DANAK
PROD Reg. No. 7026

FORCE Certification

EU-Type Examination Certificate

Measuring Instrument Directive

Certificate number: DK-0200-MI004-040

Issued by FORCE Certification A/S, Denmark
EU-notified body number 0200

In accordance with The Danish Safety Technology Authority's statutory order no. 544 of May 28, 2018 which implements the Directive 2014/32/EU of the European Parliament and Council of February 26, 2014 on measuring instruments (MID).

Issued to: **Kamstrup A/S**
Industrivej 28
DK-8660 Skanderborg
Denmark

Type of instrument:	Thermal energy meter/heat meter
Type designation:	MULTICAL® 603
Valid until:	2027-04-18
Number of pages:	16, including appendix
Date of issue:	2022-05-17
Version No.:	14 This new version of DK-0200-MI004-040 is issued due to new WELMEC and EN 1434 editions, fast response meter, new module 81 and calibration unit added. Further to this some editorial changes. The previous certificate is withdrawn.

Approved by

Michael Møller Nielsen
Certification Manager

Processed by

Lars Poder
Examiner

FORCE Certification references:
TASK No.: 121-22174.02 and ID. No.: 0200-MID-06429-14

Appendix to

EU-Type Examination Certificate
Measuring Instrument Directive

Number: DK-0200-MI004-040
Issued by FORCE Certification A/S, Denmark
EU-notified body number 0200

Revision	Issued	Changes
DK-0200-MI004-040	2017-04-18	Original certificate
DK-0200-MI004-040 ver 1	2017-06-09	New software version added, new test points added to the verification section
DK-0200-MI004-040 ver 2	2017-08-10	New software versions added
DK-0200-MI004-040 ver 3	2017-08-31	New software version added
DK-0200-MI004-040 ver 4	2017-11-15	Three additional modules added, new software version added
DK-0200-MI004-040 ver 5	2018-01-04	Type 603-H variant added, various editorial changes added, new software version added
DK-0200-MI004-040 ver 6	2018-02-15	New software version added
DK-0200-MI004-040 ver 7	2018-03-15	New software version added, PQT controller added
DK-0200-MI004-040 ver 8	2018-04-20	New software version added
DK-0200-MI004-040 ver 9	2018-10-26	New modules added (module 51 + 85)
DK-0200-MI004-040 ver 10	2019-03-06	New modules added (module 80 + 82 + 83), editorial changes
DK-0200-MI004-040 ver 11	2019-05-06	New software version added, new modules added (module type 32 + 33), temperature difference cut-off added
DK-0200-MI004-040 ver 12	2019-08-21	Minor editorial changes
DK-0200-MI004-040 ver 13	2021-02-18	Editorial changes, new modules added (module type 53 + 56), changes regarding instrument types
DK-0200-MI004-040 ver 14	2022-05-17	New WELMEC 7.2:2021, EN 1434:2007/AC:2007 and FprEN 1434:2022 from 2022-04, fast response meter, new module 81 and calibration unit added. Editorial changes.

Applied standards and documents:

- EN 1434:2007/AC:2007
- EN 1434:2015+A1:2018
- FprEN 1434:2022 from 2022-04
- WELMEC 7.2:2021

The instruments/measuring systems shall correspond with the following specifications:

Type designation:
MULTICAL® 603

Description:
The meter consists of a calculator, which constitute a thermal energy meter together with type approved temperature sensor pairs and type approved flow sensors.
The calculator unit has a display indicating registered thermal energy, and additionally, via pushbuttons, other values are available.
MULTICAL® 603 is optionally available with built-in M-Bus and can furthermore be extended by two internal communication modules (see the section on type number combination).

Technical documentation:
Reference No.:

- 121-22174.02
- 121-22174.01
- 119-24151.03
- 119-24151.02
- 119-24151.01
- 118-20781.05
- 118-20781.04
- 118-20781.03
- 118-20781.02
- 118-20781.01
- 117-26187.05
- 117-26187.04
- 117-26187.03
- 117-26187.02
- 117-26187.01

Technical data

Instrument type according to	: EN 1434:2007/AC:2007 : EN 1434:2015+A1:2018 : FprEN1434:2022 from 2022-04
Instrument type	: Combined instrument or Hybrid instrument
Parts:	
- Calculator or	: DK-0200-MI004-040
- Calculator and temperature sensors or	: DK-0200-MI004-040, -036 or -046
- Calculator and flow sensor or	: DK-0200-MI004-040, -008, -033 or -044
- Calculator, temp. sensor and flow sensor	DK-0200-MI004-040, 036 or -046 and -008, -033 or -044
Energy indication	: GJ, kWh or MWh (kWh in calibration mode)
Display registers	: 7 or 8 digit (programmable)
Integration/update intervals for energy, volume and temperature	: Fixed 2 s, 8 s, 32 s or adaptive 2...64 s (programmable)
Temperature range θ_{min} ... θ_{max}	: 2°C...180°C (or narrower range)
Temperature diff. range $\Delta\Theta_{min}$ ... $\Delta\Theta_{max}$	: 3 K...178 K (or narrower range)
Temperature diff. cut-off	: 0.00...2.50 K configurable (default 0.00 K)
Flow sensor, range	: From qp 0.6 m³/h to qp 15,000 m³/h
Flow sensor, position	: Inlet or outlet pipe (programmable)
Environment class	: E1 and E2, M1 and M2
Climatic class	: 5...55°C, non-condensing, closed location : 5...55°C, condensing, closed location
Protection class	: IP 65
Durability, combined instrument	: Defined by the flow sensor
Fast response meter (config L=4)	: DS temp. sensor response time $\tau_{0.5} \leq 2.5$ s : Temperature sampling interval ≤ 2 s : Integration time ≤ 2 s
Mains supply	: 230 VAC, 48...62 Hz (Linear or SMPS) 24 VAC, 48...62 Hz (Linear) 24 VAC/VDC, 48...62 Hz (SMPS)
Battery	: 3.65 VDC, D-cell or 2xA-cell Lithium battery
Back-up battery	: 3.0 VDC, BR-cell Lithium battery

Temperature sensor cables (un-shielded)	:	Max. 100 m sensors cables for 4-wire connections Or max. 10 m cables for Pt100 2-wire connections Or max. 20 m cables for Pt500 2-wire connections (Minimum cross sectional area according to EN 1434-2, table 2)
Flow meter cables (un-shielded)	:	Max. 10 m for ULTRAFLOW® flow sensors Max. 10 m for flow sensors w/electronic pulse output Max. 10 m for mechanical flow sensors with Reed-switch Max. 30 m via the Cable extender box, 66-99-036 Max. 100 m for flow sensors with 24 V active pulses

Software identification

Software revision	Q1 (1701)	1 7 0 1
Kamstrup Internal Item No.	50981335	1 3 3 5
Software Identification		1 3 3 5 1 7 0 1

The Software identification and checksum can be shown on the display of the meter (display No. 10 and No. 11)

Software Identification	Date	CRC-16[1)] sum	Description
13350501 (E1)	2017-04-03	11625	N: Initial release for production
13350601 (F1)	2017-05-19	19261	N: Second release for production
13350701 (G1)	2017-06-12	60228	N: Third release for production
13350801 (H1)	2017-07-14	24919	N: Fourth release for production
13351001 (J1)	2017-08-29	46594	N: Fifth release for production
13351101 (K1)	2017-10-31	17556	N: Sixth release for production
13351201 (L1)	2017-12-15	49832	N: Seventh release for production
13351301 (M1)	2018-02-09	50538	N: Eighth release for production
13351302 (M2)	2018-03-15	7954	N: Ninth release for production
13351401 (N1)	2018-04-09	7972	N: Tenth release for production
13351601 (P1)	2019-04-12	2299	N: Eleventh release for production

Software Identification	Date	CRC-32[1)] sum	Description
13351701 (Q1)	2021-11-08	Cd6Acbb2	N: Twelfth release for production

[1)] The CRC-16 is displayed in decimal and the CRC-32 is displayed in hexadecimal values. The CRC-32 is shown in upper/lower case as the letters appears on the meters 7-segment display.
N: Non-legally Relevant Software change
L: Legally Relevant Software change

Only for member states where software download is allowed

Software download according to WELMEC 7.2

The meter is approved for software download, both direct (via cable) and remote (via wireless). The software download function is separated between legally relevant (the software in the meter) and legally non-relevant software (the software in the communication module). The software separation is implemented via hardware separation, whereby the level of separation exceeds Extension S. The meter is a Type P instrument and Risk Class C applies.

The legally relevant software download function can be disabled for use in member states where software download for instruments in use is not allowed. In this case download of legally relevant software cannot be done without breaking the verification seal.

Type number combination MULTICAL® 603

					Static part				Dynamic part
Type 603 -					□	- □	- □□	- □	- □□ - □ - □□ - □□
Calculator type									
Pt100 2-wire	t1-t2	V1	w/ int. wired M-Bus		A				
Pt100 4-wire	t1-t2	V1	w/ int. wired M-Bus		B				
Pt500 2-wire	t1-t2	V1	w/ int. wired M-Bus		C				
Pt500 4-wire	t1-t2	V1	w/ int. wired M-Bus		D				
Pt500 2-wire	t1-t2-t3	V1-V2			E				
Pt500 2-wire	t1-t2-t3	V1-V2	w/ backlighted display		F				
Pt500 4-wire	t1-t2	V1 (24 V active pulses)	w/ int. wired M-Bus		G				
Pt500 4-wire	t1-t2	V1-V2			H				
Meter type									
Heat meter		MID module B+D				2			
Heat/Cooling meter		MID module B+D & TS 27.02		θ_{HC} = OFF		3			
Heat/Cooling meter		MID module B+D & TS 27.02		θ_{HC} = ON		6			
Country code									
See country code specification.							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 sensors with fast and bounce-free electronic pulses								C	
Prepared for flow sensors with slow and bounce-free electronic pulses								J	
Prepared for flow sensors with slow pulses with bounce								L	
Prepared for flow sensors with 24 V active pulses								P	
Temperature sensor set									
Delivered without temperature sensor set									00
Pt500 temperature sensors									
Short direct sensor pair or 3 set		DS 27.5 mm		1.5 m	-	3.0 m			1x
Short direct sensor pair		DS 38.0 mm		1.5 m	-	3.0 m			2x
Pocket sensor pair or 3 set		PL ø5.8 mm		1.5 m	-	10 m			3x
Pt100 temperature sensors									
Short direct sensor pair		DS 27.5 mm or DS 38.0 mm		2.0 m					Jx

Type number combination MULTICAL® 603

Dynamic part

Type 603 - □ - □ - □□ - □ - □□ - □ - □□ - □□									
Supply									
Delivered without supply module							0		
Battery, 1 x D-cell							2		
Battery, 1 x D-cell battery IoT							5		
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-cell							9		
Communication modules (2 slots)									
No module								00	00
Data Pulse, inputs (In-A, In-B)								10	10
Data Pulse, outputs (Out-C, Out-D)								11	11
Wired M-Bus, inputs (In-A, In-B)								20	20
Wired M-Bus, outputs (Out-C, Out-D)								21	21
Wired M-Bus, Thermal Disconnect								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
LinkIQ/wM-Bus, Inputs, (In-A, In-B), EU								32	32
LinkIQ/wM-Bus, Outputs, (Out-C, Out-D), EU								33	33
Analog outputs 2 x 0/4...20 mA								40	40
Analog inputs 2 x 4...20 mA / 0...10 V								41	41
KNX communication								42	42
PQT controller								43	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
LoRaWAN (Elvaco), 868 MHz								53	53
NB-IoT, Inputs (In-A, In-B)								56	56
LON TP/FT-10, inputs (In-A, In-B)								60	60
BACnet MS/TP, inputs (In-A, In-B)								66	66
Modbus RTU, inputs (In-A, In-B)								67	67
2G/4G Network, inputs (In-A, In-B)								80	80
BACnet IP, Inputs (in-A, In-B)								81	81
Modbus/KMP TCP/IP, inputs (In-A, In-B)								82	82
READy Ethernet, inputs (In-A, In-B)								83	83
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

Verification

Errors:	[Maximum permissible errors according to Directive 2014/32/EU of the European Parliament and Council of February 26, 2014 on measurement instruments (MID), Annex VI, Thermal energy meters (MI-004)]
Procedure:	(Test points and verification requirements according to EN 1434-5)

Complete meter to: [3.] (6.7)
Calculator according to (6.4)
Calculator with temperature sensors according to (6.5)

Alternative test points

	Inlet	Outlet		Inlet	Outlet		Inlet	Outlet
	a) 44.3 °C	41 °C	or	a) 43 °C	40 °C	or	a) 43 °C	40 °C
	b) 80 °C	65 °C		b) 50 °C	40 °C		b) 50 °C	40 °C
	c) 160 °C	20 °C		c) 130 °C	40 °C		c) 160 °C	40 °C
	Inlet	Outlet		Inlet	Outlet		Inlet	Outlet
or	a) 53 °C	50 °C	or	a) 43 °C	40 °C	or	a) 43 °C	40 °C
	b) 70 °C	50 °C		b) 50 °C	40 °C		b) 110 °C	40 °C
	c) 130 °C	20 °C		c) 130 °C	40 °C		c) 160 °C	40 °C

Tolerances on simulated temperatures: ± 1 °C. Tolerances on temperature differences shall follow EN 1434-5

After verification, the meter can be reprogrammed with a view to:

- Installation of flow sensor in inlet or outlet pipe, according to the sign in the display
- Measuring unit of energy indication (kWh, MWh or GJ)
- Decimal point in energy* and volume* indication

*) *Register resolution requirements according to EN 1434 must be observed*

Auto Detect function

The calculator is available with an Auto Detect function, which automatically sets the pulse value, when connected to ULTRAFLOW® x4 flow sensors (e.g. DK-0200-MI004-008 and -033). The detected pulse value (e.g. in the range of 300 pulses/litre to 0.15 pulse/litre) as well as the flow sensors nominal size (e.g. in the range of qp 0.6 to 1000 m^3/h) is available in the meters display.

Temperature offset

The temperature reading can be offset adjusted from -0.99...0.99 K, commonly for the inlet and outlet, in order to compensate for the sensor cable influence on the absolute temperature.
During change of temperature sensor pairs, it is recommended to adjust the meters offset temperature according to the newly mounted sensor pair. Alternatively adjust the offset to 0.00 K whereby the function is disabled (OFF).
Example: If the temperature sensor pair has an error at +0.20 K at zero, then the meters offset should be -0.20 K in order to compensate.

Test mode

During test of the calculator, the internal high-resolution registers are useful to reduce the test duration.

Flow sensor size	High resolution	
qp ≤ 1.5	0.001 kWh	0.01 litre
1.5 < qp ≤ 15	0.01 kWh	0.1 litre
15 < qp ≤ 150	0.1 kWh	1 litre
150 < qp ≤ 1500	1 kWh	0.01 m^3
1500 < qp ≤ 15000	0.01 MWh	0.1 m^3

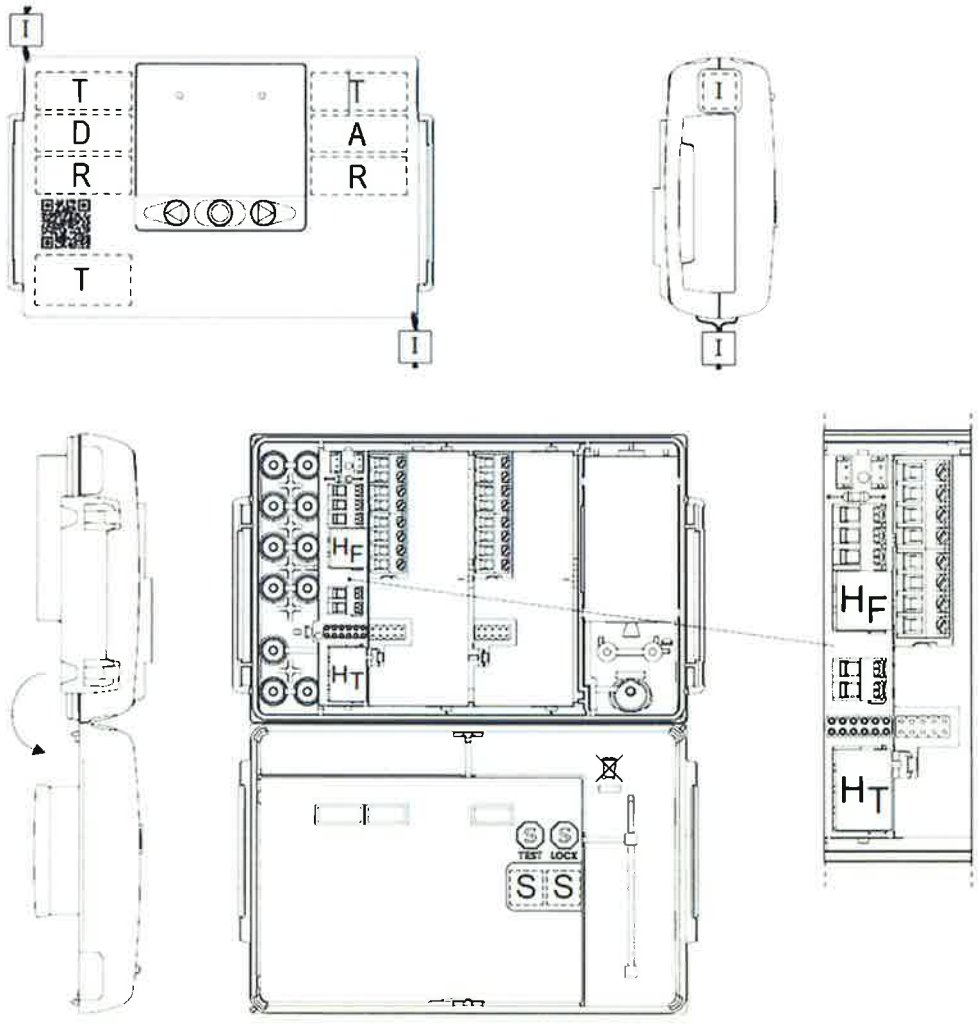
Configuration data logger

The meter includes several non-volatile data loggers, e.g. for configuration changes. The data logger read-out is done by means of an IEC 1107 optical head, placed above the display on the meter and connected to a standard PC or Tablet, using the PC-programme LogView, which is available from Kamstrup

Security measures

Sealing

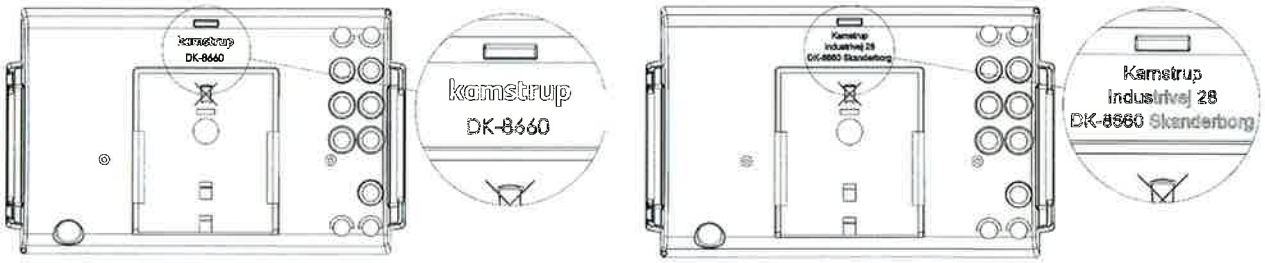
S	Security seals. Covering release for PCB box (label or integrated part of PCB box)
H_F	Additional seal for inseparable flow sensor
H_T	Additional seal for inseparable temperature sensors
D	Module D marking (engraving or separate label)
T	Type marking
I	Installation seals (sealing wire or void labels)
A	Alternative approval marking
R	Re-verification marking



Inscriptions

Marking for MULTICAL® 603

Manufacturer postal address (on the base/rear side)



Address marking through 2021

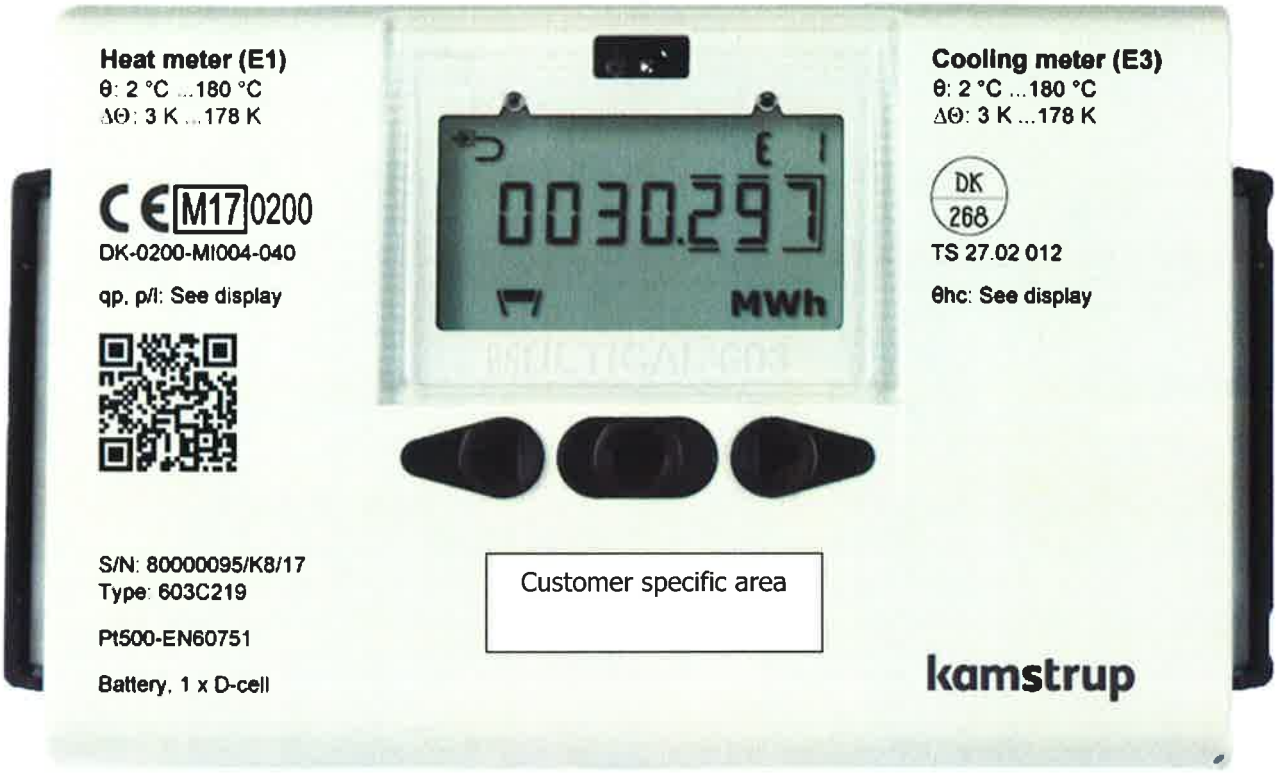
CE marking and the supplementary metrology marking
System designation (No. of the EU-type Examination Certificate)
Type, production year and serial number
Temperature limits (θ_{min} ... θ_{max})
Differential temperature limits ($\Delta\Theta_{min}$ ... $\Delta\Theta_{max}$)
Temperature sensor type (Pt500 or Pt100)

Below information is available in the installation manual:
Mechanical and electromagnetic environment classes
Climatic class
Condensing/closed location

Other information about the product
-Software identification in the display
-Unit of measurement in the display
-Mounting the flow sensor in inlet or outlet pipe in the display
-Meter factor (pulse value) and qp in the display

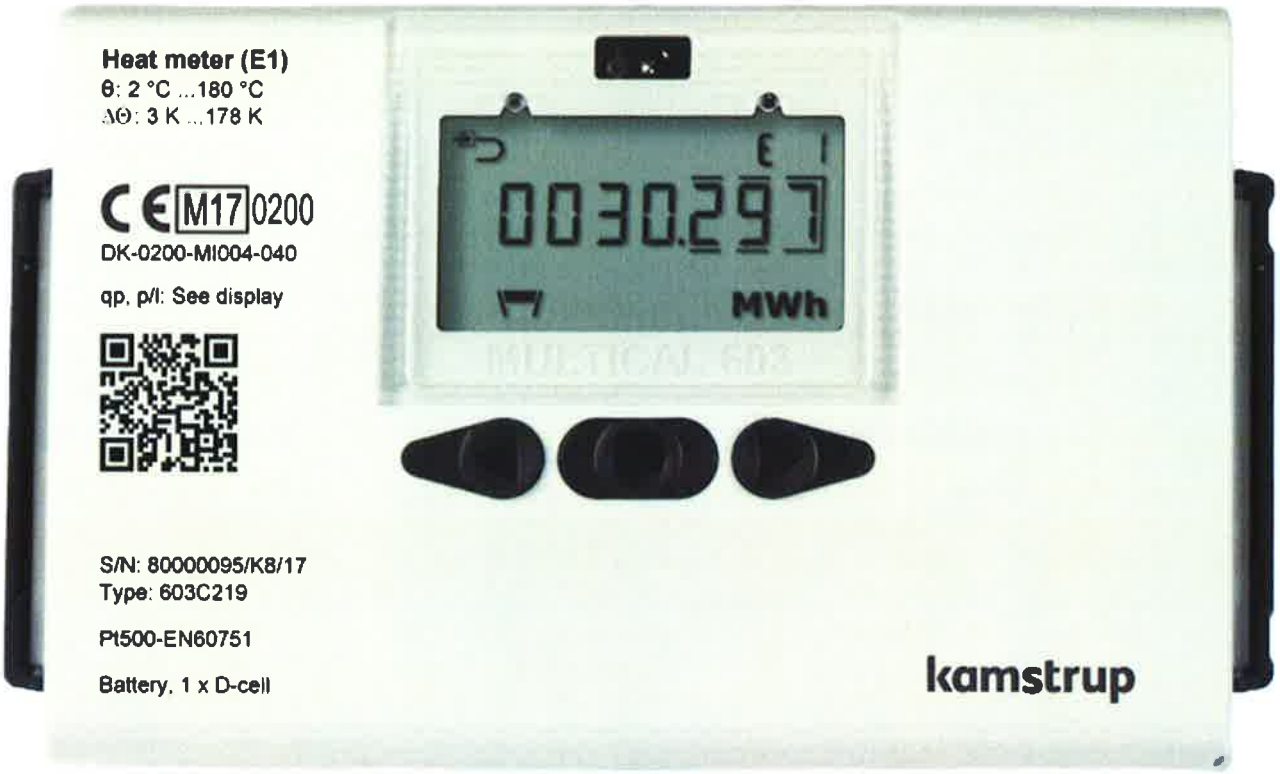
Example of type marking for MULTICAL® 603

Marking:



Symbols, as an alternative to textual inscriptions, are acceptable, if explained in the installation manual.

Photo of MULTICAL® 603



Informative Annex

Integrated functions not subject to the Measuring Instruments Directive:

Integrated bi-functional Heat/Cooling function

The MULTICAL® 603 is type tested as Heating, Cooling and as bi-functional Heating/Cooling energy meters according to EN 1434-4:2015+A1:2018 and FprEN 1434-4:2022 from 2022-04.

On this basis, the energy meter is national type approved for Cooling according to the Danish law[1], System designation TS 27.02 012.

The integrated bi-functional Heating/Cooling function can therefore be utilized under the operating conditions as described in this certificate.

The meter is type tested in the temperature differential range $\Delta\Theta_{min}$ - $\Delta\Theta_{max}$: 2 K...178 K and can be used as so.

Alternative energy units for use outside the EU

The calculator is also available with configuration as to register thermal energy in Gcal.

Re-verification

Re-verification of MULTICAL® 603 may be performed according to EN 1434-5 under the same conditions as stated in this certificate for verification of MULTICAL® 603, under consideration of national law.

Re-verification of the calculator as a heat meter or as a cooling meter is allowed, due to the extended type test.

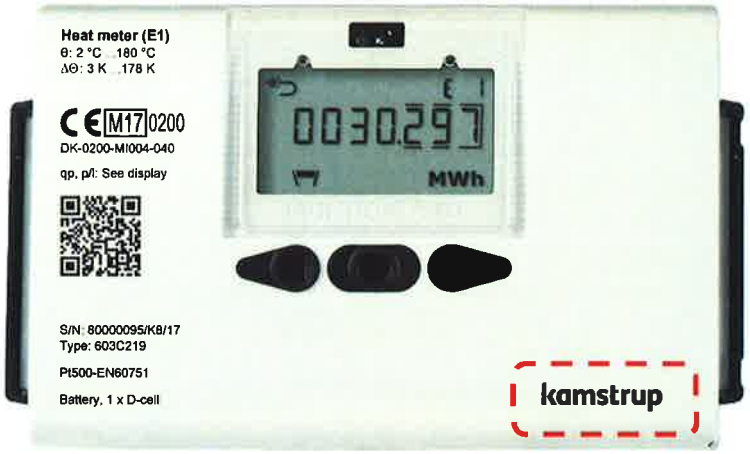
Calibration of intelligent flow sensors through the calculator

The calculator facilitates password-protected adjustment of intelligent flow sensors via serial data, whereby the subassemblies calculator and flow sensor commonly is calibrated and adjusted as a compact meter in the laboratory, if the calculator and flow sensor have the same serial number.

Calibration unit for MULTICAL® 603 as a calculator sub-assembly
Technical description, Document No.: 5512-3273
Type No.: 6699-363 (Pt500 2-Wire), Type No.: 6699-364 (Pt500 4-Wire) or
Type No.: 6699-365 (Pt100 2-Wire/4-Wire)
Temperature test points:
Heat: 44.3 °C – 41 °C = 3.3 K / 80 °C – 65 °C = 15 K / 160 °C – 20 °C = 140 K
Cooling: 15 °C – 18.3 °C = – 3.3 K / 6 °C – 20 °C = – 14 K

[1] BEK No. 1178 of 06/11/2014, Ordinance on metrological control of meters used for measuring consumption of cooling energy in district cooling systems and central cooling systems as amended by BEK. No. 549 of 01/06/2016.

Manufacturer or distributors logo



The manufacturer or distributors logo is located at the lower right part of the front, shown in the dotted red marking.
Beside Kamstrup as manufacturer logo, distributor logos from the following companies can be used:

- Schneider
- Berg