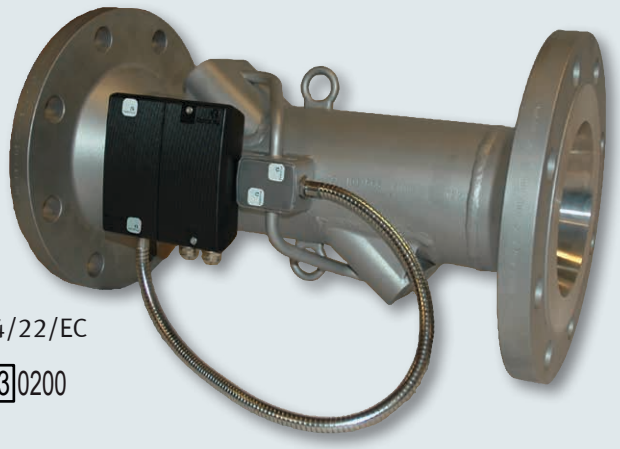
ULTRAFLOW® 54
DN150-250
DATA SHEET

- **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

CE M13 0200

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 signal 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 corresponding 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 for other equipment (e.g. other brands of calculators), the meter must be fitted with a galvanically separated output module and a supply of its own.

Kamstrup

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ULTRAFLOW® 54 DN150-250
DATA SHEET

Contents

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 (when fitted with 230 VAC power supply)
PE-directive	97/23/EC (DN150...DN250) category II

Technical data

Electrical data

Supply voltage	3.6 VDC ± 0.1 VDC
Supply, galvanically coupled output module (Y=1)	Powered by MULTICAL®
Supply, galvanically separated output module (Y=2) [1]	
– 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
Supply, galvanically separated output module (Y=3)	
– Battery	3.65 VDC, D-cell lithium
- Replacement interval	6-years @ t_{BAT} < 30 °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
Length of signal cable, flow sensor electronics box	
– galvanically coupled output module (Y=1)	Max. 10 m. (powered by calculator)
– galvanically separated output module (Y=2 and Y=3)	Depending on calculator (use of own supply)
EMC data	Fulfils DS/EN 1434:2007 class C, MID E1 and E2

1) It is possible to use battery supply in combination with output module (Y=2), e.g. for temporary supply of flow sensors installed at construction sites.

Technical data

Mechanical data

Metrological class	2 or 3
Environmental class	Fulfils 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 (Heat and heat/cooling meters) 2...50 °C (Cooling meters)

At medium temperatures above 90 °C (T_{med} > 90 °C) or medium temperature more than 5 °C below ambient temperature (T_{med} < T_{amb} - 5 °C) the electronics box must be wall-mounted or mounted via the enclosed distance piece.

Storage temp. empty sensor	-25...60 °C
Pressure stage	PN25

Nom. flow q_p [m³/h]	Nom. diameter [mm]	Meter factor [1] [imp./l]	Dynamic range q_i:q_p	q_s:q_p	Flow @125 Hz [2] [m³/h]	Δp@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 meter factor. Appears from the ULTRAFLOW® label.
[2] Saturation flow. Max. pulse frequency 128 Hz is maintained at higher flow rates.

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

Signal cable (optional for separate ULTRAFLOW® 54)
Silicone cable (3 x 0.5 mm²)

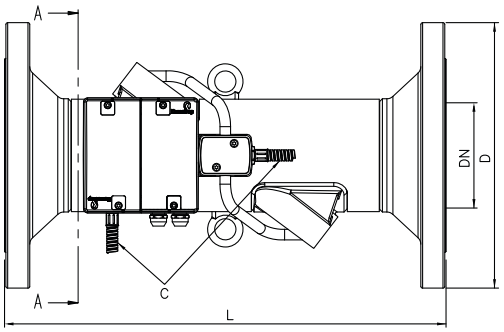
Power supply cable 24/230 VAC (optional)
Cable with PVC mantle (2 x 0.75 mm²)

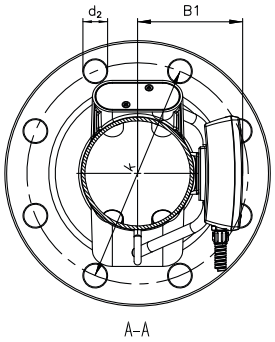
Type overview

Nom.flow q_p [m³/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

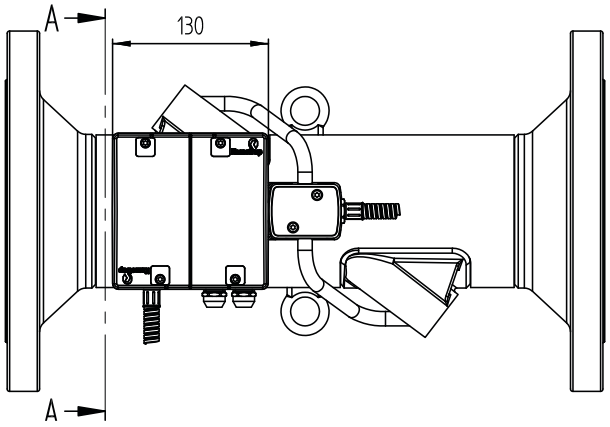
Dimension sketches

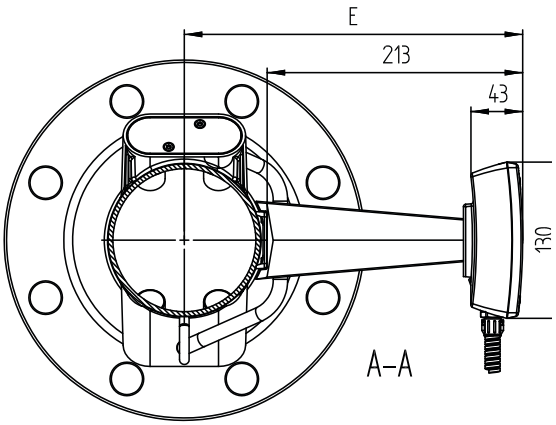




Flange EN 1092, PN25

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





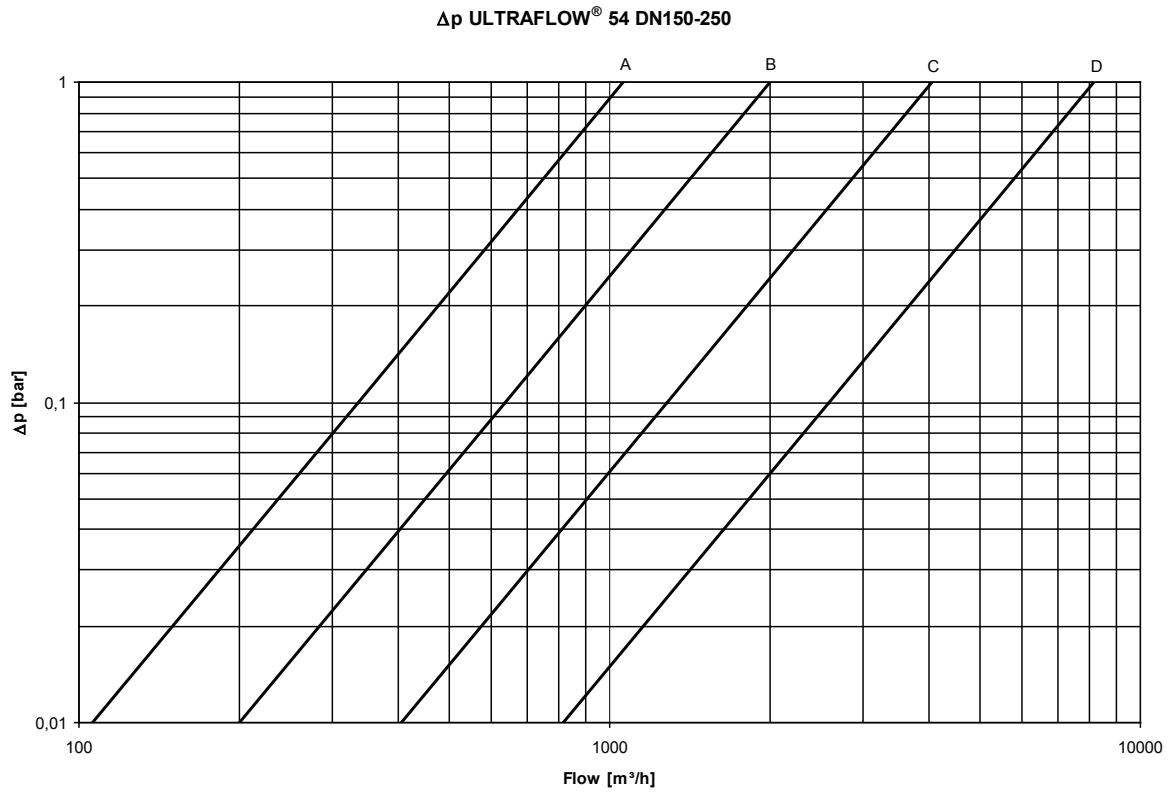
Flange EN 1092, PN25

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

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



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/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 and a power supply of its own.

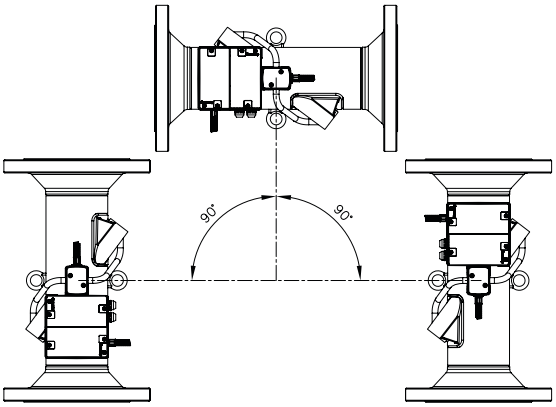
Please note: Please make sure that pulse figures of flow sensor and calculator are identical.

The steel tube between flow sensor housing and electronics box must not be disassembled.

At medium temperatures above 90 °C (T_{med} > 90 °C) or medium temperature more than 5 °C below ambient temperature (T_{med} < T_{amb} - 5 °C) 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 q_p and min. 2.5 bar at q_s. 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.



Installation angle of ULTRAFLOW® 54

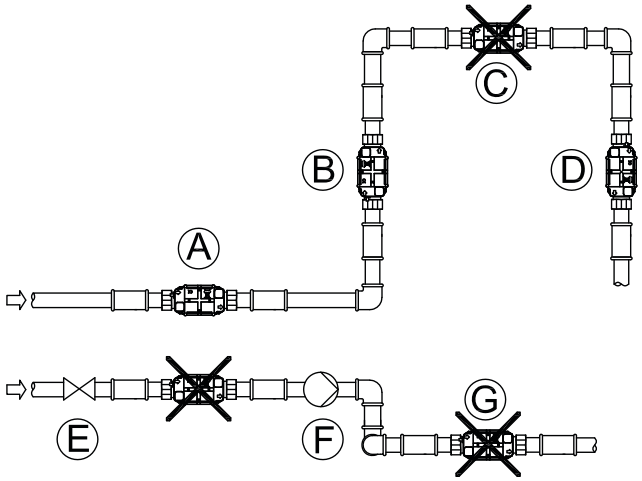
ULTRAFLOW® 54 can be installed horizontally, vertically, or at an angle.

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

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 by taking 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.

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®, 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).

ULTRAFLOW® 54	→	MULTICAL®		
11	→	11	GND	(Blue)
9	→	9	+ 3.6 V	(Red)
10	→	10	⊓⊓	(Yellow)

Battery life time in e.g. MULTICAL® 602 is approximately 10 years depending on data communication to the calculator.

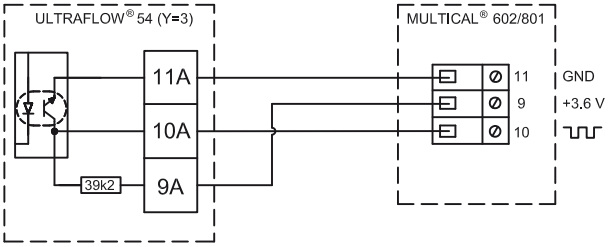
Note: It is not permitted to mount a supply module or battery in ULTRAFLOW® 54.

ULTRAFLOW® 54 and MULTICAL®, galvanically separated

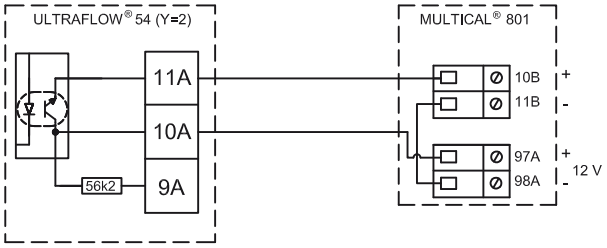
If ULTRAFLOW® 54 and MULTICAL® are connected via output module (Y=2 or 3), ULTRAFLOW® 54 is galvanically separated from MULTICAL®.

Note: Flow info cannot be read.

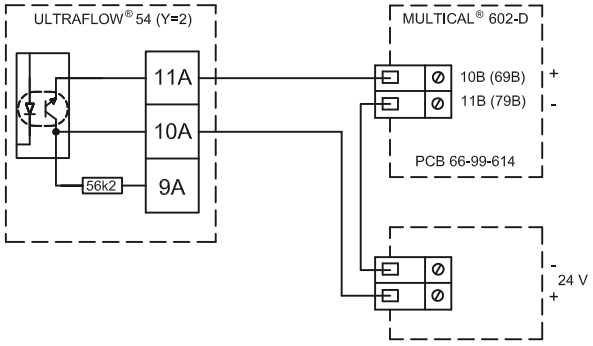
Three-wire connection, MULTICAL® 602 og 801 via output module (Y=2 or 3). Cable length up to 25 metres.



Two-wire connection, MULTICAL® 801 via output module (Y=2). Cable length up to 100 metres.



Two-wire connection, MULTICAL® 602-D via output module (Y=2) and external 24 VDC supply. Cable length up to 100 metres.



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

Type numbers of ULTRAFLOW® 54 for MULTICAL®

Type number	Nom. flow q_p [m³/h]	Min. flow q_i [m³/h]	Max. flow q_s [m³/h]	Connection [mm]	PN [bar]	Length [mm]	Meter factor [imp./l]	CCC	Material flow sensor housing
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-FECR-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	2000	DN250	25	600	0.15	493	Stainless steel

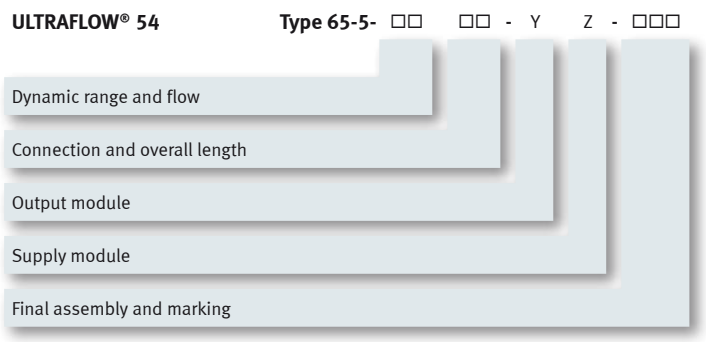
xxx, code pertaining to marking and final assembly

Type numbers for separate ULTRAFLOW® 54

Type number			Nom. flow q_p [m³/h]	Min. flow q_i [m³/h]	Max. flow q_s [m³/h]	Connection [mm]	PN [bar]	Length [mm]	Material flow sensor housing
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	2000	DN250	25	600	Stainless steel

xxx, code pertaining to marking and final assembly

Type number composition of separate ULTRAFLOW® 54



In addition to the basic variants output module (Y), supply module (Z) as well as pulse figure programming (CC) and pulse duration (E) must be selected.

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

The variant with galvanically separated output module (Y=2 or 3) 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 output module (Y=2 or 3).
3. Together with other equipment/foreign calculators.

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

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	0, 7, 8
3	Galvanically separated module, "Low power"	0, 2, 7, 8

Z	Supply module	Corresponding output module
0	No supply	1, 2, 3
2	Battery, D-cell	3
7	230 VAC supply module	2, 3
8	24 VAC supply module	2, 3

Programming variants and pulse duration

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

q_p	Meter factor			Pulse duration				
[m³/h]	[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		24	3.9	-	-	-	Default
1000	(0.25)	4	14	3.9	-	-	-	*)
1000		100	35	-	20	50	-	
1000		250	65	-	20	50	-	
1000		1000	36	-	20	50	100	
1000		2500	66	-	20	50	100	

**) Spare part for ULTRAFLOW® type 65-S/R/T q_p 1,000. Configured 65-5-FGCR. No flow info.*

Accessories

Description	Type number
Flange gaskets (PN25)	
DN150 (1 pc.)	1150-140
DN200 (1 pc.)	1150-139
DN250 (1 pc.)	1150-141
Short distance piece	6561-332
Supply	
D-cell lithium battery with two-pole connector	65000000-2000
230 VAC supply module	65000000-7000
24 VAC supply module	65000000-8000

Cables

ULTRAFLOW® 54 DN150-250, when ordered with MULTICAL®, is delivered with 2.5 m signal cable, optionally 5 or 10 m. The cable is mounted in the ULTRAFLOW® 54 electronics box and in MULTICAL® 6xx.

When ULTRAFLOW® 54 is ordered with MULTICAL® 8xx, the calculator is delivered separately. Hence the cable is only mounted in the ULTRAFLOW® 54 electronics box.

ULTRAFLOW® 54 DN150-250, when ordered as a separate flow sensor, is optionally available with signal cable in lengths of 2.5, 5 or 10 m. The cable is mounted in the ULTRAFLOW® 54 electronics box.

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.