

Data sheet

MULTICAL® 303

All-round heat and cooling meter, easy to install and easy to use

- Fully programmable data logger with minute logger
- Configurable M-Bus and Wireless M-Bus with logger reading
- On-site configurable between inlet and outlet
- Dynamic range of up to 1500:1 from start to saturation flow
- Low pressure loss – all flow sizes below 0.1 bar
- PN16/PN25 metal flow sensor – approved for up to 130 °C
- Battery lifetime of up to 16 years
- 7- or 8-digit display resolution



MID 2014/32/EU

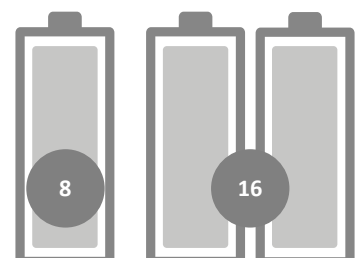


EN 1434

DK-BEK 1178 – 06/11/2014



EN 1434



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Description

Application

MULTICAL® 303 is the compact all-round heat and cooling meter that can be installed everywhere due to its minimum dimensions. The meter can be turned during installation, even in the most compact systems, enabling you to always obtain optimal reading of the display.

The robust metal flow sensor tolerates continuous temperatures of up to 130 °C, is effectively protected against condensation and can be used in both PN16 and PN25 installations.

The flow sensor is constructed with Kamstrup's unique ultrasonic technique that ensures an extremely long lifetime – also in magnetite-containing heating systems.

Functionality

MULTICAL® 303 consists of a flow sensor based on ultrasound, an electronic display unit and a Pt500 sensor set. These components are separately calibrated and then assembled to one heat, cooling or combined heat/cooling meter. If the components are separated, a reverification of the meter is required.

The meter has built-in, programmable data logger that stores all relevant registers. Standard data logger registers are stored for 20 years, 36 months, 460 days and 1400 hours.

During installation, the meter can be configured for installation of the flow sensor in either inlet or outlet pipe. Furthermore, the energy unit and resolution as well as date/time and M-Bus address can be adjusted merely by pressing a button – no special tools needed.

M-Bus or Wireless M-Bus

MULTICAL® 303 can be delivered with factory-mounted cable for M-Bus or with Wireless M-Bus in mode C1 or T1 according to EN 13757.

The M-Bus communication is galvanically separated and has auto-select 300/2400 baud, primary/secondary addressing and collision detection. The current consumption is 1 unit load, and separate registers for heat and cooling energy are read.

The Wireless M-Bus data communication follows the European standard EN 13757, and the data telegram is configurable for either mode C1, T1/C1 BSI or T1/C1 OMS. The data communication is 128 bit AES-encrypted.

Mechanical data

| | |
|-----------------------------|---|
| Ambient temperature | 5...55 °C. Non-condensing, closed location (indoor installation) |
| Protection class | |
| - Calculator | IP65 |
| - Flow sensor | IP68 |
| Media temperatures | |
| - Heat meters 303-W | 2...130 °C |
| - Cooling meters 303-C | 2...50 °C |
| - Heat/cooling meters 303-T | 2...130 °C |
| Medium in flow sensor | Water (district heating water as described in AGFW FW510) |
| Storage temperature | -25...60 °C (drained flow sensor) |
| Pressure stage | PN16/PN25, PS25 |
| Weight | From 0.7 to 0.8 kg depending on the flow sensor size |
| Flow sensor cable | 1.5 m (the cable is non-detachable) |
| Temperature sensor cables | 1.5 m or 3 m (the cables are detachable, reverification required) |

At media temperatures below the ambient temperature or above 90 °C, wall-mounting of the calculator is recommended.

Materials

| | |
|----------------------|--|
| Wetted parts | |
| - Flow sensor casing | Hot forged, dezincification-resistant brass (CW 602N) |
| - Transducer | Stainless steel, w.nr. 1.4404 |
| - O-rings | EPDM |
| - Measuring tube | Thermoplastic, PES 30 % GF |
| - Reflectors | Thermoplastic, PES 30 % GF and stainless steel, w.nr. 1.4306 |
| Flow sensor cover | Thermoplastic, PC 20 % GF |
| Wall bracket | Thermoplastic, PC 20 % GF |
| Calculator casing | |
| - Top | Thermoplastic, PC 10 % GF with TPE (thermoplastic elastomer) |
| - Base | Thermoplastic, PC/ABS |
| Cables | |
| - Flow sensor | Silicone cable with inner Teflon insulation |
| - Temperature | Silicone cable with inner Teflon insulation |
| - M-Bus | PVC cable |

Approved meter data

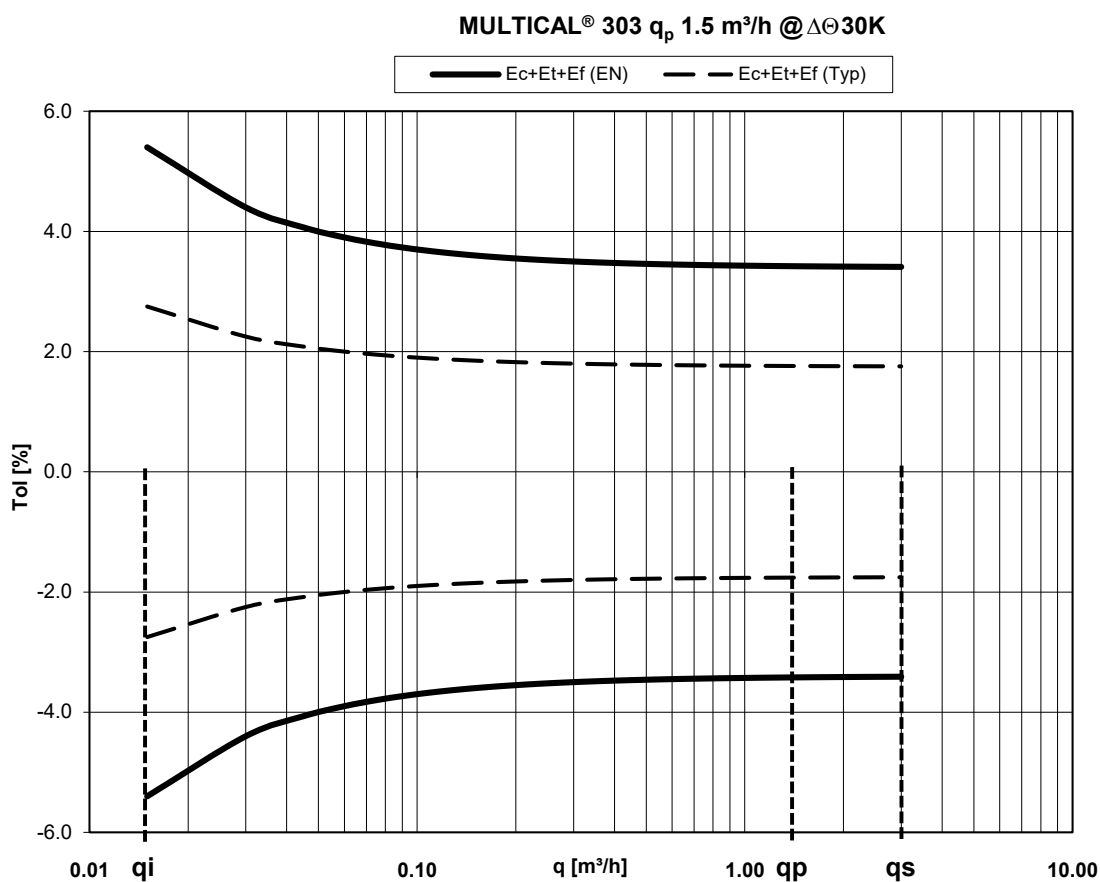
| | | |
|-----------------------------------|---|--|
| Approvals | | |
| - Heat meter | DK-0200-MI004-045 | The stated minimum temperatures only relate to the type approval. The meter has no cut-off for low temperature and thus measures down to 0.01 °C and 0.01 K. |
| - Temperature range | θ : 2 °C...180 °C | |
| - Differential range | $\Delta\theta$: 3 K...178 K | |
| - Cooling meter | TS 27.02 015 | |
| - Temperature range | θ : 2 °C...180 °C | |
| - Differential range | $\Delta\theta$: 3 K...178 K | |
| - Bifunctional heat/cooling meter | Marked with DK-0200-MI004-045 and TS 27.02 015 as well as MID year mark | |
| - Temperature range | θ : 2 °C...180 °C | |
| - Differential range | $\Delta\theta$: 3 K...178 K | |
| Standards and norms | EN 1434:2015, prEN 1434:2020 and BEK1178 | |
| EU directives | Measuring Instruments Directive Low Voltage Directive Electromagnetic Compatibility Directive Radio Equipment Directive RoHS Directive Pressurised equipment Directive | |
| EN 1434 designation | Environmental class A | |
| MID designation | | |
| - Mechanical environment | Class M1 and M2 | |
| - Electromagnetic environment | Class E1 | |
| Temperature sensor connection | | |
| - Type 303-W/C/T | Pt500 – EN 60751, 2-wire connection (the cables are detachable, reverification required) | |

| Type number | Nom. flow q_p [m ³ /h] | Max flow q_s [m ³ /h] | Min. flow | | Dynamic range | | "Min. flow cut-off" [l/h] | Saturation flow [m ³ /h] | Pressure loss Δp @ q_p [bar] | Threaded connection on meter | Length [mm] |
|-------------|---|--|-------------------------|-------------------------|---------------|-----------|------------------------------|--|---|------------------------------|----------------|
| | | | 100:1 q_i [l/h] | 250:1 q_i [l/h] | $q_p:q_i$ | $q_p:q_i$ | | | | | |
| 303-x-10 | 0.6 | 1.2 | 6 | - | 100:1 | - | 3 | 1.5 | 0.03 | G½B | 110 |
| 303-x-40 | 1.5 | 3 | 15 | 6 | 100:1 | 250:1 | 3 | 4.6 | 0.09 | G½B | 110 |
| 303-x-70 | 1.5 | 3 | 15 | 6 | 100:1 | 250:1 | 3 | 4.6 | 0.09 | G1B | 130 |
| 303-x-A0 | 2.5 | 5 | 25 | 10 | 100:1 | 250:1 | 5 | 7.6 | 0.09 | G1B | 130 |

Accuracy

| Meter components | MPE according to EN 1434-1 | MULTICAL® 303, typical accuracy |
|------------------|---|--|
| Flow sensor | $E_f = \pm [2 + 0.02 q_p/q] \%$ | $E_f = \pm [1 + 0.01 q_p/q] \%$ |
| Calculator | $E_c = \pm [0.5 + \Delta\Theta_{min.}/\Delta\Theta] \%$ | $E_c = \pm [0.15 + 2/\Delta\Theta] \%$ |
| Sensor set | $E_t = \pm [0.5 + 3 \Delta\Theta_{min.}/\Delta\Theta] \%$ | $E_t = \pm [0.4 + 4/\Delta\Theta] \%$ |

Total typical accuracy of MULTICAL® 303 compared to EN 1434-1

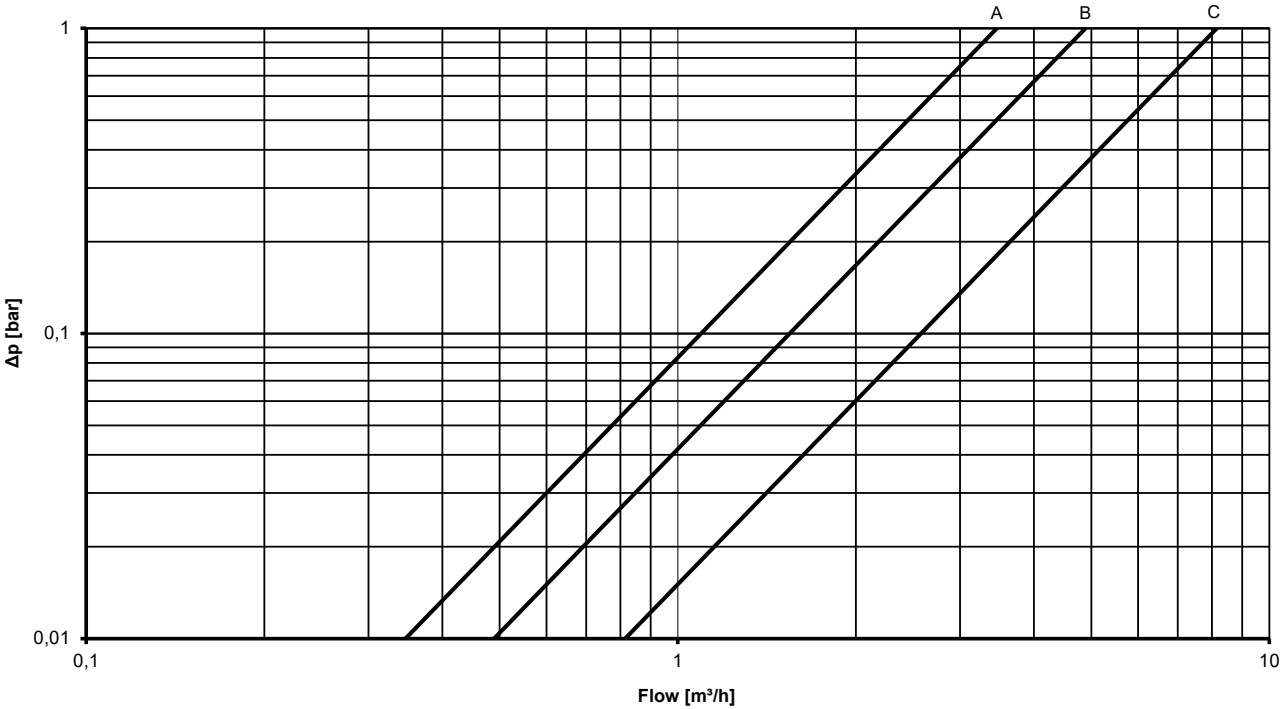


Pressure loss

The pressure loss in a flow sensor is stated as the maximum pressure loss at q_p .
 According to EN 1434, the maximum pressure loss must not exceed 0.25 bar.

| Graph | q_p [m³/h] | Installation dimen- sions | Nom. diameter [mm] | $\Delta p@q_p$ [bar] | k_v | $q@0.25\text{ bar}$ [m³/h] |
|-------|-----------------|------------------------------|-----------------------|-------------------------|-------|-------------------------------|
| A | 0.6 | G¾B x 110 mm | DN15 | 0.03 | 3.46 | 1.7 |
| B | 1.5 | G¾B x 110 mm | DN15 | 0.09 | 4.89 | 2.4 |
| B | 1.5 | G1 x 130 mm | DN 20 | 0.09 | 4.89 | 2.4 |
| C | 2.5 | G1 x 130 mm | DN 20 | 0.09 | 8.15 | 4.1 |

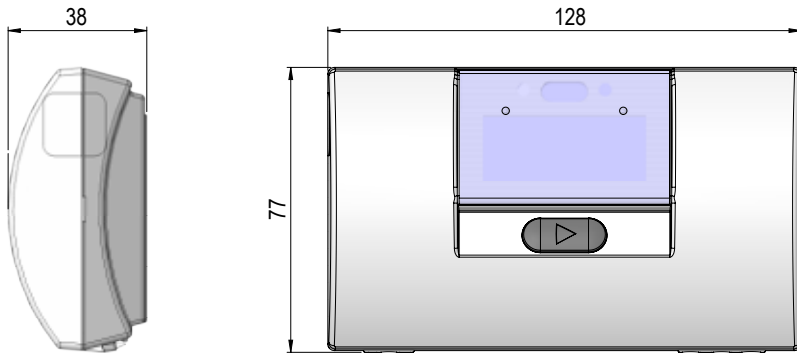
Δp MULTICAL® 303



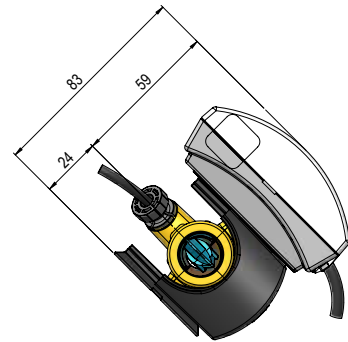
Dimensioned sketches

All measurements in [mm]

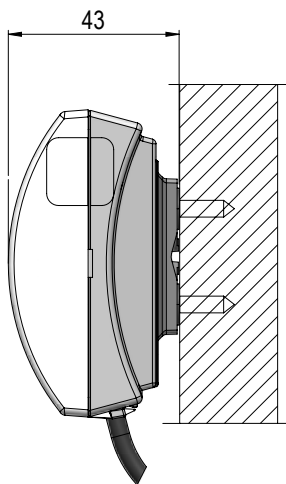
Calculator



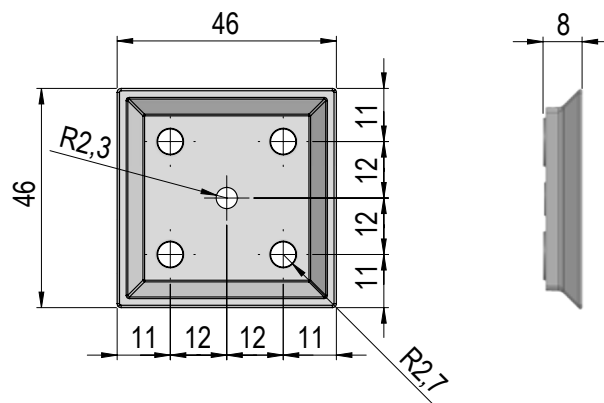
Complete MULTICAL® 303 with calculator mounted on flow sensor



Calculator mounted with wall bracket

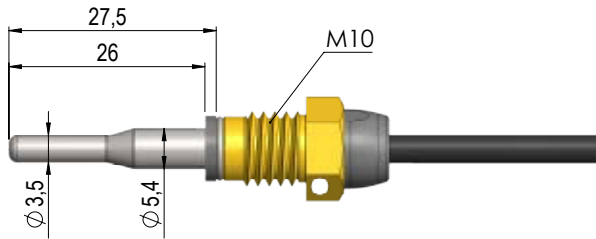


Wall bracket for calculator

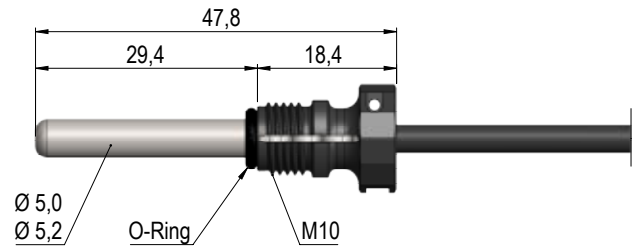


Dimensioned sketches

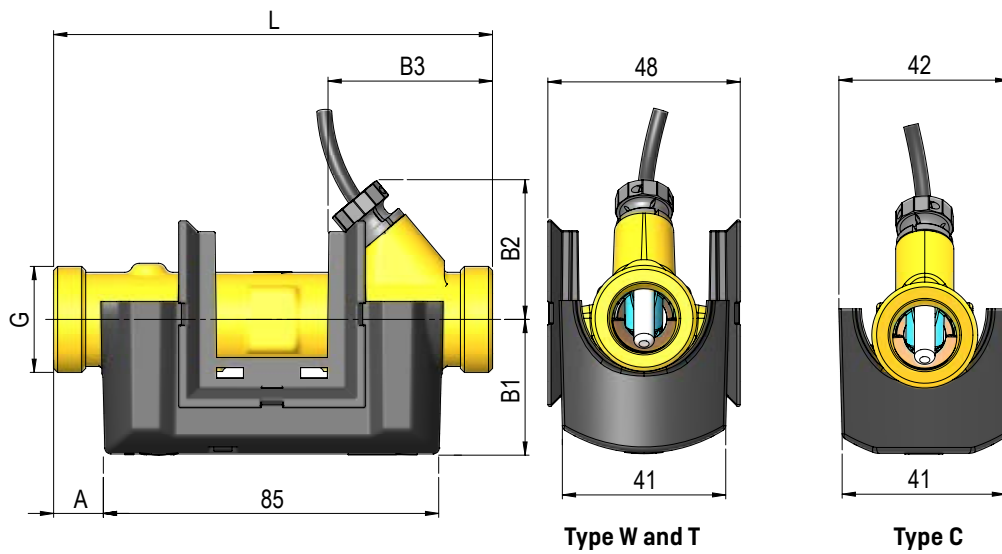
Direct short temperature sensor



Pocket temperature sensor with composite union



Flow sensor



| Thread | L [mm] | A [mm] | B1 [mm] | B2 [mm] | B3 [mm] | Approx. weight [kg] * |
|----------|--------|--------|---------|---------|---------|-----------------------|
| G½B (R½) | 110 | 12 | 35 | 35 | 40 | 0.7 |
| G1B (R¾) | 130 | 22 | 38 | 38 | 50 | 0.8 |

* The weight indication includes the complete meter including flow sensor, calculator, sensor set and 2 x A-batteries. Any provided accessories such as couplings, nipples and sensor pockets as well as packaging are not included in the weight indication.

Electrical data

Calculator data

| | | |
|---------------------------------------|---|------------------------------------|
| Display | LCD – 7 or 8 digits with a digit height of 6.8 mm | |
| Resolution | 9999.999 – 99999.99 – 999999.9 – 9999999 99999.999 – 999999.99 – 9999999.9 – 99999999 | |
| Energy units | MWh – kWh – GJ | |
| 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) | 50 info codes (50 latest are shown in the display) | |
| Clock/calendar | Clock, calendar, leap year compensation, target date | |
| Daylight saving time/wintertime (DST) | Programmable The function can be disabled so that "technical normal time" is used | |
| Clock accuracy | Without external adjustments: Less than 15 minutes/year With external adjustment every 48 hours: Less than 7 s from legal time | |
| Data communication | KMP protocol with CRC16 is used for optical communication | |
| M-Bus | Protocol according to EN 13757-3:2018, 300 and 2400 baud communication speeds with automatic baudrate detection. Current consumption: 1 unit load (1.5 mA). Fixed 2-wire cable. Polarity independent. | |
| Wireless M-Bus | Mode C1 protocol according to EN 13757-4:2019. Individual 128 bit AES-encryption. Transmission interval: 16 s. / 96 s. / 15 m. Transmission frequency: 868.95 MHz Mode T1/C1 BSI protocol according to EN13757-4:2019 and OMS Specification Volume 2 issue 4.2.1. Individual 128 bit AES encryption, security profile B. Transmission interval: 16 s. / 96 s. / 15 m. Transmission frequency: 868.95 MHz Mode T1/C1 OMS protocol according to EN13757-4:2019 and OMS Specification Volume 2 issue 4.2.1. Individual 128 bit AES encryption, security profile A. Transmission interval: 16 s. / 96 s. / 15 m. Transmission frequency: 868.95 MHz | |
| Power in temperature sensors | < 0.4 μ W RMS "normal mode" / < 2 μ W RMS "fast mode" | |
| Supply voltage | 3.65 VDC \pm 0.1 VDC | |
| EMC data | Complies with EN 1434 class A (MID class E1) | |
| Battery | 3.65 VDC, 1 x A-cell lithium | 3.65 VDC, 2 x A-cell lithium |
| Life* | Up to 8 years @ $t_{BAT} < 30$ °C | Up to 16 years @ $t_{BAT} < 30$ °C |
| Lithium contents | Approx. 0.9 g | 2 x approx. 0.9 g |
| Transport category | Not included in the rules of dangerous goods | |

* The battery lifetime is affected by the meter's communication and setup parameters as well as transmission interval, transmission power and datagram contents.

Product variants

| MULTICAL® 303 type number | Static data Written on the front of the meter 303-x-xx-x-xx | | | | Dynamic data Shown in the display xx-x-xx | | | |
|---|---|--------------------------|--------------------------|--------------------------|---|--------------------------|--------------------------|--------------------------|
| | Type 303 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Sensor connection | | | | | | | | |
| Pt500 Heat meter | | W | | | | | | |
| Pt500 Heat/cooling meter | | T | | | | | | |
| Pt500 Cooling meter | | C | | | | | | |
| Flow sensor ¹⁾ | | | | | | | | |
| q_p [m ³ /h] | Connection | Length [mm] | Dynamic range | | | | | |
| 0.6 | G½B (R½) | 110 | 100:1 | 10 | | | | |
| 1.5 | G½B (R½) | 110 | 100:1 | 40 | | | | |
| 1.5 | G1B (R¾) | 130 | 100:1 | 70 | | | | |
| 2.5 | G1B (R¾) | 130 | 100:1 | A0 | | | | |
| Meter type | | | | | | | | |
| Heat meter (MID module B+D) | | | | 2 | | | | |
| Heat/cooling meter (MID module B+D & TS27.02+DK268) | θ_{hc} = OFF | | | 3 | | | | |
| Heat meter, National approvals | | | | 4 | | | | |
| Cooling meter (TS27.02+DK268) | | | | 5 | | | | |
| Heat/cooling meter (MID module B+D & TS27.02+DK268) | θ_{hc} = ON | | | 6 | | | | |
| Country code | | | | | | | | |
| Determined by Kamstrup upon receipt of order XX | | | | | | | | |
| Temperature sensor set (Pt500) | | | | | | | | |
| | Length [mm] | Diameter Ø [mm] | Cable length [m] | | | | | |
| Direct short temperature sensors | 27.5 | - | 1.5 | 51 | | | | |
| Direct short temperature sensors | 27.5 | - | 3.0 | 52 | | | | |
| Ø5.0 with composite unions | - | 5.0 | 1.5 | 61 | | | | |
| Ø5.0 with composite unions | - | 5.0 | 3.0 | 62 | | | | |
| Ø5.2 with composite unions | - | 5.2 | 1.5 | 71 | | | | |
| Ø5.2 with composite unions | - | 5.2 | 3.0 | 72 | | | | |
| Supply ²⁾ | | | | | | | | |
| Battery, 1 x A-cell | Battery lifetime of up to 8 years | | | | | | | 1 |
| Battery, 2 x A-cells | Battery lifetime of up to 16 years | | | | | | | 9 |
| Communication | | | | | | | | |
| M-Bus, (comes with 1.5 m factory mounted cable) | | | | | | | | 20 |
| Wireless M-Bus, 868.95 MHz EU | | | | | | | | 30 |

1) The flow sensors are type-approved for the dynamic ranges $q_p; q_i = 250:1$ and $100:1$, but are as standard delivered as $100:1$. Please contact Kamstrup A/S for further information.

2) The battery lifetime is affected by the meter's communication and setup parameters as well as transmission interval, transmission power and datagram contents. Please contact Kamstrup A/S for calculations of specific configurations.

Meter configuration

| | A | B | CCC | DDD | L | RR | T | VVVV | XXX | YY | ZZZ |
|---|---|---|-----|-----|---|----|---|------|-----|----|-----|
| Flow sensor position | | | | | | | | | | | |
| Inlet | 3 | | | | | | | | | | |
| Outlet | 4 | | | | | | | | | | |
| Measure | | | | | | | | | | | |
| GJ | | 2 | | | | | | | | | |
| kWh | | 3 | | | | | | | | | |
| MWh | | 4 | | | | | | | | | |
| Flow sensor coding | | | | | | | | | | | |
| Normal/high resolution (7 digits) | | | 4xx | | | | | | | | |
| High resolution (8 digits) | | | 5xx | | | | | | | | |
| Display | | | | | | | | | | | |
| Heat meter | | | | 210 | | | | | | | |
| Heat/cooling meter | | | | 310 | | | | | | | |
| Cooling meter | | | | 510 | | | | | | | |
| Integration mode | | | | | | | | | | | |
| Adaptive mode (4-64 s) | | | | | 5 | | | | | | |
| Normal mode (32 s) | | | | | 6 | | | | | | |
| Fast mode (4 s) | | | | | 7 | | | | | | |
| Data logger profile | | | | | | | | | | | |
| Standard data logger profile | | | | | | 10 | | | | | |
| Encryption level | | | | | | | | | | | |
| Individual key | | | | | | | 3 | | | | |
| Customer label | | | | | | | | | | | |
| Serial number | | | | | | | | xxxx | | | |
| Communication configuration | | | | | | | | | | | |
| Communication hardware | | | | | | | | | | | |
| M-Bus (selection in type number) | | | | | | | | | x20 | | |
| Wireless M-Bus (selection in type number) | | | | | | | | | x30 | | |
| System configuration (wM-Bus) | | | | | | | | | | | |
| See the technical description - 5512-2701 | | | | | | | | | | YY | |
| Datagram (M-Bus/wM-Bus) | | | | | | | | | | | |
| See the technical description - 5512-2701 | | | | | | | | | | | ZZZ |

Please contact Kamstrup A/S for further information on configuration options.

Information codes in display

| Display digit | | | | | | | | Description |
|-----------------|----|----|---|----|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
| Info | t1 | t2 | 0 | V1 | 0 | 0 | 0 | |
| 1 | | | | | | | | Supply voltage is missing |
| 2 | | | | | | | | Low battery level |
| | 1 | | | | | | | t1 above measuring range or disconnected |
| | | 1 | | | | | | t2 above measuring range or disconnected |
| | 2 | | | | | | | t1 below measuring range or short-circuited |
| | | 2 | | | | | | t2 below measuring range or short-circuited |
| | 9 | 9 | | | | | | Invalid temperature difference (t1-t2) |
| | | | | 3 | | | | V1 Air |
| | | | | 4 | | | | V1 Wrong flow direction |
| | | | | 6 | | | | V1 > q _s for more than one hour |
| Example: | | | | | | | | |
| 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | |

Note: Infocodes are configurable. It is thus not certain that all parameters are available in a given MULTICAL® 303. An info logger stores the info code each time the info code is changed. It is possible to read the latest 50 changes of the info code as well as the date of the change.

Accessories

| Type number | Description |
|-------------|--|
| 3026-655.A | Wall bracket including rawlplugs and screws |
| 6699-099 | Infrared optical read-out head with USB plug |
| 6696-005 | Optical read-out head with Bluetooth |
| 3026-909 | Holder for optical read-out head |
| 669-042 | Metal plate for optical read-out head, 20 pcs. |
| 3130-262 | Blind plug including O-ring for the temperature sensor connecting in the flow sensor |
| 2210-061 | Gasket for flow sensor G $\frac{3}{4}$ B (R $\frac{1}{2}$) / coupling 6561-323 |
| 2210-062 | Gasket for flow sensor G1B (R $\frac{3}{4}$) / coupling 6561-324 |
| 2105-002 | Sealing cap for flow sensor G $\frac{3}{4}$ B (R $\frac{1}{2}$), blue |
| 3026-1148 | Sealing cap for flow sensor G $\frac{3}{4}$ B (R $\frac{1}{2}$), self-locking, blue |
| 6556-491 | R $\frac{1}{2}$ - M10 nipple for direct short temperature sensor |
| 6556-492 | R $\frac{3}{4}$ - M10 nipple for direct short temperature sensor |
| 6556-474 | G $\frac{1}{2}$ B ball valve with M10x1 sensor socket, 48 mm |
| 6556-475 | G $\frac{3}{4}$ B ball valve with M10x1 sensor socket, 54 mm |
| 3026-517 | Sealing cap for direct short temperature sensor DS27,5, blue |
| 3026-518 | Sealing cap for direct short temperature sensor DS27,5, red |
| 3026-1034 | Sealing cap for Ø5.0 mm / Ø5.2 mm temperature sensor with composite union, black |

For further information on MULTICAL® 303, please refer to the technical description, which you can find on products.kamstrup.com.

Accessories

2 couplings including gaskets

| Article number | Size | Nipple | Union |
|----------------|------|--------|-------|
| 6561-323 | DN15 | R½ | G¾B |
| 6561-324 | DN20 | R¾ | G1B |

Material

Copper alloy brass, CW617N [nipple]

Copper alloy brass, CW602N [union]

Extension piece

| Article number | Description | Length [mm] | Total length [mm] |
|----------------|---|-------------------|-------------------|
| 1330-010 | Extension including gaskets, 110 - 165 mm, G¾B - G1B, 1 pc. ¹⁾ | 55 ²⁾ | 165 ²⁾ |
| 1330-012 | Extension including gaskets, 110 - 220 mm, G¾B - G1B, 1 pc. ¹⁾ | 110 ²⁾ | 220 ²⁾ |
| 1330-013 | Extension including gaskets, 110 - 130 mm, G¾B - G1B, 1 pc. ¹⁾ | 20 ²⁾ | 130 ²⁾ |
| 1330-015 | Extension excluding gaskets, 110 - 130 mm, G¾B - G¾B, 1 pc. | 20 | 130 |
| 1330-019 | Extension excluding gaskets, 110 - 165 mm, G¾B - G¾B, 1 pc. | 55 | 165 |

1) Order 2 pcs. per meter

2) Total length with 2 extension pieces

Material

Copper alloy brass, CW614N

MULTICAL® 303

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