

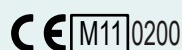
ULTRAFLOW® 54

DN150-250

DATA SHEET

- For flow from 150 m³/h up to 1000 m³/h
- Ultrasonic flow sensor
- Compact design
- Static meter, no moving parts
- Large dynamic range
- No wear
- High accuracy
- Longevity

MID-2004/22/EC



Application

ULTRAFLOW® 54 is a static flow sensor based on the ultrasonic measuring principle. It is primarily used as a volume flow sensor for energy meters such as MULTICAL®. ULTRAFLOW® 54 has been designed for use in heating and cooling installations where water is the heat-bearing medium.

ULTRAFLOW® 54 employs ultrasonic measuring techniques and microprocessor technology. All calculating and flow measuring circuits are collected on one single board, thus providing a compact and rational design and, in addition, exceptionally high measuring accuracy and reliability is obtained.

The volume is measured using bidirectional ultrasonic technique based on the transit time method, with proven long-term stability and accuracy. Four ultrasonic transducers are used to send sound signals both against and with the flow. The ultrasonic signal travelling with the flow reaches the opposite transducer first. The time difference between the two signals can be converted into flow velocity and thereby also volume.

A three-wire pulse cable is used to connect ULTRAFLOW® 54 to the Kamstrup MULTICAL® calculator. The cable supplies the flow sensor and also transfers the signal from sensor to calculator. A signal correspond-

ing to the flow – or more correctly, a number of pulses proportional to the water volume flowing through – is transmitted.

ULTRAFLOW® 54 is available with internal supply, e.g. if the distance between MULTICAL® and ULTRAFLOW® 54 is 10 m or more.

If ULTRAFLOW® 54 is used as a pulse generator for other equipment, the meter must be fitted with a galvanically separated pulse output and a supply of its own.



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Approvals

The Measuring Instruments Directive

ULTRAFLOW® 54 is available with CE-marking according to MID (2004/22/EC). The certificates have the following numbers:

B-Module	DK-0200-MI004-008
D-Module	DK-0200-MIQA-001

Please contact Kamstrup A/S for further details on type approval and verification.

CE marking

ULTRAFLOW® 54 is marked according to the following directives:

EMC-directive	2004/108/EC
LV-directive	2006/95/EC (together with Pulse Transmitter or Pulse Divider)
PE-directive	97/23/EC (DN150...DN1000) category II

Technical data

Electrical data

Supply voltage	3,6 V ± 0,1 V
Supply	
- galvanically coupled output module (Y=1)	Powered by MULTICAL®
- galvanically separated output module (Y=2)	
- Battery	3.65 VDC, D-cell lithium
- Replacement interval	6 years @ $t_{BAT} < 30^{\circ}\text{C}$
- Mains supply	230 VAC +15/-30%, 50 Hz 24 VAC ±50%, 50 Hz
- Power consumption	< 1 W
- Backup	Integral SuperCap eliminates interruptions due to short-term power failures
Cable length flow sensor	
- galvanically coupled output module (Y=1)	Max. 10 m. (powered by calculator)
- galvanically separated output module (Y=2)	Depending on calculator (use of own supply)
EMC data	Fulfil DS/EN 1434:2007 class C, MID E1 and E2

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Technical data

Mechanical data

Metrological class	2 or 3
Environmental class	Fulfil DS/EN 1434 class C
Ambient temperature	5...55°C (indoors)
Protection class	IP67
Humidity	93% RF non-condensing
Mechanical environment	MID M1 and M2
Medium temperature	2...150°C 15...130°C 2...50°C

At medium temperatures above 90°C or medium temperatures more than 5°C below ambient temperature, the electronics box must be wall-mounted or mounted via the enclosed distance piece.

Storage temp. empty sensor	-25...70°C, 60°C if battery mounted/enclosed
Pressure stage	PN25

Nom. flow q_p [m³/h]	Nom. diameter [mm]	Pulse figures ¹⁾ [imp./l]	Dynamic range $q_s:q_p$	$q_s:q_p$	Flow @125 Hz ²⁾ [m³/h]	$\Delta p@q_p$ [bar]	Min. cut off [l/h]
150	DN150	1	1:100	2:1	450	0.02	300
250	DN150	0.6	1:100	2:1	750	0.055	500
400	DN150	0.4	1:100	2:1	1125	0.04	800
400	DN200	0.4	1:100	2:1	1125	0.01	800
400	DN250	0.4	1:100	2:1	1125	0.01	800
600	DN200	0.25	1:100	2:1	1800	0.022	1200
600	DN250	0.25	1:100	2:1	1800	0.022	1200
1000	DN250	0.15	1:100	2:1	3000	0.015	2000

¹⁾ Standard pulse figures. Appears from the ULTRAFLOW® label.

²⁾ Saturation flow. Max. pulse frequency 128 Hz is maintained at higher flow rates.

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Material

Wetted parts

Housing	Stainless steel, W.no. 1.4307
Transducer holder	Stainless steel, W.no. 1.4308
Transducer	Titanium
Gaskets	Fibre

Electronics box

Base	Thermoplastic, PBT 30% GF
Cover	Thermoplastic, PC 10% GF
Fitting hardware distance piece for electronics box	Thermoplastic, PPS 40% GF

Connection cable (optional, enclosed separately)

Silicone cable (3 x 0.5 mm²)

Supply cable 24/230 VAC (optional)

Cable with PVC mantle (2 x 0.75 mm²)

Type overview

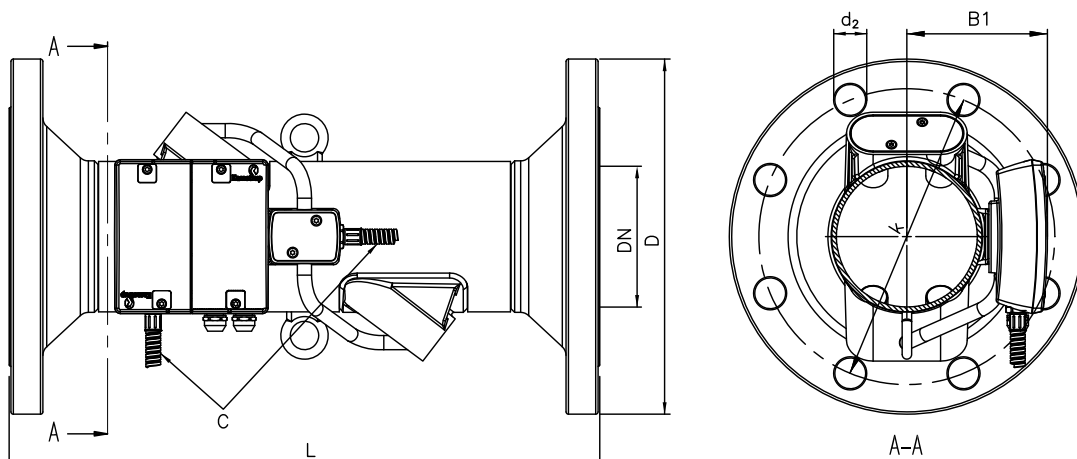
Nom.flow q _p [m ³ /h]	Sizes		
150	DN150 x 500 mm		
250	DN150 x 500 mm		
400	DN150 x 500 mm	DN200 x 500 mm	DN250 x 600 mm
600	DN200 x 500 mm	DN250 x 600 mm	
1000	DN250 x 600 mm		

Flange EN 1092, PN25

ULTRAFLOW® 54, DN150-250

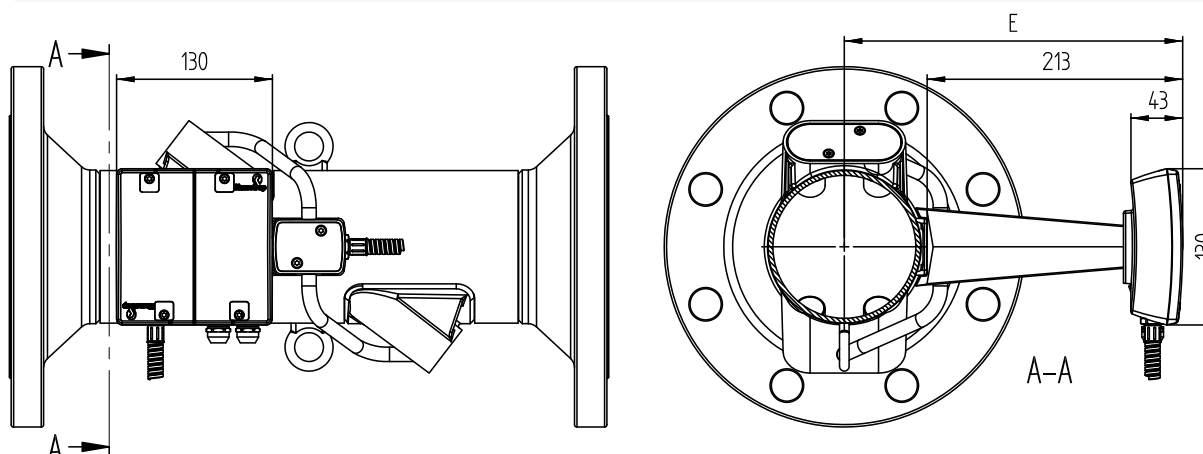
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Dimension sketches



Flange EN 1092, PN25

Nom. diameter [mm]	Nom. flow q_p [m³/h]	L [mm]	D [mm]	k [mm]	B1 [mm]	Bolts			Steel tube length C [mm]	Approx. weight [kg]
						Quantity	Thread [mm]	d_2 [mm]		
DN150	150 & 250	500	300	250	119	8	M24	26	650	37
DN150	400	500	300	250	140	8	M24	26	625	36
DN200	400 & 600	500	360	310	166	12	M24	26	570	49
DN250	400 & 600	600	425	370	166	12	M27	30	570	79
DN250	1000	600	425	370	194	12	M27	30	500	75



Flange EN 1092, PN25

Nom. diameter [mm]	Nom. flow q_p [m³/h]	E [mm]
DN150	150 & 250	282
DN150	400	303
DN200	400 & 600	329
DN250	400 & 600	329
DN250	1000	357

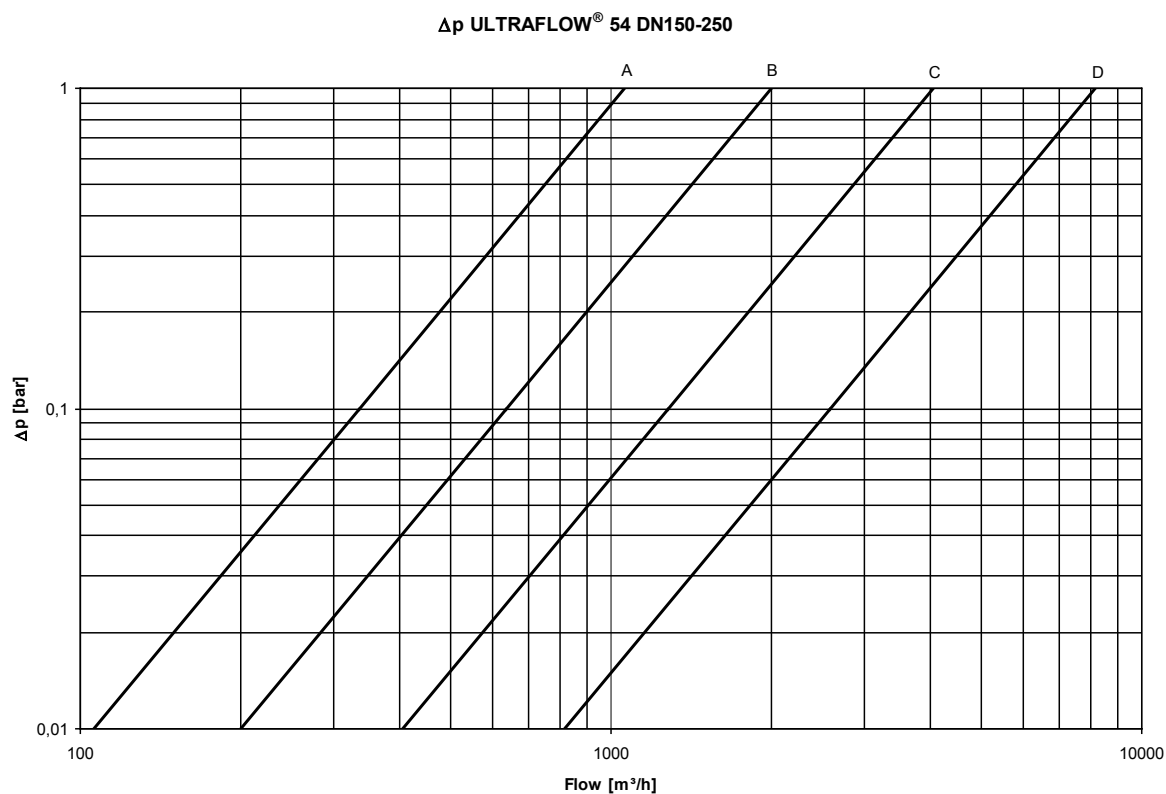
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Pressure loss

Graph	Nominal flow q_p [m³/h]	Nom. diameter [mm]	k_v	Q@0.25 bar [m³/h]
A	150 & 250	DN150	1060	530
B	400	DN150	2000	1000
C	400 & 600	DN200 & DN250	4040	2020
D	1000	DN250	8160	4080

Pressure loss graph



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Installation

Prior to installation of the flow sensor, the system should be flushed.

Correct flow sensor position (flow or return) appears from the front label of MULTICAL®. The flow direction is indicated by an arrow on the side of the flow sensor.

Please note: ULTRAFLOW® 54 may be lifted in the lifting rings only.

Pressure stage ULTRAFLOW® 54: PN25

Temperature of medium, ULTRAFLOW® 54: 2...150°C/15...130°C/2...50°C. See marking on label.

Mechanical environment: M1 and M2 (fixed installation with minimum vibration and fixed installation with considerable or high vibration level respectively). See marking on label.

Electromagnetic environment: E1 and E2 (housing/light industry and industry respectively). See marking on label.

The meter's signal cables must be drawn at min. 25 cm distance to other installations.

Climatic environment: Must be installed in environments with non-condensing humidity as well as in closed locations (indoors).

The ambient temperature must be within 5...55°C.

Maintenance and repair: The flow sensor is verified separately and can, therefore, be separated from the calculator. It is permitted to replace the supply and change the supply type. For battery supply a lithium battery with connector from Kamstrup A/S must be used. Lithium batteries must be correctly handled and disposed of (see Kamstrup document 5510-408, "Lithium batteries - Handling and disposal"). Other repairs require subsequent reverification in an accredited laboratory.

If ULTRAFLOW® 54 is connected via a galvanically coupled output module, the flow sensor may be connected to a Kamstrup MULTICAL® calculator only.

If other calculator types are connected, ULTRAFLOW® 54 must be fitted with a galvanically separated output module.

Please note: Please make sure that pulse figures of flow sensor and calculator are identical.

At medium temperatures above 90°C or medium temperatures more than 5°C below ambient temperature the flow sensor's electronics box must be mounted via the enclosed distance piece. Alternatively, the electronics box can be wall-mounted at a distance of minimum 170 mm from the sensor.

In order to prevent cavitation, the back pressure at ULTRAFLOW® 54 must be min. 1.5 bar at qp and min. 2.5 bar at qs. This applies to temperatures up to approx. 80°C.

When the installation has been completed, water flow can be turned on. The valve on the inlet side must be opened first.

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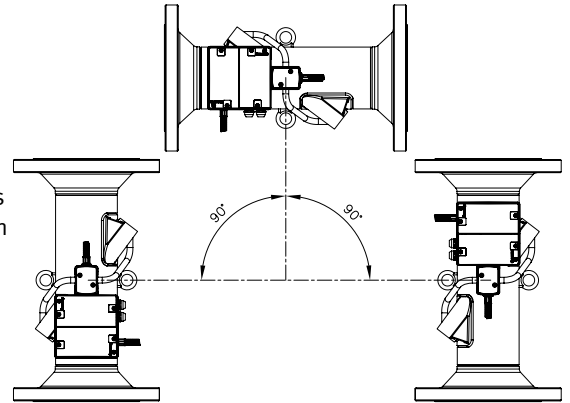
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Installation

Installation angle of ULTRAFLOW® 54

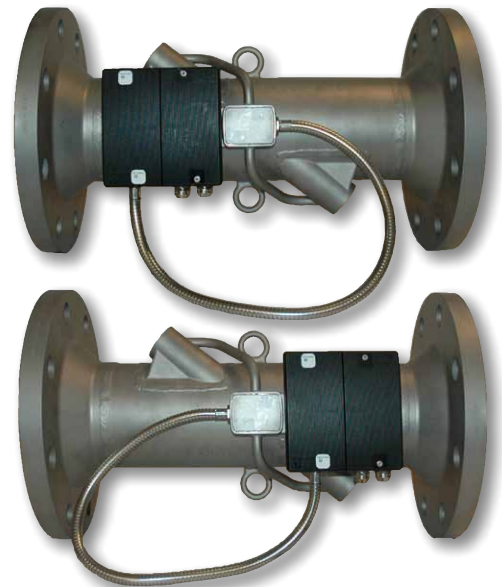
ULTRAFLOW® 54 can be installed horizontally, vertically, or at an angle.

ULTRAFLOW® 54 is normally installed horizontally, with the lifting rings oriented vertically. The ultrasound paths in the flow sensor tube will thus be horizontal, which is optimal in connection with possible stratification of the medium.



Mounting ULTRAFLOW® 54 in lifting ring

ULTRAFLOW® 54 can be mounted hanging from one of the two lifting rings depending on required flow direction. The enclosed distance piece can be used to secure an optimal position of the electronics box.



At medium temperature below 90°C and at medium temperature less than 5°C below ambient temperature, the electronics box can be mounted directly on the flow sensor case via the factory mounted fitting.

If the flow sensor is vertically mounted, the cable connections of the electronics box will be horizontally oriented. This is permitted. If the cable connections should preferably point downwards, the electronics box can be mounted via the enclosed distance piece, which moves the box approx. 170 mm away from the flow sensor case. Alternatively, a shorter distance piece, which only moves the box approx. 45 mm away from the flow sensor case, can be used. The short distance piece must be ordered separately (6561-332).



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Installation

At **medium temperature above 90°C** there is a risk that the electronics (and possibly the battery) will be damaged due to too high temperature in the electronics box if it is mounted directly on the flow sensor case.

Therefore, the electronics box must be mounted via the enclosed distance piece. The cable connections must always point downwards.

Alternatively, the electronics box can be wall-mounted as long as the distance to flow sensor case and pipe installation is minimum 170 mm.



It can also be an advantage to use the enclosed distance piece if the flow sensor case is insulated and the electronics box must be removed from the insulation.

If the required position of the electronics box differs from the standard position, the distance piece can be mounted with the enclosed collar band around the flow sensor tube. However, please note that the cable connections must always point downwards.



At **medium temperatures which are more than 5° below ambient temperature** (typically in cooling installations) there is a risk of condensation in the electronics box, which can damage the electronics.

Therefore, the electronics box must be mounted via the enclosed distance piece. The cable connections must always point downwards.

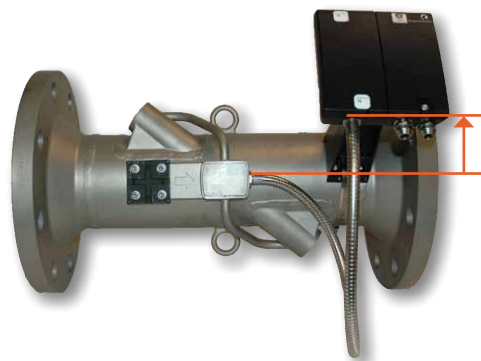
Alternatively, the electronics box can be wall-mounted as long as the distance to flow sensor case and pipe installation is minimum 170 mm.

Furthermore, when mounting the electronics box please make sure that the cable connections on the box are at a higher level than the cable connection on the flow sensor tube.

By vertical mounting of ULTRAFLOW® 54 in a riser this can be secured by mounting the distance piece by means of the collar band as shown above.

If ULTRAFLOW® 54 is mounted horizontally, the electronics box can be mounted on the distance piece by means of the collar band. The distance piece can then be turned upwards until the cable connections on the electronics box are in a higher position than the cable connection on the flow sensor pipe as shown to the right.

Alternatively, the electronics box can be wall-mounted at a suitable distance to the installation (minimum 170 mm).



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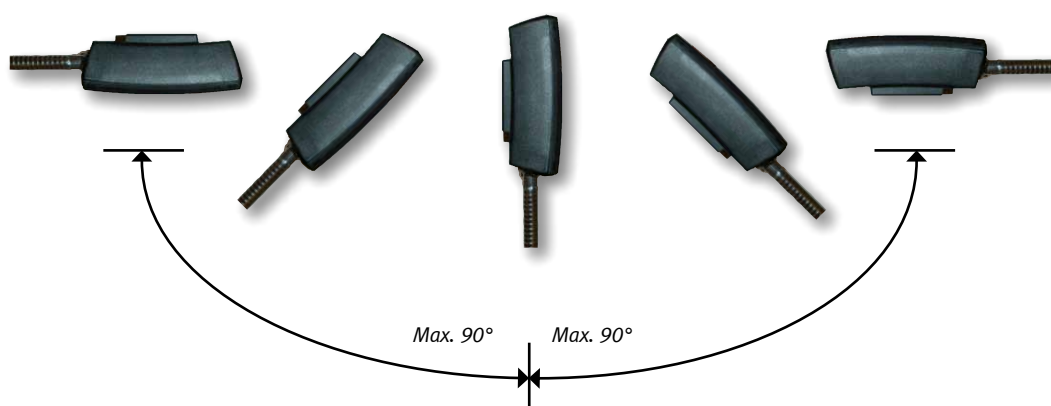
Installation

Orientation of flow sensor electronics box

Mounting the electronics box, the cable connections must always be horizontally or downwards oriented in order to avoid the risk of water and condensation being led into the electronics box via the cables.

This is specially important in humid environments, when ULTRAFLOW® 54 is used as cooling sensor, or if the medium temperature can become more than 5°C lower than the ambient temperature.

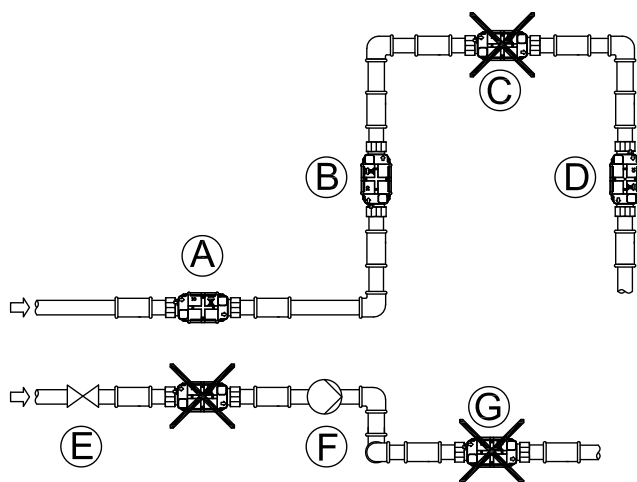
Furthermore, the steel tube and wires must in general hang freely downwards after the cable connections to form a drip nose for drainage of water and condensation.



Straight inlet ULTRAFLOW® 54

ULTRAFLOW® 54 requires neither straight inlet nor outlet in order to fulfil the Measuring Instruments Directive (MID) 2004/22/ EC and EN 1434:2007. A straight inlet section will only be necessary in case of heavy flow disturbances before the meter. We recommend that the guidelines of CEN CR 13582 are followed.

Optimal position can be obtained if you take the below-mentioned installation methods into consideration:



- A. Recommended flow sensor position.
- B. Recommended flow sensor position.
- C. Unacceptable position due to risk of air build-up
- D. Acceptable in closed systems.
Unacceptable position in open systems due to risk of air build-up in the system
- E. A flow sensor ought not to be placed immediately after a valve, with the exception of block valves (ball valve type) which must be fully open when not used for blocking.
- F. A flow sensor must never be placed on the inlet side of a pump
- G. A flow sensor ought not to be placed after a double bend in two levels.

For general information concerning installation, see CEN report DS/CEN/CR 13582, Heat meter installation. Instructions in selection, installation and use of heat meters.

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Operating pressure


In order to prevent cavitation, the back pressure at ULTRAFLOW® 54 must be min. 1.5 bar at q_p and min. 2.5 bar at Q_s . This applies to temperatures up to approx. 80°C.

Connection to calculator

ULTRAFLOW® 54 and MULTICAL® are galvanically coupled

If ULTRAFLOW® 54 and MULTICAL® are connected via output module (Y=1), ULTRAFLOW® 54 is galvanically coupled with MULTICAL® and is powered via the three-wire signal cable (cable length up to 10 m.)

Note: It is not permitted to mount a supply module or battery in ULTRAFLOW® 54.

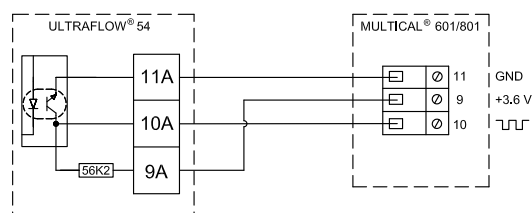
ULTRAFLOW® 54	→	MULTICAL®		
11	→	11	GND	(Blue)
9	→	9	+ 3,6 V	(Red)
10	→	10		(Yellow)

ULTRAFLOW® 54 and MULTICAL®, galvanically separated

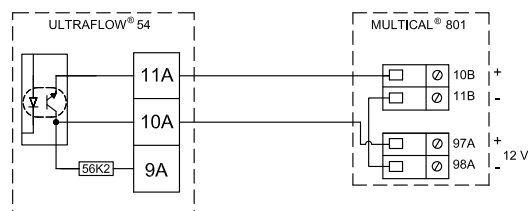
If ULTRAFLOW® 54 and MULTICAL® are connected via output module (Y=2), ULTRAFLOW® 54 is galvanically separated from MULTICAL®.

Note: Flow info cannot be read.

Three-wire connection, MULTICAL® 601 and 801. Cable length up to 10 metres.



Two-wire connection, MULTICAL® 801. Cable length up to 100 metres.



When using long signal cables, careful consideration is required in connection with installation. With a view to EMC, there must be a distance of min. 25 cm between signal cables and all other cables.

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Type numbers of ULTRAFLOW® 54 for MULTICAL®

The table below shows a list of type numbers for ULTRAFLOW® 54 ordered with MULTICAL®

Type number	Nom. flow q_p [m³/h]	Min. flow q_i [m³/h]	Max. flow q_i [m³/h]	Connection [mm]	PN bar]	Length [mm]	Pulse figure [imp./l]	CCC	Material flow sensor case
65-5-FCCN-XXX	150	1.5	300	DN150	25	500	1	447 (489)	Stainless steel
65-5-FDCN-XXX	250	2.5	500	DN150	25	500	0.6	481	Stainless steel
65-5-FECN-XXX	400	4.0	800	DN150	25	500	0.4	491	Stainless steel
65-5-FECP-XXX	400	4.0	800	DN200	25	500	0.4	491	Stainless steel
65-5-FECP-XXX	400	4.0	800	DN250	25	600	0.4	491	Stainless steel
65-5-FFCP-XXX	600	6.0	1200	DN200	25	500	0.25	492	Stainless steel
65-5-FFCR-XXX	600	6.0	1200	DN250	25	600	0.25	492	Stainless steel
65-5-FGCR-XXX	1000	10.0	1800	DN250	25	600	0.15	493	Stainless steel

xxx, code pertaining to marking and final assembly

Type number composition of separate ULTRAFLOW® 54

ULTRAFLOW® 54

Type 65-5- □□ □□ - Y Z - □□□

Dynamic range and flow

Connection and overall length

Output module

Supply module

Final assembly and marking

In addition to the basic variants listed in the above table, you must select output module (Y), supply module (Z) as well as pulse figure programming (CC) and pulse duration (E).

The variant with galvanically coupled module (Y=1) is solely for use together with MULTICAL®.

The variant with galvanically separated output module (Y=2) is used in the following situations:

1. More than 10 m cable length between MULTICAL® and ULTRAFLOW® 54 is required.
2. As flow sensor no. 2 in connection with MULTICAL®. If two flow sensors are used together with MULTICAL®, one must include a galvanically separated module (Y=2).
3. Together with other equipment/foreign calculators.

Please note: Flow info cannot be read if output module with galvanic separation is used.

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Type numbers for separate ULTRAFLOW® 54

Type number			Nom. flow q_p	Min. flow q_i	Max. flow q_i	Connection	PN	Length	Material flow sensor case
			[m³/h]	[m³/h]	[m³/h]	[mm]	[bar]	[mm]	
65-5-FCCN	-YZ	-XXX	150	1.5	300	DN150	25	500	Stainless steel
65-5-FDCN	-YZ	-XXX	250	2.5	500	DN150	25	500	Stainless steel
65-5-FECN	-YZ	-XXX	400	4.0	800	DN150	25	500	Stainless steel
65-5-FECP	-YZ	-XXX	400	4.0	800	DN200	25	500	Stainless steel
65-5-FECR	-YZ	-XXX	400	4.0	800	DN250	25	600	Stainless steel
65-5-FFCP	-YZ	-XXX	600	6.0	1200	DN200	25	500	Stainless steel
65-5-FFCR	-YZ	-XXX	600	6.0	1200	DN250	25	600	Stainless steel
65-5-FGCR	-YZ	-XXX *	1000	10.0	1800	DN250	25	600	Stainless steel

* Spare part for ULTRAFLOW® 54 type 65-S/R/T

Type numbers of output and supply modules

Type number overview of output modules (Y) as well as supply modules (Z) for separate ULTRAFLOW® 54

Y	Output module	Corresponding supply module
1	Galvanically coupled module	0 (powered by MULTICAL®)
2	Galvanically separated module	2, 7, 8

Z	Supply module	Corresponding output module
0	No supply	1
2	Battery, D-cell	2
7	230 VAC supply module	2
8	24 VAC supply module	2

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Programming variants and pulse duration

Overview of programming variants of pulse figures (CC) and pulse durations (E) for separate ULTRAFLOW® 54.

qp [m³/h]	Pulse figure			Pulse duration				
	[imp/l]	[l/pulse]	CC	[ms] (E=1)	[ms] (E=4)	[ms] (E=5)	[ms] (E=6)	
150	1		33	3.9	-	-	-	Default
150		10	34	-	20	-	-	
150		25	64	-	20	-	-	
150		100	35	-	20	50	100	
150		250	65	-	20	50	100	
150		1000	36	-	20	50	100	
150		2500	66	-	20	50	100	
250	0.6		43	3.9	-	-	-	Default
250		10	34	-	20	-	-	
250		25	64	-	20	-	-	
250		100	35	-	20	50	100	
250		250	65	-	20	50	100	
250		1000	36	-	20	50	100	
250		2500	66	-	20	50	100	
400	0.4		63	3.9	-	-	-	Default
400		100	35	-	20	50	-	
400		250	65	-	20	50	100	
400		1000	36	-	20	50	100	
400		2500	66	-	20	50	100	
600	0.25		14	3.9	-	-	-	Default
600		100	35	-	20	50	-	
600		250	65	-	20	50	-	
600		1000	36	-	20	50	100	
600		2500	66	-	20	50	100	
1000	0.15		54	3.9	-	-	-	Default
1000		100	35	-	20	50	-	
1000		250	65	-	20	50	-	
1000		1000	36	-	20	50	100	
1000		2500	66	-	20	50	100	
1000	0.25		14	3.9	-	-	-	Spare part

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Accessories

Description	Type number
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Flange gaskets (PN25)	
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DN150 (1 pc.)	1150-140
DN200 (1 pc.)	1150-139
DN250 (1 pc.)	1150-141

Short distance piece	6561-332
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Cables

As an option, ULTRAFLOW® 54 DN150-250 is available with signal cable in lengths of 2.5, 5 or 10 m. The cable is enclosed separately.

If 24/230 VAC supply module is selected, the sensor is optionally available with power cable. The cable is mounted in the sensor's electronics box from the factory.