

MULTICAL® 21

DATA SHEET

- Ultrasonic measurement
- Pinpoint accuracy
- Longevity
- Vacuum sealed construction
- Environment-friendly meter

MID-2004/22/EC



Electronic ultrasonic cold and hot water meter

MULTICAL® 21 is used for measurement of cold and hot water consumption in households and blocks of flats as well as industry.

Ultrasonic flow measurement guarantees pinpoint measuring accuracy and longevity. Ultrasonic flow measurement is based on the transit time method, and all measurements, references, readings, calculations and data communication is controlled by an advanced specially designed electronic circuit. Thus the meter includes no moving parts, which makes MULTICAL® 21 resistant to wear and impurities in the water.

The meter has been constructed as a hermetically vacuum sealed unit, which prevents humidity from reaching the electronics. Therefore you avoid condensation water between

the glass and the large display. The meter is watertight, IP68 type tested, so suitable for installation in meter wells too.

MULTICAL® 21 is easy to install in all operating environments, horizontally as well as vertically, independent of piping and installation conditions. Consumption data can be read manually direct from the display or using an optical eye. Furthermore, consumption data can be remotely read by means of Wireless M-Bus, which is built into the meter.

The meter has been approved according to Drinking Water Standards in several countries. The meter case and measuring tube are made of the synthetic material PPS which is free from lead and other heavy metals. The Carbon Footprint documents the

meter's low environmental impact including recycling of materials.

MULTICAL® 21 includes leak surveillance securing that waste of water is discovered very quickly.

The unique combination in MULTICAL® 21 of pinpoint measuring accuracy, longevity and built-in Wireless M-bus - wireless radio communication – reduces the current operating costs of the water supply company measurably – and minimizes unexpected expenses in connection with a possible leakage.



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General description

MULTICAL® 21 is an integral and hermetically closed static water meter intended for the registration of cold and hot water consumption. The water meter uses the ultrasonic principle and has been constructed on the basis of Kamstrup's experience since 1991 with the development and production of static ultrasonic meters.

MULTICAL® 21 has been subjected to a very comprehensive OIML R 49 type test with a view to securing a long-term stable, accurate and reliable meter. One of the water meter's many advantages is the fact that it has no wearing parts, which entails high immunity towards particles and thereby longevity. Furthermore, the meter has a low-flow cut-off (start flow and stop flow) of only 3 l/h for $Q_3 = 1.6 \text{ m}^3/\text{h}$ and 5 l/h for $Q_3 = 2.5$ and $4.0 \text{ m}^3/\text{h}$, which provides accurate measurement also at low water flows.

MULTICAL® 21 is constructed as a vacuum chamber of moulded composite material. Thus, the electronics are fully protected against penetration of water. This means that the meter can without problems be placed in e.g. bathrooms where it is sprayed with water daily, and it is also suitable for mounting in meter wells, which are frequently filled with water.

The meter can and must only be opened by one of Kamstrup's authorized service centres by means of special tools. If the meter has been opened and the seals have thus been broken, the meter is no longer valid for billing purposes. Furthermore, the factory guarantee no longer applies.

The volume is measured using bidirectional ultrasonic technique based on the transit time method, proven a long-term stable and accurate measuring principle. Two ultrasonic transducers are used to send sound signals both against and with the flow. The ultrasonic signal travelling with the flow reaches the opposite transducer first. The time difference between the two signals can be converted into flow velocity and subsequently volume.

The accumulated water consumption is displayed by MULTICAL® 21 in cubic metres (m^3) with five digits and up to three decimals, i.e. the resolution has been extended to 1 litre only. The display has been specially designed to obtain long lifetime and sharp contrast in a wide temperature range.

In addition to volume reading, a graphic indication of current flow and a number of information codes are displayed.

All registers are saved daily in the meter's memory for 460 days. Furthermore, monthly data for the latest 36 months are saved.

MULTICAL® 21 is fitted with an optical eye which makes it possible to read saved consumption data, data logger and serial PC connection for configuration of the water meter.

The water meter is powered by an internal lithium battery with up to 16 years' lifetime. The battery can be changed by one of Kamstrup's authorized service centres or by Kamstrup A/S.

MULTICAL® 21 comes with integral data communication for wireless M-Bus.

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Approved meter data

MID classifications

Approval	DK-0200-MI001-015
Mechanical environment	Class M1
Electromagnetic environment	Class E1 and E2
Climatic environment	5...55°C, condensing humidity (indoors mounted in utility rooms and outdoors in meter wells)

OIML R 49 designations

Accuracy class	2
Ambient class	Fulfils OIML R 49 class B and C (indoors/outdoors)
Medium temperature, cold water	0.1...30°C (T30) or 0.1...50°C (T50)
Medium temperature, hot water	0.1...70°C (T70)

Meter type

Q3 = 1.6 m ³ /h
Q3 = 2.5 m ³ /h
Q3 = 4.0 m ³ /h

Meter sizes

MULTICAL® 21 is available in four different combinations of overall length and maximum flow Q3.

Type number	Nom. flow Q3 [m ³ /h]	Min. flow Q1 [l/h]	Max. flow Q4 [m ³ /h]	Dynamic range Q3/Q1	Min. cutoff [l/h]	Max. cutoff [m ³ /h]	Pressure loss Δp at Q3 [bar]	Connection on meter	Length [mm]
021-66-A0A8XX	1.6	16	2.0	100	3	4.6	0.25	G3/4B	110
021-66-A0D8XX	2.5	25	3.1	100	5	4.6	0.55	G3/4B	110
021-66-A0G8XX	2.5	25	3.1	100	5	4.6	0.55	G1B	105
021-66-A0H8XX	2.5	25	3.1	100	5	4.6	0.55	G1B	130
021-66-A0L8XX	4.0	16	5	250	5	11.5	0.38	G1B	130

The meter is available in versions for cold and hot water. The choice is controlled by the type number's country code, which is 8XX for cold water and 7XX for hot water.

Three different extension pipes can be enclosed as accessories. These extension pipes make it possible to adjust the meter to most existing current overall lengths. See the paragraph on accessories.

Material

Wetted parts

Meter case and meter pipe	Polyphenylene sulfide PPS
Reflectors	Stainless steel, W.no. 1,4306

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Technical data

Electrical data

12-year battery	3.65 VDC, 2 A cells lithium
16-year battery	3.65 VDC, 1 C cell lithium
Replacement interval	12 years or 16 years at $t_{\text{BAT}} < 30^{\circ}\text{C}$
EMC data	Fulfils MID class E1 and E2

Mechanical data

Metrological class	2
Ambient class	Fulfils OIML R 49 class B and C (indoors/outdoors)
Ambient temperature	2...55°C
Protection class	IP68
Medium temperature	0.1...30°C (T30); 0.1...50°C (T50); 0.1...70°C (T70) or T30/70.
Storage temp. empty sensor	-25...60°C
Pressure stage	PN16

Accuracy

MPE (maximum permissible error)

MPE according to OIML R 49

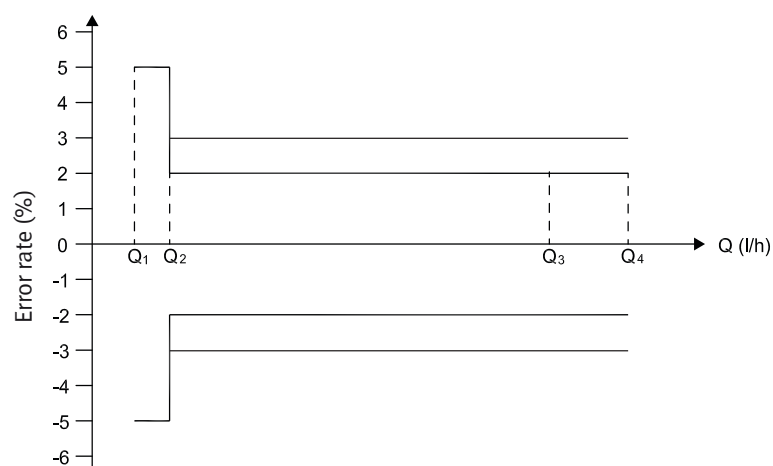
Meter approved 0.1...70°C

±5% in range $Q_1 \leq Q < Q_2$

±2% in range $Q_2 \leq Q \leq Q_4$

At $30^{\circ}\text{C} < t < 70^{\circ}\text{C}$

3% in range $Q_2 \leq Q \leq Q_4$

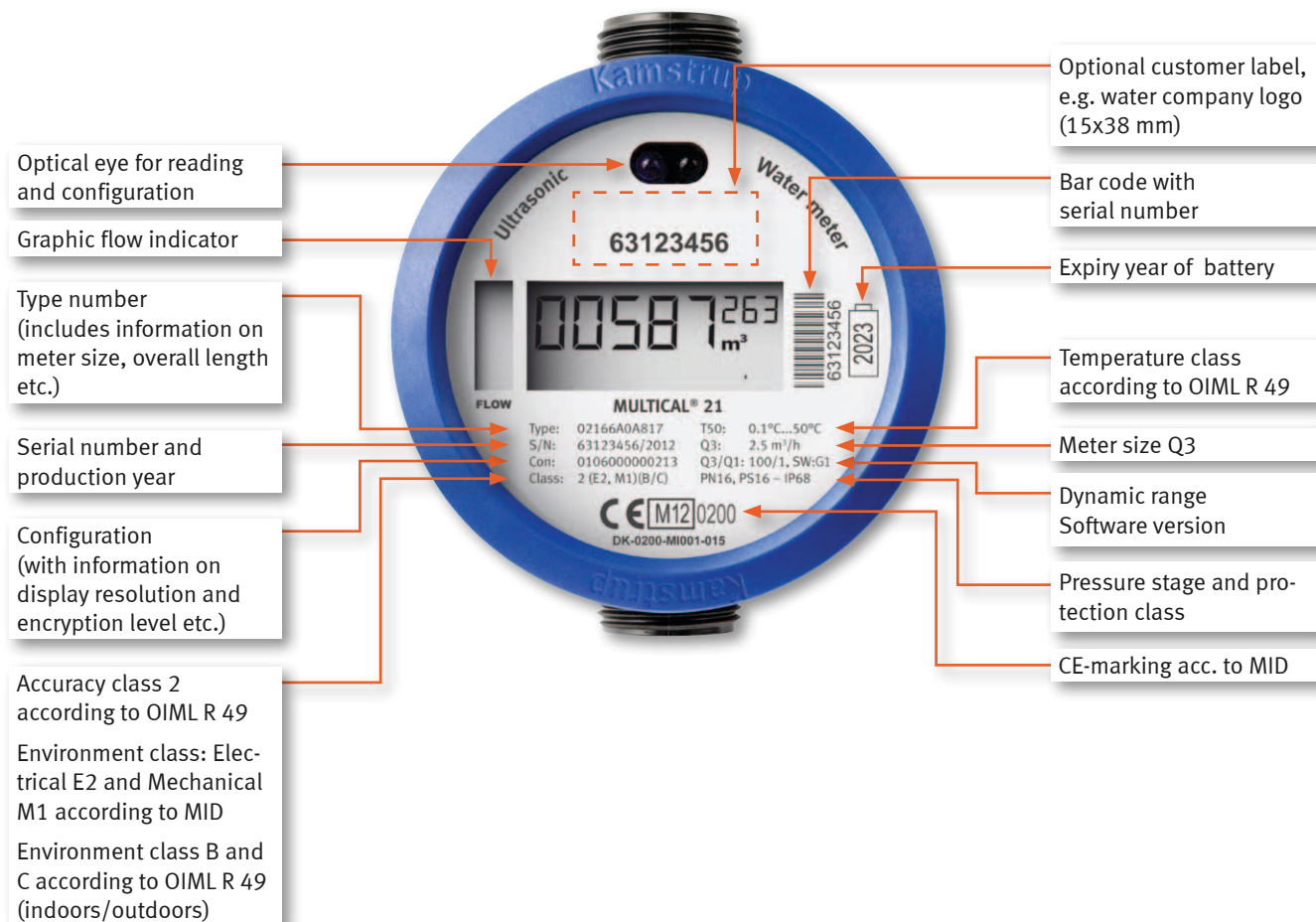


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Meter details

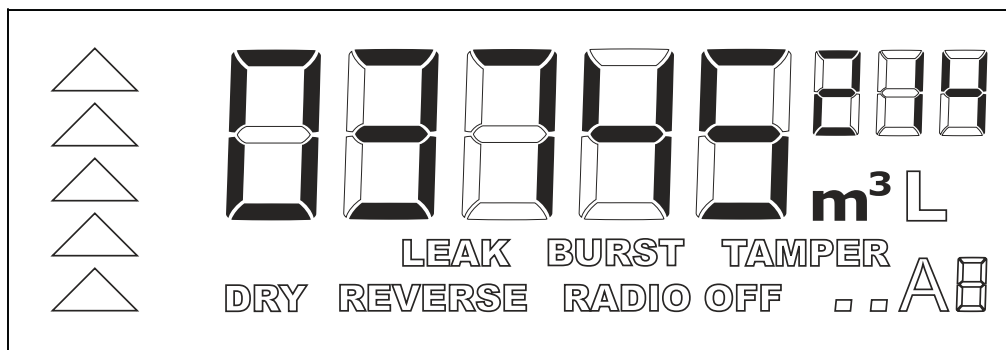
Meter information in permanent laser engraved text.



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Display and info codes



MULTICAL® 21 can be read from the big, easily readable, specially designed display. The five big figures indicate number of cubic metres. The three small figures are decimals.

The sign L (to the right of m³) will always be off when the meter is in operation as it is solely used during factory control and verification of the meter.

The flow arrows in the left side of the display indicate water flow through the meter. If there is no flow, all arrows will be off.

The info codes in the display have the following meaning and function.

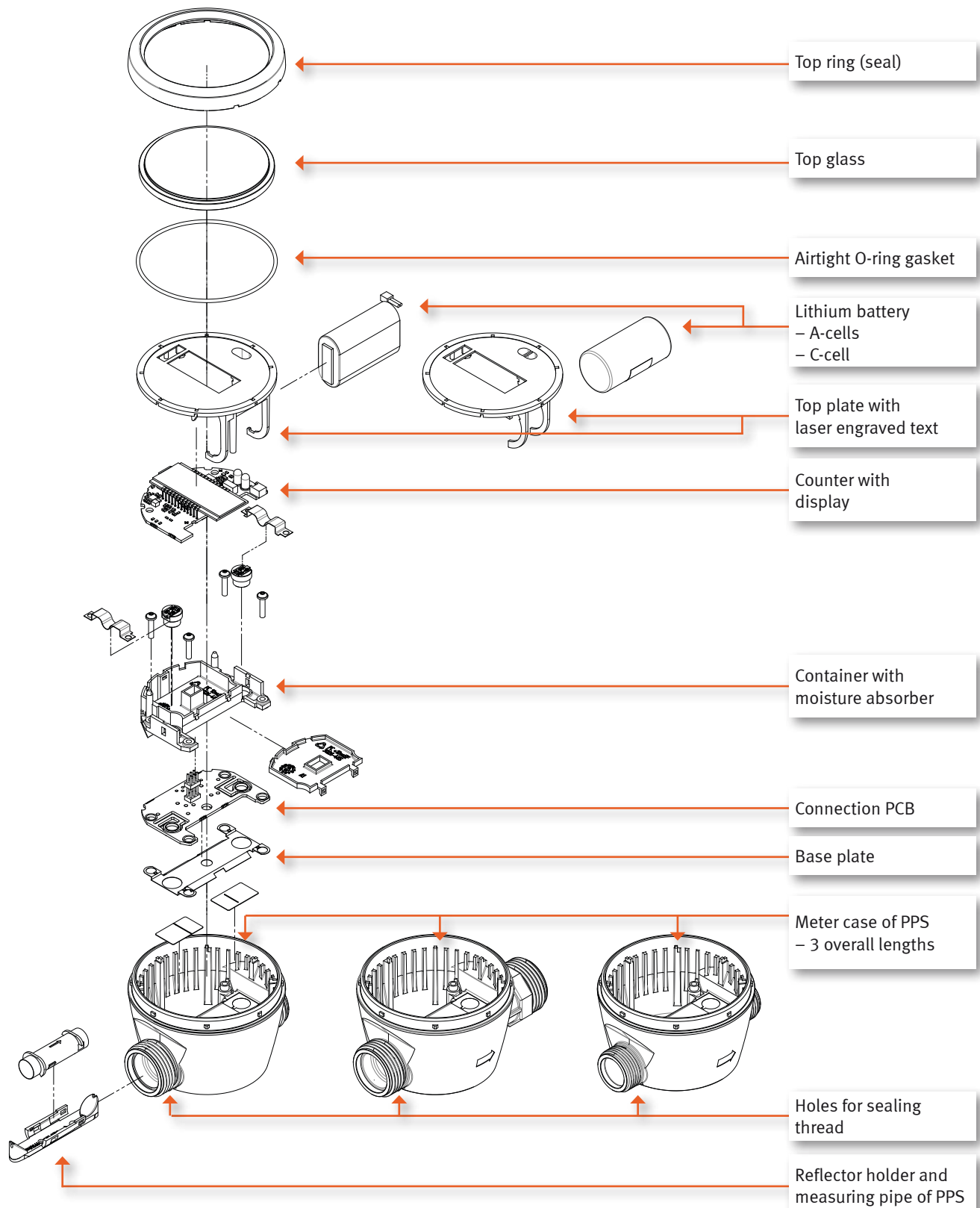
Info code flashes in the display	Meaning
LEAK	The water in the meter has not been stagnant for one continuous hour during the latest 24 hours. This can be a sign of a leaky faucet or toilet cistern.
BURST	The water consumption has been consistently high for half an hour, which indicates a pipe burst.
TAMPER	Attempt of fraud. The meter is no longer valid for billing.
DRY	The meter is not water-filled. In this case nothing will be measured.
REVERSE	The water flows through the meter in the wrong direction.
RADIO OFF	The meter is still in transport mode with the built-in radio transmitter turned off. The transmitter turns on automatically when the first litre of water has run through the meter.
■ ■ (two squared "dots")	Two small squares flashing alternately indicate that the meter is active.
'A' followed by a number	Indicates that the meter has been checked and given a new revision number.

Info codes "LEAK", "BURST", "DRY" and "REVERSE" switch off automatically, when the conditions that activated them no longer exist. In other words, LEAK disappears when the water has been stagnant for an hour, BURST disappears when the consumption falls to normal level, REVERSE disappears when the water flows in the right direction, and DRY when the meter is filled with water.

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Mechanical construction



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Pressure loss

According to OIML R 49 the maximum pressure loss must not exceed 0.63 bar (0.063 MPa) in the range Q1 to Q3.

The pressure loss in a meter increases with the square of the flow and can be stated as:

$$Q = k_v \times \sqrt{\Delta p}$$

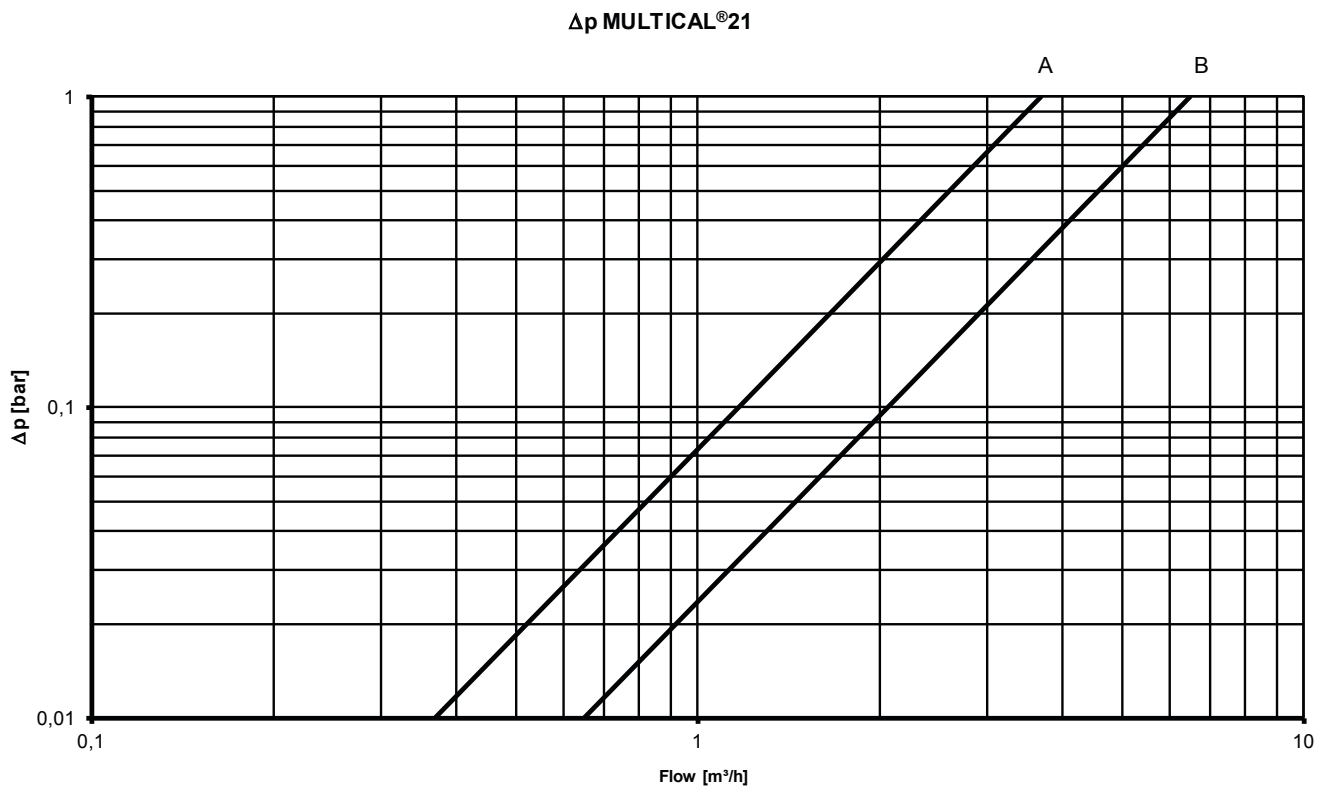
where:

Q = volume flow rate [m³/h]

k_v = volume flow rate at 1 bar pressure loss

Δp = pressure loss [bar]

Graph	Q3 m ³ /h	Nom. diameter [mm]	k _v	Q at 0.63 bar m ³ /h
A	1.6 & 2.5	DN15 & DN20	3.4	2.7
B	4.0	DN20	6.5	5.1



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Wireless M-Bus – wireless radio communication

MULTICAL® 21 communicates via built-in Wireless M-Bus, which gives access to easy and fast wireless reading of the meter.

If a roof antenna on the reading unit is used, the meter can be read via "drive-by".

The Wireless M-Bus radio transmitter built into MULTICAL® 21 transmits a data package every 16 secs. In order to obtain long battery lifetime the data package has been compressed to include only the most important meter readings.

The following details are transmitted:

- Current meter reading
- Meter reading on the first day of this month. Alternatively, max. flow during latest completed month
- List of active info codes
- List of info codes which have been active within the latest 30 days.

The list of info codes which have been active also includes information on how long they have been active.

Wireless M-Bus is an open standard, which means that MULTICAL® 21 can be configured with or without encryption of the Wireless M-Bus signal.

Encryption protects personal data against unauthorised monitoring. Furthermore, the encryption file provides easy access to import of meter data into reading programs.

Kamstrup A/S recommends encryption.

Serial number	Address	Meter type	Time of receipt	Volume V1 [m³]	Info	Operational hour counter [h]	Monthly data [m³]
63001068	Kastanievej 3	MC21	22-12-2010 14:13	5.239		1298	2.692
63001069	Kastanievej 5	MC21	22-12-2010 14:13	4.336		1298	1.735
63001070	Nørregade 11	MC21	22-12-2010 14:13	11.108		1298	4.593
63001071	Nørregade 14	MC21	22-12-2010 14:13	2.17		1298	0.741
63001072	Nørregade 17	MC21	22-12-2010 14:13	3.986		1297	1.63
63001073	Nørregade 22	MC21	22-12-2010 14:13	4.083		1298	1.687



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Data registers

MULTICAL® 21 has a permanent memory (EEPROM), in which the values of various data loggers are saved.

The meter includes the following registers:

Data logging interval	Data logging depth	Logged value
Monthly logger	36 months	See table below
Daily logger	460 days	See table below
Info logger	50 events	Info code, meter reading and date

Thus, it is always possible to read target volume and info codes for each of the latest 36 months as well as corresponding meter reading and possible info codes for each of the latest 460 days. The loggers can only be read via the meter's optical eye.

The following registers are logged: The monthly logger is written on the first day of the month, the daily logger is written at midnight.

Register type	Description	Monthly logger, 36 months	Daily logger, 460 days
Date (YY.MM.DD)	Logging time, year, month and day	•	•
Volume	Current meter reading (legal)	•	•
Operating hour counter	Accumulated number of operating hours	•	•
Info	Information code	•	•
Vol Reverse	Volume during reverse flow	•	•
Date of max. flow	Date stamp of max. flow during period	•	–
Max. flow, V1	Value of max. flow during period	•	•
Date of min. flow, V1	Date stamp of min. flow during period	•	–
Min. flow V1	Value of min. flow during period	•	•

Every time the information code changes, date and info codes are logged. Thus, it is possible to data read the latest 50 changes of the information code as well as the date the change was made. Reading is only possible via the optical eye.

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Ordering details

Start your order by stating the type number of the selected model of MULTICAL® 21. The type number includes information on meter type - cold or hot water, meter size, overall length, battery life, country code etc.

Some of the features included in the type number cannot be changed.

Subsequently the meter configuration, which determines customer specific requirements such as number of digits in display etc., is selected. The configuration is completed during programming of the finished meter.

Finally, required accessories, if any, in the form of gaskets, three different extension pipes, non-return valve, strainer and standard glands are selected.

Accessories are enclosed separately to be mounted by the installer.

MULTICAL® 21	Type 021	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Communication		Wireless M-Bus, 868 MHz, mode C1		66				
Supply		12 years' battery life		A				
		16 years' battery life		C				
Meter size		Q3 [m³/h]		Connection		Length [mm]		
		1.6		G ³ / ₄ B (R ¹ / ₂)		110		A
		2.5		G ³ / ₄ B (R ¹ / ₂)		110		D
		2.5		G1B (R ³ / ₄)		105		G
		2.5		G1B (R ³ / ₄)		130		H
		4.0		G1B (R ³ / ₄)		130		L
Meter type		Hot water meter						7
		Cold water meter						8
Country code (language on label etc.)								XX

The country code is used for:

- Language and approval on type label
- Temperature class of water meter, cold water (T30 and T50) or hot water (T70 and T30/70)

Unless otherwise stated in the order, Kamstrup supplies the following:

66

A

0

A

8

12

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Configuration

Configuration	KK	LLL	MMM	N	P	R	S	T
Target date (fixed)	01							
Average time of max. values (1..120 min.)		LLL						
Customer label 2005-MMM			MMM					
Leakage message limit								
OFF				0				
Flow continuously > 0.5 % of Q3 per hour				1				
Flow continuously > 1.0 % of Q3 per hour				2				
Flow continuously > 2.0 % of Q3 per hour				3				
Pipe burst limit								
OFF					0			
Flow > 5 % of Q3 for 30 minutes					1			
Flow > 10 % of Q3 for 30 minutes					2			
Flow > 20 % of Q3 for 30 minutes					3			
Optional register in data logger								
Meter reading on target date						1		
Max. flow during latest completed month						2		
Display resolution								
00000 m ³							0	
00000.1 m ³							1	
00000.01 m ³							2	
00000.001 m ³							3	
Encryption level								
No encryption								0
Encryption with separately forwarded key								3

Unless otherwise stated in the order, Kamstrup supplies the following:

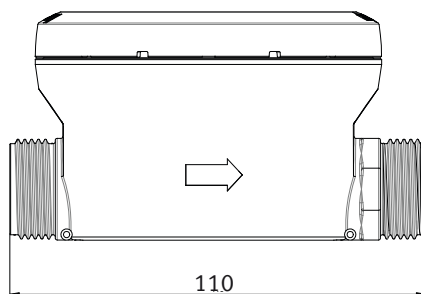
01	002	000	2	3	1	3	3
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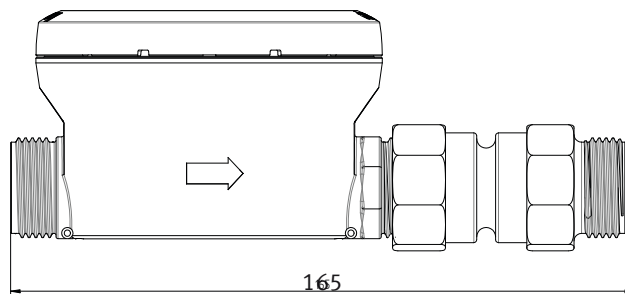
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Dimensioned sketches

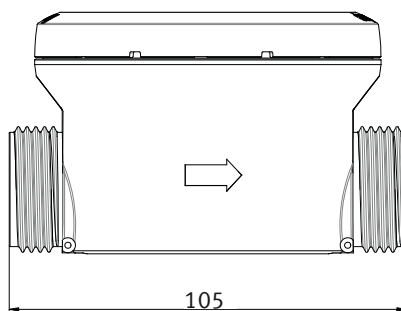
Type A and D – G3/4B x 110 mm



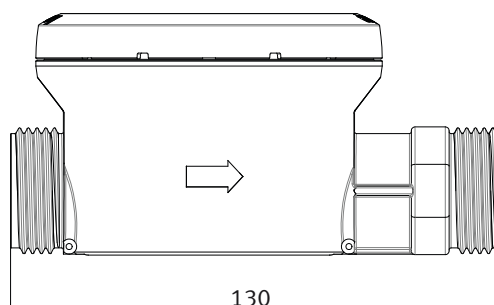
Type A1 and D1 – G3/4B x 165 mm



Type G – G1B x 105 mm



Type H – G1B x 130 mm

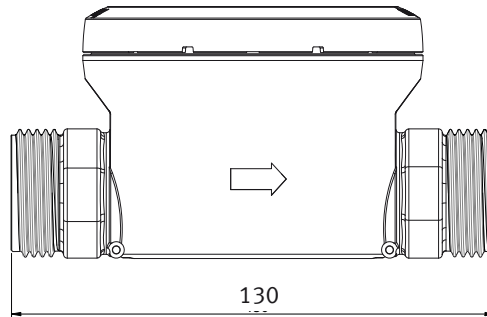


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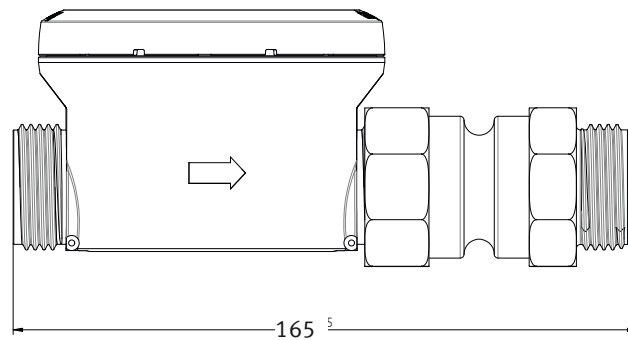
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Dimensioned sketches

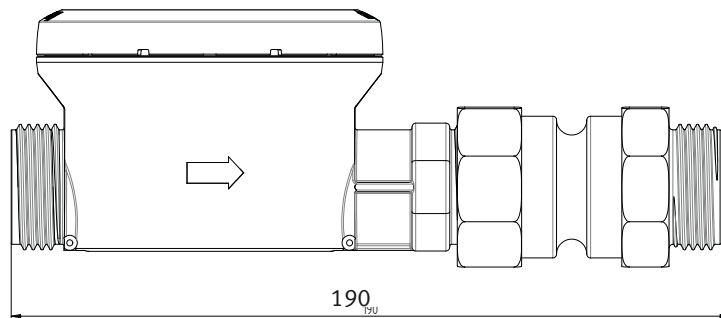
Type L – G1B x 130 mm



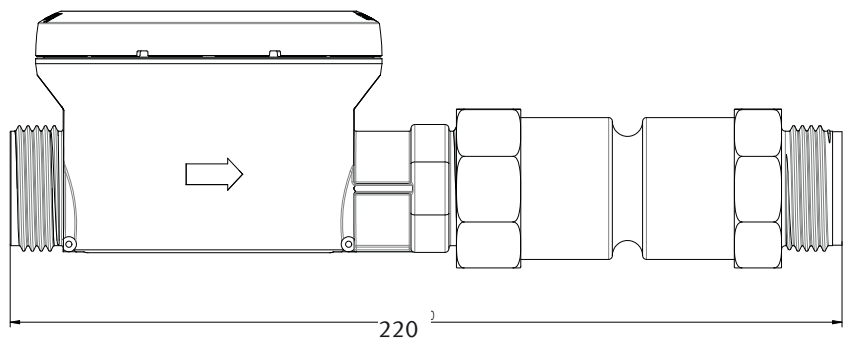
Type G2 – G1B x 165 mm



Type H2 – G1B x 190 mm



Type H3 – G1B x 220 mm



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Accessories

Extension pipes, which make it possible to adjust the meter to most existing installations are available for MULTICAL® 21, cf. table below.

Pipe sizes		Meter sizes in combination with extensions				
Pipe thread	DN	Meter thread	Overall length (mm)	Q3 [m³/h]	Extension pipe used	Type
1/2	15	G3/4B	110	1.6	None	A
1/2	15	G3/4B	165	1.6	G3/4B x 55 mm	(A1)
1/2	15	G3/4B	110	2.5	None	D
1/2	15	G3/4B	165	2.5	G3/4B x 55 mm	(D1)
3/4	20	G1B	105	2.5	None	G
3/4	20	G1B	130	2.5	None	H
3/4	20	G1B	165	2.5	G1B x 60 mm	(G2)
3/4	20	G1B	190	2.5	G1B x 60 mm	(H2)
3/4	20	G1B	220	2.5	G1B x 90 mm	(H3)
3/4	20	G1B	130	4.0	None	L
3/4	20	G1B	190	4.0	G1B x 60 mm	(L2)
3/4	20	G1B	220	4.0	G1B x 90 mm	(L3)

() Extension pipes are enclosed separately.

Extension pipes

3026-522	Extension G3/4B x 55 mm
3026-523	Extension G1B x 60 mm
3026-524	Extension G1B x 90 mm

Non-return valve (EN 13959) incl. strainer (filter)

6556-504	Non-return valve DN15 for G3/4B, incl. strainer
6556-501	Non-return valve DN20 for G1B, incl. strainer, not for 105 mm housing

Strainer for inlet

6556-503	Strainer DN15 for G3/4B (R1/2), (one)
6556-502	Strainer DN20 for G1B (R3/4), (one)

Glands

6561-333	Gland with built-in controllable non-return valve for DN20, (R3/4 x G1B), (one)
6561-334	Gland for DN15, (R1/2 x G3/4B), (two)
6561-335	Gland for DN20, (R3/4 x G1B), (two)
6561-340	Gland with telescopic extension for DN15, (R1/2xG3/4B), (one)
6561-341	Gland with telescopic extension for DN20, (R3/4xG1B), (one)

Gaskets for hot water (PTFE with silicate fill)

3130-134	DN15 for G3/4B (three)
3130-135	DN20 for G1B (three)

Gaskets for cold water (EPDM)

3130-137	DN15 for G3/4B (three)
3130-136	DN20 for G1B (three)