FORCE-Dantest CERT

EC-type examination certificate

Examination certificate number: DK-0200-MI004-001

Issued by FORCE-Dantest CERT, Denmark, EU Notified Body no. 0200

In accordance with The Danish Safety Technology Authority 's statutory order no. 436 of 16 May 2006 which implements the Directive 2004/22/EC of the European Parliament and Council of March 31, 2004 on measuring instruments (MID)

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

Type of instrument: Heat meter, Calculator and flow sensor

Type designation: MULTICAL® 401 (type 66-W and 66-V)

Valid until: December 11, 2016

One appendix forms part of this certificate and consist of 6 pages

Date of issue: December 11, 2006

Reference file No.: 80.970.6-005A/06

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Appendix to

EC-type examination certificate

Examination certificate number: DK-0200-MI004-001

Applied standards and documents:
prEN1434: 2006, except test 6.14 which is replaced by OIML D11:2004, test 12.1.2

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

Type designation
MULTICAL® 401 (type 66-W and 66-V)

Description

The meter consists of a calculator and a flow sensor, which constitute a heat meter together with a type approved Pt 500 or Pt100 temperature sensor pair.
The electrical connection between the calculator and the flow sensor is a 140 cm long cable, and the units can either be physically assembled or mounted separately.
The calculator unit has a display indicating registered thermal energy, and additionally via a pushbutton also accumulated volume, operating hour counter, forward and return temperatures etc. If the pushbutton is left untouched for 150 seconds, the display automatically reverts to the indication of registered thermal energy. System errors, if any, will appear from the display.

The calculator is equipped with an optical data communication interface according to IEC 870, which makes it possible to read measuring values through a window in the cover plate. It can also be used for entering legal data, however this requires a physical short-circuit in the test plug which is covered by a security seal. The calculator can be retrofitted with various approved plug-in modules, e.g. pulse, modem and radio modules. The modules are mounted under the cover plate of the calculator without subsequent reverification.
The volume measurement is made by means of bi directional ultrasonic technique according to the transit time method. Through two ultrasonic transducers sound signals are sent both with and against the flow direction. The flow sensor consists of a meter case made of brass or cast iron, in which the ultrasonic heads are placed. On top of the meter case a two-parted plastic cabinet with a rail for possible mounting of the calculator is mounted.

Technical documentation
FORCE-Dantest CERT File no. 80.970.6-005A/06

Technical data

Instrument type according to:prEN1434:2006

Instrument type:

Complete instrument with
possibility of build in temperature sensor (M10x1 connection).This possibility applies for
G3/4 and G1 flow sensors (threaded) only.
Temperature sensors: 2 paired, type approved, Pt500 or Pt100 sensors, depending on type. (max. cable length: Pt500, 10 m and Pt100, 5 m.) DK-0200-MI004-002

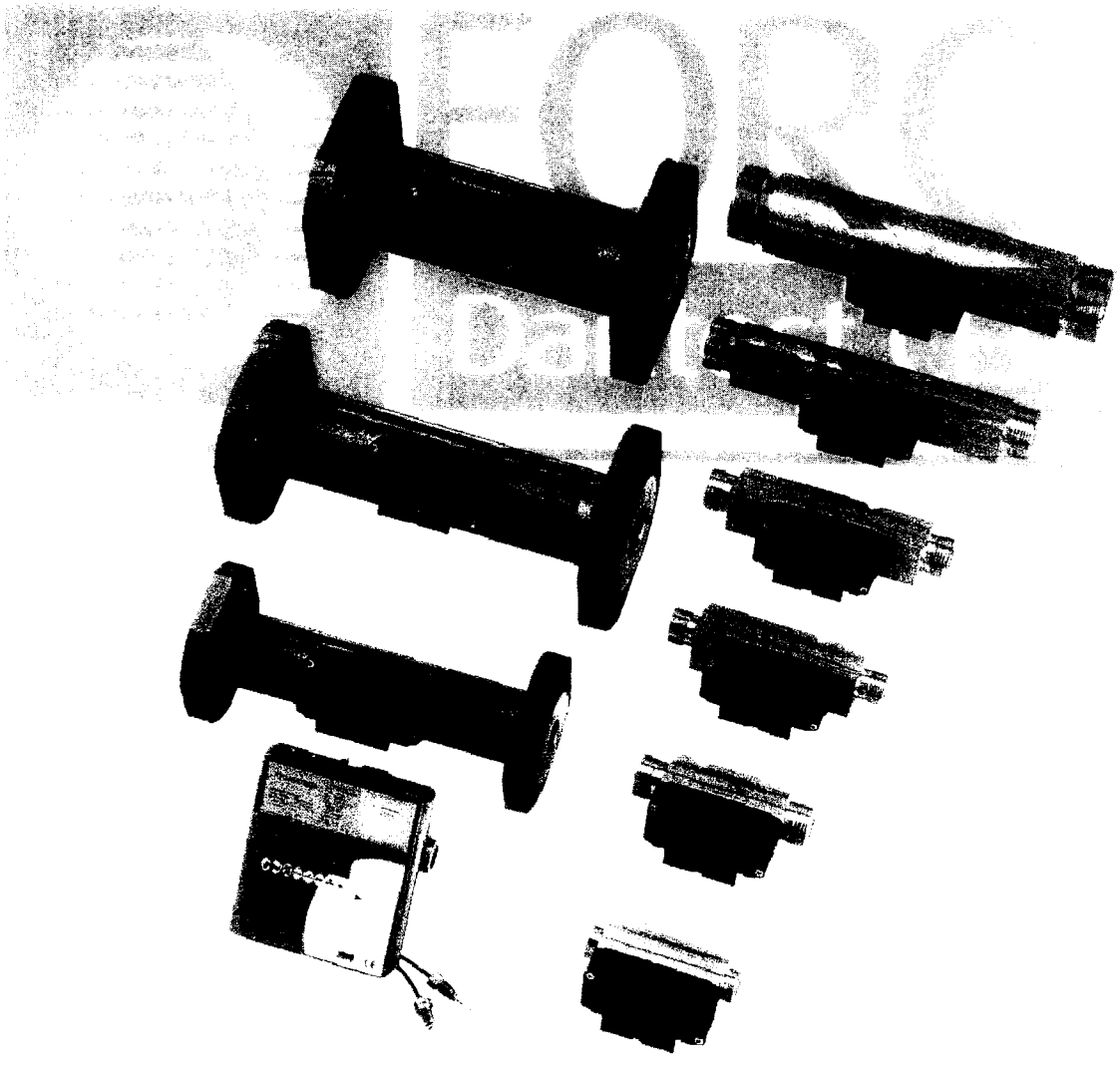
Combined instrument
Parts: Calculator and flow sensor with separate exchangeable type approved temperature sensor pair

Energy indication:	kWh, MWh or GJ	
Temperature range, Calculator:	θ_{min} - θ_{max}:	10...160°C
Temperature diff. range	$\Delta\Theta_{min}$ - $\Delta\Theta_{max}$:	3...150K
Temperature of medium, flow sensor:	15...130°C	
Flow sensor, position	Mounted in either flow or return	
Pressure	PN16 and PN25	

Nominal volume flow rate (q_p) [m³/h] :	0.6	1.5	3	3.5	6	10	15
Pressure loss [bar] :	0.04	0.25	0.05	0.07	0.19	0.06	0.14

Dynamic range q_i:q_p:	1:100 and 1:50
q_s:q_p :	2:1
Accuracy class:	**2 and 3**
Environment class:	E1, M1

Climatic class:	5…55°C, non-condensing, closed location.
Durability specification:	Normal flow sensor, typical 5 years and longer (long life flow sensor)
Installation angle:	Horizontally, vertically or at an angle
Power supply:	230 VAC 24 VAC 3.65 VDC, Lithium battery, D-cell
Software version:	SE 3.01



Verification

Errors: Maximum permissible errors according to Directive 2004/22/EC of the European Parliament and Council of March 31, 2004 on measuring instruments (MID), Annex MI-004

Procedure:
Test points and verification requirements according to prEN1434-5:2006

Calculator and flow sensor can be verified in one of the following three ways:

a) Energy direct via the display. However, this method requires long measuring periods due to the resolution of the display.

b) Energy in testing mode, where both flow volume and accumulated energare read with higher resolutions: energy (E') 10 [mWh] and volume quantity (Q') 1 [ml]. The heat energy bottom part is set in testing mode using one of the following methods: 1) Pressing the button in the bottom left side (to the left of the test and module connection plug) for 5 seconds until a "P" is shown in the left side of the display, or 2) via the test plug of the calculator.

c) Separate verification of the calculator and the flow sensor in testing mode, where both flow volume and accumulated energy are read with higher resolutions: energy (E') 10 [mWh] and volume quantity (Q') 1 [ml]. The heat energy bottom part is set in testing mode using one of the following methods: 1) Pressing the button in the bottom left side (to the left of the test and module connection plug) for 5 seconds until a "P" is shown in the left side of the display, or 2) via the test plug of the calculation unit. During the subsequent verification of the integrator the button marked "P" and the display shift button are pressed for approx. 0.5 seconds, upon which measuring starts, stopping again when the integrator has simulated water flow corresponding to 100 litres and made 10 energy calculations. This verification method is called "autointegration". The energy indication of the calculator is verified in the below-mentioned points,

	Forward	Return			Forward	Return
1)	43°C	40°C		1)	53°C	50°C
2)	80°C	60°C	or	2)	70°C	50°C
3)	160°C	20°C		3)	130°C	20°C

In connection with verification according to b) and c) Kamstrup's test interface no. 66-99-109, serial communication via the test plug, and controlled start/stop can be used.

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

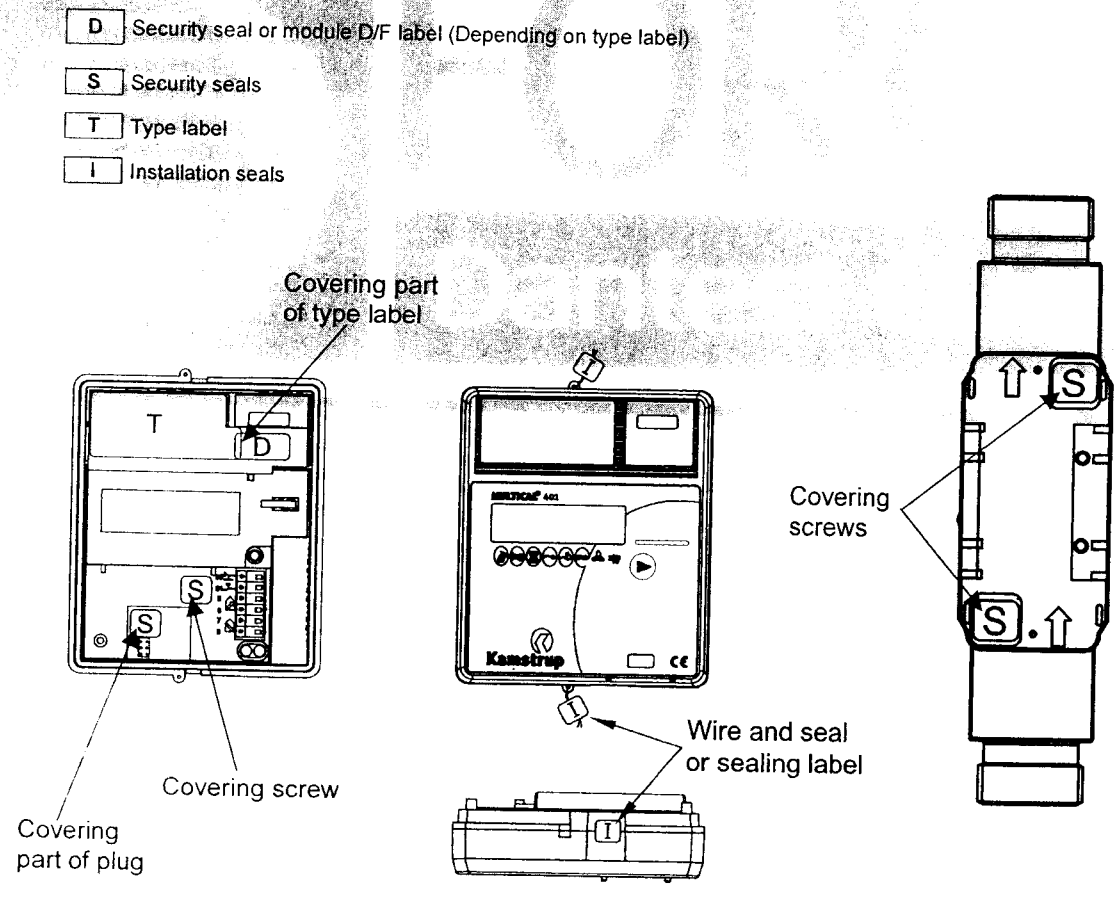
Placing of flow sensor in forward or return pipe
Measuring unit of energy indication (kWh, MWh or GJ)*
Decimal point in energy* and volume indication*

***) Register resolution requirements according to prEN 1434-1:2006, point 6.3.7 must be observed**

Security measures

Sealing

MULTICAL® 401
Seals and markings



Labeling and inscriptions

Type label placed on the front plate of the calculator with the following imprint:

Examination certificate number
Manufacturer designation or logo
Type, production year and serial number
Accuracy class
Mechanical and electromagnetic environment classes;
Software version
Flow limits q_i, q_p, q_s
Temperature limits (Θ_{min} - Θ_{max})
Differential temperature limits ($\Delta\Theta_{min}$ - $\Delta\Theta_{max}$)
Temperature sensor type (Pt500 or Pt100)
Mounting in forward or return pipe
Maximum working pressure (PN 16 or 25)

Modules

The meter can be supplied and used with the following modules.
XXX is a configuration and marking code.

Communication modules:

66-0P-000-XXX	M-Bus/pulse inputs
66-0Q-000-XXX	Data/Pulse output
66-0R-000-XXX	Data/Pulse inputs
66-0S-000-XXX	M-Bus/Pulse inputs
66-0T-000-XXX	Modem
66-0U-000-XXX	Radio/Pulse inputs
66-0W-000-XXX	Radio with external antenna /Pulse inputs

Supply modules:

66-00-200-XXX	Battery, D-cell
66-00-700-XXX	230 V AC supply module
66-00-800-XXX	24 V AC supply module