

Ultrasonic flowmeter type SHARKY 475



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Introduction

1

1.1 Preface

These instructions contain all the information required to commission and use the ultrasonic flowmeter type SHARKY 475.

These instructions are intended to assist personnel performing mechanical installation, electrical connection and commissioning of the device, as well as service and maintenance engineers.

General safety instructions

2

2.1 Safety notes



For safety reasons it is important that the following points, especially those marked with a warning sign, are read and understood before the system is installed:

- Installation, connection, commissioning and service must be carried out by personnel who are qualified and authorized to do so.
- It is very important for any person working with the equipment to read and understand the instructions and directions provided in this manual and follow instructions and directions before using the equipment.
- Only personnel authorized and trained by the owner of the equipment may operate the equipment.
- Installation personnel must ensure that the measuring system is correctly connected in accordance with the connection diagram.
- For applications involving high working pressures or media that can be dangerous to people, surroundings, equipment or other in the event of pipe fracture, HYDROMETER recommends taking precautions such as special placement, shielding or installation of a safety guard or safety valve prior to installation of the sensor.
- Repair and service may be performed by approved HYDROMETER personnel only.

2.2 Manufacturer's design and safety statement



- Responsibility for the choice of flowmeter pipe material as regards abrasion and corrosion resistance lies with the purchaser. The effect of any change in process medium during operation of the meter should be taken into account. Incorrect selection of flowmeter pipe material could lead to failure of the flowmeter.
- Stresses and loading caused by earthquakes, traffic, high winds and fire damage are **not** taken into account during flowmeter design.
- Do **not** install the flowmeter such that it acts as a focus for pipeline stresses. External loading is **not** taken into account during flowmeter design.
- Please be aware of the risk of installing the sensor in a highly vibrating environment. Parts may shake loose and the complete system must be monitored in that case.
- Flanges and joints as well as related pressure/temperature (p/t) classification has been described in EN 1092-1. See ferrite steel group 1E1: table 15.
- Ensure that the pressure and/or temperature ratings indicated on the data label or in this Operating Instructions are **not** exceeded during operation.
- It is recommended that all installations include an appropriate safety valve and adequate means for draining.
- Under the „Pressure Equipment Directive“ (PED), this product is a pressure accessory and not approved for use as a safety accessory, as defined by the PED.

Battery operation:

- When battery operated, SHARKY 475 is not covered by the „Low Voltage Directive“ (LVD). Hence, an installation can be considered in conformance with LVD, only when the SHARKY 475 is connected to equipment conforming to LVD.
- Lithium batteries are primary power sources with high energy content. They are designed to meet the highest possible safety standard. They may, however, present a potential hazard if they are abused electrically or mechanically. This is in most circumstances associated with the generation of excessive heat, where increased internal pressure may cause the cell to rupture.

Thus the following basic precautions should be observed when handling and using lithium batteries:

- Do not short-circuit, recharge, overcharge or connect with false polarity.
 - Do not expose to temperature beyond the specified temperature range or incinerate the battery.
 - Do not crush, puncture or open cells or disassemble battery packs.
 - Do not weld or solder to the body of the battery.
 - Do not expose contents to water.
- Lithium batteries are regulated under United Nations Model Regulations on Transport of Dangerous goods, UN document ST/SGAC.10-1, 12th revised edition, 2001. UN no. 3091 class 9 covers lithium batteries packed with or inside the equipment. UN no. 3090 class 9 covers transportation of batteries on their own.

Thus the following basic precautions should be followed when transporting lithium batteries:

- Transport only in special packaging with special labels and transportation documents.
 - Exercise caution in handling, transporting and packing in order to prevent short circuiting of the batteries.
 - The gross mass of the package is limited according to the type of transportation.
In general, a gross mass below 5 kg is acceptable for all forms of transportation.
- Remove the battery from the transmitter before returning the flowmeter to HYDROMETER for service or warranty claim.

3.1 Product description

The 2-track ultrasonic flowmeter SHARKY 475 comes as 230 V mains powered and is designed to measure water flow in district heating plants, local stations, substations, chiller plants and other general water applications including treated waste water.

SHARKY 475 is a type-approved flowmeter dedicated to measure flow in a heating system. SHARKY 475 is approved according to heat meter standards EN 1434 class 2, OIML R75 class 2, and MID.

SHARKY 475 may be marked „neutral“ or have a country-specific approval label, depending on selection of flowmeter setup when ordering.

Flowmeter type SHARKY 475 is available in either compact or remote version and electrical wiring and operation are identical for both types.

The distance between sensor and transmitter is 10 meters.

In SHARKY 475 parameters and pulse output are preset from factory and protected via software lock.

In SHARKY 475 - metrological parameters and pulse output are preset from factory and protected via hardware lock and sealings to avoid manipulation.

No settings of installation are required as all parameters are set from factory (plug and play).

Media temperature range compact for DN 100 ... 800 sensors:
2 ... 120 °C (35,6 ... 248 °F); (MID: 15 ... 120 °C / 59 ... 248 °F).

Media temperature range remote version DN 100 ... 800 steel sensors:
2 ... 200 °C (35,6 ... 392 °F); (MID: 15 ... 200 °C / 59 ... 392 °F).

Accessories for correct pipeline assembly and use of flanges gaskets are not HYDROMETER responsibility.

3.2 Service

Failure information is available on the display. Failures are stored in memory, and can be accessed via the infra-red communication port.

4.1 Installation of sensor compact/remote versions

Requirement for straight inlet before flowmeter

In order to maximise performance it is necessary to have straight inlet and outlet flow conditions before and after the flowmeter.

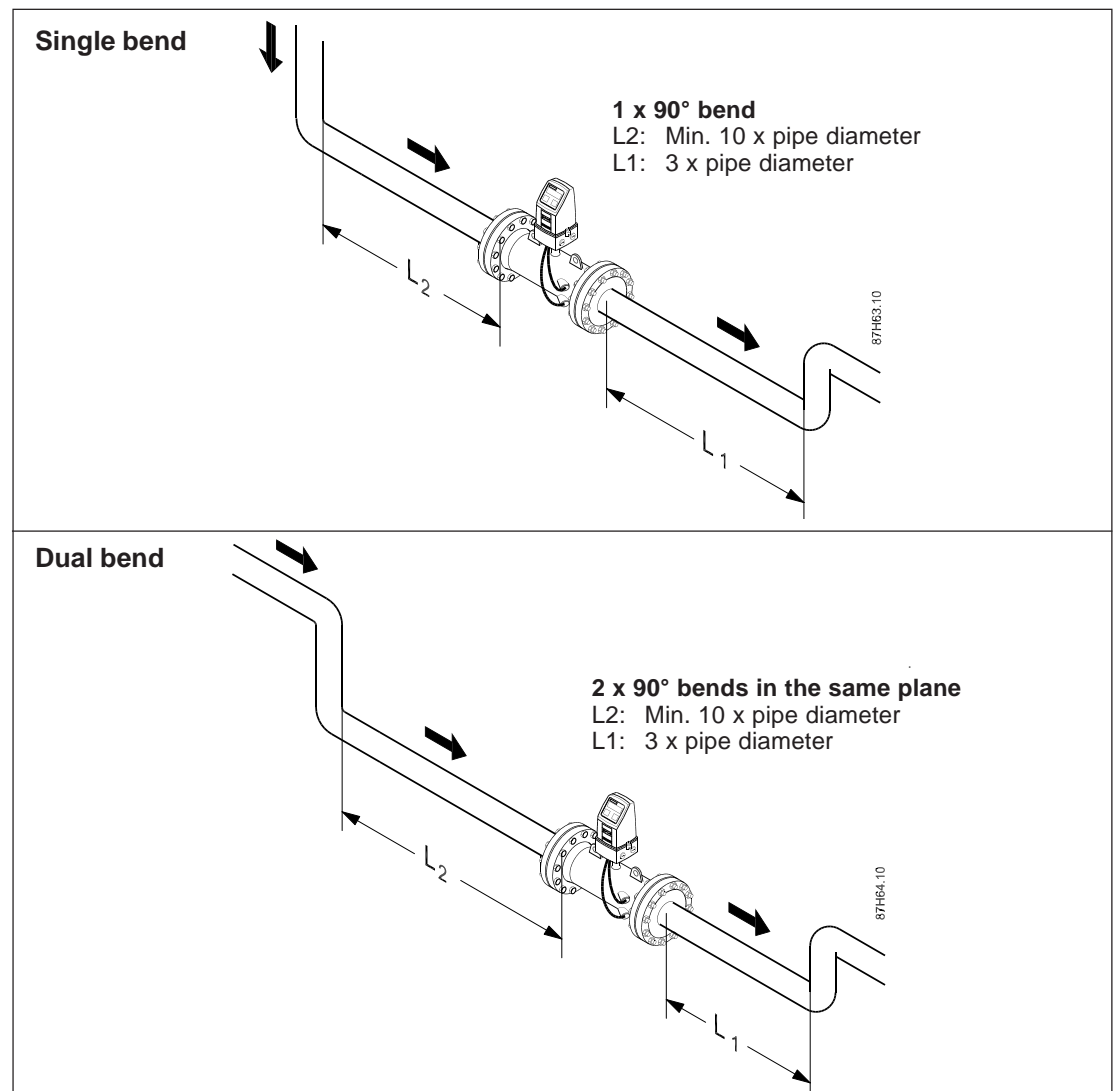
Furthermore, a minimum distance between flowmeter and pumps and valves must be respected. It is also important to centre the flowmeter in relation to flanges and gaskets.

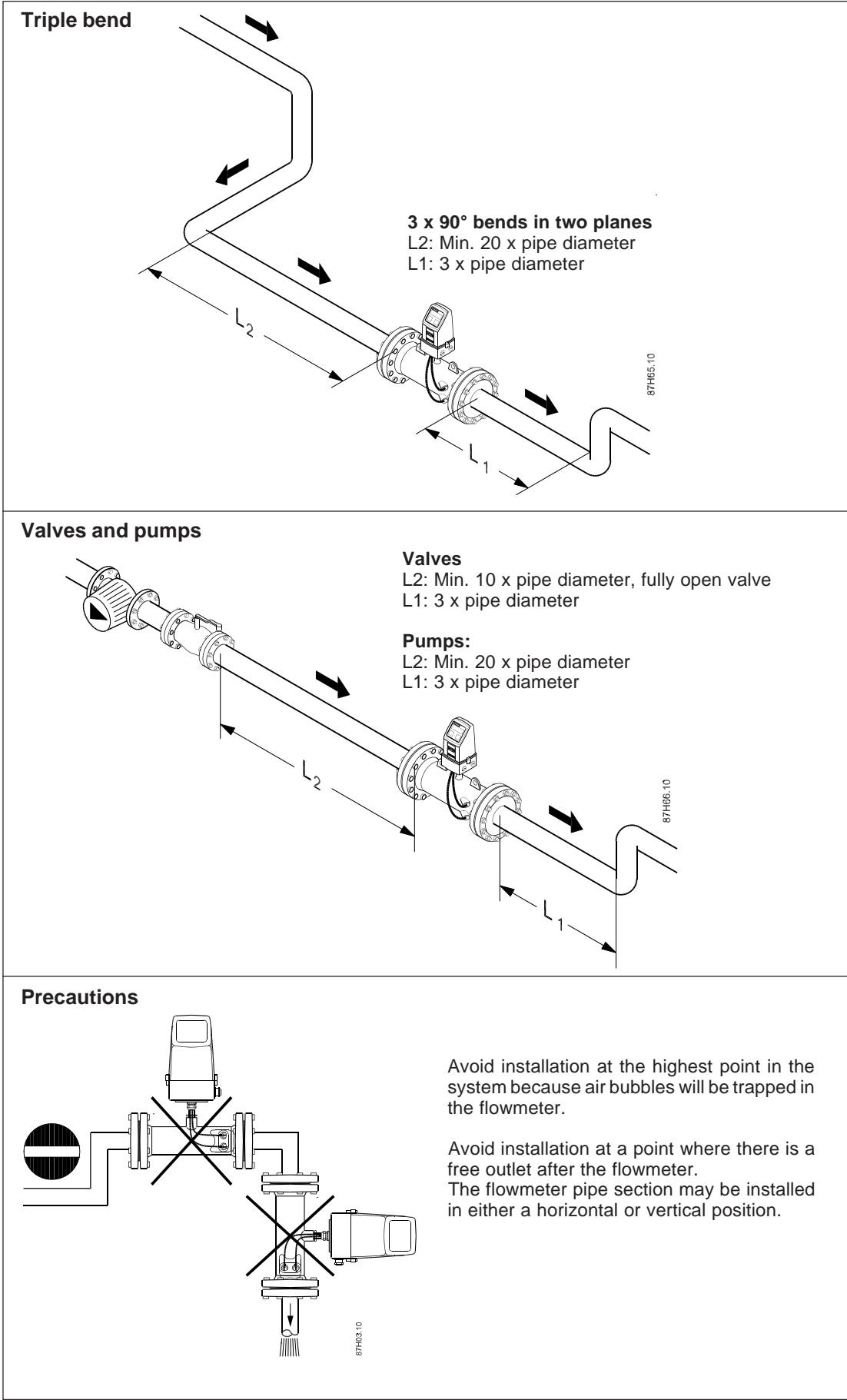
Make sure that the flowmeter is positioned as low as possible to prevent air from being trapped in the flowmeter at the transducers.

Find a position on the pipeline where the inlet pipe to the flowmeter has a straight length as specified below.

Note

For MID approved SHARKY 475 systems the following inlet pipe is recommended:
L2 for sizes \geq DN100: 1.5 m





4.2 Installation of transmitter compact/remote versions

4.2.1 General information

The transmitter is packed separately - ready for plug-in into the base part.

SHARKY 475 is 230 V mains powered. Determine the flowmeter power source type by reading the label or via the product code.

Important:

On compact versions, all transducer cables are pre-mounted from factory.

Mounting of output pulse cables is identical for compact and remote versions.

4.2.2 Insulation

Both versions can be insulated.

HYDROMETER always recommends insulation of the sensor in the **compact version** to prevent heat transfer to the transmitter.

4.2.3 Wiring diagram for mains power supply, pulse output



Always disconnect mains supply before removing the transmitter top part (mains powered units only).

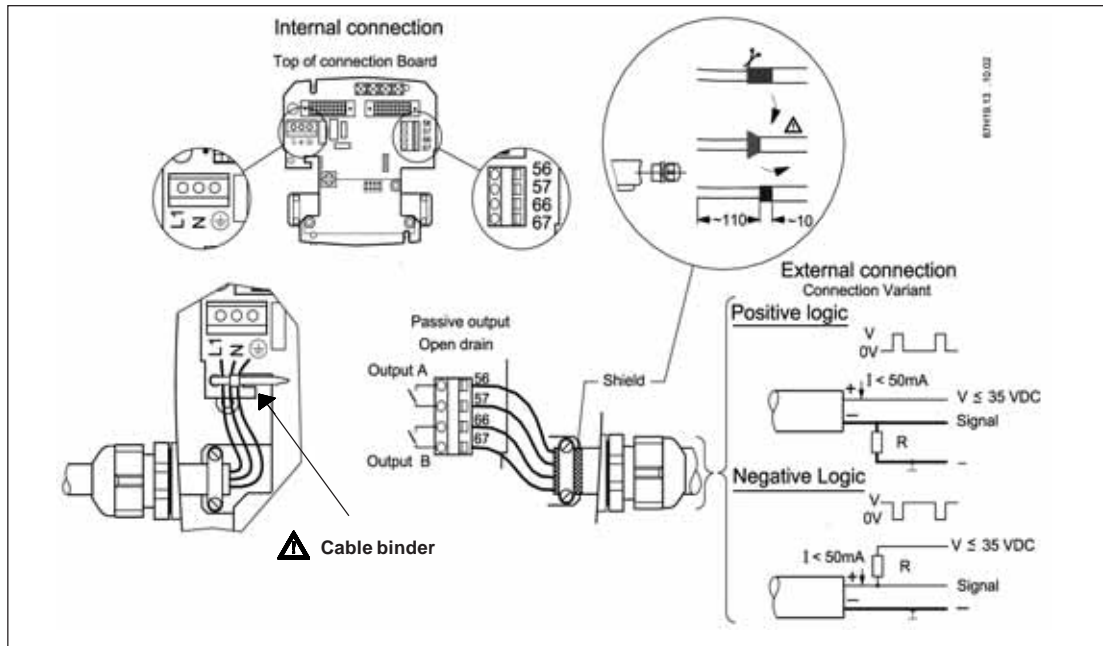


Important

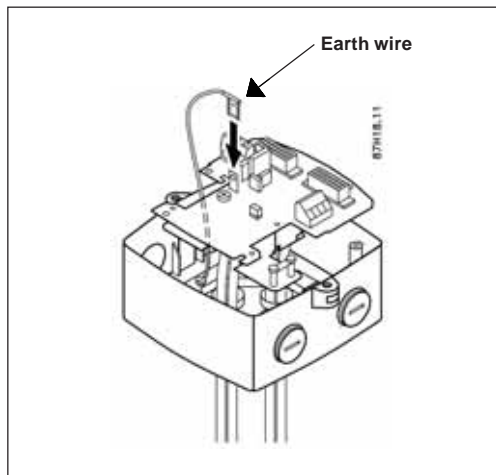
Cable binder **must** be fastened to printed circuit board according to drawing.

Top of connection board

Mains powered units: Terminal L1, N, terminal \oplus
Voltage: 87 V AC...250 V AC



Potential hazards grounding



In mains powered units the protective earth wire must be connected to the PE \oplus on the printed circuit board using the connector.

Do **not** touch the rear of the printed circuit board.

4.2.4 Mains powered units with back-up battery

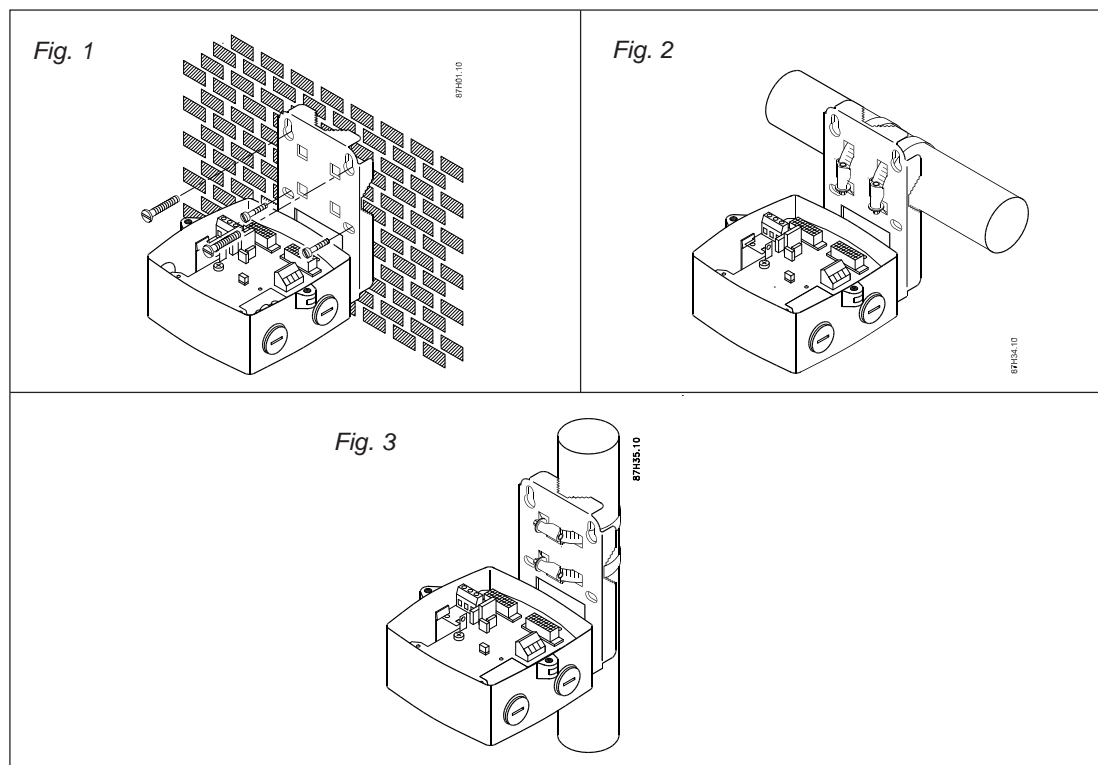
If SHARKY 475 is mains powered, a battery can be inserted as back-up power supply to ensure continuous operation in the event of power failure. Depending on duration and numbers of mains power failures, the battery has a lifetime of minimum 6 years (one battery). (Average: one mains power failure per day (duration 1 hour) for min. 6 years).

Check that the mains power supply symbol appears in the display when installation is complete. This symbol indicates that installation is correct. If the mains power supply connection is not established correctly, the flowmeter will operate on battery power only. Battery life will be significantly shorter if batteries are used continuously as opposed to only occasionally in a back-up function.

4.3 Installation of the transmitter, remote version

4.3.1 Installation of wall/pipe bracket

1. Loosen the 2 screws on each side of the unit and remove the transmitter.
2. Mount the wall bracket in an appropriate place taking the coaxial cable length into consideration, and allowing adequate space for cable inlets underneath and on both sides.

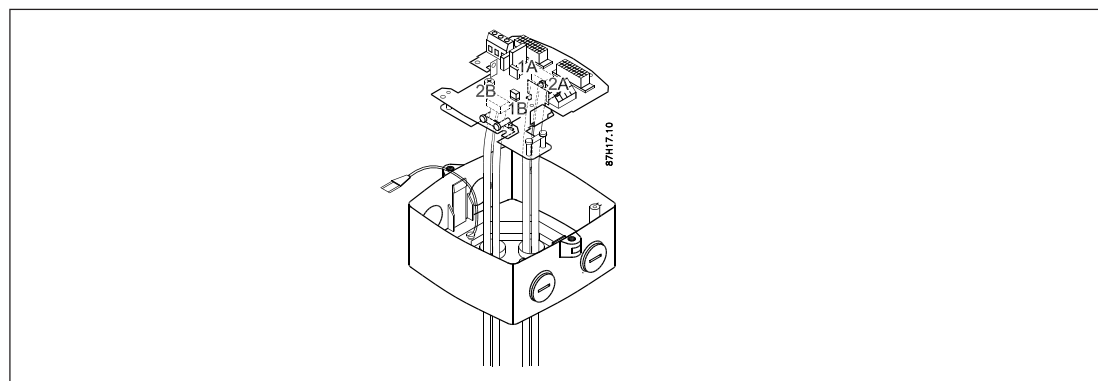


4.3.2 Connection of transducer cables

SHARKY 475 is supplied with 4 separate cables. Cables can be used on all transducers. (The cables are not paired with a specific transducer).

Snap out the connection plate and loosen grounding wire.

Cables are manufactured with crimp on cable ends. Smoothly push the cables one by one from underneath the base through the glands and adjust all four cable ends approximately 100 mm from the upper frame of the base (see figure).



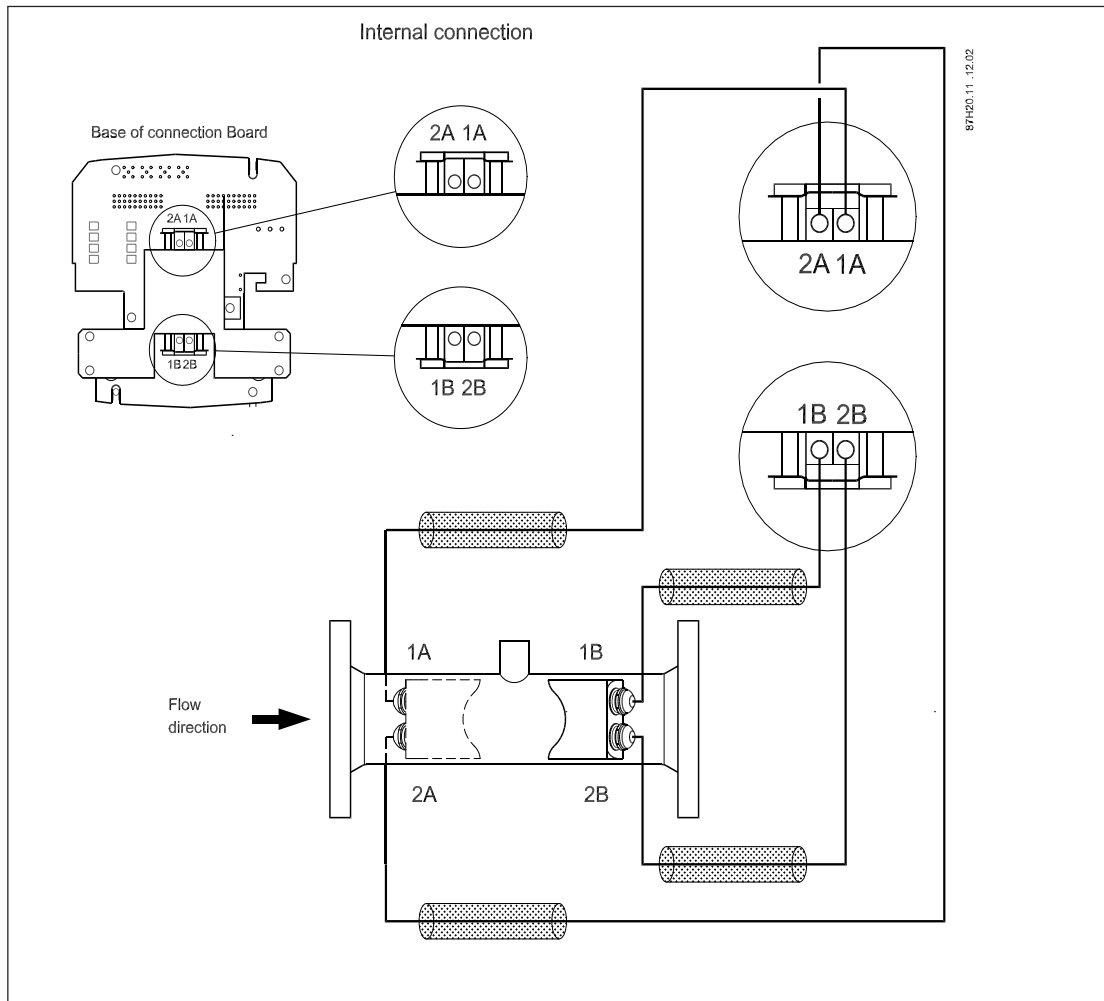
4.3.3 Transducer connection scheme

Cables 1A and 1B first track, 1A upstream, 1B downstream.
Cables 2A and 2B second track, 2A upstream, 2B downstream.

Note

Do **not** change the length of the four cables, as this will influence the accuracy of the unit.

4.3.4 Wiring diagram, base of connection board



5.1 Pulse output A and B setting

Install the pulse cable through the glands, **before pushing** the printed circuit board back into place in the base part.

Preset pulse output settings dedicated to energy calculator type ENERGY-INT 6.

Output A, terminals 56/57:

Pulse rate can be seen on the transmitter side label and **must correspond** to the pulse setting of the energy calculator type.

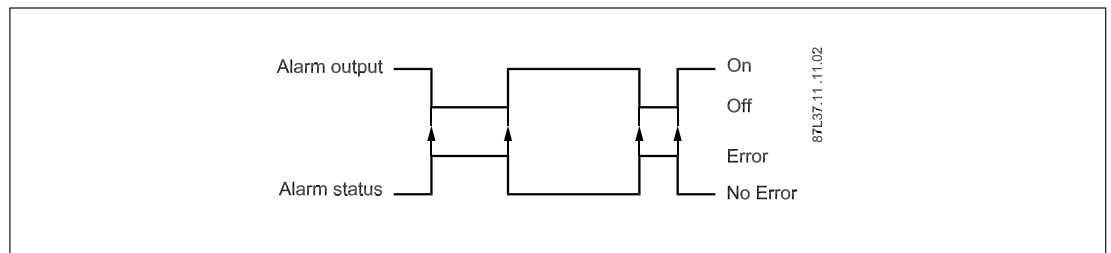
Factory pre-settings SHARKY 475 . (Pulse width 5 ms).

DN	Pulse setting (liter/pulse)
100	2.5
125	2.5
150	10
200	10
250	10
300	50
350	50
400	50
500	100
600	100
700	100
800	100

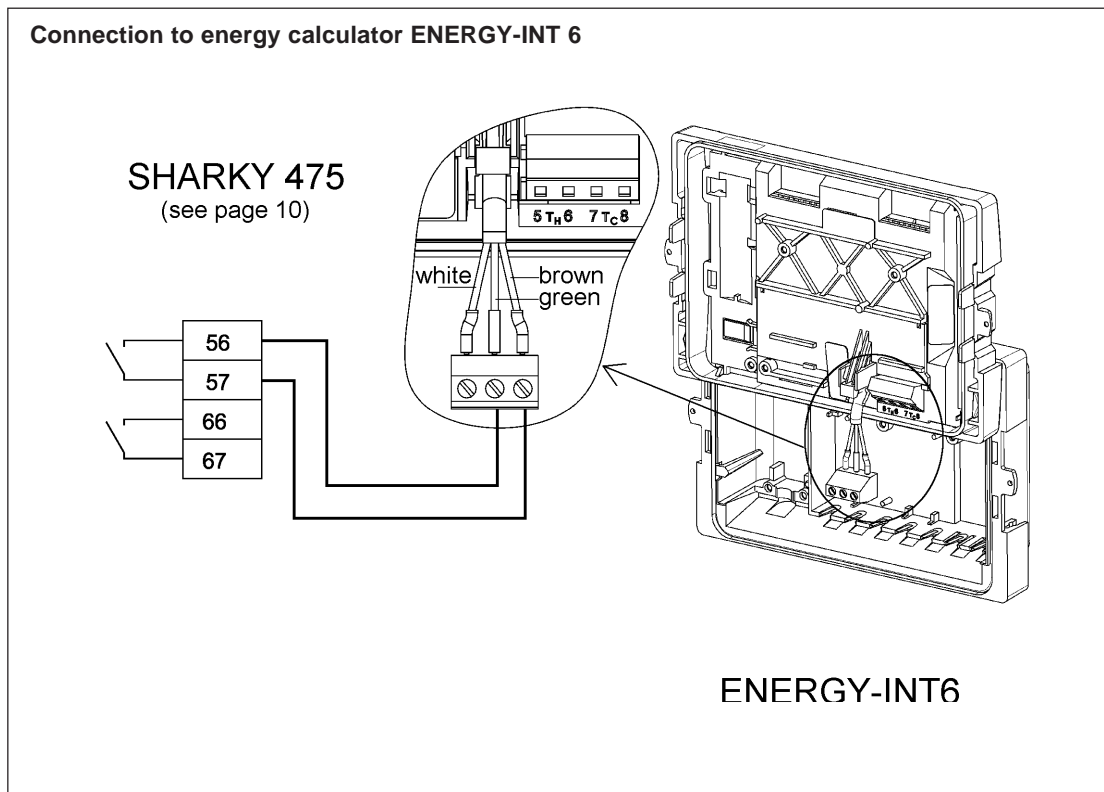
Output B, terminals 66/67:

Preset to alarm indication.

Example: If track 1 is not measuring, a „triangle“ alert appears on the display. The failure code „F1“ appears in display menu 4, and the relay output terminals switch to „off“.



5.1.1 Wiring diagram for connection to energy calculator type ENERGY-INT 6



Distance between energy calculator ENERGY-INT 6 and SHARKY 475 = 10 meter.

Important

Pulse output from the flowmeter **must** correspond to pulse input setting on the energy calculator.

6.1 Flowmeter operation via push button and display

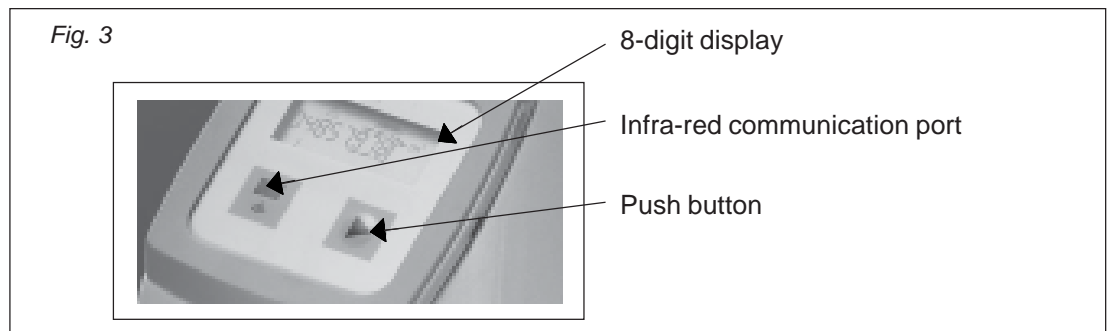
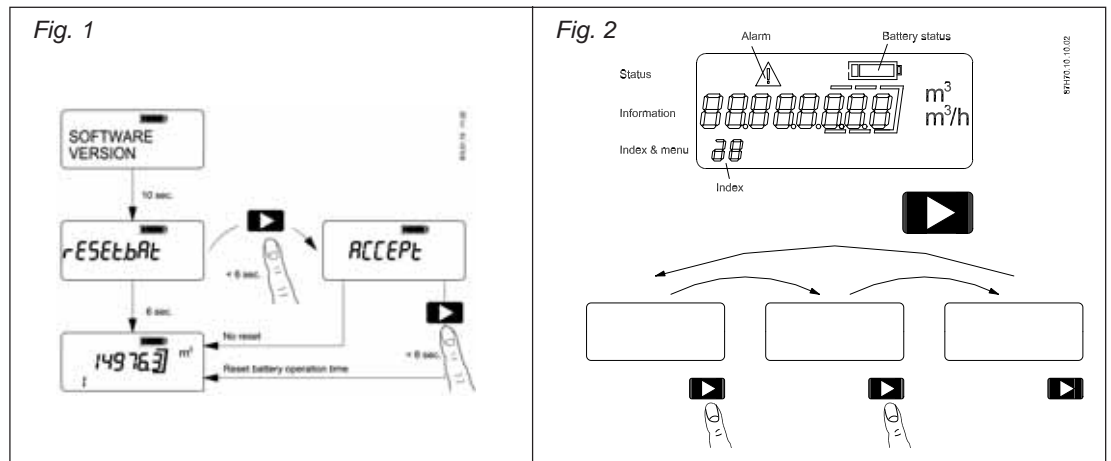
The transmitter control panel is designed with a single push button and a digital display for optimal dialog.

After fitting new batteries, reset the internal power calculation counter to correctly indicate the power capacity.

When new batteries are installed, the flowmeter startup routine begins. First, the display shows the active software version. After ten seconds the message „reset.bat“ will appear. Press the push button within six seconds to reset the internal power calculation counter. The message „accept“ will appear. When the push button is pressed again within six seconds, the internal battery counter will be reset, and the battery indicator will show „full“.

Push button

Activate the push button to toggle to the next index and related information.



6.2 Operator menu

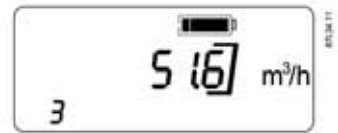
Menu 1

Flow volume totalizer 1.
Battery icon shows full.



Menu 3

Actual flow rate.
Negative values indicate reverse flow.



Menu 4

Failure information.
Each code indicates a specific failure.

F	No failure (normal indication)
F1	Track 1 not measuring
F2	Track 2 not measuring
F3	Internal failure
F4	Internal failure
F5	Battery low
F6	Flow overload
F7	Pulse freq. overload output A
F8	Pulse freq. overload output B
F9	Consumption interval warning/alarm

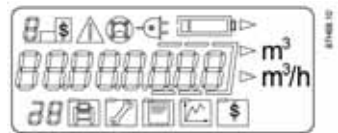
Failure code combinations:

F12 is the equivalent of F1 and F2 simultaneously:
track 1 and track 2 are not measuring.



Display test

Check of all segments.
Display toggles between all segments on/off.



For special versions more menu points can be made accessible.

6.3 Information symbols

The status information symbols show the actual status of important flowmeter elements.

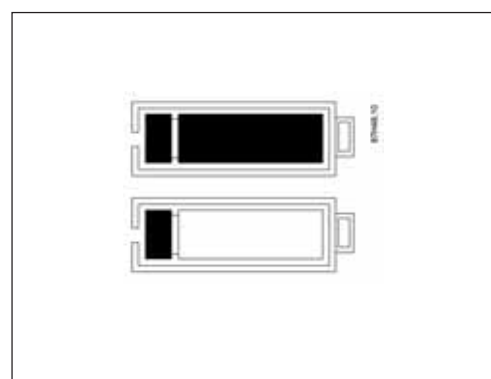
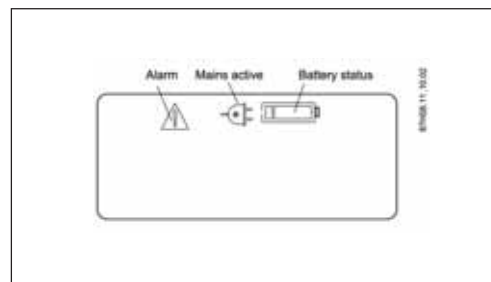
The warning symbol appears when the ultrasonic sensor does not measure or when a failure occurs according to menu 4.

The warning symbol disappears when the problem is rectified.

The mains power supply symbol appears when mains power is connected to the transmitter.

There are two symbols for battery charge status. The „battery full“ symbol indicates the battery charge is above the warning level (6-year hour counter).

The „battery low“ symbol indicates that the battery charge is below the warning level and the battery should be replaced. The battery low symbol indicates only that the battery charge is below a pre-set level, not that the charge is zero. Flow measurement continues uninterrupted when the battery low symbol appears, until battery is completely drained.



Troubleshooting

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7.1 Alarm code

Alarm code	Failure	Remedy
Blank display	Battery plug not connected, or battery empty, mains power interrupted	Check flowmeter version. Battery version not able to run on mains power Wrong battery version: Replace battery pack
F1	Track 1 (upper track) not measuring	No water in upper part of pipe and/or cables or transducer 1A or 1B defect
F2	Track 2 (lower track) not measuring	No water in lower part of pipe and/or cables or transducers for 2A or 2B defect
F3	Internal software failure	Contact supplier
F4	Internal software failure	Contact supplier
F5	Battery charge below preset limitation	Replace battery pack
F6	Flow exceeds preset flow rate in unit (max. speed 10 m/s)	Water flow in pipe too fast
F7	Pulse output A overflow	Pulse output exceeds 100 Hz
F8	Pulse output B overflow	Pulse output exceeds 100 Hz
F9	Consumption interval warning/Alarm	The consumption warning monitors whether the actual consumption on totalizer 1 is above or below the consumption limits. During current log interval the limit was exceeded. This is only a warning and has no influence on the device functions.

Example:

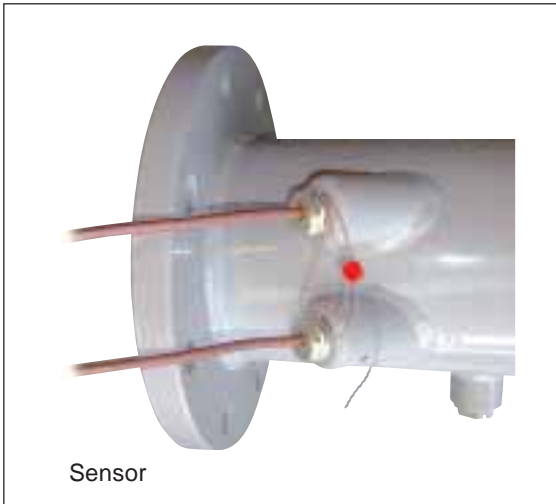
Failure information in display F12. This indicates a combination of failure codes F1 and F2.

Diagnosis:

No water in pipe, or track 1 and 2 cables defect, or transducers defect.

Sealing

8.1 User sealing of the SHARKY 475



8.2 Verification of the SHARKY 475

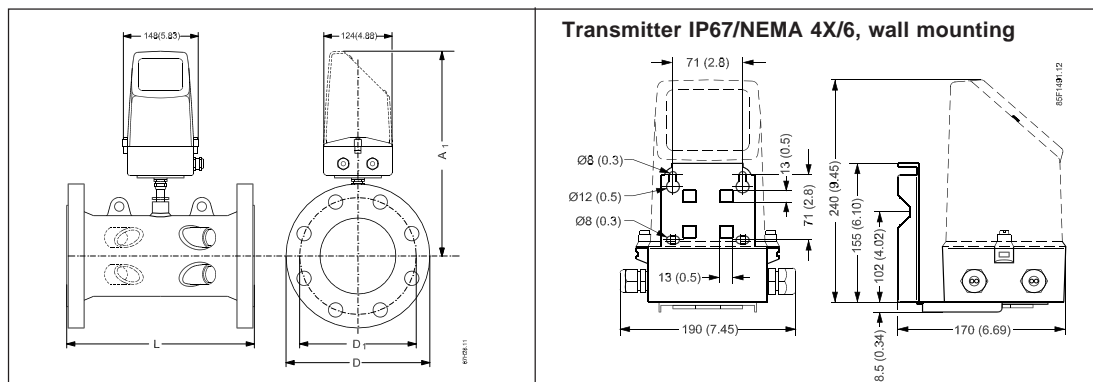


9.1 Technical data SHARKY 475

Description	Specification
Transmitter	
Enclosure	IP67 according to EN 60529 and DIN 40050 (NEMA 4X/6)
Ambient temperature	0 °C ...60 °C (32 °F.... 140 °F)
Storage temperature	-35 °C...85 °C (-40 °F...185 °F)
Installation	Cable max. 5, 10, 20, 30 m (16.4, 33, 65, 90 ft) from sensor
Mechanical vibration	2 g, 1...800 Hz sinusoidal in all directions to IEC 68-2-6
Design	Fibre glass reinforced polyamide in light-gray color
Power supply	Replaceable battery pack 3.6 V LiSOCl (Lithium Thionyl Chloride) <ul style="list-style-type: none"> • Battery: replaceable 3.6 V LiSOCl (Lithium Thionyl battery pack 32 Ah) • Mains: 87 ... 265 V AC (50 ... 60 Hz)
Battery change interval	6 years at 60 °C (140 °F) operation
Display	LCD, 8-digit display for information, index and icons for status information
Push button	One push button for toggling between display information
Measuring function	0.5 Hz battery mode or 20 Hz mains powered
Communication	IrDA on the display panel (MODBUS RTU protocol)
Digital output	Two passive galvanically isolated open drain-mos outputs A and B Max. ±35 V, 50 mA
Pulse output A	Preset to pulse output for forward flow
Pulse output B	Preset to alarm for present failure
Pulse width	5, 10, 20, 50, 100, 200, 500 ms
Volume units	SHARKY 475 : m ³
Flow units	SHARKY 475 : m ³ /h (default)
Alarm codes	Track 1 and 2 measuring, internal failure, battery low, flow overload, pulse output frequency overload, consumption interval warning
Cable length	Max. 10 meter between transmitter and pipe (factory sets: 5, 10, 20, 30 m)
EMC	Emission EN 61000-6-4 Immunity EN 61000-6-2
Weight	Transmitter: 1.5 kg (3 lb)
Sensor	
Pipe design	2-track sensor with flanges and integrated transducers wet calibrated from factory
Nominal size welded version	DN 100, 125, 150, 200, 250, 300, 350, 400, 500, 600, 700, 800
Pressure rate	PN 16, PN 25, PN 40, EN 1092-1
Pipe material	Carbon Steel EN1.0345 / p235GH
Transducer design	Integrated version welded onto the pipe
Transducer material	Stainless steel AISI316 (1.4404)
Media temperature	Compact: DN 100 ... 800: 2 ... 120 °C (35.6 ... 248 °F) ¹⁾ Remote: DN 100 ... 800: 2 ... 200 °C (35.6 ... 392 °F) ¹⁾

1) MID: minimum temperature 15 °C (59 °F)

9.2 Dimensional drawings for SHARKY 475



9.2.1 Pipe dimensions for SHARKY 475

Size	PN 16		PN 25		PN 40		A1	D	D1	Lift hug
	L	Weight	L	Weight	L	Weight				
DN	mm	kg	mm	kg	mm	kg	mm	mm	mm	
100	350+0-2	15	-	-	350+0-3	18	375	220	180	No
125	350+0-2	18	-	-	350+0-3	24	380	250	210	No
150	500+0-3	28	-	-	500+0-3	34	390	285	240	Yes
200	500+0-3	38	500+0-3	47	500+0-3	55	414	340	295	Yes
250	600+0-3	60	600+0-3	76	600+0-3	91	440	405	355	Yes
300	500+0-3	66	500+0-3	81	-	-	466	460	410	Yes
350	550+0-3	94	550+0-3	121	-	-	495	520	470	Yes
400	600+0-3	124	600+0-3	153	-	-	507	580	525	Yes
500	625+0-3	190	625+0-3	244	-	-	558	715	650	Yes
600	750+0-3	303	750+0-3	365	-	-	609	840	770	Yes
700	875+0-3	361	875+0-3	552	-	-	660	910	840	Yes
800	1000+0-3	494	1000+0-3	770	-	-	710	1025	950	Yes

Size	PN 16		PN 25		PN 40		A1	D	D1	Lift hug
	L	Weight	L	Weight	L	Weight				
inch	inch	lb	inch	lb	inch	lb	inch	inch	inch	
4	13.77+0-0.08	33	-	-	13.77+0-0.12	40	15	8.66	7.09	No
5	13.77+0-0.08	40	-	-	13.77+0-0.12	53	15.2	9.84	8.27	No
6	19.68+0-0.12	62	-	-	19.68+0-0.12	75	15.6	11.22	9.45	Yes
8	19.68+0-0.12	84	19.68+0-0.12	104	19.68+0-0.12	121	16.30	13.39	11.61	Yes
10	23.62+0-0.12	132	23.62+0-0.12	168	23.62+0-0.12	201	17.32	15.94	13.98	Yes
12	19.68+0-0.12	146	19.68+0-0.12	179	-	-	18.35	18.11	16.14	Yes
14	21.65+0-0.12	207	21.65+0-0.12	267	-	-	19.8	20.8	18.8	Yes
16	23.62+0-0.12	273	23.62+0-0.12	337	-	-	19.96	22.83	20.67	Yes
20	24.61+0-3	419	24.61+0-3	538	-	-	21.97	28.15	25.59	Yes
24	29.53+0-0.12	668	29.53+0-0.12	805	-	-	23.98	33.07	30.31	Yes
28	34.45+0-0.12	796	34.45+0-0.12	1217	-	-	25.98	35.83	33.07	Yes
32	39.37+0-0.12	1089	39.37+0-0.12	1698	-	-	27.95	40.35	37.40	Yes

Notes:

- Weight for transmitter/electronics 1.5 kg (3.3 lb).
- D and D1 are values for standard versions (with standard flanges).
For versions with higher pressure ratings - see EN 1092-1.
- - Means not available.

Ordering

10.1 Selection and ordering data

			Order-No.	Order code
Flowmeter SHARKY 475 (type approved)			7ME 3 4 1 3 -	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Diameter	Qp [m ³ /h]	Qs [m ³ /h]		
DN 100 / 4"	60 ¹⁾	120	1 P	
DN 100 / 4"	60 ¹⁾	180	1 Q	
DN 100 / 4"	120 ²⁾	180	1 R	
DN 125 / 5"	100 ¹⁾	200	1 T	
DN 125 / 5"	100 ¹⁾	280	1 U	
DN 125 / 5"	200 ²⁾	280	1 V	
DN 150 / 6"	150 ¹⁾	300	2 B	
DN 150 / 6"	150 ¹⁾	420	2 C	
DN 150 / 6"	300 ²⁾	420	2 D	
DN 200 / 8"	250 ¹⁾	500	2 F	
DN 200 / 8"	250 ¹⁾	700	2 G	
DN 200 / 8"	500 ²⁾	700	2 H	
DN 250 / 10"	400 ¹⁾	800	2 K	
DN 250 / 10"	400 ¹⁾	1120	2 L	
DN 250 / 10"	800 ²⁾	1120	2 M	
DN 300 / 12"	560 ¹⁾	1120	2 P	
DN 300 / 12"	560 ¹⁾	1560	2 Q	
DN 300 / 12"	1120 ²⁾	1560	2 R	
DN 350 / 14"	750 ¹⁾	1500	2 T	
DN 350 / 14"	750 ¹⁾	2100	2 U	
DN 350 / 14"	1500 ²⁾	2100	2 V	
DN 400 / 16"	950 ¹⁾	1900	3 B	
DN 400 / 16"	950 ¹⁾	2660	3 C	
DN 400 / 16"	1900 ²⁾	2660	3 D	
DN 500 / 20"	1475 ¹⁾	2950	3 K	
DN 500 / 20"	1475 ¹⁾	4130	3 L	
DN 500 / 20"	2950 ²⁾	4130	3 M	
DN 600 / 24"	2150 ¹⁾	4300	3 T	
DN 600 / 24"	2150 ¹⁾	6020	3 U	
DN 600 / 24"	4300 ²⁾	6020	3 V	
DN 700 / 28"	2900 ¹⁾	5800	4 F	
DN 700 / 28"	2900 ¹⁾	8120	4 G	
DN 700 / 28"	5800 ²⁾	8120	4 H	
DN 800 / 32"	3800 ¹⁾	7600	4 P	
DN 800 / 32"	3800 ¹⁾	10640	4 Q	
DN 800 / 32"	7600 ²⁾	10640	4 R	




1) EN 1434 flow values
2) OIML R75 flow values

		Order-No.	Order code
Flowmeter SHARKY 475 (type approved)		7ME 3 4 1 3 -	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Flange norm and pressure rating EN 1092-1 PN 16 (DN 100 ... 800) PN 40 (DN 100 ... 250)		C	
Remote version, max. 200 °C (392 °F) 10 m (32.8 ft)		E	
Approvals / pulse output Without approval (neutral) Selectable pulse output (following code can be 3...9)		3	
With approval marks and seal Selectable pulse output (following code can be 3...9)		0	
		2	

Note:
Typical pulse output setting, see table on p.14
(chapter 5.1).

	Order-No.	Order code
Flowmeter SHARKY 475 (type approved)	7ME 3 4 1 3 -	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Pulse value		
2.5 l/pulse (DN 100, DN 125 ENERGY-INT 6)		3
10 l/pulse (DN 150...DN 250 ENERGY-INT 6)		4
50 l/pulse (DN 300...DN 400 ENERGY-INT 6)		5
100 l/pulse (DN 500...DN 800 ENERGY-INT 6)		6
Transmitter SHARKY 475 IP67/NEMA 4X/6, 115 ... 230 V AC		B
Country / approval type		
No approval mark		A
MID-Approval (EN 1434/OIML R75), English		R
MID-Approval (EN 1434/OIML R75), German		S
Pulse width setup		
5 ms		2

10.2 Accessories

Description	Order No.	Symbol
PG 13.5 set for SHARKY 475 PG 13.5 set for dual coax	FDK-083G0228 A5E00694500	
Complete connection box, remote version	A5E00694509	
IrDA infrared interface	FDK-087L4163	
IrDA holder	A5E00695277	
Cable set (4 pcs.) 10 meter (PG 13.5 LT)	A5E00695479	

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