Data sheet

MULTICAL® 603

The future-proof heat and cooling meter with full flexibility

- Fully programmable data logger with minute loggers
- 2 second integration interval
- 16 years battery lifetime at a reading interval down to 10 seconds
- Possibility of built-in M-Bus
- 2 communication modules
- 7 or 8 digit display resolution
- User-friendly interface with 3 push buttons
- Possibility of backlit display
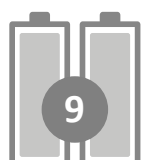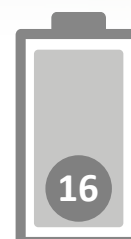- Auto Detect of ULTRAFLOW®

MID

CE M17 0200

EN 1434

DK-BEK 1178 – 06/11/2014

DK 268   17

EN 1434

16   9

Contents

Description

MULTICAL® 603 is an all-round calculator, suitable as heat meter, cooling meter or combined heat/cooling meter together with 1 or 2 flow sensors and 2 or 3 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® 603 can, in addition to heat and cooling measurement, be used for leakage monitoring, permanent performance monitoring, as power and flow limiter with valve control as well as for energy measurement in both open and closed systems.

According to EN 1434 and MID, MULTICAL® 603 can be designated as a "calculator" with separate type approval and verification, and it can be delivered either as a separate calculator or as a complete meter, with mounted temperature sensors and flow sensor according to customer requirements.

MULTICAL® 603 has 2 flow sensor inputs that can be used for both electronic and mechanical flow sensors. The pulse figure can be programmed from 0.001 to 300 pulses/liter, and the calculator can be programmed to all nominal flow sensor sizes from 0.6 to 15,000 m³/h. The calculator can be delivered with both galvanically connected and separated flow sensor inputs.

The accumulated heat energy and/or cooling energy can be displayed in kWh, MWh, GJ or Gcal, all in the form of seven or eight 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. Furthermore, MULTICAL® 603 can be delivered in a variant with backlit display (type 603-F).

MULTICAL® 603 is powered by an internal D-cell lithium battery with a lifespan of up to 16 years or a 2xAA lithium packet with a lifespan of up to 9 years. Alternatively, the meter can be mains supplied, either by 24 VAC or 230 VAC.

In designing MULTICAL® 603, 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. The meter has been configured from the factory and is ready for use. It can, however, be changed/reconfigured after installation via the front keys of the meter, READy or METERTOOL HCW.

Auto Detect enables the exchange of ULTRAFLOW® X4 on MULTICAL® 603 without the need for reconfiguration (change of the CCC code). MULTICAL® 603 can automatically adjust the pulse figure and q_p to match the connected ULTRAFLOW® X4 via Auto Detect. Auto Detect is active with CCC code 8xx and is initiated when the calculator top and base are separated and reassembled.

Mechanical construction
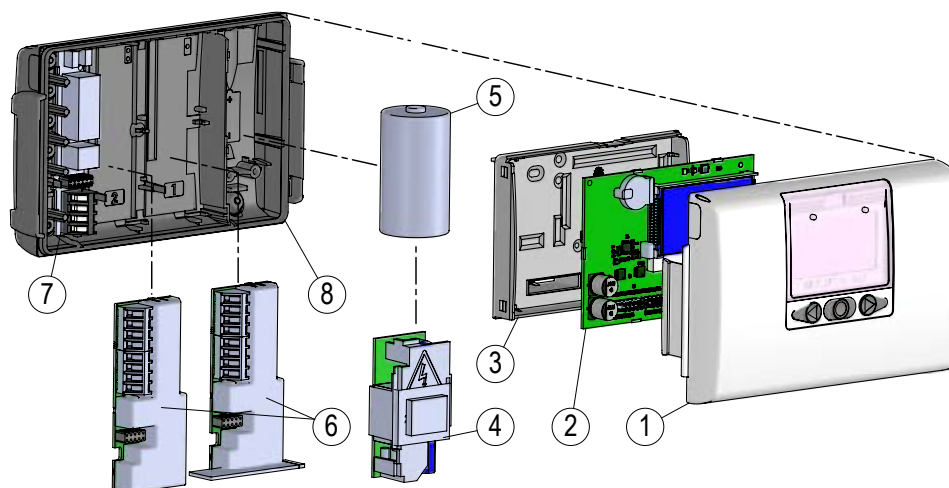
1   Calculator top with front keys and laser engraving
2   PCB with microcontroller, display, etc.
3   Verification cover (may only be opened at an authorised laboratory)

4   Either a power supply module can be mounted...

5   ... or a battery can be mounted
6   1 or 2 communication modules
7   Connection of temperature sensors and flow sensors
8   Calculator base

Mechanical data

Environmental class	Complies with EN 1434 class A and C (MID class E1 and E2)
Ambient temperature	5...55 °C non-condensing, closed location (installation indoors)
Protection class	Calculator: IP65 according to EN/IEC 60529
Medium temperatures ULTRAFLOW®	2...130 °C At medium temperatures below ambient temperature or above 90 °C in the flow sensor, we recommend that the calculator is wall-mounted.
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	ø3.5...6 mm
Supply cable	ø5...8 mm

Materials

Calculator case	
– Top and base	Thermoplastic, PC 10 % GF with TPE (thermoplastic elastomer)
– Verification cover	ABS
Cables	Silicone cable with inner Teflon insulation

Dimensioned sketches

All measurements in [mm].

154

102

166

47
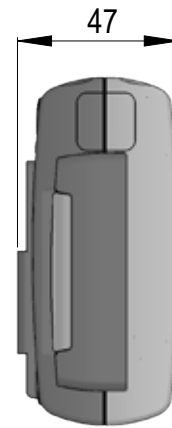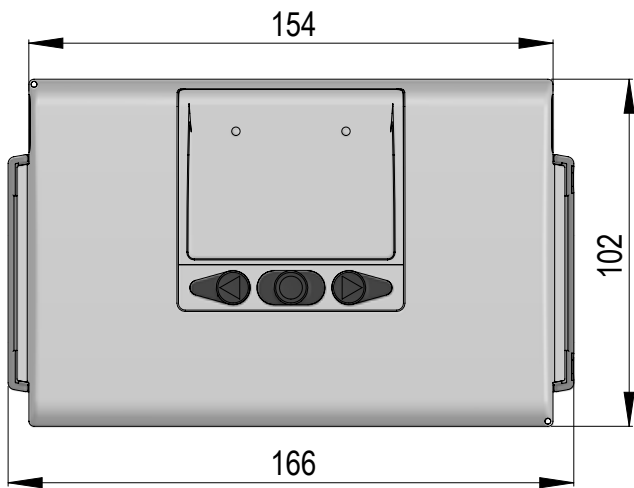
Mechanical measurements for MULTICAL® 603 calculator
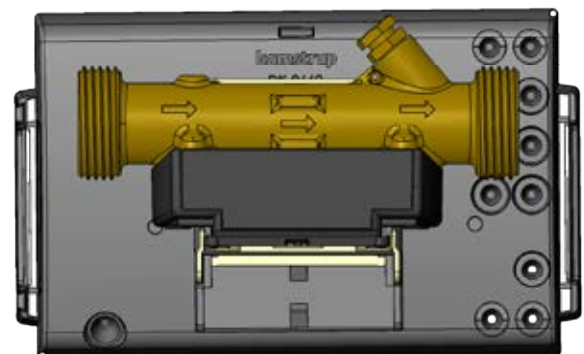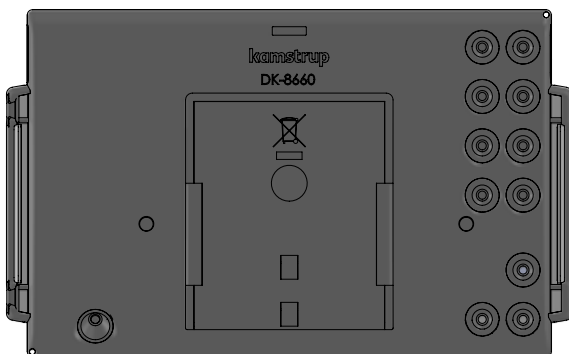
Calculator base separate and mounted on ULTRAFLOW®

78

75

MULTICAL® 603 mounted on ULTRAFLOW® with G¾ threaded connection

Measurement accuracy

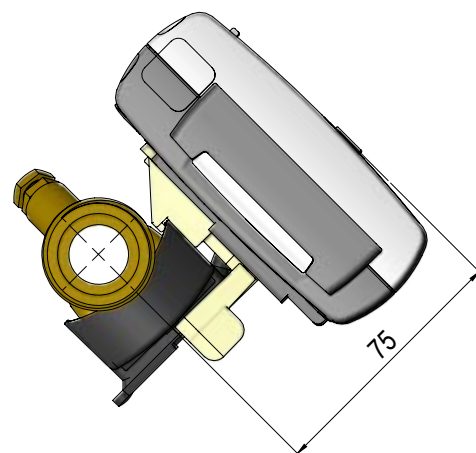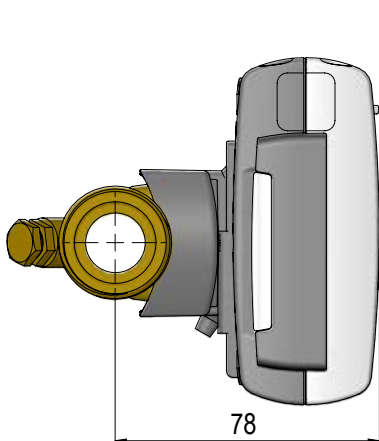| Heat meter components	MPE according to EN 1434-1	Typical accuracy
MULTICAL® 603	$E_c = \pm (0.5 + \Delta\Theta \min/\Delta\Theta)$ %	$E_c = \pm (0.15 + 2/\Delta\Theta)$ %
Sensor pair	$E_t = \pm (0.5 + 3\ \Delta\Theta \min/\Delta\Theta)$ %	$E_t = \pm (0.4 + 4/\Delta\Theta)$ %
ULTRAFLOW®	$E_f = \pm (2 + 0.02\ q_p/q)$, but not above $\pm$ 5 %	$E_f = \pm (1 + 0.01\ q_p/q)$ %

MULTICAL® 603
and ULTRAFLOW® q_p 1.5 m³/h @$\Delta\Theta$ 30K

Total typical accuracy of MULTICAL® 603, sensor pair and ULTRAFLOW® compared to EN 1434-1.

— Ec+Et+Ef (EN)   – – Ec+Et+Ef (Typ)
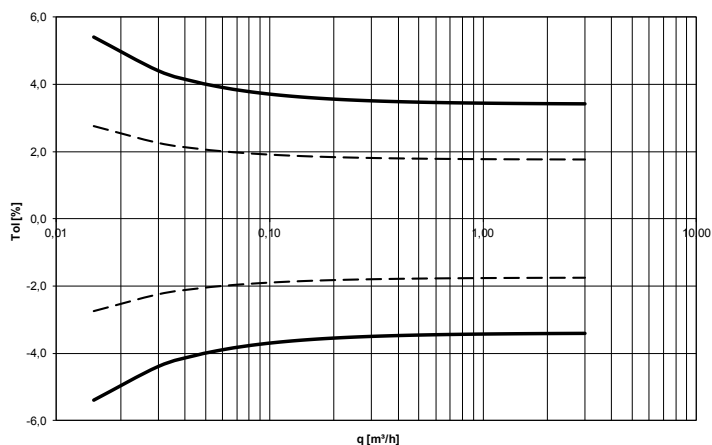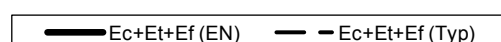
Approved meter data

Approvals	DK-0200-MI004-040, heat meter according to MID 2014/32/EU and EN 1434:2015
	TS 27.02 012, cooling meter according to DK-BEK 1178 and EN 1434:2015
EU directives	Measuring Instrument Directive, Low Voltage Directive, Electromagnetic Compatibility Directive, Radio Equipment Directive, RoHS directive
Heat meter approval	DK-0200-MI004-040
– Temperature range	θ: 2 °C...180 °C
– Differential area	$\Delta\Theta$: 3 K...178 K
Cooling meter and cooling/heat meter	TS 27.02 012
– Temperature range	θ: 2 °C...180 °C
– Differential area	$\Delta\Theta$: 3 K...178 K
Medium temperature, ULTRAFLOW®	θq: 2 °C...130 °C
Temperature sensor connection	Type 603-A Pt100 – EN 60751, 2-wire connection
	Type 603-B Pt100 – EN 60751, 4-wire connection
	Type 603-C/E/F Pt500 – EN 60751, 2-wire connection
	Type 603-D/G Pt500 – EN 60751, 4-wire connection
EN 1434 designation	Environmental class A and C
MID designation	Mechanical environment: Class M1 and M2
	Electromagnetic environment: Class E1 and E2
	Non-condensing environment, closed location (indoors), 5...55 °C

Electrical data

Calculator data

Typical accuracy	Calculator: $E_c \pm (0.15 + 2/\Delta\Theta)$ % Sensor pair: $E_t \pm (0.4 + 4/\Delta\Theta)$ %
Display	LCD – 7 or 8 digits, digit height 8.2 mm
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)	
– Logger contents	Programmable – all registers can be selected
– Logging interval	Programmable – from 1 minute to 1 year
– Logging depth	Programmable – standard: 20 years, 36 months, 460 days, 1400 hours (RR code = 10)
Info logger (EEPROM)	250 info codes (last 50 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
Time 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 as well as for modules
Power in temperature sensors	< 10 μW RMS
Power supply	3.6 VDC ± 0.1 VDC
Battery	

	3.65 VDC, D-cell lithium	3.65 VDC, 2xA cell lithium
Wall-mounted	16 years @ t_{BAT} < 30 °C	9 years @ t_{BAT} < 30 °C
Mounted on flow sensor	14 years @ t_{BAT} < 40 °C	7 years @ t_{BAT} < 40 °C

Note: Depends on the meter and module configuration

Mains supply	230 VAC +15/-30 %, 50/60 Hz 24 VAC ±50 %, 50/60 Hz
Insulation voltage	3.75 kV
Power consumption	< 1 W
Backup supply	Integrated supercap eliminates interruptions due to short-term power failures (only supply modules type 7 and 8)
EMC data	Complies with EN 1434:2015, class A and C (MID class E1 and E2)

Electrical data

Temperature measurement	t1 Inlet	t2 Outlet	t3 Inlet	t4 Outlet	ΔΘ (t1-t2) Heat measurement	ΔΘ (t2-t1) Cooling measurement	t5 Preset for A1 and A2
Measuring range 603-A, 2-wire, Pt100 603-B, 4-wire, Pt100 603-C/E/F, 2-wire, Pt500 603-D/G, 4-wire, Pt500	0.00...185.00 °C (t1 and t2: Approved for 2.00...180.00°C)						
Offset adjustment	± 0.99 K joint zero point adjustment for t1, t2 and t3						
	Note: The offset adjustment is only active on measured temperatures. If, for example, 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 contacts V1: 10-11 V2: 69-11	FET contacts 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 > 0,5 ms	< 0.4 V in > 300 ms	< 0.4 V in > 30 ms	< 4 V in > 3 ms
Pulse OFF	> 2.5 V in > 10 ms	> 2.5 V in > 100 ms	> 2.5 V in > 100 ms	> 12 V in > 10 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	Type HC-003-21	Type HC-003-11	Type HC-003-11
Pulse output type		Before 2017-05-01	After 2017-05-01
Type	Open collector (OB)	Open collector (OB)	Opto FET
External voltage	5...30 VDC	5...30 VDC	5...48 VDC/AC
Current	1...10 mA	1...10 mA	1...50 mA
Residual stress	$U_{CE} \approx 1$ V at 10 mA	$U_{CE} \approx 1$ V at 10 mA	$R_{ON} \leq 40\ \Omega$
Electrical isolation	2 kV	2 kV	2 kV
Max cable length	25 m	25 m	25 m

Product variants

The required product variant is selected via the meter's type number, whereas the meter configuration is selected via the meter's configuration number. Further configuration parameters can be selected at submission of order. The meter has been configured from the factory and is ready for use. It can, however, be changed/reconfigured after installation via the front keys of the meter, READy or METERTOOL HCW.

MULTICAL® 603 type number

					Statistical data Written on the meter's front				Dynamic data Appearing from display			
				Type 603-	□	□	□□ –	□	□□	□	□□	□□
Calculator type												
Pt100 2-wire	t1-t2	V1	M-Bus		A							
Pt100 4-wire	t1-t2	V1	M-Bus		B							
Pt500 2-wire	t1-t2	V1	M-Bus		C							
Pt500 4-wire	t1-t2	V1	M-Bus		D							
Pt500 2-wire	t1-t2-t3	V1-V2			E							
Pt500 2-wire	t1-t2-t3	V1-V2	Backlit display		F							
Pt500 4-wire	t1-t2	V1 (24 V active pulses)	M-Bus		G							
Meter type												
Heat meter	MID module B					1						
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						7						
Energy meter						9						
Country code												
Determined by Kamstrup upon receipt 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				

Product variants

MULTICAL® 603 type number								Dynamic data Appearing from display			
			Type 603- ☐	☐	☐☐	– ☐	☐☐	☐	☐☐	☐☐
Temperature sensor set											
No temperature sensors							00				
PT500 temparature sensor pair											
Short direct sensor pair	27.5 mm	1.5 m					11				
Short direct sensor pair	27.5 mm	3.0 m					12				
Short direct pair (3 pairs)	27.5 mm	1.5 m					15				
Short direct pair (3 pairs)	27.5 mm	3.0 m					16				
Short direct sensor pair	38.0 mm	1.5 m					21				
Short direct sensor pair	38.0 mm	3.0 m					22				
Pocket sensor pair	ø5.8 mm	1.5 m					31				
Pocket sensor pair	ø5.8 mm	3.0 m					32				
Pocket sensor pair	ø5.8 mm	5.0 m					33				
Pocket sensor pair	ø5.8 mm	10.0 m					34				
Pocket sensor pair (3 pairs)	ø5.8 mm	1.5 m					35				
Pocket sensor pair (3 pairs)	ø5.8 mm	3.0 m					36				
Pocket sensor pair (3 pairs)	ø5.8 mm	5.0 m					37				
Pocket sensor pair (3 pairs)	ø5.8 mm	10.0 m					38				
Pt100 temperature sensor pair											
Short direct sensor pair	27.5 mm	2.0 m					J1				
Short direct sensor pair	38.0 mm	2.0 m					J2				
Supply											
No supply								0			
Battery, 1 x D-cell								2			
230 VAC high-power SMPS								3			
24 VAC/VDC high-power SMPS								4			
230 VAC power supply								7			
24 VAC power supply								8			
Battery, 2 x A-cells								9			
Communication module (2 module slots)											
No module										00	00
Data + 2 pulse inputs (In-A, In-B)										10	10
Data + 2 pulse outputs (Out-C, Out-D) + pulse transmitter (V1+V2)										11	11
M-Bus, configurable + 2 pulse inputs (In-A, In-B)										20	20
M-Bus, configurable + 2 pulse outputs (Out-C, Out-D)										21	21
M-Bus, configurable with Thermal Disconnect										22	22
Wireless M-Bus, EU, configurable, 868 MHz + 2 pulse inputs (In-A, In-B)										30	30
Wireless M-Bus, EU, configurable, 868 MHz + 2 pulse outputs (Out-C, Out-D)										31	31
Analog output module 2x 0/4...20 mA										40	40
LON FT-X3 + 2 pulse inputs (In-A, In-B)										60	60
BACnet MS/TP (RS-485) + 2 pulse inputs (In-A, In-B)										66	66
Modbus RTU (RS-485) + 2 pulse inputs (In-A, In-B)										67	67

Meter configuration

The required product variant is selected via the meter's type number, whereas the meter configuration is selected via the meter's configuration number (shown below). The below overview shows the standard configurations. Contact Kamstrup A/S for information about further configuration posasibilities.

		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 (UF 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															
Adaptive mode (2-64 s)	Display on								1						
Normal mode (32 s)	Display on								2						
Fast mode (8 s)	Display on								3						
Mains mode (2 s)	Display on								4						
Adaptive mode (2-64 s)	Display off								5						
Normal mode (32 s)	Display off								6						
Fast mode (8 s)	Display off								7						
Mains mode (2 s)	Display & 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

		PP
Out-C: V1/1, 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

	RR
Standard data logger profile	10

Encryption level

	T
Common key	2
Individual key	3

Customer label

	VVVV
Serial number	0000

Information code types in display

Display digit								
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	
Info	t1	t2	t3	V1	V2	In-A	In-B	Description
1								No voltage supply *
2								Low battery level
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 Above measuring range or switched off
	2							t1 Below measuring range or short-circuited
		2						t2 Below measuring range or short-circuited
			2					t3 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 > q_s, for more than 1 hour)
					6			V2 Increased flow (flow2 > q_s, 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

Note: Info codes are configurable. Therefore, it is not certain that all the parameters are available in a given MULTICAL® 603.

* This parameter of the info code does not appear from the current info code as it is only active when the meter is without supply.

** The info code for leakage at pulse input B must be actively selected.

Accessories

Article number	Description
HC-993-02	Battery module with one D-cell
HC-993-03	230 VAC high-power supply module
HC-993-04	24 VAC/VDC high-power supply module
HC-993-07	230 VAC supply module
HC-993-08	24 VAC supply module
HC-993-09	Battery module with 2 A-cells
3026-207	Wall bracket
3026-858	Angle fitting ULTRAFLOW® (q_p 0.6...2.5)
3026-909	Holder for optical readout head for MULTICAL® 302/403/603
6699-035	USB module configuration cable
6699-099	Infrared optical reading head w/USB plug
6699-724	METERTOOL HCW
6699-725	LogView HCW

Calibration units

Article number	Description
6699-363	2-wire Pt500, Heat/Cooling (used with METERTOOL HCW)
6699-364	4-wire Pt500, Heat/Cooling (used with METERTOOL HCW)
6699-365	2/4-wire Pt100, Heat/Cooling (used with METERTOOL HCW)

Sensor nipples and pockets

Article number	Description
6556-491	R½ nipple for Pt500 short direct sensor
6556-492	R¾ nipple for Pt500 short direct sensor
6557-324	R½ x 65 mm sensor pocket, ø5.8 mm
6557-327	R½ x 90 mm sensor pocket, ø5.8 mm
6557-314	R½ x 140 mm sensor pocket, ø5.8 mm
6561-330	11 mm adapter for 38 mm short direct sensor

Ball valves

Article number	Description
6556-474	½" ball valve with M10 connection for short direct temperature sensor with flat gasket
6556-475	¾" ball valve with M10 connection for short direct temperature sensor with flat gasket
6556-476	1" ball valve with M10 connection for short direct temperature sensor with flat gasket
6556-526	1¼" ball valve with M10 connection for short direct temperature sensor with flat gasket
6556-527	1½" ball valve with M10 connection for short direct temperature sensor with flat gasket

Contact Kamstrup A/S for information about further accessories.