kamstrup

Data sheet

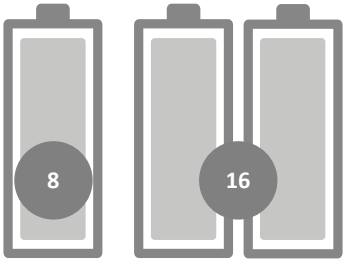
MULTICAL® 303

All-round heat and cooling meter, easy to install and easy to use

- Fully programmable data logger with minute logger
- Configurable M-Bus and Wireless M-Bus with logger reading
- On-site configurable between inlet and outlet
- Dynamic range of up to 1500:1 from start to saturation flow
- Low pressure loss – all flow sizes below 0.1 bar
- PN16/PN25 metal flow sensor – approved for up to 130 °C
- Battery lifetime of up to 16 years
- 7- or 8-digit display resolution

MID 2014/32/EU
CE M23 0200
EN 1434

DK-BEK 1178 – 06/11/2014
DK 268 23
EN 1434



Contents

Description	3
Mechanical design	4
Mechanical data	5
Approved meter data	6
Accuracy	7
Pressure loss	8
Dimensioned sketches	9
Electrical data	11
Product variants	12
Meter configuration	13
Information codes in display	14
Accessories	15

Description

Application

MULTICAL® 303 is the compact all-round heat and cooling meter that can be installed everywhere due to its minimum dimensions. The meter can be turned during installation, even in the most compact systems, enabling you to always obtain optimal reading of the display.

The robust metal flow sensor tolerates continuous temperatures of up to 130 °C, is effectively protected against condensation and can be used in both PN16 and PN25 installations.

The flow sensor is constructed with Kamstrup's unique ultrasonic technique that ensures an extremely long lifetime – also in magnetite-containing heating systems.

Functionality

MULTICAL® 303 consists of a flow sensor based on ultrasound, an electronic display unit and a Pt500 sensor set. These components are separately calibrated and then assembled to one heat, cooling or combined heat/cooling meter. If the components are separated, a reverification of the meter is required.

The meter has built-in, programmable data logger that stores all relevant registers. Standard data logger registers are stored for 20 years, 36 months, 460 days and 1400 hours.

During installation, the meter can be configured for installation of the flow sensor in either inlet or outlet pipe. Furthermore, the energy unit and resolution as well as date/time and M-Bus address can be adjusted merely by pressing a button – no special tools needed.

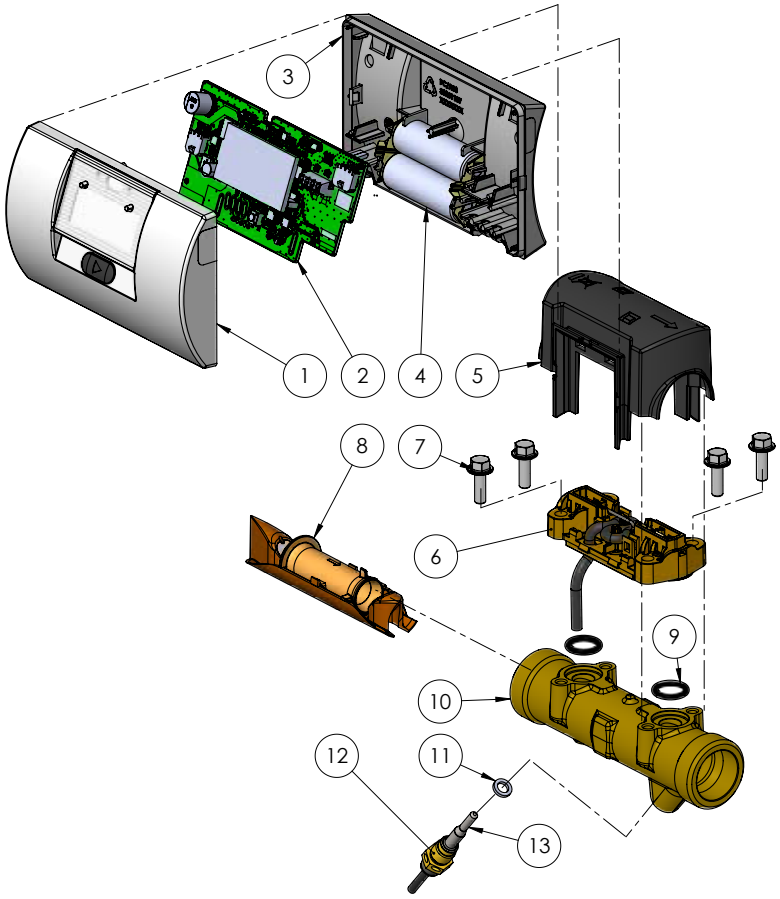
M-Bus or Wireless M-Bus

MULTICAL® 303 can be delivered with factory-mounted cable for M-Bus or with Wireless M-Bus in mode C1 or T1 according to EN 13757.

The M-Bus communication is galvanically separated and has auto-select 300/2400 baud, primary/secondary addressing and collision detection. The current consumption is 1 unit load, and separate registers for heat and cooling energy are read.

The Wireless M-Bus data communication follows the European standard EN 13757, and the data telegram is configurable for either mode C1, T1/C1 BSI or T1/C1 OMS. The data communication is 128 bit AES-encrypted.

Mechanical design



1. Top cover with front key and laser engraving
2. PCB with microcontroller, flow-ASIC, display, etc.
3. Base cover (may only be opened by an authorised laboratory)
4. One or two A-cell batteries
5. Flow sensor cover (may only be opened by an authorised laboratory)
6. Piezo cell console
7. Screws for piezo cell console
8. Ultrasound measuring tube
9. O-rings, piezo cells
10. Brass casing
11. O-ring, temperature sensor
12. Union, temperature sensor
13. Temperature sensor (ø5,0 – ø5,2 – DS 27,5)

Mechanical data

Ambient temperature	5…55 °C. Non-condensing, closed location (indoor installation)
Protection class	
– Calculator	IP65
– Flow sensor	IP68
Media temperatures	
– Heat meters 303-W	2…130 °C
– Cooling meters 303-C	2…50 °C
– Heat/cooling meters 303-T	2…130 °C
Medium in flow sensor	Water (district heating water as described in AGFW FW510)
Storage temperature	-25…60 °C (drained flow sensor)
Pressure stage	PN16/PN25, PS25
Weight	From 0.7 to 0.8 kg depending on the flow sensor size
Flow sensor cable	1.5 m (the cable is non-detachable)
Temperature sensor cables	1.5 m or 3 m (the cables are detachable, reverification required)

At media temperatures below the ambient temperature or above 90 °C, wall-mounting of the calculator is recommended.

Materials

Wetted parts	
– Flow sensor casing	Hot forged, dezincification-resistant brass (CW 602N)
– Transducer	Stainless steel, w.nr. 1.4404
– O-rings	EPDM
– Measuring tube	Thermoplastic, PES 30 % GF
– Reflectors	Thermoplastic, PES 30 % GF and stainless steel, w.nr. 1.4306
Flow sensor cover	Thermoplastic, PC 20 % GF
Wall bracket	Thermoplastic, PC 20 % GF
Calculator casing	
– Top	Thermoplastic, PC 10 % GF with TPE (thermoplastic elastomer)
– Base	Thermoplastic, PC/ABS
Cables	
– Flow sensor	Silicone cable with inner Teflon insulation
– Temperature	Silicone cable with inner Teflon insulation
– M-Bus	PVC cable

Approved meter data

Approvals	
– Heat meter	DK-0200-MI004-045
- Temperature range	θ: 2 °C...180 °C
- Differential range	ΔΘ: 3 K...178 K
– Cooling meter	TS 27.02 015
- Temperature range	θ: 2 °C...180 °C
- Differential range	ΔΘ: 3 K...178 K
– Bifunctional heat/cooling meter	Marked with DK-0200-MI004-045 and TS 27.02 015 as well as MID year mark
- Temperature range	θ: 2 °C...180 °C
- Differential range	ΔΘ: 3 K...178 K
Standards	EN 1434:2007/AC:2007 EN 1434:2015+A1:2018 FprEN 1434:2022 from 2022-04
EU directives	Measuring Instruments Directive Low Voltage Directive Electromagnetic Compatibity Directive Radio Equipment Directive RoHS Directive Pressurised equipment Directive
EN 1434 designation	Environmental class A
MID designation	
– Mechanical environment	Class M1 and M2
– Electromagnetic environment	Class E1, non-condensing environment, closed location (indoors), 5...55°C
Temperature sensor connection	
– Type 303-W/C/T	Pt500 – EN 60751, 2-wire connection (the cables are detachable, reverification required)

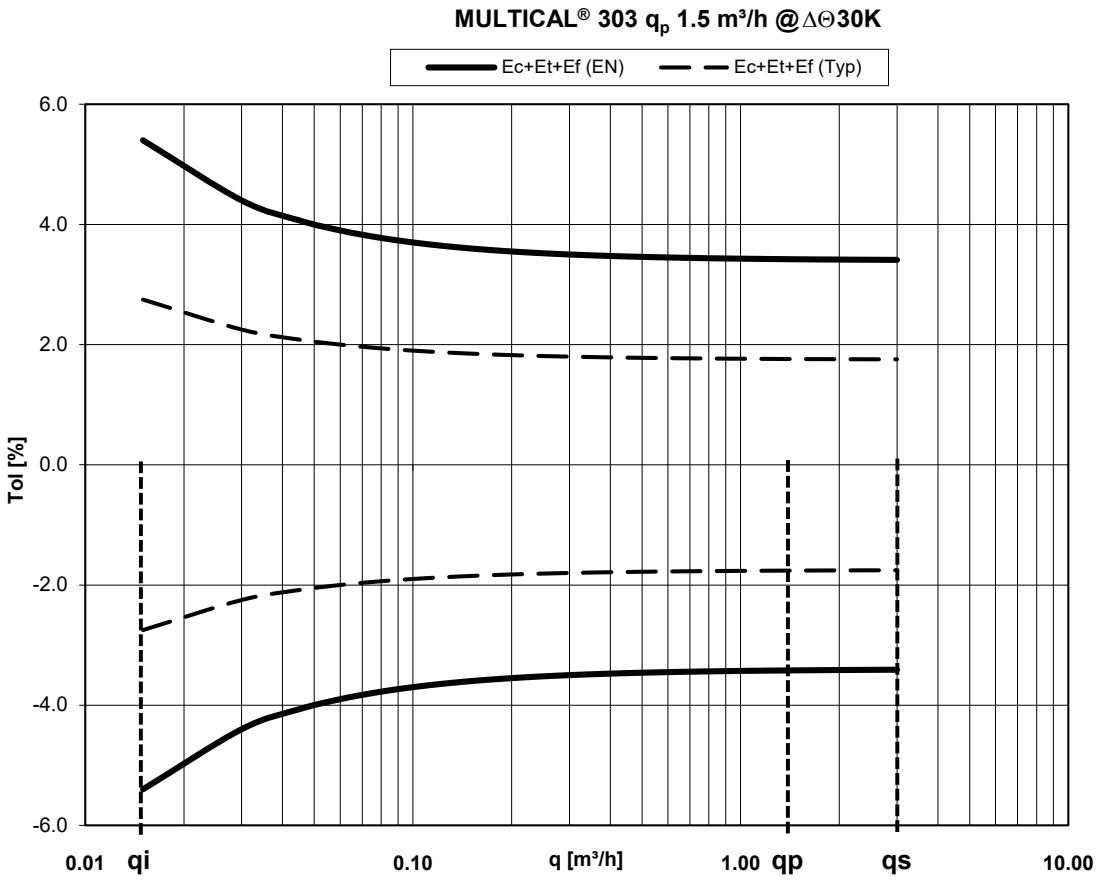
The stated minimum temperatures only relate to the type approval. The meter has no cut-off for low temperature and thus measures down to 0.01 °C and 0.01 K.

Type number	Nom. flow	Max flow	Min. flow		Dynamic range		"Min. flow cut-off"	Saturation flow	Pressure loss Δp @ q_p	Threaded connection on meter	Length
			100:1	250:1							
	q_p	q_s	q_i	q_i							
	[m^3/h]	[m^3/h]	[l/h]	[l/h]	[q_p:q_i]	[q_p:q_i]	[l/h]	[m^3/h]	[bar]		[mm]
303-x-10	0.6	1.2	6	-	100:1	-	3	1.5	0.03	G¾B	110
303-x-40	1.5	3	15	6	100:1	250:1	3	4.6	0.09	G¾B	110
303-x-70	1.5	3	15	6	100:1	250:1	3	4.6	0.09	G1B	130
303-x-A0	2.5	5	25	10	100:1	250:1	5	7.6	0.09	G1B	130

Accuracy

Meter components	MPE according to EN 1434-1	MULTICAL® 303, typical accuracy
Flow sensor	$E_f = \pm [2 + 0.02\ q_p/q]$ %	$E_f = \pm [1 + 0.01\ q_p/q]$ %
Calculator	$E_c = \pm [0.5 + \Delta\Theta_{min.}/\Delta\Theta]$ %	$E_c = \pm [0.15 + 2/\Delta\Theta]$ %
Sensor set	$E_t = \pm [0.5 + 3\ \Delta\Theta_{min.}/\Delta\Theta]$ %	$E_t = \pm [0.4 + 4/\Delta\Theta]$ %

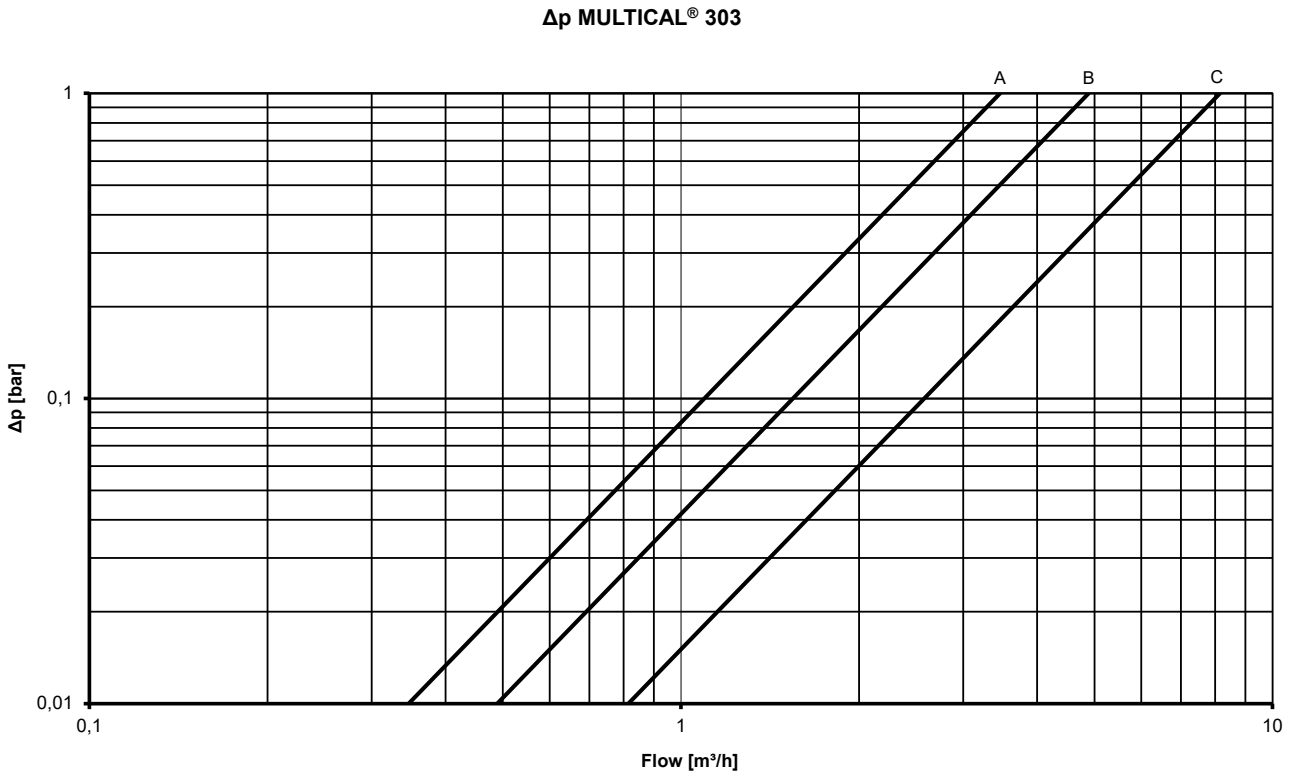
Total typical accuracy of MULTICAL® 303 compared to EN 1434-1



Pressure loss

The pressure loss in a flow sensor is stated as the maximum pressure loss at q_p.
According to EN 1434, the maximum pressure loss must not exceed 0.25 bar.

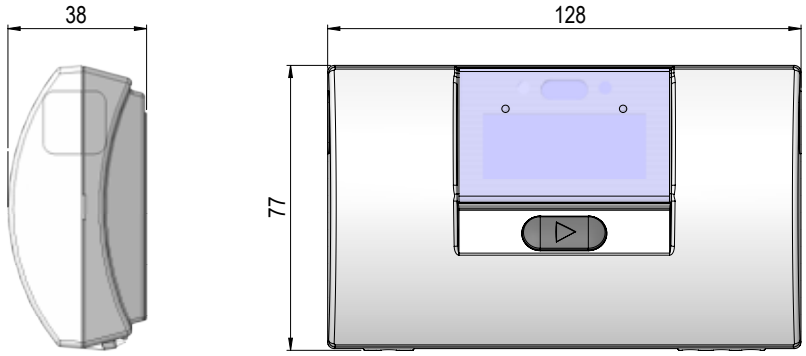
Graph	q_p [m³/h]	Installation dimensions	Nom. diameter [mm]	$\Delta p@q_p$ [bar]	k_v	q@0.25 bar [m³/h]
A	0.6	G¾B x 110 mm	DN15	0.03	3.46	1.7
B	1.5	G¾B x 110 mm	DN15	0.09	4.89	2.4
B	1.5	G1 x 130 mm	DN 20	0.09	4.89	2.4
C	2.5	G1 x 130 mm	DN 20	0.09	8.15	4.1



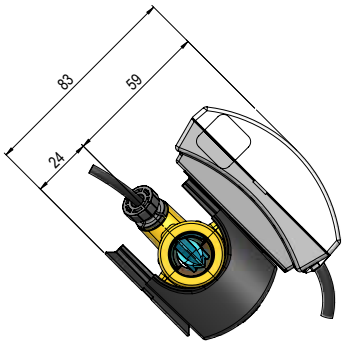
Dimensioned sketches

All measurements in [mm]

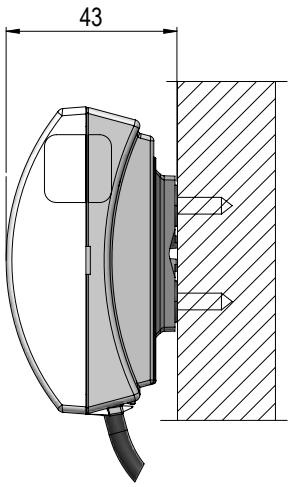
Calculator



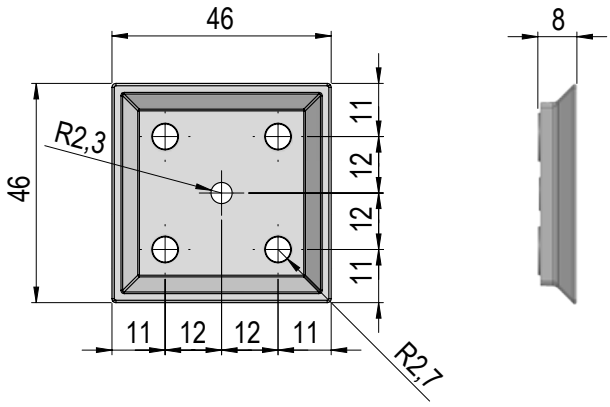
Complete MULTICAL® 303 with calculator mounted on flow sensor



Calculator mounted with wall bracket

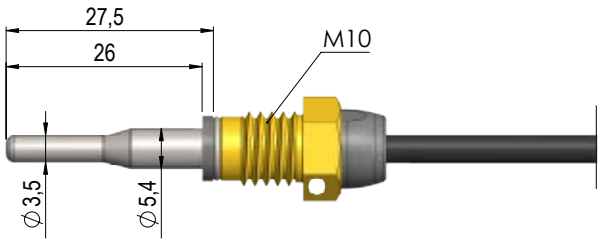


Wall bracket for calculator

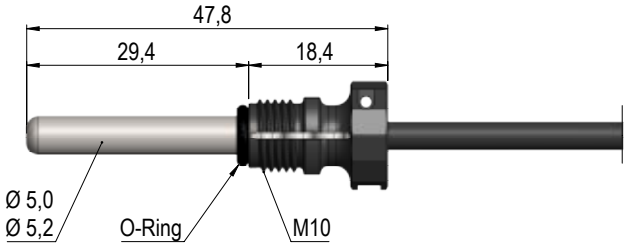


Dimensioned sketches

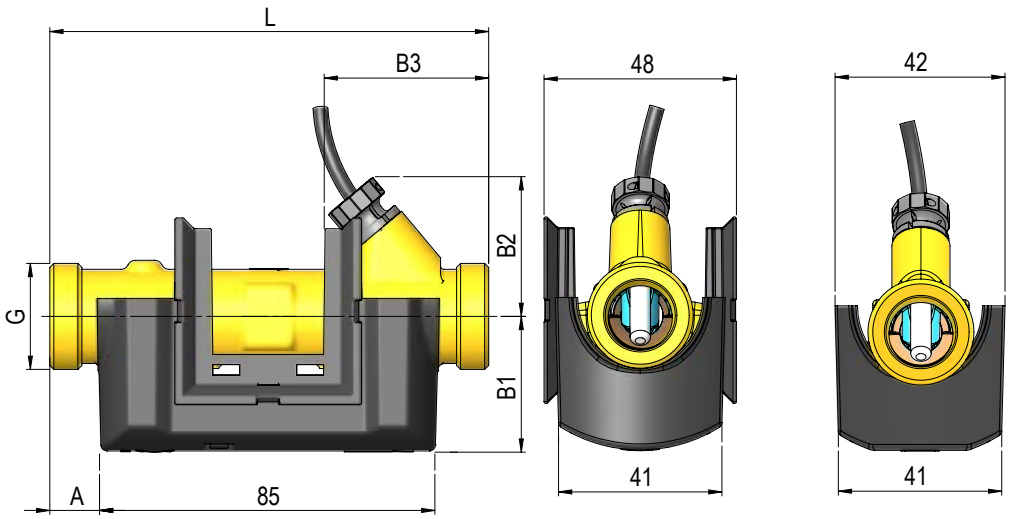
Direct short temperature sensor



Pocket temperature sensor with composite union



Flow sensor



Type W and T **Type C**

Thread	L [mm]	A [mm]	B1 [mm]	B2 [mm]	B3 [mm]	Approx. weight [kg] *
G¾B (R½)	110	12	35	35	40	0.7
G1B (R¾)	130	22	38	38	50	0.8

* The weight indication includes the complete meter including flow sensor, calculator, sensor set and 2 x A-batteries.
Any provided accessories such as couplings, nippels and sensor pockets as well as packaging are not included in the weight indication.

Electrical data

Calculator data

Display	LCD – 7 or 8 digits with a digit height of 6.8 mm	
Resolution	9999.999 – 99999.99 – 999999.9 – 9999999 99999.999 – 999999.99 – 9999999.9 – 99999999	
Energy units	MWh – kWh – GJ	
Data logger (EEPROM) – Logger contents – Logging interval – Logging depth	 Programmable - all registers can be selected Programmable - from 1 minute to 1 year Programmable - standard: 20 years, 36 months, 460 days, 1400 hours (RR-code = 10)	
Info logger (EEPROM)	50 info codes (50 latest are shown in the display)	
Clock/calendar	Clock, calendar, leap year compensation, target date	
Daylight saving time/wintertime (DST)	Programmable The function can be disabled so that "technical normal time" is used	
Clock accuracy	Without external adjustments: Less than 15 minutes/year With external adjustment every 48 hours: Less than 7 s from legal time	
Data communication	KMP protocol with CRC16 is used for optical communication	
M-Bus	Protocol according to EN 13757-3:2018, 300 and 2400 baud communication speeds with automatic baudrate detection. Current consumption: 1 unit load (1.5 mA). Fixed 2-wire cable. Polarity independent.	
Wireless M-Bus	Mode C1 protocol according to EN 13757-4:2019. Individual 128 bit AES-encryption. Transmission interval: 16 s. / 96 s. / 15 m. Transmission frequency: 868.95 MHz Mode T1/C1 BSI protocol according to EN13757-4:2019 and OMS Specification Volume 2 issue 4.2.1. Individual 128 bit AES encryption, security profile B. Transmission interval: 16 s. / 96 s. / 15 m. Transmission frequency: 868.95 MHz Mode T1/C1 OMS protocol according to EN13757-4:2019 and OMS Specification Volume 2 issue 4.2.1. Individual 128 bit AES encryption, security profile A. Transmission interval: 16 s. / 96 s. / 15 m. Transmission frequency: 868.95 MHz	
Power in temperature sensors	< 0.4 µW RMS "normal mode" / < 2 µW RMS "fast mode"	
Supply voltage	3.65 VDC ± 0.1 VDC	
EMC data	Complies with EN 1434 class A (MID class E1)	
Battery	3.65 VDC, 1 x A-cell lithium	3.65 VDC, 2 x A-cell lithium
Life*	Up to 8 years @ t_{BAT} < 30 °C	Up to 16 years @ t_{BAT} < 30 °C
Lithium contents	Approx. 0.9 g	2 x approx. 0.9 g
Transport category	Not included in the rules of dangerous goods	

* The battery lifetime is affected by the meter's communication and setup parameters as well as transmission interval, transmission power and datagram contents.

Product variants

		Static data Written on the front of the meter 303-x-xx-x-xx					Dynamic data Shown in the display xx-x-xx		
MULTICAL® 303 type number	**Type 303**	☐	☐☐	☐	☐☐	-	☐☐	☐	☐☐
Sensor connection									
Pt500 Heat meter		W							
Pt500 Heat/cooling meter		T							
Pt500 Cooling meter		C							
Flow sensor [1]									
q_p [m³/h]	Connection / Length [mm] / Dynamic range								
0.6	G¾B (R½) / 110 / 100:1		10						
1.5	G¾B (R½) / 110 / 100:1		40						
1.5	G1B (R¾) / 130 / 100:1		70						
2.5	G1B (R¾) / 130 / 100:1		A0						
Meter type									
Heat meter (MID module B+D)				2					
Heat/cooling meter (MID module B+D & TS27.02+DK268) [2]	θ_{hc}= OFF			3					
Heat meter, National approvals				4					
Cooling meter (TS27.02+DK268)				5					
Heat/cooling meter (MID module B+D & TS27.02+DK268) [2]	θ_{hc}= ON			6					
Country code									
Determined by Kamstrup upon receipt of order					XX				
Temperature sensor set (Pt500)	Length (mm) / Diameter Ø [mm] / Cable length (m)								
Direct short temperature sensors	27.5 / - / 1.5					51			
Direct short temperature sensors	27.5 / - / 3.0					52			
Ø5.0 with composite unions	- / 5.0 / 1.5					61			
Ø5.0 with composite unions	- / 5.0 / 3.0					62			
Ø5.2 with composite unions	- / 5.2 / 1.5					71			
Ø5.2 with composite unions	- / 5.2 / 3.0					72			
Supply [3]									
Battery, 1 x A-cell	Battery lifetime of up to 8 years						1		
Battery, 2 x A-cells	Battery lifetime of up to 16 years						9		
Communication									
M-Bus, configurable									20
Wireless M-Bus, configurable 868.95 MHz EU									30

1. The flow sensors are type-approved for the dynamic ranges q_p:q_i = 250:1 and 100:1, but are as standard delivered as 100:1. Please contact Kamstrup A/S for further information.
2. In some countries bi-functional meters type 3 and 6 are only allowed to be assigned with the MID marking, due to national law.
3. The battery lifetime is affected by the meter's communication and setup parameters as well as transmission interval, transmission power and datagram contents. Please contact Kamstrup A/S for calculations of specific configurations.

Meter configuration

	A	-	B	-	CCC	-	DDD	-	L	-	RR	-	T	-	VVVV	-	XXX	-	YY	-	ZZZ
Flow sensor position																					
Inlet	3																				
Outlet	4																				
Measure																					
GJ			2																		
kWh			3																		
MWh			4																		
Flow sensor coding																					
Normal/high resolution (7 digits)					4xx																
High resolution (8 digits)					5xx																
Display																					
Heat meter							210														
Heat/cooling meter							310														
Cooling meter							510														
Integration mode																					
Adaptive mode (4-64 s)									5												
Normal mode (32 s)									6												
Fast mode (4 s)									7												
Data logger profile																					
Standard data logger profile											10										
Encryption level																					
Individual key													3								
Customer label																					
Serial number															xxxx						
Communicaion configuration																					
Communication hardware																					
M-Bus (selection in type number)																	x20				
Wireless M-Bus (selection in type number)																	x30				
System configuration (wM-Bus)																					
See the technical description - 5512-2701																			YY		
Datagram (M-Bus/wM-Bus)																					
See the technical description - 5512-2701																					ZZZ

Please contact Kamstrup A/S for further information on configuration options.

Information codes in display

Display digit								Description
1	2	3	4	5	6	7	8	
Info	t1	t2	0	V1	0	0	0	
1								Supply voltage is missing
2								Low battery level
	1							t1 above measuring range or disconnected
		1						t2 above measuring range or disconnected
	2							t1 below measuring range or short-circuited
		2						t2 below measuring range or short-circuited
	9	9						Invalid temperature difference (t1-t2)
				3				V1 Air
				4				V1 Wrong flow direction
				6				V1 > q_s for more than one hour
Example:								
1	0	2	0	0	0	0	0	

Note: Infocodes are configurable. It is thus not certain that all parameters are available in a given MULTICAL® 303. An info logger stores the info code each time the info code is changed. It is possible to read the latest 50 changes of the info code as well as the date of the change.

Accessories

Type number	Description
3026-655.A	Wall bracket including rawlplugs and screws
6699-099	Infrared optical read-out head with USB plug
6696-005	Optical read-out head with Bluetooth
3026-909	Holder for optical read-out head
669-042	Metal plate for optical read-out head, 20 pcs.
3130-262	Blind plug including O-ring for the temperature sensor connecting in the flow sensor
2210-061	Gasket for flow sensor G¾B (R½) / coupling 6561-323
2210-062	Gasket for flow sensor G1B (R¾) / coupling 6561-324
2105-002	Sealing cap for flow sensor G¾B (R½), blue
3026-1148	Sealing cap for flow sensor G¾B (R½), self-locking, blue
6556-491	R½ - M10 nipple for direct short temperature sensor
6556-492	R¾ - M10 nipple for direct short temperature sensor
6556-474	G½B ball valve with M10x1 sensor socket, 48 mm
6556-475	G¾B ball valve with M10x1 sensor socket, 54 mm
3026-517	Sealing cap for direct short temperature sensor DS27,5, blue
3026-518	Sealing cap for direct short temperature sensor DS27,5, red
3026-1034	Sealing cap for Ø5.0 mm / Ø5.2 mm temperature sensor with composite union, black

For further information on MULTICAL® 303 and its accessories, please refer to the technical description, which you can find on Kamstrup Product Centre.

Kamstrup A/S • FILE100000653_A_EN-58101794_D1_02.2023

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