Ultrasonic heating and cooling meter
T230
Residential

ULTRAHEAT®T230
ULTRACOLD®T230

Technical description

32 18 101 001 g
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Landis+Gyr GmbH

Outstanding features

Meter for measurement of flow and energy in a heat or cold circuit with water using the ultrasonic principle.

Important properties are:

- Non-wearing due to non-moving parts
- Measuring range of 1:100 according to EN1434:2007, 1:1.000 total range
- Fast, intelligent temperature measurement interval
- Easy installation and read out
- Removable electronic unit
- Large, easy readable display
- Flow and power measurement with maximum values
- 2 set days for in whole 24 months (can be parameterized)
- Yearly set day (can be parameterized)
- Battery lifetime up to 11 years
- Optical interface according to EN 62056-21:2003
- Communication interfaces for remote readout or system connection
- Self-diagnosis

Contents

1 General notes

Note: In the text below, the term meter refers both to the heat meter and to the cooling meter and the combined heat and cooling meter, unless otherwise specified.

The meter is used as a meter for heating or cooling consumption measurement in systems with water.
The meter consists of a high-tech composite volume measurement unit, two temperature sensors connected in a fixed position and an electronic unit that calculates the energy consumption from the volume and temperature difference.
This technology is thus wear free, robust and largely maintenance free. High precision and long-term stability guarantee precise and equitable cost accounts.

Other available documents

- Operating and Installation Instructions T230
- Respective module operating and installation instruction
- Illustrated catalogue
- Battery exchange description.

Additional information is available on request.

2 Safety information

The meter may only be used in building service engineering systems and only for the applications described.

The local regulations (installation etc.) must be adhered to.

The operating conditions according to the type plate must be complied with during use. Non-compliance can result in hazardous situations and the expiry of all claims arising from liability for defects as well as liability based on any expressly granted guarantees.

Do not under any circumstances carry out welding, drilling or soldering work close to the meter.

Adhere to the requirements regarding circulating water (CEN / TR 16911:2016).

The meter is only suitable for circulating water in heating systems.

The meter is not suitable for drinking water.

Only personnel, trained in the installation and operation of meters in heating and cooling systems, may install and remove the meter.

Only install or remove the meter when the pipes are pressureless.

After installing the meter, check the leak-tightness of the system.

Guarantee and calibration validity will lapse if the calibration relevant security seal is broken.

Only clean the meter from outside with a soft, lightly wetted cloth. Do not use any spirit or cleaning solvent.

As far as disposal is concerned, the meter is a waste electronic appliance in the sense of European Directive 2012/19/EU (WEEE) and it must not be disposed of as domestic waste. The relevant national, legal regulations must be observed as the appliance must be disposed of via the channels provided for this purpose. The local and currently valid legislation must be observed.

The meter contains lithium batteries. Do not dispose of the meter and the batteries with domestic waste. Observe the local stipulations and laws on disposal.

You can return the lithium batteries to the manufacturer for appropriate disposal following use. When shipping please observe legal regulations, in particular, those governing the labelling and packaging of hazardous goods.

Do not open the batteries. Do not bring batteries into contact with water or expose to temperatures above 80 °C.

The meter does not have any lightning protection. Ensure lightning protection via the in-house installation.

3 Technical Data

General	
Measuring accuracy	Class 2 or 3 (EN 1434)
Environment class	A (EN 1434) for indoor installation
Mechanical class	M1 *)
Electromagnetic class	E1 *)
*) according to 2014/32/EU Measuring Instruments Directive	
Ambient humidity	< 93% rel. humidity at 25 °C, without condensation
Max. height	2000 m above sea level
Storage temperature	-20 … 60 °C
Electronic unit	
Ambient temperature	5 … 55 °C
Housing protection rating	IP 54 acc. to EN 60529, optional IP 65
Power supply	Battery for 6 or 11 years
Operation threshold for ΔT	0.2 K
Temperature difference ΔT	3 K … 80 K
Temperature measurement range	0 ... 180 °C
LCD	7 digits
Optical interface	Standard, EN 62056-21
Communication	Optional
Separability	Always, cable length 1.5 m
Temperature sensor	
Type	Pt 500 according to EN 60751, not detachable
Connection type	Pt 500, 2 wire technology
Cable length	1.5 m (optional 5 m)
Construction type	Bulb sensor ø 5.2 × 45 mm
Temperature range	0 ... 95 °C
Volume measurement unit	
Protection class	IP 65 according to EN 60529
Mounting place	Hot side / cold side
Installation position	Any
Flow straightening	None
Measuring range	1:100
Temperature range	5 … 90 °C National type approvals may differ
Maximum overload	qs = 2 x qp, permanent
Nominal pressure	PN16 (1.6 MPa; PS16)
Power Supply	
Type of power supply	Battery for 6 or 11 years
Type of battery	AA-cell Lithium
Lithium content	0,65 g per battery
Number of batteries	1 – 3; depending on configuration
Exchangeability	As of FW 7.20 changeable in the field

qp m³/h	**Length and connection**	
0.6	110 mm (3/4 ")	
1.5	110 mm (3/4 ")	130 mm (1 ")
2.5		130 mm (1 ")

Nominal flowrate q_p	Overall length	Connection	Maximum flowrate q_s	Minimum flowrate q_i	Response threshold (variable)	Pressure loss at q_p	Kv flowrate at Δp 1 bar	Kv flowrate at Δp 100 mbar	Weight
m^3/h	**mm**	**G/DN**	**m^3/h**	**l/h**	**l/h**	**mbar**	**m^3/h**	**m^3/h**	**g**
0.6	110	G 3/4	1.2	6	1.2	75	2.2	0.7	520
1.5	110	G 3/4	3	15	3	135	4.1	1.3	520
1.5	130	G1	3	15	3	135	4.1	1.3	560
2.5	130	G1	5	25	5	135	6.8	2.2	560

Tolerance of pressure loss: +/- 5%

4 Overview dimensions (qp 0.6 – 2.5 m³/h)

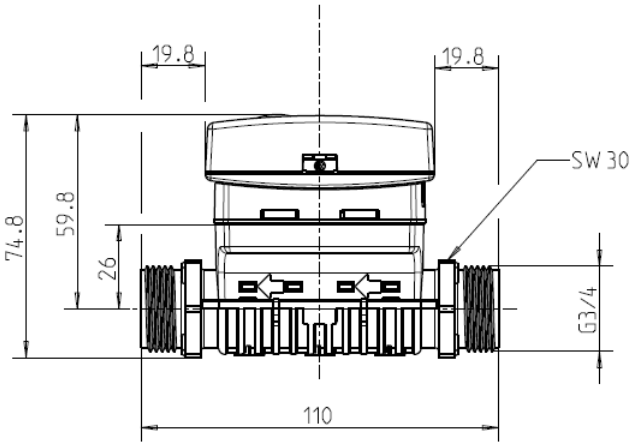


Fig. 1: Overview dimensions overall length 110 mm

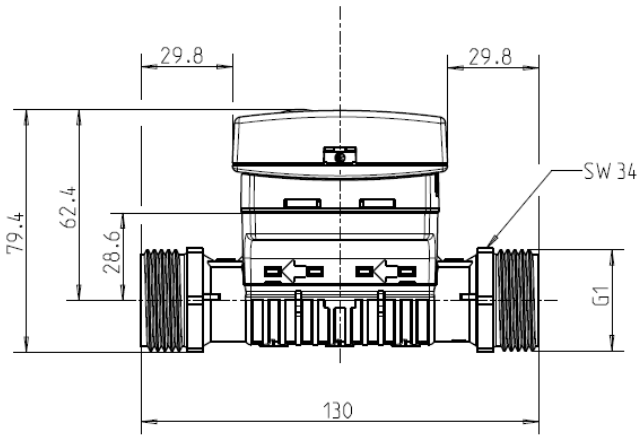


Fig. 2: Overview dimensions overall length 130 mm

Order-No.	qp	PN	Overall length
	m³/h	bar	mm
T230-x05	0.6	16	110
T230-x21	1.5	16	110
T230-x26	1.5	16	130
T230-x36	2.5	16	130

5 Installation

To install the meter, proceed as follows:

- Determine the place of installation in line with the inscription on the meter.

Note: For a **heat meter** the mounting place of the flow sensor cold side is equivalent to return . The mounting place of the flow sensor hot side is equivalent to flow .

Note: For a **cooling meter** the mounting place of the flow sensor hot side is equivalent to the return . The mounting place of the flow sensor cold side is equivalent to flow .

Note: At a meter with an **adjustable mounting place** L1, the mounting place hot side is displayed as hot. The mounting place cold side is displayed as cold.

- Observe the dimensions of the meter and check whether there is enough space available.
- Rinse the system thoroughly before installing the meter.
- Fit the meter vertically or horizontally between two slide valves so that the arrow on the housing and the flow direction match. Also observe the installation situations and the following examples of installation.

Note: Only use the flat seals that are supplied.

- The meter must not be exposed to tensions or forces caused by pipes or fittings. If this cannot be permanently guaranteed, it is necessary to improve the point of installation or fix the lines in position, by means of suitable connecting brackets for example.
- Fit the temperature sensors in the same circuit as the meter.
- Seal the temperature sensor and the fittings to protect against manipulation.
- If you install the meter for cooling metering, follow the appropriate notes.

Recommendation: If you are installing several meters, the same installation conditions must be consistent for all meters.

5.1 Change mounting place

Note: The mounting place is locked and can't be changed after the meter has detected a volume of 10 liters. As a result, the "P" disappears from the display: hot or cold

For meters with adjustable mounting place, the mounting place can be set manually. Proceed as follows:

- Hold the button several times long (for more than 3 s) until LOOP 1 appears on the LCD.
- Press the button briefly repeatedly until P hot or P cold appears on the LCD.
- To change the mounting place, press the button longer (more than 3 sec). The LCD display changes.

The change happens automatically. The mounting place is locked and can't be changed after the meter has detected a volume of 10 liters.

- Adjust the temperature sensors according to the installation requirements.

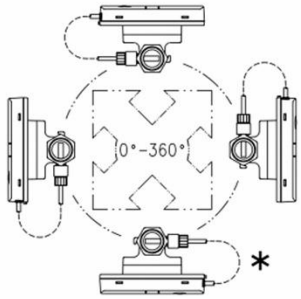
5.2 Installation Notes

Inlet or outlet sections are not necessary. If you install the meter in the common return of two circuits, determine a place of installation with a minimum distance of 10 × DN from the T-piece. This distance ensures a good thorough mixing of the different water temperatures. You can install the temperature sensors in T-pieces, ball valves, directly immersed or in pockets depending on the version. The temperature sensor ends must reach to at least the middle of the pipe cross section.

Note: Protect the meter against damage through impacts or vibrations at the place of installation.

5.3 Examples of installation (directly immersed sensor)

You can install the meter in any position, e.g., vertically, or horizontally. To avoid accumulation of air and disruption in operation, fit the meter in a vertical installation position and not in the uppermost area of a pipeline.



* This position is not permitted for cooling meters and in cases where moisture can enter the electronic unit due to condensation (e.g., during an interruption in the summer).

Fig. 3:

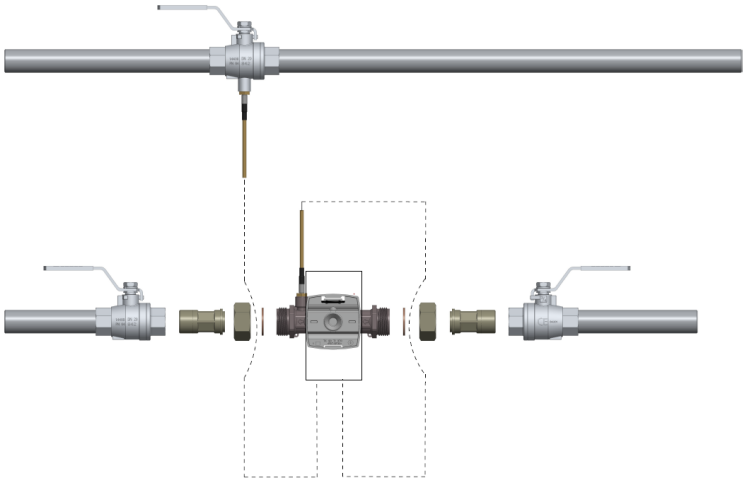


Fig. 4: Installation example

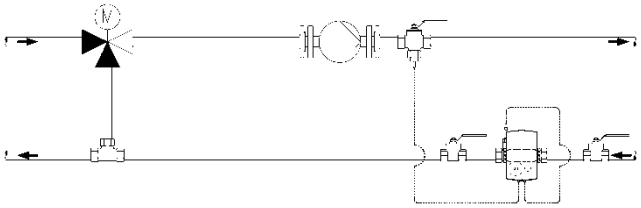


Fig. 5: Installation for circulation with admixing; placement of temperature sensors

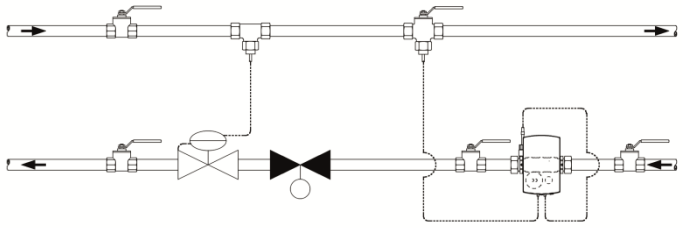


Fig. 6: Installation for circulation with throttling configuration (flow sensor in flow direction before control valve / differential pressure regulating valve)

5.4 Installation notes for sensor adapter set

A mounting set is included for meters with 5.2 × 45 mm temperature sensor. With this you can fit the temperature sensor directly immersed into an insert or a ball valve for example.

1. Install with O-ring at the point of installation with the fit-up aid/pen provided.
2. Place both halves of the plastic bolting round the 3 notches of the temperature sensor.
3. Press the bolting together and screw the bolting hand tight into the point of installation until it comes to a stop (tightening torque 3 ... 5 Nm).

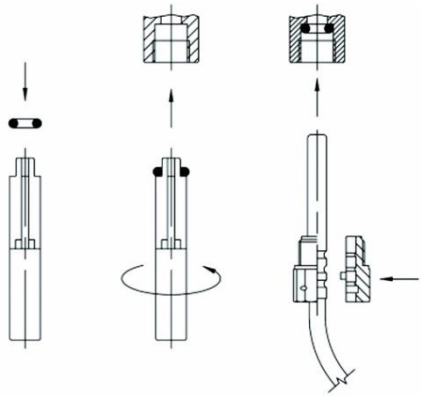


Fig. 7: Mounting adapter set

5.5 Asymmetric mounting (temperature sensor)

The meter can be mounted asymmetrically, too. This means one temperature sensor is directly immersed in the volume measuring tube, whereas the other temperature sensor is mounted in a protection pocket.
For asymmetrical installation, the following minimum requirements for qi and ΔT apply, which differ from the dial plate:

Permissible minimum values for asymmetrical installation				
Nominal flow [m³/h]	Option 1		Option 2	
	qi [l/h]	ΔT min [K]	qi [l/h]	ΔT min [K]
0.6	60	6	100	3
1.5	60	6	100	3
2.5	60	6	100	3

Only the protection pockets listed below are permitted. In addition, the national regulations in the respective country of use must be observed.

Number on PTB tolerance list	Inner diameter	Rack length from upper edge	Thread size
	[mm]	[mm]	[mm]
TH 001	5,2	42	½“
TH 003	5,2	56	½“
TH 004	5,2	53	½“

TH 005	5,2	52	½“
TH 013	5,0	49	¼“
TH 015	5,0	60	⅜“
TH 017	5,0	56	⅜“
TH 018	5,0	60	½“
TH 020	5,0	49	⅜“
TH 021	5,0	49	½“
TH 033	5,0	56	M10x1
TH 040	5,2	46	½“
TH 043	5,2	57	⅜“
TH 044	5,2	57	½“
TH 046	5,2	46	M10x1
TH 047	5,0	46	M10x1
TH 048	5,2	49	¼“
TH 051	5,0	49	¼“
TH 054	5,2	49	M10x1
TH 055	5,0	49	M10x1
TH 067	5,2	59	¼“
TH 068	5,2	69	¼“
TH 079	5,2	39	½“
TH 095	5,0	51	½“
TH 096	5,0	71	½“
TH 097	5,0	96	½“
TH 098	5,0	126	½“
TH 099	5,0	156	½“
TH 100	5,0	216	½“

5.6 Installation of cooling and combined heat and cooling meters

Observe the following installation instructions to avoid condensation:

- Mount the cooling meter so that the black covering on the measuring section points sideward or downwards.
- Mount the electronic unit separated from the volume measuring unit e. g. on the wall.
- Form a loop downwards with the connected cables.
- Mount the protection pocket so that the temperature sensor is oriented horizontally or downwards.
- Mount the temperature sensor horizontally or downward in the pipe.

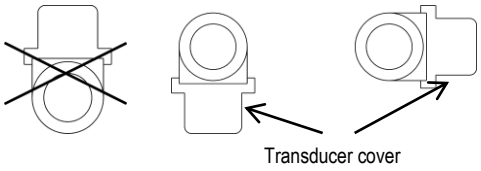


Fig. 9: Recommended installation orientation for cooling meters

6 Dimensions of electronic unit

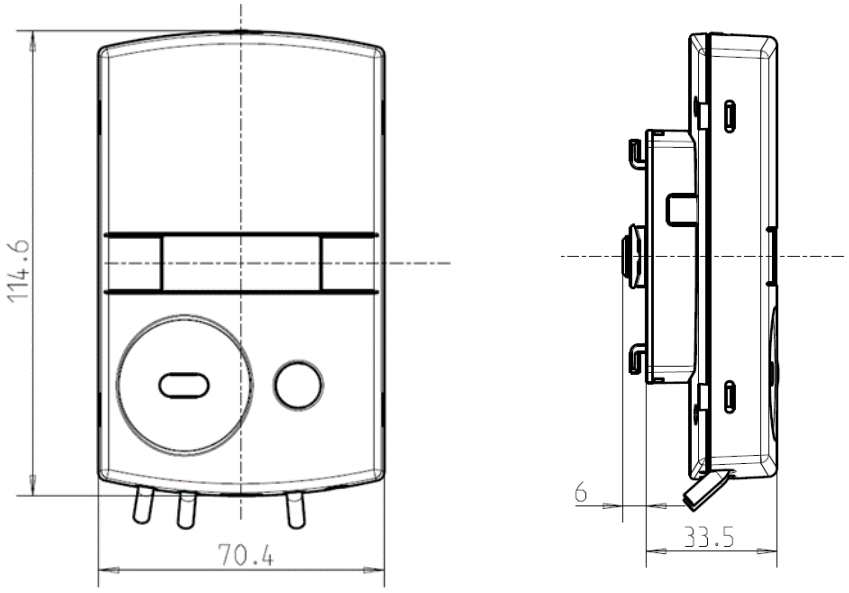


Fig. 15: Dimensions of the electronic unit

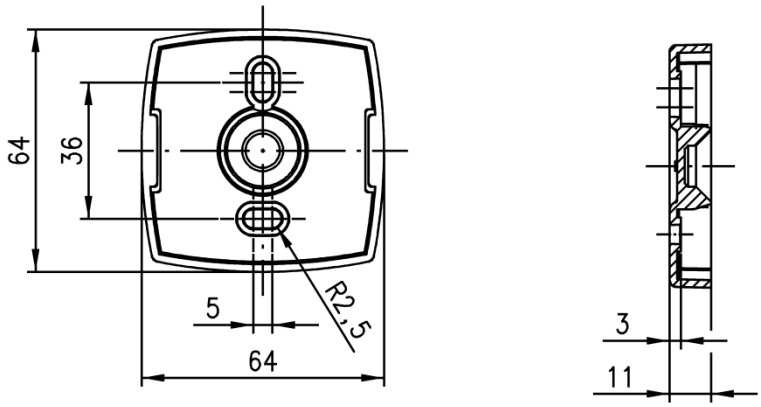


Fig. 16: Wall adapter (view from above and side)

Note: Wall adapter plates are available as an accessory.

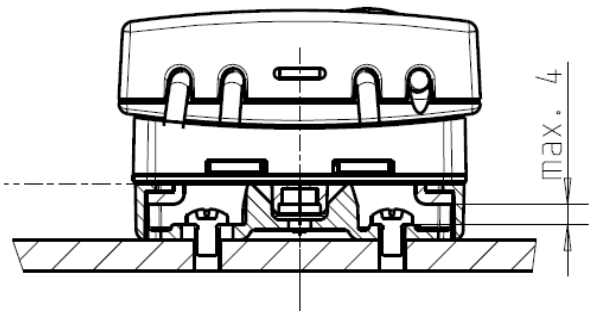


Fig. 17: Maximum screw head height (if using the wall bracket)

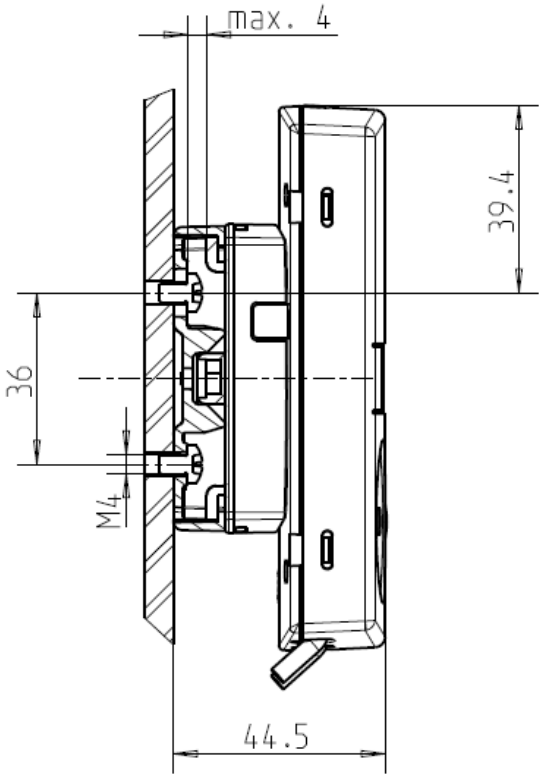


Fig. 18: Wall mounting

7 Operating elements

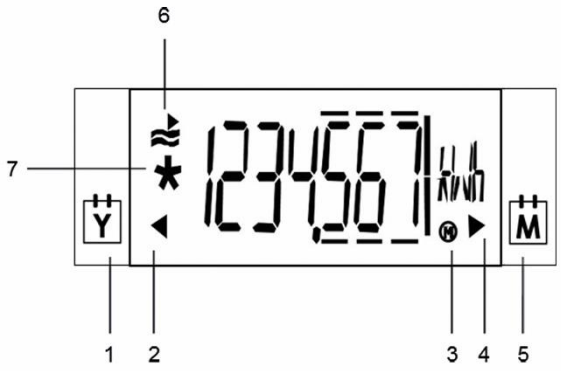


Fig. 17: LCD

No.	Description
1	Identification previous year value
2	Previous year value
3	Maxima
4	Previous month value
5	Identification previous month value
6	Activity display at flow
7	Calibrated value

7.1 Displaying current meter status

The meter displays the current meter status in kWh, MWh, MJ or GJ.

Note: To prevent reading errors, the decimal places of the values displayed are marked with a frame.

Note: Calibrated values can be recognized by an additionally displayed star symbol.

Note: Both display range and data displayed can differ from the description depending on the appliance parameterization. Certain button functions can also be blocked.

7.1.1 User loop “LOOP 0“

User loop

Energy quantity

Cooling registers (optional)

Volume

Segment test

In case of error: message with error code

7.1.2 Current values “LOOP 1“

Current values

Current flow

Current heat power

Alternate current temperature hot and cold side in 2 s cycles

Temperature difference

Mounting place here: hot side, changeable; optional)

Operating time with flow

Missing time

Time with flow

7.1.3 Previous month's values “LOOP 2“

Previous month's values

Log date

Energy quantity

Cooling registers at the reporting date (optional)

Volume on set day

Missing time on set day

Max. flow on set day in 2 s cycles with date stamp

Max. power in 2 s cycles with date stamp

Max. temperature hot side in 2 s cycles with date stamp

Max. temperature cold side in 2 s cycles with date stamp

7.1.4 General / Communication “LOOP 3“

General / Communication

Device number, 7-digit

Optional interface

Primary address (only for M-Bus)

Secondary address
7-digit - for M-Bus

Yearly set day

Monthly set day

Firmware version

CRC-Code

7.1.5 Other “LOOP 4“

Other

Date

Time

Code entry for test / para operation

7.2 Monthly values

The meter stores the following values for 24 months on the monthly set day

- Energy
- Volume
- Missing time

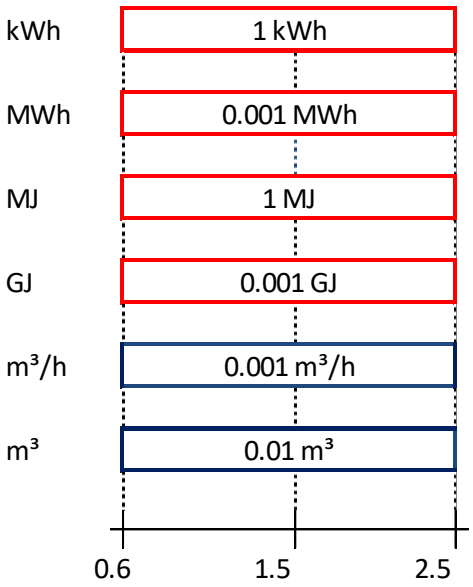
and the maxima with date stamp for

- Flow
- Power
- Temperature hot side
- Temperature cold side

The monthly values can be read via optical interface.

Note: Central European Time (CET) applies as the standard time. During summer time the storage takes place at the corresponding times.

8 Display resolution



9 Power supply

The meter is equipped with 1 – 3 Lithium long-life batteries, depending on the configuration.

Options:

- 6 years battery
- 11 years battery

10 Communication

Electronic unit interfaces

The meter is equipped with an optical interface in accordance with EN 62056-21:2002 as standard.

Note: You can find further information in their respective documentation.

10.1 M-Bus

If the meter is equipped with the option M-Bus, it is supplied with a 2-wire cable which you can extend by fitting a junction box.

Standard	EN 13757-2 and -3
Data refreshment	permanent
Reading interval	>1 min @ 2400 baud

10.2 Pulse output

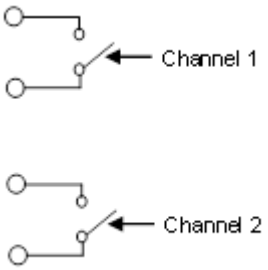
The pulse output permits the transmission of energy or volume equivalent pulses.

Two channels are available whose functions can be parameterized with the service software or in the “Para menu” of the meter.

The pulses can be parameterized to standard pulses or to high-definition pulses.

The pulse duration is identical for channel 1 and channel 2.

Cable labelling	passive pulse output
Cable	1.5 m; 4-wired, LL84201 4xAWG28 / 0.2 mm²
Cable diameter	4 mm
Output type	open drain
Voltage	max. 30 V
Current	max. 30 mA
Dielectric strength	500 V_{eff} against ground
Classification	OB/OC (according to EN 1434-2)
ON/OFF resistance	100 Ω / 6 MΩ
Output connection	



10.3 Wireless M-Bus

The wireless M-Bus function enables the meter to communicate with a stationary or a mobile receiver using 868 MHz radio frequency (unlicensed).

The function supports OMS[1)]-compliant data transfer.

Standard	Open Metering System Specification (Issue 3.0.1); EN 13757-4, T1 or C1
Frequency	868.95 MHz (min. 868.90 MHz to max. 869.00 MHz)
Transmission power	Min. 3.16 mW (5 dBm) to max. 25 mW (13.9 dBm)
Range [2)]	
- Free field	Up to max. 400 m
Power supply	3 batteries type AA
Encryption	None, security profile A/5 or B/7
Sending interval	
- Mobile data reading	20 s
- Stationary data reading	15 min
- User defined data reading	Acc. to telegram length 20 – 900 s

1) Open Metering System
2) May vary depending on terrain and building structure

Predefined data telegrams

Note: Please tell us if encryption needs to be set at factory. The unique encryption key for every meter will be created and you will get a file by email (meter number <> encryption key).

Data telegram F000 – stationary radio (15 min.)

Following data are available by default for data reading:

- Current energy
- Current volume
- Current flowrate
- Current power
- Current temperature hot side
- Current temperature cold side
- Error (manufacturer specific)
- Current timestamp (type I)

Data telegram F001 – mobile data reading (20 sec., 6 years)

Following data are available by default for data reading:

- Current energy
- Current volume
- Energy: previous month on reference date
- Volume: previous month on reference date
- Monthly reference date
- Energy: previous year on reference date
- Annual reference date
- Error (manufacturer specific)
- Current timestamp (type I)

Data telegram F002 – mobile data reading (20 sec., 11 years)

Following data are available by default for data reading:

- Current energy
- Energy: previous month on reference date
- Monthly reference date
- Energy: previous year on reference date
- Annual reference date
- Error (manufacturer specific)
- Current timestamp (type I)

10.4 LoRa®

The LoRa® function also allows wireless data transmission over long distances (up to 10 km) within a LoRa® network.

Frequency	868 MHz
Transmission power	14 dBm
Receiver sensitivity	-143 dBm
Device class	A, bidirectional
Transmission intervals	15 min to 24 h
LoRa® version	1.0.2
Activation	OTAA or ABP
Data rate	DR0-DR5 (250 bit/s to 5470 bit/s)
Configuration	Via NFC or Downlink
Key handling	Via Web-Portal
Certification	LoRaWAN® (Elvaco CMi4111)

Note: With activated EcoMode (default setting), a battery life of 11 years is achieved. If the reception quality is not sufficient, the module automatically extends the transmission interval (to max. 1/120min).

11 Cooling register for heat meters (optional)

Note: Heat meters that have an optional cooling register do not have a register of incorrect installation.

In addition to the heat energy, the meter measures cooling energy, which is summed up in a separate tariff register (uncalibrated).
Heat energy is always measured when the temperature difference (> +0.2 K) and the flow rate are positive.
Cooling energy is then measured when the temperature difference (< -0.2 K) is negative while the flow is positive.

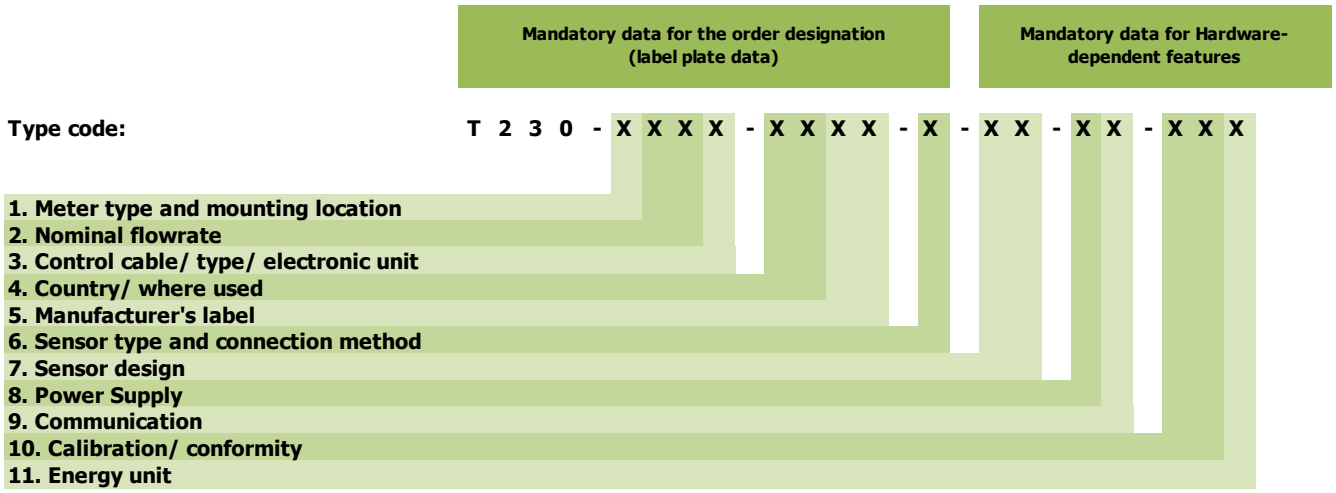
12 Error codes

The meter continuously runs a self-diagnosis and can thus recognize and display various installation or error messages.

Error code	Error	Service guidelines
FL neG	Incorrect flow direction	Check flow or installation direction; correct if necessary
if necessary, in exchange with:		
DIFF nEG	Negative temperature difference	Check installation point of the temperature sensors; exchange if necessary
if necessary, in exchange with:		
F0	No flow can be measured	Air in the measurement unit/pipe; bleed air from line (delivery condition)
F1	Interruption in the hot side temperature sensor	Inform service department
F2	Interruption in the cold side temperature sensor	Inform service department
F3	Electronics for temperature evaluation defective	Inform service department
F4	Problem with the power supply; Battery flat	Inform service department
F5	Short-circuit hot side temperature sensor	Inform service department
F6	Short-circuit cold side temperature sensor	Inform service department
F7	Fault in internal memory holding	Inform service department
F8	Errors F1, F2, F3, F5 or F6 for longer than 8 hours, recognition of attempts to manipulate. No further measurements are carried out.	Measure dependent on error code. Error message F8 must be reset by service department.
F9	Fault in the electronics	Inform service department
EoL	End of Life	Inform service department

Note: Reset the message F8 in the parameterization mode manually or with the service software. All other error messages are deleted automatically once the error has been rectified.

13 Order codes (type number key)



Order codes for label plate data	
1. Type of meter and mounting location	**Code**
Heat meter, mounting place cold side	A
Heat meter, mounting place hot side	B
Combined heat/cooling meter, mounting place cold side of the heat meter	C
Combined heat/cooling meter, mounting place hot side of the heat meter	E
Cooling meter, mounting place hot side	G
Cooling meter, mounting place cold side	H
2. Nominal flowrate	**Code**
Nominal flowrate 0.6 m³/h, length 110 mm, nominal pressure PN16, connection G ¾ B	05
Nominal flowrate 1.5 m³/h, length 110 mm, nominal pressure PN16, connection G ¾ B	21
Nominal flowrate 1.5 m³/h, length 130 mm, nominal pressure PN16, connection G 1	26
Nominal flowrate 2.5 m³/h, length 130 mm, nominal pressure PN16, connection G 1 B	36
3. Control cable / type / electronic unit	**Code**
Split version with 1.5 m control cable	C
4. County / where used	**Code**
Dial plate for Middle East (English)	AE
Dial plate for Austria (German)	AT
Dial plate for Belarus (Russian)	BY
Dial plate for Switzerland (German/French)	CH
Dial plate for Czech Republic (Czech)	CZ
Dial plate for Germany (German)	DE
Dial plate for Denmark (Danish)	DK
Dial plate English neutral	EN
Dial plate for Spain (Spanish)	ES
Dial plate for Great Britain (English)	GB
Dial plate for Italy (Italian)	IT
Dial plate for Norway (Norwegian)	NO
Dial plate for Poland (Polish)	PL
Dial plate for Russia (Russian)	RU
Dial plate for Sweden (Swedish)	SE
Dial plate for Slovenia (Slovenian)	SI
Dial plate for Slovak Republic (Slovakian)	SK
Dial plate for Uzbekistan (Russian)	UZ
5. Manufacturer's label	**Code**
Logo Landis+Gyr	00
Other labels on request	xx

6. Sensor type and method of connection	**Code**
Sensor Pt500, not removable, mounted in the tube	P
Sensor Pt500, not removable, mounting in the tube as an option	Z
Hardware-dependent features	
7. Sensor type	**Code**
Type PS, 16 bar / 95 °C / Ø5.0x45 mm, cable length 1.5 m	0F
Type PS, 16 bar / 95 °C/ Ø5.0x45 mm, cable length 5 m	0G
Type PS, 16 bar / 95 °C / Ø5.2x45 mm, cable length 1.5 m	0H
Type PS, 16 bar / 95 °C / Ø5.2x45 mm, cable length 5 m	0J
8. Power supply	**Code**
Standard battery for 6 years (1xAA cell)	A
Battery for 6 years (3xAA cells)	C
Battery for 11 years (2xAA cells)	E
Battery for 11 years (3xAA cells)	F
9. Communication	**Code**
No module	0
M-Bus module	B
Radio module 868 MHz*	E
Pulse module	L
LoRaWAN® module	W
12. Calibration / conformity	**Code**
Certified acc. to national regulations	CL
Compliant to MID class 2	M2
Compliant to MID class 3	M3
Compliant with CEN 1434, class 2	T2
Compliant with CEN 1434, class 3	T3
Compliant acc. to national regulations	TL
13. Energy unit	**Code**
Display: kWh (until qp 2.5)	A
Display: MWh with 3 decimal places (until qp 2.5)	B
Display: MJ (until qp 2.5)	C
Display: GJ with 3 decimal places (until qp 2.5)	D
Further features	**Code**
Test protocol (paper)	PP
Test protocol (Excel file per mail)	PE
Adjustable mounting place	PB
Protection class electronic unit IP 65 (IP_CALC=xx)	01

*) Additional ordering information needed (see page 24)

14 Additional ordering information for wireless M-Bus

Note: The battery lifetime always depends on the meter configuration (Q & T measurement) and on the data telegram length, encryption (with / without) and sending interval (mobile / stationary)!
All these configurations can be changed with the service software!

Note: Data in the radio module is updated every 15 minutes.

Note: Standard from factory is “stationary radio”.

14.1 Necessary additional ordering information:

1. Transmission interval
2. Type of protocol
3. Encryption
4. Data telegram
5. Automatic transmission start

1. Transmission interval
   Please specify the transmission interval in seconds.
   Standard values are:
   - 34 s for mobile data reading and
   - 900 s (15 min) for stationary data reading.

2. Type of protocol
   Two types of protocol are available:
   - C1 A: Improved energy efficiency, not supported by all receivers
   - T1 A: Longer radio telegrams, supported by all wM-Bus receivers

3. Encryption
   The following options can be chosen:
   - No encryption: Radio telegrams are transmitted unencrypted.
   - Security profile A/ Mode 5: AES-encryption in conformance with OMS
   - Security profile B/ Mode 7: AES-encryption in conformance with OMS for the connection to a SmartMeter-Gateway (complying with the requirements of Germany’s BSI)

   For every meter, a unique encryption key will be created and delivered via electronic delivery note (meter number <> encryption key).

4. Data telegram
   Standard radio telegrams:

F000 – Stationary radio	**F001 – mobile data reading**	**F002 – Short telegram mobile**
for stationary readout (6, 11 or 12 years)	for mobile readout (6 years, 11 years at 30s)	for mobile readout (6 years, 11 years at 30s)
Current energy	Current energy	Current energy
Current volume	Current volume	1st prev. month energy
Current flow rate	1st prev. month energy	1st prev. month due date
Current power	1st prev. month volume	Prev. year energy

Current temperature hot side	1st prev. month due date	Prev. year due date
Current temperature cold side	Prev. year energy	Errors (manufacturer specific)
Errors (manufacturer specific)	Prev. year due date	Current timestamp (type I)
Current timestamp (type I)	Errors (manufacturer specific)	
	Current timestamp (type I)	

Depending on the radio configuration and the desired battery life, not every telegram is available. Other telegrams on request.

5. Automatic transmission start
   The radio interface is deactivated on delivery. It can be activated manually (via the LCD button or with UltraAssist) or automatically. As soon as a volume of 10l has been detected, the wireless interface is activated and begins to send data at the set transmission interval.
   Please let us know if this is not desired

14.2 Examples for ordering

14.2.1 Stationary readout

Example: Configuration for connection to a SmartMeter-Gateway:

Battery lifetime **6 Jahre**, Data telegram F000, Transmission interval 15 Min.:

T230-XXXX-XXXX-X-XX-**CE**-XXX
- C = battery life **6 years**
- E = wireless M-Bus function
- F000 = Stationary radio telegram
- Type of protocol = T1 A
- Transmission interval = 15min
- Encryption = Security profile B/ Mode 7
- Automatic start of transmission = Yes

Example: Configuration stationary readout with wM-Bus receiver with long lifetime:

Battery lifetime **11 years**, Data telegram F000, Transmission interval 15 Min.:

T230-XXXX-XXXX-X-XX-**FE**-XXX
- F = battery life **11 years**
- E = wireless M-Bus function
- F000 = Stationary radio telegram
- Type of protocol = C1 A
- Transmission interval = 15min
- Encryption = Security profile A/ Mode 5
- Automatic start of transmission = Yes

14.2.2 Mobile readout „walk by“

Example: Configuration for readout with a mobile radio receiver:

Battery lifetime **6 years**, Data telegram F002, Transmission interval 34 Sek.:

UH30-XXXX-XXXX-X-XX-**CE**-XXX
- C = battery life **6 years**
- E = wireless M-Bus function
- F002 = Short telegram mobile
- Type of protocol = C1 A
- Transmission interval = 20s
- Encryption = Security profile A/ Mode 5
- Automatic start of transmission = Yes

15 Pressure loss

Nominal flowrate qp	Overall length	Connection	Pressure loss at qp	Kv-Factor at Δp 1 bar	Graph in diagram
m³/h	mm		mbar	m³/h	
0,6	110	G ³/₄	75	2.2	A
1,5	110, 130	G ¾, G1	135	4.1	B
2,5	130	G1	135	6.8	C

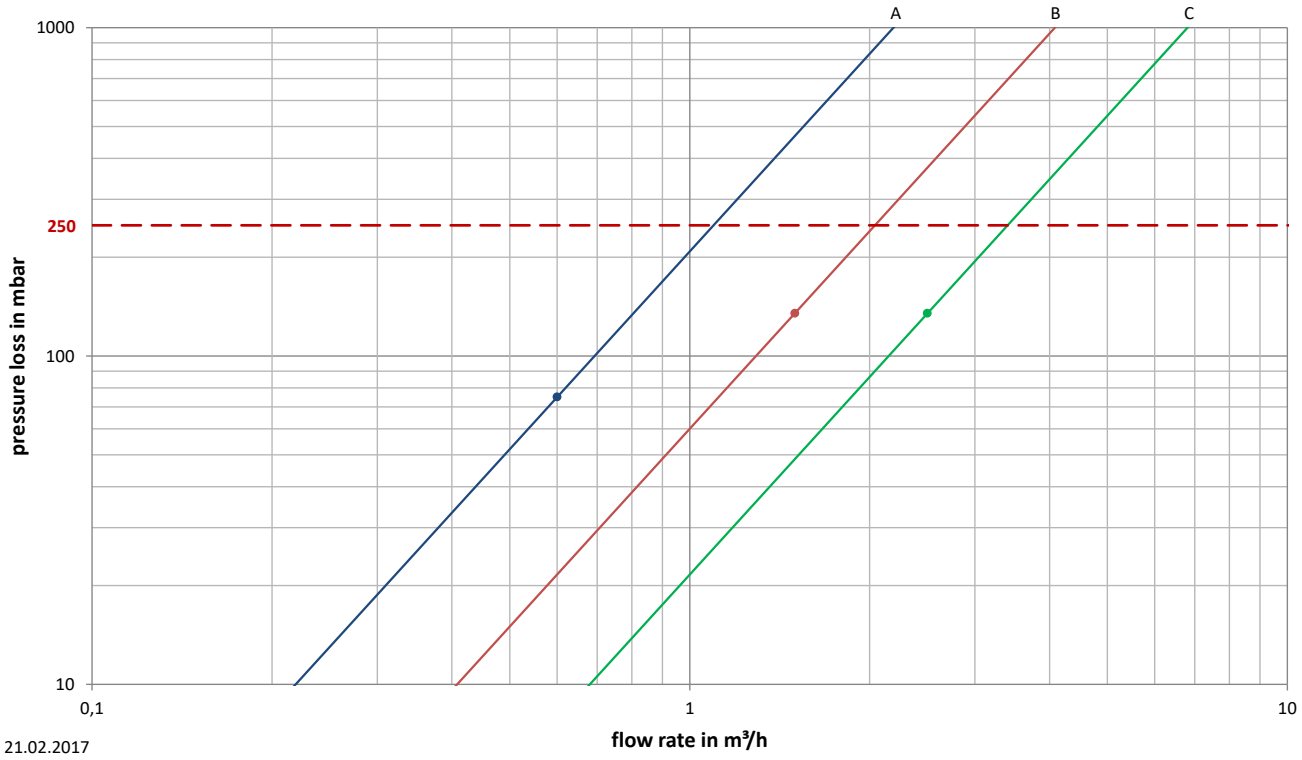
The indicated pressure loss of a flow sensor is at the nominal flowrate qp.
Using the Kv-Factor, which defines the flow rate at a pressure loss of 1 bar, the pressure loss at any given flow rate can be calculated:

$$\Delta p = 1bar \times \left(\frac{Q}{K_v}\right)^2$$

$\Delta p = pressure\ loss\ in\ bar$

$Q = flowrate\ in\ m^3/h$

$K_v = K_v - Factor\ at\ \Delta p = 1\ bar$



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