1 Config. temp. 2 Config. temp. 3	Error in the configuration of the temperature input.	
E34 E66 E98	Temperature 1 Temperature 2 Temperature 3	Temperature measurement faulty. Incorrect configuration, short circuit, cable break.	
E35 E67 E99	Config. pressure 1 Config. pressure 2 Config. pressure 3	Error in the configuration of the pressure input.	
E36 E68 E100	Pressure 1 Pressure 2 Pressure 3	Measured variable outside the measuring range. Wiring error. Pressure transmitter is selected but not connected or the current is less than 3.6mA. No pressure transmitter connected or no default value for gaseous media.	Measured value fails or calculation is carried out with default values
E37 E69	Conf. density 1 Conf. density 2	Error in the configuration of the density measurement.	
E38 E70	Density 1 Density 2	Density measurement faulty or outside the specified area for the fluid.	Default value is used for calculations.
E39 E71	Conf. dp 1 Conf. dp 2	Error in the configuration of the differential pressure input.	dp=0
E40 E41 E42 E72 E73 E74	dp 1 dp 1A dp 1B dp 2 dp 2A dp 2B	Measured variable differential pressure outside the measuring range. Wiring error. Differential pressure transmitter is selected but not connected or the current is less than 3.6mA.	dp=0
E43 E75	Conf. pri. transm. Conf.sec. transm.	Error in the configuration of the primary transmitter / secondary transmitter.	Flow rates are set to 0
E44 E76	Primary transmitter Secondary transmitter	Mass/Volume flow is set to 4-20mA for the transmitter and the current falls below 3.6 mA.	Flow rates are set to 0
E45 E77	Base density 1 Base density 2		
E46 E78	Saturated steam 1 Saturated steam 2	Saturated steam monitor active and measured values outside the saturated steam line.	Saturated steam parameters are used for the further calculation.
E47 E79	GERG 1 GERG 2	Incorrect GERG parameters.	Calculation with constant compressibility.
E49 E81	Comp pulse 1 Comp pulse 2	Number of permitted error pulses exceeded. (only dual pulse)	
E50 E82	Zero balance 1 Zero balance 2	Zero balance faulty (only EWZ211)	dp=0
E51	Volume 1	Measured variable fault fort he volume	No re-evaluation

E83	Volume 2	calculation.	
E52 E84	Energy 1 Energy 2	Measured variable fault for the energy calculation.	No energy calculation.
E53 E85	Conf. concentrat. 1 Conf. concentrat. 2	Error in configuration of concentration measurement	Conc = 0
E54 E86	Concentrat. 1 Concentrat. 2	Error concentration measurement	Calculation with default value.
E55 E87	Conf. cal. value 1 Conf. cal. value 2	Error in configuration of caloric value measurement	Caloric value = 0
E56 E88	Caloric value 1 Caloric value 2	Error caloric value measurement	Calculation with default value.
E129 E130 E131 E132	Mod0 malfunct. Mod1 malfunct. Mod2 malfunct. Mod3 malfunct.	Module defective	If module 0 is a current input module 3/4, then I3, I4 = 0 mA.
E133 E134 E135 E136	Mod0 unknown Mod1 unknown Mod2 unknown Mod3 unknown	Basic device does not recognize the module Software not compatible	
E137	Mod0 EEprom	Module memory (EEPROM) defective or not installed	
E138	Wrong slot I3/4	Current module recognized, but wrong slot (<> MODUL0)	Current 3 and 4 are set to 0 mA
E139 E140 E141	M-Iin34 malfun. M-Iout34 malfun. M-Iout56 malfun.	Communication with module faulty	
E142 E143	M-Iout34 config. M-Iout56 config.	Incorrect configuration of the module	
E144	M-DEin36 malfun.	Error communication	
E145	M-DEin36 config.	Wrong module setup	
E146	M-Profi. malfun.	Communication with module faulty	
E147	M-Profi config.	Incorrect configuration of the module	
W01 W02 W03	Temp 1 threshold Temp 2 threshold Temp 3 threshold	Temperature outside the set thresholds.	Switch to default value.
W04 W05 W06	Pressure 1 thres. Pressure 2 thres. Pressure 3 thres.	Pressure outside the set thresholds.	Switch to default value.
W07 W08	Density 1 thres. Density 2 thres.	Density outside the set thresholds.	Switch to default value.
W09 W10	Freq. 1 threshold Freq. 2 threshold	Frequency outside the set thresholds.	

20.2 Units

Volume		-->>		-->>	
Litre	l	0.001	m3	1000	l
Hectolitre	hl	0.1	m3	10	hl
Cubic decimetre	dm3	0.001	m3	1000	dm3
Cubic metre	m3	1	m3	1	m3
Fluid ounce [US]	oz	2.95735E-05	m3	33814.02449	oz
Cubic foot	ft3	0.028316847	m3	35.31466621	ft3
Gallon [US]	gal	0.003785412	m3	264.1720722	gal
Imperial gallon	igal	0.00454609	m3	219.9692483	igal
Barrel [US] (mineral oil)	bbl	0.1591132	m3	6.284833691	bbl
Barrel [US] (liquids)	bl	119.2405	m3	0.008386412	bl

Acre foot	acf	1233.481838	m3	0.000810713	acf
Mass		-->>		-->>	
Gram	g	0.001	kg	1000	g
Kilogram	kg	1	kg	1	kg
Metric ton	t	1000	kg	0,001	t
Pound	lb	0.45359237	kg	2.204622622	lb
Short ton	ton	907.18474	kg	0.001102311	ton
Long ton	ton	1016.0469	kg	0.000984207	ton
Density		-->>		-->>	
Kilogram per cubic meter	kg/m3	1	kg/m3	1	kg/m3
Gram per liter	g/l	1	kg/m3	1	g/l
Pound per cubic foot	lb/ft3	16.018463	kg/m3	0.062427962	lb/ft3
Pound per gallon [US]	lb/gal	119.82643	kg/m3	0.008345404	lb/gal
Temperature		-->>		-->>	
Degree Celsius	°C	1	°C	1	°C
Kelvin	K	TK-273.15	°C	TC+273.15	K
Degree Fahrenheit	°F	(TF-32)*5/9	°C	TC*1.8+32	°F
Degree Rankin	°Ra	TRa*5/9-273.15	°C	TC*1.8+491.67	°Ra
Energy		-->>		-->>	
Watt hours	Wh	1000	kWh	0.001	Wh
Kilo-Watt hours	kWh	1	kWh	1	kWh
Mega-Watt hours	MWh	0,001	kWh	1000	MWh
Joule	J	2,77778E-07	kWh	3600000	J
Kilo Joule	kJ	2,77778E-04	kWh	3600	kJ
Mega Joule	MJ	2,77778E-01	kWh	3.6	MJ
Giga Joule	GJ	2,77778E+02	kWh	0,0036	GJ
Calories	cal	1.16E-06	kWh	859845.2279	cal
Kilo calories	kcal	1.16E-03	kWh	859.8452279	kcal
Mega calories	Mcal	1.16E+00	kWh	0.859845228	Mcal
Giga calories	Gcal	1.16E+03	kWh	0.000859845	Gcal
Kilo British thermal unit	kbtu	0.29307107	kWh	3.412141635	kbtu
Mega British thermal unit	Mbtu	293.07107	kWh	0.003412142	Mbtu
Giga British thermal unit	Gbtu	293071.07	kWh	3.41214E-06	Gbtu