DANAK
PROD Reg. No. 7026

FORCE Certification

EU-Type Examination Certificate

Measuring Instrument Directive

Certificate number: DK-0200-MI004-045

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

In accordance with Annex II Module B of the Directive 2014/32/EU of the of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to the making available on the market of measuring instruments (MID).

Issued to:	**Kamstrup A/S** **Industrivej 28, Stilling** **DK-8660 Skanderborg**
Type of instrument:	Thermal energy meter
Type designation:	MULTICAL® 303
Valid until:	2030-12-17
Number of pages:	19, including appendix
Date of issue:	2026-02-25
Version:	7 This new version of DK-0200-MI004-045 is issued due to textual clarifications, updated references and editorial changes. The previous certificate is withdrawn.

Approved by

Michael Møller Nielsen
Certification Manager

Processed by

Lars Poder
Examiner

FORCE Certification references:
TASK no.: 126-23444.01 and ID no.: 0200-MID-10526-7

Appendix to

EU-Type Examination Certificate
Measuring Instrument Directive

Number: DK-0200-MI004-045
Issued by FORCE Certification A/S, Denmark
EU-notified body number 0200

Revision	Issue date	Changes
DK-0200-MI004-045	2020-12-17	Original certificate
DK-0200-MI004-045 ver 1	2021-01-20	New software version added, minor editorial changes
DK-0200-MI004-045 ver 2	2021-03-25	New software version added, minor editorial changes
DK-0200-MI004-045 ver 3	2021-06-17	New software version added and tolerances on alternative test points added
DK-0200-MI004-045 ver 4	2022-05-17	New WELMEC 7.2:2021, EN 1434:2007/AC:2007 and FprEN 1434:2022 from 2022-04, fast response meter and calibration unit added. Editorial changes
DK-0200-MI004-045 ver 5	2023-06-02	New software version and added support for readout of loggers via wired M-bus. Added OIML R75:2002 reference and minor editorial changes.
DK-0200-MI004-045 ver 6	2024-03-22	Minor editorial changes
DK-0200-MI004-045 ver 7	2026-02-25	Clarification of instrument types and sub-assemblies, simplification of sealing instructions, extension of medium temperature range, update of references and editorial changes.

Applied standards and documents:

- EN 1434:2022
- WELMEC 7.2:2025
- OIML R75:2002

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

Type designation:

MULTICAL® 303

Description:

The meter consists of a calculator and a flow sensor, which make out a thermal energy meter together with a separately type approved Pt500 temperature sensor pair with max 3 m unshielded 2-wire cable. The electrical connection between the calculator and the flow sensor is a max 1.5 m long cable. Cable connections of flow and temperature sensor in the calculator are protected by security sealing, i.e. the sub-assemblies cannot be exchanged in the field.
The calculator unit has a display indicating registered thermal energy, and additionally via a pushbutton also accumulated volume, operating hour counter, inlet and outlet temperatures etc. The calculator is available with either M-Bus or wireless M-Bus.
The volume measurement is made by means of bi directional ultrasonic technique according to the transit time method. Through two ultrasonic transducers, the sound signals are sent both with and against the flow direction. The flow sensor consists of a meter case made of brass, in which the ultrasonic elements are placed. The heat meter version has a rail for mounting the calculator directly on the flow part.

Technical documentation:

Reference No.:

- 126-23444.01
- 120-36040.07
- 120-36040.06
- 120-36040.05
- 120-36040.04
- 120-36040.03
- 120-36040.02
- 120-36040.01

Technical data

Legal measuring data according to		: EN 1434:2022 : OIML R 75:2002
Instrument type[1]		: Complete instrument or : Hybrid instrument
Parts[2]:		
Calculator and flowsensor or		: DK-0200-MI004-045
Calculator, flow sensor and temp. sensor		: DK-0200-MI004-045, and -036, -046 or other
Accuracy class (flow sensor)		: 2 and 3
Environment class		: E1, M1 and M2
Climatic class		: 5...55 °C, non-condensing, closed location and : 5...55 °C, condensing, closed location
Protection class		: Flow sensor IP68 : Calculator IP65
Energy indication		: kWh, MWh or GJ
Temperature range, calculator	θ_{min} ... θ_{max}	: 2...180 °C (or narrower range)
Temperature difference range	$\Delta\Theta_{min}$ ... $\Delta\Theta_{max}$	: 3...178 K (or narrower range)
Temperature difference cut-off		: 0.00...2.50 K configurable (default 0.00 K)
Temperature sensors		: 2 paired Pt500 sensors Max 3 m unshielded 2-wire cable
Flow sensor, position		: Inlet or outlet pipe
Straight inlet requirement		: 0D (No requirements for straight inlet)
Installation angle for flow sensor		: Horizontally, vertically or at an angle
Temperature of medium (flow sensor)	θ_q	: 2...130 °C (or narrower range)
Pressure stage (flow sensor)		: PN16/PN25, PS25
Nominal volume flow rate	q_p [m^3/h]	: 0.6 1.5 2.5
Pressure loss	Δp [bar]	: 0.03 0.09 0.09
Dynamic range, q_p 0.6	$q_p:q_i$	: 100:1 or 50:1
Dynamic range, q_p 1.5 -2.5	$q_p:q_i$	: 250:1 or 100:1 or 50:1
	$q_s:q_p$	: 2:1
Durability specification (flow sensor)		: Minimum 10 years (Long life flow sensor)
Durability specification (temperature sensor)		: Depending on temperature sensor; (Minimum 10 years for DK-0200-MI004-046)
Fast response meter (Config L=7)		: DS temp. sensor response time $\tau_{0.5} \leq 2.5$ s : Temperature sampling interval ≤ 4 s : Volume sampling interval ≤ 1 s : Integration time ≤ 4 s
Provision for direct temperature (DS) sensor in the flow sensor (M10x1 connection)		: G¾B - G1B; Threaded flow sensors
Power supply options		: 3.65 VDC, Lithium battery 1 x A-cell or 2 x A-cell

[1] The instrument type of MULTICAL® 303 results from the verification of the complete meter (complete instrument) or of the separate sub-assemblies or combinations thereof (hybrid instrument).
[2] This certificate applies for calculator and flow sensor of MULTICAL® 303. For temperature sensors consult the respective EU-Type Examination Certificate, e.g. DK-0200-MI004-036, -046 or other.

Software identification

Software revision	K1 (1101)	1 1 0 1
Kamstrup Internal Item No.	50981603	1 6 0 3
Software Identification		1 6 0 3 1 1 0 1

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

Software Identification	Date	CRC-16 sum[1)]	Description
16030501 (E1)	2020-06-26	54156	N: Initial release
16030601 (F1)	2020-12-22	40356	N: Second release

Software Identification	Date	CRC-32 sum[1)]	Description
16030701 (G1)	2021-03-05	F8602cd6	N: Third release. For production.
16030801 (H1)	2021-06-09	Cb7A19b0	N: Fourth release. For production.
16031001 (J1)	2021-12-20	dd35C2Cb	N: Fifth release. For production.
16031101 (K1)	2023-05-09	049b5429	N: Sixth 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

Type number combination MULTICAL® 303

			Static data 303-XXXXXX Printed on the meter				*Dynamic data* XXXXX Displayed		
Type 303-			□	□□	□	□□	□□	□	□□
Sensor connection									
Pt500 Heat meter			W						
Pt500 Heat/Cooling meter			T						
Pt500 Heat/Cooling meter			C						
Flow sensor q_p [m³/h]	Connection	Length [mm]							
0.6	G¾B (R½)	110		1X					
1.5	G¾B (R½)	110		4X					
1.5	G1B (R¾)	130		7X					
2.5	G1B (R¾)	130		AX					
Meter type									
Heat meter (MID module B, prepared for module F)					1				
Heat meter (MID module B+D)					2				
Heat meter with additional cooling register (MID module B+D) θ_{hc}=OFF					3				
Heat meter with additional cooling register (MID module B+D) θ_{hc}=ON					6				
Country code									
						XX			
Temperature sensor pair									
							XX		
Supply									
Battery, 1xA-cell								1	
Batteries, 2xA-cells								9	
Communication (Built-in)									
Wired M-Bus, configurable									20
Wireless M-Bus, configurable, 868-870 MHz									30

Verification

Errors:	[Maximum permissible errors according to Directive 2014/32/EU of the European Parliament and Council of February 26th, 2014 on measurement instruments (MID), Annex VI MI-004]
Procedure:	(Test points and verification requirements according to EN 1434-5[3])

Complete meter according to: [3.] (6.7)

Hybrid instrument according to: [7.1] (6.2), [7.2] (6.3), [7.3] (6.4), (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
or	Inlet	Outlet	or	Inlet	Outlet	or	Inlet	Outlet
	a) 53 °C	50 °C		a) 43 °C	40 °C		a) 43 °C	40 °C
	b) 70 °C	50 °C		b) 110 °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 EN1434-5.

During verification of the flow sensor a water temperature of 20 ± 5 °C can be used.

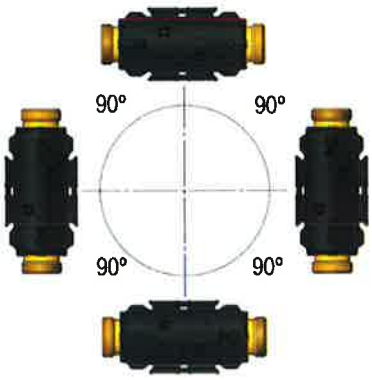
For dynamic ranges q_p:q_i 100:1 and 50:1, the dynamic range 100:1 can be used.
For dynamic ranges q_p:q_i 250:1 and 100:1 and 50:1, the dynamic range 250:1 can be used.

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 to 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.

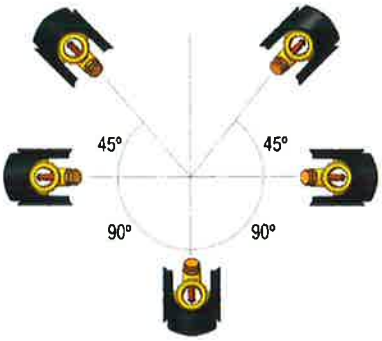
[3] References below are according to EN 1434-5:2022

Installation angle

The flow sensor can be installed horizontally, vertically or at an angle



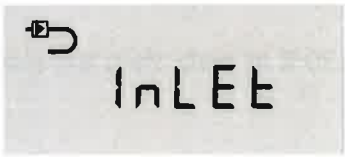
The flow sensor can be turned up to max. 45° and down to max. 90° in respect to the pipe axis.



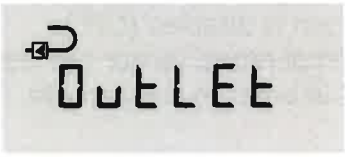
After verification, but before commissioning, the meter can be reprogrammed with a view to:

Placing of flow sensor in inlet pipe or outlet pipe, measuring unit of energy indication (kWh, MWh or GJ)* and decimal point in energy* and volume* indication*

Mounting the flow sensor in Inlet or in Outlet:



If the meter is set to be an inlet meter, the "Inlet arrow" is displayed.



If the meter is set to be an outlet meter, the "Outlet arrow" is displayed.

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

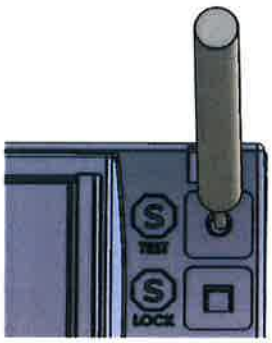
Test description

MULTICAL® 303 can be tested as a complete meter, or as a hybrid meter depending of the approval or the available test equipment.

Before separate test of all 3 sub-assemblies in a hybrid meter MULTICAL® 303, the temperature sensors must be removed from the calculator, but the flow sensor remains connected to the calculator. Subsequently, the calculator can be tested separately by means of precision resistors and the meter's built-in "Auto-integration". Flow sensor and temperature sensors are tested separately too.

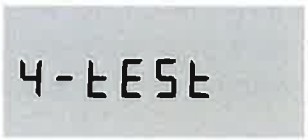
Depending on the available test equipment, different combinations of sub-assemblies can also be tested together. As an example, the calculator can be tested together with the connected temperature sensor pair while the flow sensor is in this case tested separately.

In order to obtain quick test/verification of MULTICAL® 303, the meter has a test mode which repeats the measuring sequence every four seconds, i.e. eight times faster than in normal mode. In test mode heat energy, cooling energy and volume are displayed with a resolution which is higher than normal in order to enable shorter test duration. The high-resolution test registers can be read from the display, via serial data reading, or via high-resolution pulses.



In order to access test mode the "TEST" seal Ⓢ on the back of the meter must be carefully broken with a screwdriver and the contact points behind the seal short-circuited with a short-circuit pen or a screwdriver.

Subsequently, test is displayed.



The meter remains in test mode until the front button is activated for 5 sec. However, a time-out secures that the meter returns from test mode to normal mode after 9 hours.

When tests are finished the seal must be re-established using a void label size 15 x 15 mm. The seal is important with a view to the meter's approval.

Test loop

Test loop includes six different main readings and three different sub-readings:

Test loop (Loop_4) Main		Test loop (Loop_4) Sub			Index number in display
1.0	High-resolution heat energy *)				4-001
		1.1	Heat energy (E1)		4-001-01
2.0	High-resolution cooling energy *)				4-002
		2.1	Cooling energy (E3)		4-002-01
3.0	High-resolution volume *)				4-003
		3.1	Volume		4-003-01
4.0	t1 (Inlet)				4-004
5.0	t2 (Outlet)				4-005
6.0	Flow				4-006

After 9 hours the meter reverts to energy reading in "User loop".

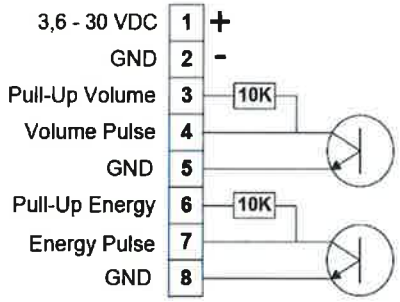
*) Register/resolution of the high-resolution registers are as follows:
"0000001 Wh" and "00000.01 l"

Test-loop can only be displayed if the verification seal is broken and the contact points behind the seal have been short-circuited.
The high-resolution registers can only be reset in connection with a total reset.

Test connection

During test optical reading head with USB plug (66-99-099) for serial reading of high-resolution energy and volume registers, or Pulse Interface (66-99-143) with optical reading head and connection unit for high-resolution pulse outputs can be used. In these cases the meter must be in Test mode.

Verification pulses



When Pulse Interface type 66-99-143 is connected to power supply or battery, the unit is placed on the meter, and the meter is in test mode, the following pulses are transmitted:

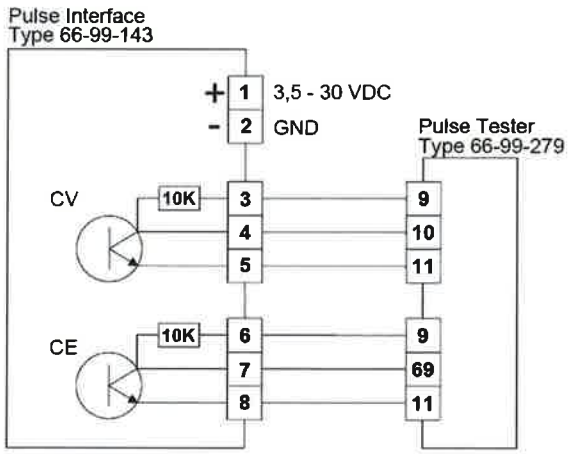
- High-resolution energy pulses (1 Wh/pulse) on terminals 7 and 8
- High-resolution volume pulses (10 ml/pulse) on terminals 4 and 5

Pulse Interface 66-99-143, technical data

Supply voltage	3.6 – 30 VDC
Current consumption	< 15 mA
Pulse outputs	< 30 VDC < 15 mA
Pulse duration	3.9 ms.
Energy pulse	1 Wh/pulse (1000 pulses/kWh)
Volume pulse	10 ml/pulse (100 pulses/litre)

Use of high-resolution pulses

High-resolution energy and volume pulses can be connected to the test stand used for calibration of the meter, or to Kamstrup Pulse Tester, type 66-99-279, as shown in the drawing below.



Auto-integration

The purpose of auto-integration is to test the calculator's accuracy. During auto-integration the water flow through the meter must be cut off to make it possible to read the volume and energy counted during auto-integration without the meter continuing normal counting in the registers afterwards.

At the beginning of an auto-integration the meter receives a serial data command with test volume and number of integrations over which the meter is to distribute the volume.

After auto-integration all volume and energy registers – incl. the high-resolution test registers – have been enumerated by the given volume and the calculated energies. Furthermore, the average of the temperatures measured during auto-integration has been saved in two registers, "t1 average inlet temperature" and "t2 average outlet temperature".

For calculation of accuracy the below-mentioned registers can be read after auto-integration:

Verification registers	
Heat energy	E1HighRes
Cooling energy	E3HighRes
Volume	V1HighRes
t1 average inlet temperature	t1average_AutoInt
t2 average outlet temperature	t2average_AutoInt

Handling different test methods

Standing start/stop
Standing start/stop is a method, where the flow sensor's accuracy is part of the test. During the test the meter is mounted in a flow test stand. The flow through the flow sensor is cut off. Subsequently, water flow is added for a certain period, during which the water passing through the flow sensor is collected. Having switched off the flow, the volume of the collected water in reference equipment is compared to the volume counted by the meter. In general, standing start/stop requires bigger test volume than flying start/stop. It is recommended to set MULTICAL® 303 in test mode.

Standing start/stop via display reading
Condition: MULTICAL® 303 should be in test mode (see "Test mode").
The high-resolution display readings are in that case updated at 4-second intervals.

Standing start/stop using pulse outputs
Condition: MULTICAL® 303 must be in test mode (see "Test mode").
Verification pulses are connected as described in "Verification pulses" above.

Flying start/stop
Condition: MULTICAL® 303 must be in test mode (see "Test mode").
Verification pulses are connected as described in "Verification pulses" above.

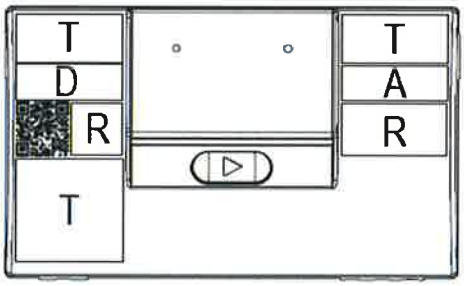
"Flying start/stop" is the most frequently used method for testing the accuracy of flow sensors. During the test the meter must be mounted in a flow test stand and there is constant water flow through the sensor.

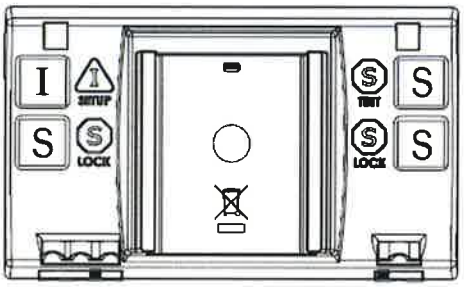
Verification pulses, as described in "Verification pulses", can be directly used for the test stand if it is designed to control the start/stop synchronisation. Alternatively, Pulse Tester, type 66-99-279, can be used as external start/stop pulse counter.
As the meter calculates volume and energy every four seconds in test mode (see "Test mode"), the verification pulses will also be updated every four seconds as described in "Verification pulses". It is important to allow for this time interval, which means that the test duration from start to stop must be so long that the update time does not influence the measuring uncertainty to any very considerable extent.

Security measures

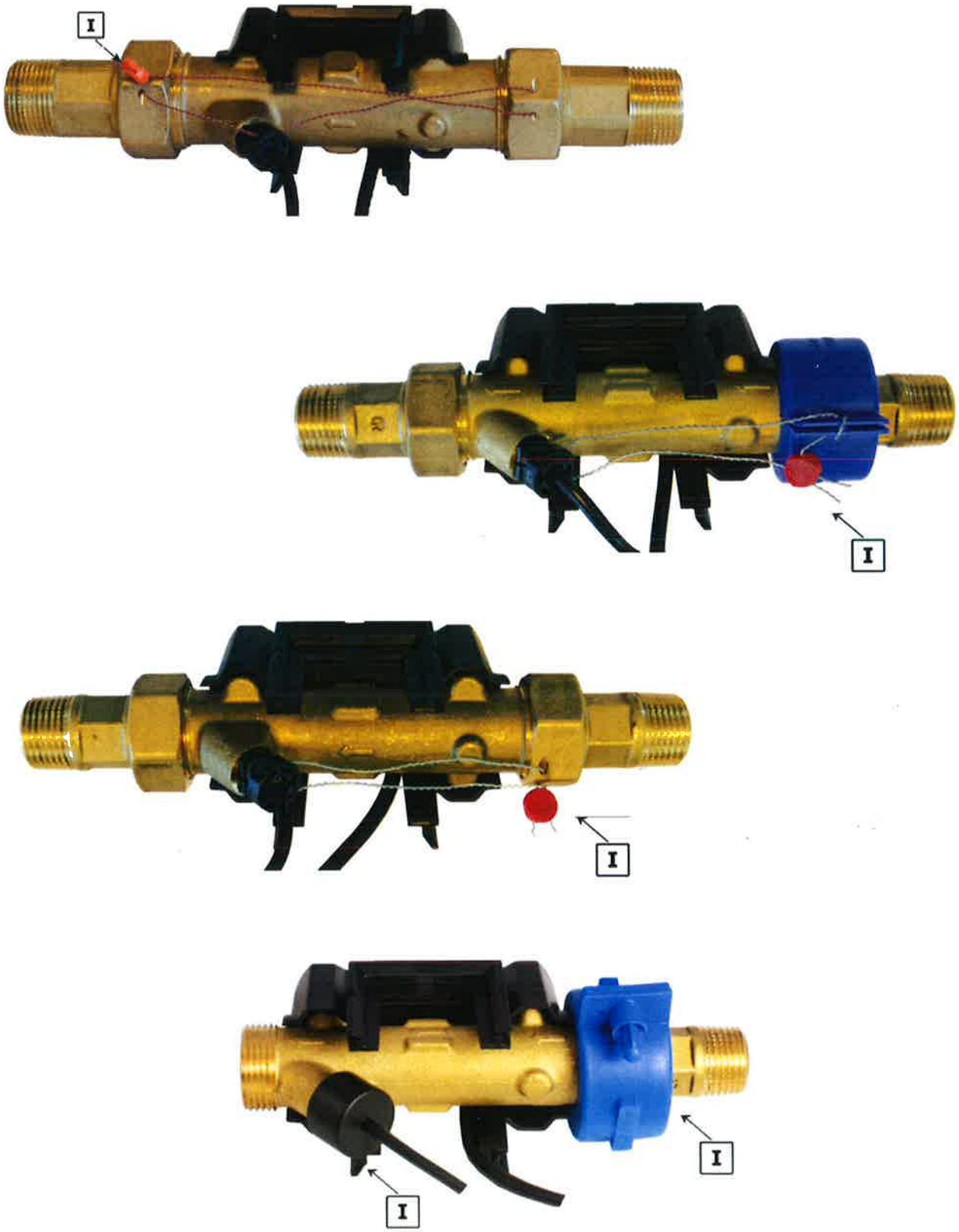
Sealing

S	Security seals. Covering release for PCB box (label or integrated part of PCB box)
D	Module D marking (engraving or separate label)
T	Type marking
I	Installation seals (sealing wire or void labels), if required
A	Alternative approval marking
R	Re-verification marking, if required – suggested position





I	Installation seals (Sealing wire or sealing cap)	Examples



Labelling and inscriptions

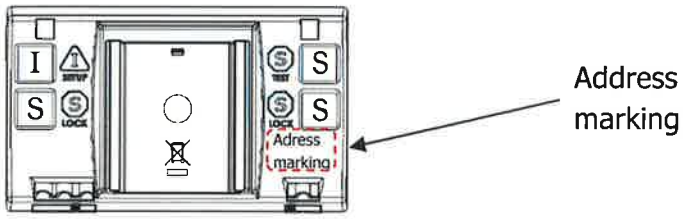
Calculator

Marking of the calculator applies for calculator and flow sensor.

Temperature sensors can be marked separately according to the requirements of their EU-type Examination Certificate. If temperature sensors are not marked separately, marking of the calculator applies also for the temperature sensor pair.

Base part/rear side of calculator

Manufacturer's postal address (applies for calculator and flow sensor or calculator, flow sensor and temperature sensor pair)



Front of calculator
(applies for calculator and flow sensor; applies for temperature sensor, if not separately marked)

CE marking and the supplementary metrology marking
System designation (No. of the EU-type Examination Certificate)[4]
Type, production year and serial number
Mechanical and electromagnetic environment classes
Environmental class
Temperature limits (θ_{min} ... θ_{max})
Differential temperature limits ($\Delta\Theta_{min}$ ... $\Delta\Theta_{max}$)

Temperature sensor type (Pt500)
Identification of inlet and outlet temperature sensor, if not indicated on the temperature sensor

(applies for flow sensor)

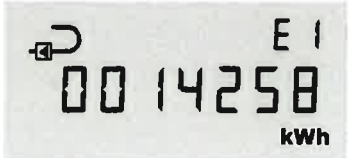
Temperature of medium θ_q
Flow limits q_i, q_p, q_s
Accuracy class

(applies for flow sensor; applies for temperature sensor, if not separately marked)

Nominal pressure (PN)
Maximum admissible pressure (PS)

Place of the flow sensor installation: Inlet or outlet (see display)

If the meter is set to be an inlet meter, the "Inlet arrow" is displayed.



If the meter is set to be an outlet meter, the "Outlet arrow" is displayed.

[4] Does not apply for temperature sensor pair.

Additional info in the display:
- Unit of measurement
- Software version

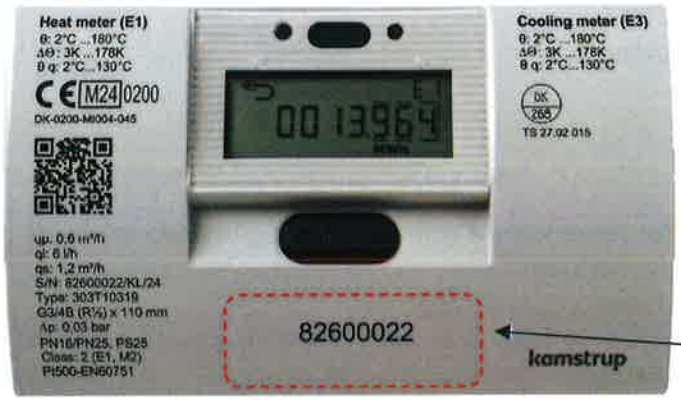
Flow sensor

Arrow for flow direction

Temperature sensors

Identification of inlet and outlet temperature sensor, if not indicated on the calculator front

Example of inscriptions for MULTICAL® 303

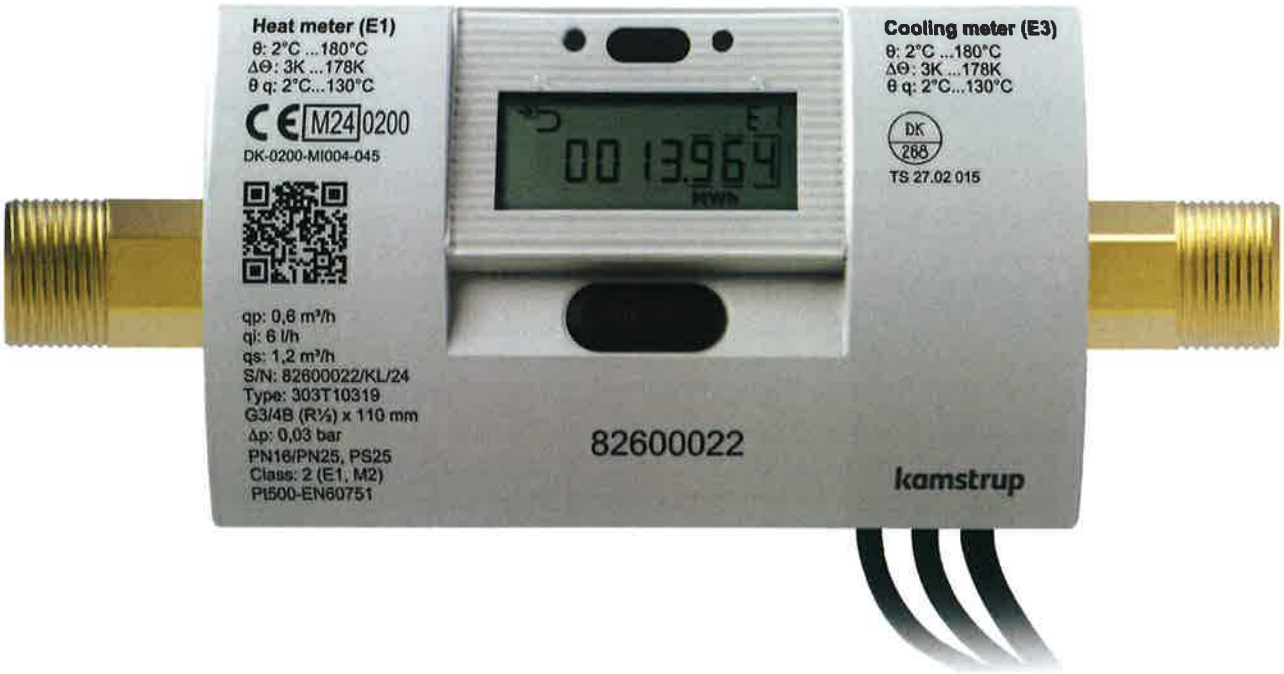


MULTICAL® 303 shown as an example with both the MID mark (to the left) and additional approval mark (to the right) outside the scope of the Measuring Instrument Directive

Customer specific area

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

Photo of MULTICAL® 303



Informative Annex

Integrated functions not subject to the Measuring Instruments Directive:

Integrated bi-functional Heat/Cooling function

The MULTICAL® 303 is type tested as Heating, Cooling and as bi-functional Heating/Cooling energy meters according to EN 1434-4:2022.

On this basis the energy meter is approved according to national type approval for Cooling according to the Danish law[5], System designation TS 27.02 015.

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.

Re-verification

Re-verification of MULTICAL® 303 may be performed according to EN 1434-5 under the same conditions as stated in this certificate for verification of MULTICAL® 303, 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.

During re-verification of the flow sensor a water temperature of 20 ± 5 °C can be used.

Calibration unit for MULTICAL® 303 as a calculator sub-assembly

Technical description, Document No.: FILE100001757_EN (55123271_EN)

Type No.: 6699-303 (Pt500 2-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

[5] 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, distributor or customer logo

There may be a manufacturer, distributor or customer logo located at the lower right part of the front, shown in the dotted red marking.