kamstrup

Data sheet

MULTICAL® 803

Heat and cooling meter for trade and industry

- Fully programmable data logger with minute loggers
- 2 second integration interval
- 4 communication modules
- 7 or 8 digit display resolution
- User-friendly interface with 3 push buttons
- Large backlit display
- IP65 density
- 6-year battery backup
- Auto Detect of Kamstrup's ULTRAFLOW®
- Auto Detect of Pt-temperature sensor
- Mixed fluid compatible



MID 2014/32/EU
CE M19 0200
EN 1434

DK-BEK 1178 – 06/11/2014
DK 268 19
EN 1434

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Description

MULTICAL® 803 is a robust and all-round calculator, suitable as heat meter, cooling meter or bifunctional heat/cooling meter together with 1 or 2 flow sensors and 1, 2, 3 or 4 temperature sensors. The meter is intended for energy measurement in almost all types of thermal installations where water is used as the energy-conveying medium.

MULTICAL® 803 can, in addition to heat and cooling measurement, be used for leakage monitoring, permanent performance monitoring, power, flow and temperature limiter with valve control as well as for energy measurement in both open and closed systems.

According to EN 1434 and MID, MULTICAL® 803 can be designated as a "calculator" with separate type approval and verification. The MULTICAL® 803 calculator top can be separated from the connection base by means of a 4 mm Allen wrench when the installation seals have been broken.

MULTICAL® 803 has 2 flow sensor inputs that can be used for both electronic and mechanical flow sensors. The pulse value can be configured from 0.001 to 300 pulses/liter, and the calculator can be configured for all nominal flow sensor sizes from 0.6 to 15,000 m^3/h. By default, the calculator is supplied with galvanically coupled flow sensor inputs that fit ULTRAFLOW® and, for example, reed switches. In addition, a connection PCB with 2 galvanically isolated flow sensor inputs can also be supplied.

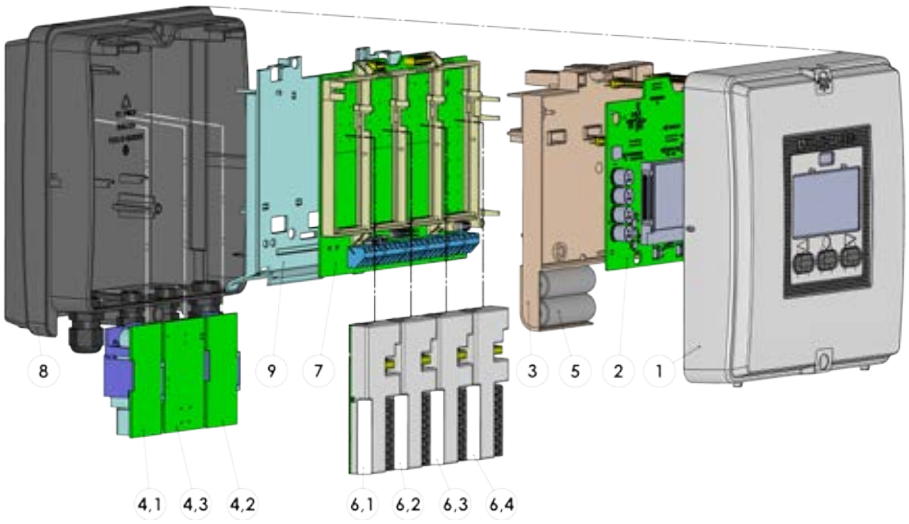
The accumulated heat energy and/or cooling energy can be displayed in kWh, MWh, GJ or Gcal, all in the form of 7 or 8 significant digits plus measuring unit. The display has been specially designed with a view to obtaining long lifetime and sharp contrast in a wide temperature range and, by default, MULTICAL® 803 has backlit display.

MULTICAL® 803 can be mains-supplied either by 24 VAC or 230 VAC. A built-in battery backup also ensures that the meter continues the energy measurement for 6 years in case of a voltage failure. Furthermore, it is possible to connect a battery backup to module slot M1 by which, for example, M-Bus or wM-Bus will continue to operate during a voltage failure.

In designing MULTICAL® 803, great importance has been attached to flexibility through programmable functions and plug-in modules in order to secure optimum use in a wide range of applications.

Auto Detect UF enables the exchange of ULTRAFLOW® X4 on MULTICAL® 803 without the need for reconfiguration (change of the CCC code). MULTICAL® 803 can automatically adjust the pulse value and qp to match the connected ULTRAFLOW® X4 X4. Auto Detect UF is active with CCC code 8xx and is initiated when the calculator top and base are assembled. In addition, MULTICAL® 803 has automatic conversion between Pt100 and Pt500 sensors via Auto Detect Pt. The meter even detects the type of the connected temperature sensor. However, all connected sensors must be of the same type.

Mechanical design



1	Top cover with front keys and laser engraving
2	PCB with microcontroller, display, etc.
3	Verification cover (may only be opened at an authorised laboratory)
4.1	Mandatory power supply
4.2	Optional power supply
4.3	Optional power supply (isolated 24 VDC)
5	Backup battery
6.1	Module slot M1
6.2	Module slot M2
6.3	Module slot M3
6.4	Module slot M4
7	Connection PCB
8	Base cover with cable glands
9	Power supply cover (only authorized personnel must remove this)

Mechanical data

Weight	1150 g incl. backup battery
Ambient temperature	5…55 °C. Non-condensing, closed location (indoor installation)
Protection class	IP65
Media temperatures ULTRAFLOW®	2…130 °C

At medium temperatures below the ambient temperatur or above 90 °C in flow sensor, wall-mounting of the calculator is recommended.

Medium in ULTRAFLOW®	Water (district heating water as described in CEN TR 16911 and AGFW FW510)
Storage temperature	-25…60 °C (drained flow sensor)
Connection cable	M12: ø3…8 mm M16: ø4…10 mm
Supply cable	ø4…10 mm

Materials

Cast composite parts	Thermoplastic, PC 10 % GF
Gasket	Neoprene rubber
Push buttons	EPDM rubber

Approved meter data

Approvals	
– Heat meter approval	DK-0200-MI004-042
- Temperature range	θ: 2 °C...180 °C
- Differential area	ΔΘ: 3 K...178 K
– Cooling meter	TS 27.02 013
- Temperature range	θ: 2 °C...180 °C
- Differential area	ΔΘ: 3 K...178 K
– Bifunctional heat/cooling meter	Marked with DK-0200-MI004-042 and TS 27.2 013 as well as yearly mark of MID
- Temperature range	θ: 2 °C...180 °C
- Differential range	ΔΘ: 3 K...178 K
Standards	EN 1434:2015
EU directives	Measuring Instrument Directive, Low Voltage Directive, Electromagnetic Compatibility Directive, RoHS Directive, Pressurised Equipment Directive
EN 1434 designation	Environmental classes A and C
MID designation	
– Mechanical environment	Classes M1 and M2
– Electromagnetic environment	Classes E1 and E2
Temperature sensor connection	
– Type 803-A	Pt100 or Pt500 – EN 60 751, 2-wire or 4-wire connection

The stated minimum temperatures are related to the type approval.

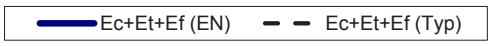
The meter has no cut-off for low temperature and thus measures down to 0.01 °C and 0.01 K.

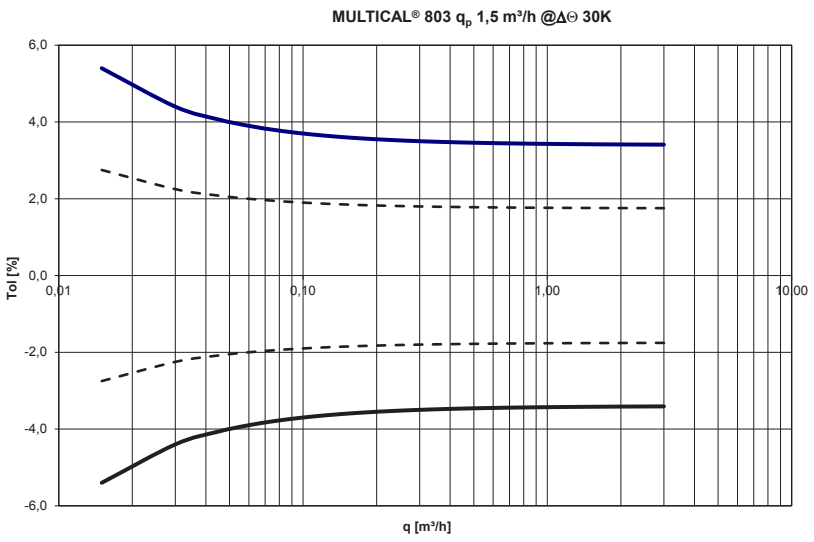
Accuracy

Heat meter components	MPE according to EN 1434-1	Typical accuracy
MULTICAL® 803	$E_c = \pm (0.5 + \Delta\Theta \text{ min}/\Delta\Theta)$ %	$E_c = \pm (0.15 + 2/\Delta\Theta)$ %
ULTRAFLOW®	$E_f = \pm (2 + 0.02\ q_p/q)$, but not above ± 5 %	$E_f = \pm (1 + 0.01\ q_p/q)$ %
Sensor pair	$E_t = \pm (0.5 + 3\ \Delta\Theta \text{ min}/\Delta\Theta)$ %	$E_t = \pm (0.4 + 4/\Delta\Theta)$ %

MULTICAL® 803 and ULTRAFLOW® q_p 1.5 m³/h @ΔΘ 30K

Total typical accuracy of MULTICAL® 803, sensor pair and ULTRAFLOW® compared to EN 1434-1.

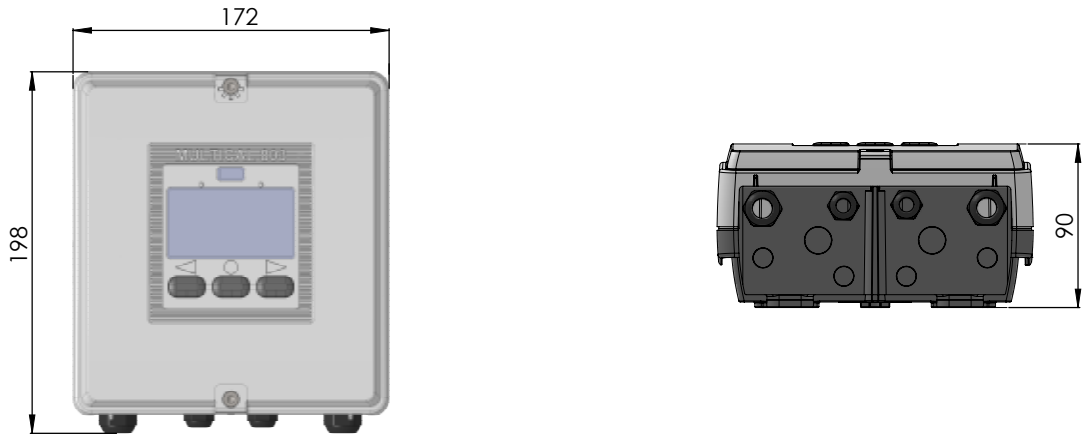




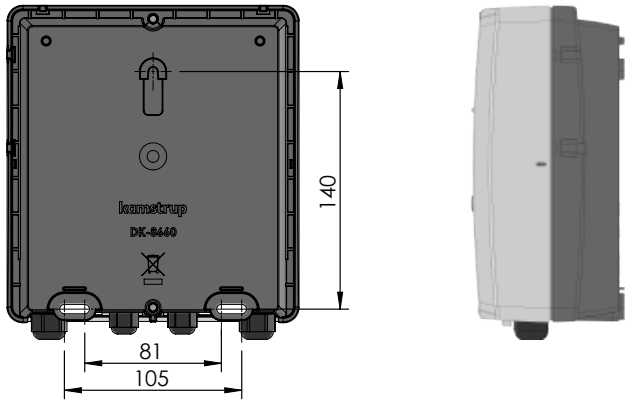
Dimensioned sketches

All measurements in [mm].

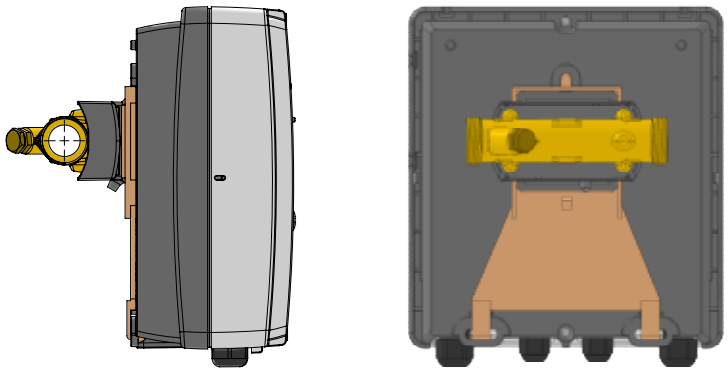
Mechanical measurements of MULTICAL® 803 calculator



Calculator base



MULTICAL® 803 mounted on ULTRAFLOW® with G¾ x 110 mm threaded connection



Electrical data

Calculator data

Display	LCD – 7 or 8 digits, 10 mm digit height
Resolutions	999.9999 - 9999.999 – 99999.99 – 999999.9 – 9999999 9999.9999 - 99999.999 – 999999.99 – 9999999.9 – 99999999
Energy units	MWh – kWh – GJ – Gcal
Data logger (EEPROM) – Logging intervals – Logger contents – Logger profile	Programmable From 1 minute to 1 year All registers can be selected Standard: 20 years, 36 months, 460 days, 1400 hours
Info logger (EEPROM)	280 info codes (the latest 50 info codes are shown in the display)
Clock/calender (with backup battery)	Clock, calendar, leap year compensation, target date
Daylight saving time/wintertime (DST)	Programmable This function can be disabled so that "technical normal time" is used
Clock accuracy	Without external adjustment: Less than 15 min./year With external adjustment every 48 hours: Less than 7 s from legal time
Data communication	KMP protocol with CRC16 used for optical communication and for modules
Power in temperature sensors	< 10 µW RMS
Power supply	3.6 VDC ± 0.1 VDC
Backup battery	3.6 VDC, 2 x A lithium
Mains supply	230 VAC +15/-30 %, 50/60 Hz 24 VAC ±50 %, 50/60 Hz or 24 VDC +75/-25 %
Insulation voltage	3.75 kV
Power consumption	< 1 W for type 803-0000000-A and b < 7 W for type 803-0000000-C and d

Electrical data

Temperature measurement	t1 Inlet	t2 Outlet	t3 Con- trol	t4 Extra	ΔΘ (t1-t2) Heat measurement	ΔΘ (t2-t1) Cooling measurement	t5 Preset for A1 and A2
Measuring range 803-A, 2/4-wire, Pt100/Pt500 803-M, 2/4-wire, Pt100/Pt500	0.00...185.00 °C (t1 and t2: approved for 2.00...180.00 °C) -40...140 °C						
Offset adjustment	± 0.99 K joint zero point adjustment for t1, t2, t3 and t4 **Note:** The offset adjustment is only active on measured temperatures. For example, if t3 has been selected for a preset value, the offset adjustment will not influence the preset value.						

Max cable lengths (max ø6 mm cable)	Pt100, 2-wire	Pt100, 4-wire	Pt500, 2-wire	Pt500, 4-wire
	2 x 0.25 mm²: 2.5 m 2 x 0.50 mm²: 5 m 2 x 1.00 mm²: 10 m	4 x 0.25 mm²: 100 m	2 x 0.25 mm²: 10 m	4 x 0.25 mm²: 100 m

Flow measurement V1/V2	ULTRAFLOW® V1: 9-10-11 V2: 9-69-11	Reed switches V1: 10-11 V2: 69-11	FET switches V1: 10-11 V2: 69-11	24 V active pulses V1: 10B-11B
CCC code	1xx-2xx-4xx-5xx-8xx	0xx	9xx	2xx and 9xx
EN 1434 pulse class	IC	IB	IB	(IA)
Pulse input	680 kΩ pull-up to 3.6 V	680 kΩ pull-up to 3.6 V	680 kΩ pull-up to 3.6 V	12 mA at 24 V
Pulse ON	< 0.4 V in > 1 ms	< 0.4 V in > 300 ms	< 0.4 V in > 30 ms	< 4 V in > 3 ms
Pulse OFF	> 2.5 V in > 4 ms	> 2.5 V in > 100 ms	> 2.5 V in > 70 ms	> 12 V in > 4 ms
Pulse frequency	< 128 Hz	< 1 Hz	< 8 Hz	< 128 Hz
Integration frequency	< 1 Hz	< 1 Hz	< 1 Hz	< 1 Hz
Electrical isolation	No	No	No	2 kV
Max cable length	10 m	10 m	10 m	100 m
Max cable length with Cable Extender Box, Type 66-99-036	30 m	30 m	30 m	-

Pulse inputs In-A/In-B	Electronic switch	Reed switch
Pulse input	680 kΩ pull-up to 3.6 V	680 kΩ pull-up to 3.6 V
Pulse ON	< 0.4 V in > 30 ms	< 0.4 V in > 500 ms
Pulse OFF	> 2.5 V in > 30 ms	> 2.5 V in > 500 ms
Pulse frequency	< 3 Hz	< 1 Hz
Electrical isolation	No	No
Max cable length	25 m	25 m
Requirements to external contact	Leakage current at function open < 1 µA	

Pulse outputs Out-C/Out-D	HC-003-11 (before 2017-05) HC-003-21/-31 (before 2018-04)	HC-003-11 (after 2017-05) HC-003-21/-31 (after 2018-04)
Pulse output type	Open collector (OB)	Opto FET
External voltage	5...30 VDC	1...48 VDC/VAC
Current	< 10 mA	< 50 mA
Residual stress	U_{CE} ≈ 1 V at 10 mA	R_{ON} ≤ 40 Ω
Electrical isolation	2 kV	2 kV
Max cable length	25 m	25 m

Product variants

MULTICAL® 803 type number				Static data Written on the meter's front 803-X-X-XX-	Dynamic data Meter Shown on the display X-XX-X-	Dynamic data Module Shown on the display XX-XX-XX-XX
Type 803-				□ - □ - □□	- □ - □□ - □	- □□ - □□ - □□ - □□
Calculator type						
Pt100/Pt500 2/4-wire, t1-t2-t3-t4. V1-V2, backlit display				A		
Pt100/Pt500 2/4-wire, t1-t2-t3-t4. V1-V2, backlit display (Mixed fluid only)				M		
Meter type						
Heat meter	MID module B+D			2		
Heat/cooling meter	MID module B+D & TS 27.02	θ_{HC} = OFF		3		
Heat meter	National approval			4		
Cooling meter	TS 27.02+BEK1178			5		
Heat/cooling meter	MID module B+D & TS 27.02	θ_{HC} = ON		6		
Volume meter, hot				7		
Volume meter, cold				8		
Energy meter				9		
Country code						
Determined by Kamstrup upon placement of order				XX		
Flow sensor connection type						
Delivered with one ULTRAFLOW®					1	
Delivered with two identical ULTRAFLOW®					2	
Prepared for one ULTRAFLOW®					7	
Prepared for two identical ULTRAFLOW®					8	
Prepared for flow sensor with fast and bounce-free electronic pulses					C	
Prepared for flow sensor with slow and bounce-free electronic pulses					J	
Prepared for flow sensor with slow pulses with bounce					L	
Prepared for flow sensor with 24 V active pulses					P	
Delivered with one flow sensor (Mixed fluid only)					G	
Temperature sensor set						
Supplied without temperature sensors						00
2-wire Pt500 temperature sensors						
Direct short temperature sensors, 2 pcs.	DS 27.5 mm		L 1.5 m - 3.0 m			1x
Direct short temperature sensors, 2 pcs.	DS 38.0 mm		L 1.5 m - 3.0 m			2x
Pocket temperature sensors, 2/3 pcs..	PL ø5.8 mm		L 1.5 m - 10 m			3x
2-wire Pt100 temperature sensors						
Direct short temperature sensors, 2 pcs.	DS 27.5 mm or DS 38.0 mm		L 2.0 m			Jx
4-wire Pt500/Pt100 temperature sensors						
Pocket temperature sensors with connection head, 2 pcs.		PL ø6.0 mm	L 105 mm - 230 mm			Ax
Pocket temperature sensors with connection head, 2 pcs.		PL ø5.8 mm	L 90 mm - 180 mm			Bx
Supply modules						
1 x 230 VAC	supply of 2 communication modules (M1+M2)					A
1 x 24 VAC/VDC	supply of 2 communication modules (M1+M2)					b
2 x 230 VAC	supply of 4 communication modules (M1+M2+M3+M4)		1 x 24 VDC auxiliary supply			C
2 x 24 VAC/VDC	supply of 4 communication modules (M1+M2+M3+M4)		1 x 24 VDC auxiliary supply			d

Product variants

MULTICAL® 803 type number	Static data Written on the meter's front	Dynamic data Meter Shown on the display	Dynamic data Module Shown on the display			
	803-X-X-XX-	X-XX-X-	XX-XX-XX-XX			
Type 803-	□ - □ - □□	- □ - □□ - □ -	□□ -	□□ -	□□ -	□□
Communication module (4 module slots)			**M1**	**M2**	**M3**	**M4**
No module			00	00	00	00
Data Pulse, inputs (In-A, In-B)			10	10	10	10
Data Pulse, outputs (Out-C, Out-D)			11	11	11	11
Wired M-Bus, inputs (In-A, In-B)			20	20	20	20
Wired M-Bus, outputs (Out-C, Out-D)			21	21	21	21
Wired M-Bus, Thermal Disconnect			22	22	22	22
Wireless M-Bus, inputs (In-A, In-B), 868 MHz			30	30		
Wireless M-Bus, outputs (Out-C, Out-D), 868 MHz			31	31		
Analog outputs 2 x 0/4...20 mA					40	40
Analog inputs 2 x 4...20 mA / 0...10 V					41	
PQT Controller					43	
Low Power Radio, inputs (In-A, In-B), 434 MHz			50	50		
Low Power Radio GDPR, inputs (In-A, In-B), 434 MHz			51	51		
LON TP/FT-10, inputs (In-A, In-B)			60	60	60	60
BACnet MS/TP, inputs (In-A, In-B)			66	66	66	66
Modbus RTU, inputs (In-A, In-B)			67	67	67	67
2G/4G Network			80	80		
Modbus/KMP TCP/IP, inputs (In-A, In-B)			82	82	82	82
High Power Radio Router, inputs (In-A, In-B), 444 MHz			84	84		
High Power Radio Router GDPR, inputs (In-A, In-B), 444 MHz			85	85		

Please contact Kamstrup A/S for further information about product variants.

Meter configuration

	A	-	B	-	CCC	-	DDD	-	EE	-	FF	-	GG	-	L	-	M	-	N	-	PP	-	RR	-	T	-	VVVV
Flow sensor position																											
Inlet	3																										
Outlet	4																										
Measuring unit																											
GJ			2																								
kWh			3																								
MWh			4																								
Gcal			5																								
Auto Detect CCC codes (ULTRAFLOW® x4)																											
Normal resolution (7 digits)					807																						
High resolution (8 digits)					818																						
Static CCC codes																											
Reed contact (7 digits)					0xx																						
Electronic, fast pulses (7 digits)					1xx																						
Electronic, fast pulses (8 digits)					2xx																						
Kamstrup, UF X4 (7 digits)					4xx																						
Kamstrup, UF X4 (8 digits)					5xx																						
Electronic, slow pulses (7 digits)					9xx																						
Display																											
Heat meter (standard)							210																				
Heat/cooling meter (standard)							310																				
Cooling meter (standard)							510																				
Tariffs																											
No active tariff									00																		
Power tariff									11																		
Flow tariff									12																		
t1-t2 tariff									13																		
Inlet tariff									14																		
Outlet tariff									15																		
Time-controlled tariff									19																		
Heat/cooling volume tariff									20																		
PQ tariff									21																		
Pulse inputs In-A/In-B																											
10 m³/h, 10 l/imp, pre-counter 1 (standard)											24		24														
Integration mode																											
Fast mode (2 s)	Display on														4												
Fast mode (2 s)	Display and backlight on														9												
Leakage limits (V1/V2)																											
OFF																	0										
1.0 % of q_p + 20 % of q																	1										
1.0 % of q_p + 10 % of q																	2										
0.5 % of q_p + 20 % of q																	3										
0.5 % of q_p + 10 % of q																	4										
Cold water leakage limits (In-A/In-B)																											
OFF																			0								
30 min. without pulses																			1								
One hour without pulses																			2								
Two hours without pulses																			3								

Meter configuration

	A - B - CCC - DDD - EE - FF - GG - L - M - N -	PP	- RR	- T	- VVVV
Pulse outputs Out-C/Out-D					
Out-C: V1/4	5 ms	73			
Out-C: V1/4 Out-D: V2/1	3.9 ms	80			
Out-C: V1/1	3.9 ms	82			
Out-C: V1/4	22 ms	83			
E1 and V1 or E3 and V1	10 ms	94			
E1 and V1 or E3 and V1	32 ms	95			
E1 and V1 or E3 and V1	100 ms (0.1 s)	96			
Controlled output based on data commands		99			
Data logger profile					
Standard data logger profile			10		
Encryption level					
Individual key				3	
Customer label					
Serial number					0000

Please contact Kamstrup A/S for further information about meter configuration.

Information code types in display

Display digit								Description
1	2	3	4	5	6	7	8	
Info	t1	t2	t3	V1	V2	In-A	In-B	
1								Supply voltage interrupted
2								The meter is supplied by the backup battery
9								External alarm (e.g. via KMP)
	1							t1 above measuring range or switched off
		1						t2 above measuring range or switched off
			1					t3/t4 above measuring range or switched off
	2							t1 below measuring range or short-circuited
		2						t2 below measuring range or short-circuited
			2					t3/t4 below measuring range or short-circuited
	9	9						t1-t2 Invalid temperature difference
				1				V1 Communication error
					1			V2 Communication error
				2				V1 Wrong pulse figure
					2			V2 Wrong pulse figure
				3				V1 Air
					3			V2 Air
				4				V1 Wrong flow direction
					4			V2 Wrong flow direction
				6				V1 Increased flow (flow1 > qs, for more than 1 hour)
					6			V2 Increased flow (flow2 > qs, for more than 1 hour)
				7				V1/V2 Burst, water loss (flow1 > flow2)
					7			V1/V2 Burst, water penetration (flow1 < flow2)
				8				V1/V2 Leakage, water loss (M1 > M2)
					8			V1/V2 Leakage, water penetration (M1 < M2)
						7		In-A2 Leakage in the system
						8		In-A1 Leakage in the system
						9		In-A1/A2 External alarm
							7	In-B2 Leakage in the system
							8	In-B1 Leakage in the system
							9	In-B1/B2 External alarm
Example:								
1	0	2	0	6	7	9	9	

Note: Info codes are configurable. Therefore, it is not certain that all the parameters to the left are available in a given MULTICAL® 803.

An info logger saves the info code every time the info code is changed. It is possible to read the latest 280 changes of the information code as well as the dates of the changes.

Accessories

Article number	Description
HC-993-10	Backup battery, 2xA-cells
HC-993-11	230 VAC supply module
HC-993-12	24 VAC/VDC supply module
HC-993-13	230 VAC til 24 VDC auxiliary supply module
HC-993-14	24 VAC/VDC til 24 VDC auxiliary supply module
3026-517	Sealing cap for temperature sensors, blue 2 pcs.
3026-518	Sealing cap for temperature sensors, red 2 pcs.
3026-657	Bracket for ULTRAFLOW®
5000-337	Module cable, 2 m (2 x 0.25 mm²)
6699-035	USB module configuration cable
6699-036	Cable Extender Box
6699-042	Metal plate for optical read-out head (20 pcs)
6699-099	Infrared optical reading head w/USB plug
6699-102	Infrared optical reading head w/D-sub plug
6699-403	230/24 VAC safety transformer 5 VA
6699-404	230/24 VAC safety transformer 10 VA
6699-405	230/12/24 VAC safety transformer 63 VA
6699-447.E	Internal antenna for Kamstrup radio, 434 MHz
6699-448	Mini Triangle antenna for Wireless M-Bus and 2G/4G Network Module
6699-482.E	Internal antenna for Wireless M-Bus 868 MHz
6699-724	METERTOOL HCW
6699-725	LogView HCW

Calibration units

Article number	Description
6699-361	2/4-wire Pt500, heat/cooling (used with METERTOOL HCW)
6699-362	2/4-wire Pt100, heat/cooling (used with METERTOOL HCW)

Find more information on ULTRAFLOW®, temperature sensors and ball valves on products.kamstrup.com.

Contact Kamstrup A/S for information about further accessories.

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