Technical
Information
TI 042D/06/en
No. 50091532

Ultrasonic Flow Measuring System *prosonic flow DMU 93*

Flexible – Cost-effective – Innovative

Flexible application

Clamp On
- The system is attached to the outside of the pipe
- No preliminary work on the measuring point required
- Pipe size range DN 50...3000 mm
- No wetted parts
- Suitable for measurement on highly corrosive materials
- No process interruption required to install
- No pressure rating limitation
- Ex Zone 1 and 2

Insertion
- For flow measurement in non sonically conductive pipe
- Economical alternative for large diameters
- Pipe size range DN 200.3000 mm
- Dual path available for >DN 400 mm
- Dual-path measurement, requires only short upstream piping
- Ex Zone 2

Simple operation
- Interactive operation for all parameters
- Two-line illuminated display
- Touch Control: operation without opening housing
- HART protocol for remote configuration

Reliable to use
- ISO 9001 certified
- High electromagnetic compatibility
- Comprehensive self-monitoring, diagnosis with alarm function
- EEPROM saves data upon power supply failure (no batteries required)

Wide application range
- Sensor in stainless steel, IP 68 ingress protection
- Insensitive to plant vibration
- No moving parts
- No pressure loss
- Simple and cost effective installation

Endress+Hauser
The Power of Know How

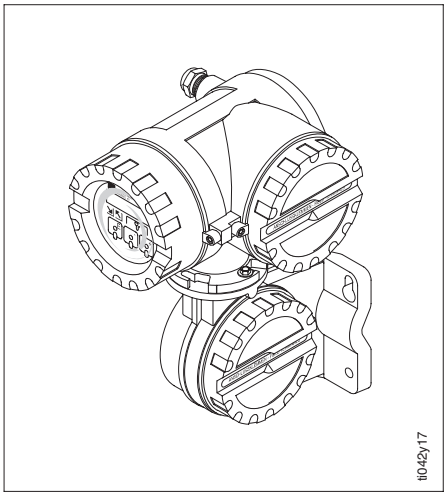
Measuring System

Application
Prosonic Flow is ideal for bi-directional measurement of clean or slightly dirty liquids.
Prosonic Flow Clamp On is mounted directly onto existing piping. Isolating or opening the piping is not required. Prosonic Flow Clamp On is especially suitable when retrofitting equipment since no interruption of the process is necessary.

Prosonic Flow Insertion extends ultrasonic flow measurements to piping with material of insufficient sonic conductivity.

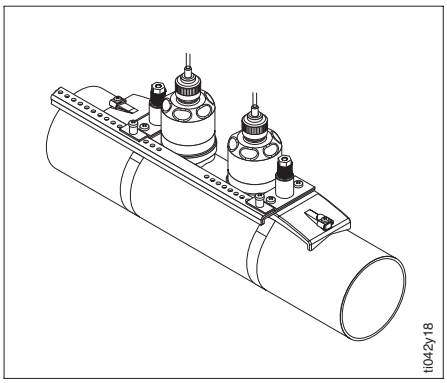
Prosonic Flow Insertion is equally suitable for retrofitting but requires a process interruption for installation.

Modular Measuring System
Prosonic Flow's modularity allows all sensors to be connected to the DMU 93 transmitter.
The measuring system measures both the volumetric flow and the sound velocity of the liquid. This means, for instance that various products can be identified or the quality of the product monitored.
Using the Quick Setup Prosonic Flow can be calibrated on-site for the specific application.



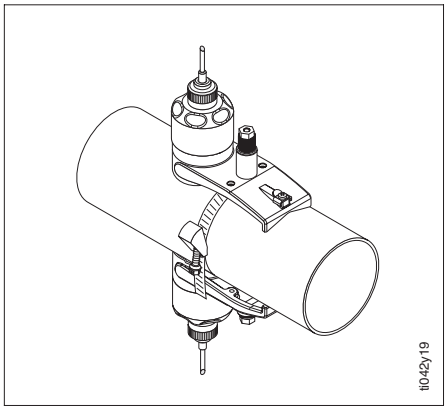
Transmitter DMU 93

Transmitter Prosonic Flow DMU 93
- Interactive operation with two-line illuminated display and three optical operating elements (Touch Control).
- "Quick Setup" interactive menu for guidance through commissioning.
- All outputs are galvanically isolated from the power supply, the measuring circuit and from each other.
- The standard transmitter accepts wall thickness sensor.
- Prepared for measuring with sensor pairs at the same or two different measuring points.
- Housing IP 67



Sensors DDU 10

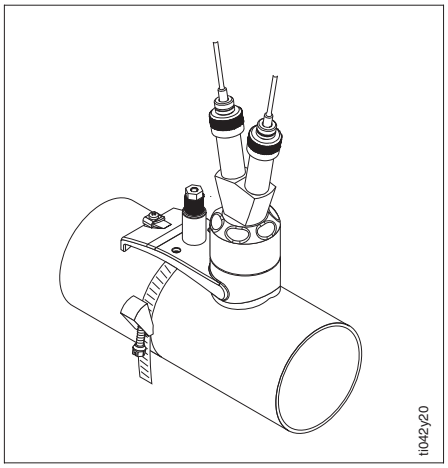
Clamp On flow sensors Prosonic Flow DDU 10
Sensor pair for measuring the volumetric flow and the sound velocity of the liquid at operating conditions.
- 2 sensor types for pipe sizes DN 50...3000 (2"...120")
- Temperature ranges –40 °C...+80 °C or 0...+170 °C
- Stainless steel housing, IP 68



Sensors DDU 18

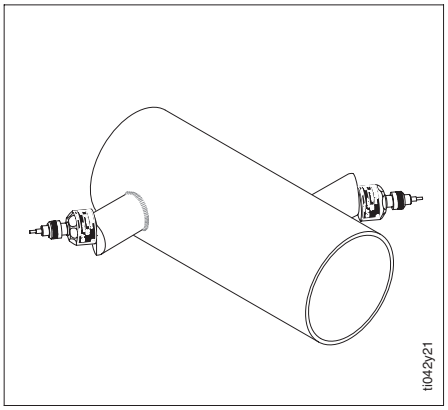
Sound velocity sensors Prosonic Flow DDU 18 (accessory)
Sensor pair for measuring the sound velocity. This is only required during commissioning of a Clamp On system if the sound velocity in the product is not known.
- Pipe sizes DN 50...3000 (2"...120")
- Temperature ranges –40 °C...+80 °C or 0...+170 °C
- Stainless steel housing, IP 68

Measuring System



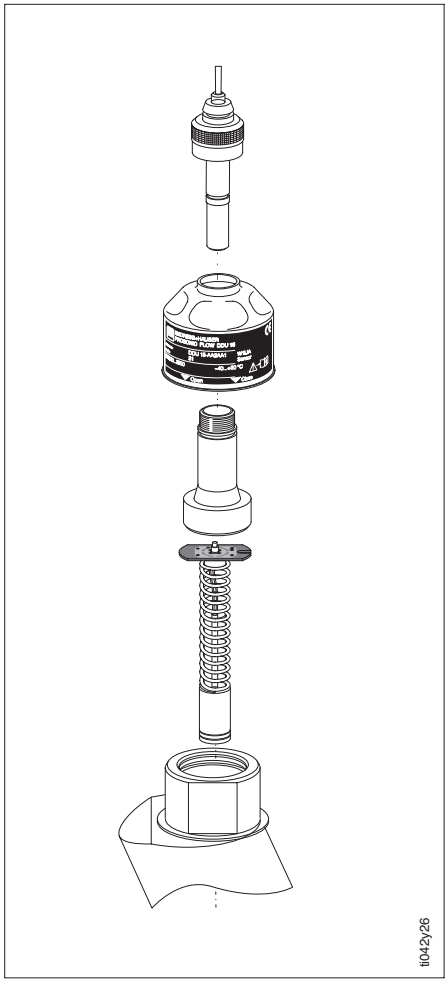
Sensor DDU 19

Wall thickness sensor
Prosonic Flow DDU 19 (accessory)
Sensor for measuring the pipe wall thickness. This is only required during commissioning of a Clamp On system if the wall thickness is not known.
- Measures wall thickness up to 75 mm
- Temperature range 0...+60 °C
- Stainless steel housing, IP 67



Sensor DDU 15

Insertion flow sensors
Prosonic Flow DDU 15
Sensor pair for measuring the flow and the sound velocity of the product during operation.
- 1 type of sensor for pipe sizes DN 200...3000 (8"...120")
- Temperature ranges –40 °C...+80 °C
- Stainless steel housing, IP 68
- Two versions: Single path and dual path



Exchange of the sensor element

- Exchange of the sensor element of insertion sensor.
  The active part of the sensor, the sensor element, is exchangeable during normal operation. No process interruption is required.

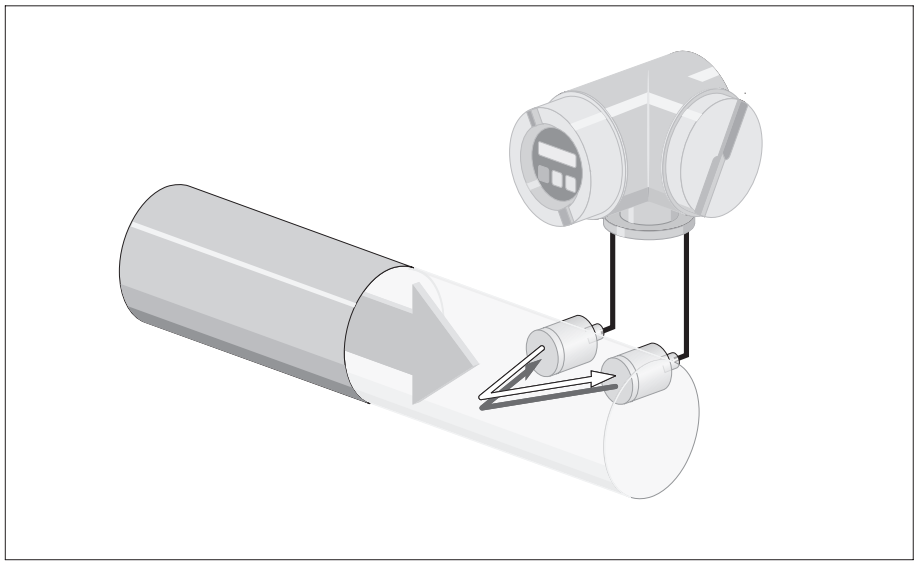
Operation of the Measuring System

Measuring principle
Prosonic Flow operates on the principle of transit time differences.
An acoustic signal (ultrasonic) is transmitted from one sensor to another. This can be either in the direction of flow or against the direction of flow.
The time (transit) that the signal requires to arrive at the receiver is then measured.
According to physical principles, the signal sent against the direction of flow requires longer to return than the signal in the direction of flow.

The difference in the transit time is directly proportional to the velocity of flow.

$v \sim \Delta t$
$Q = v \cdot A$

v = flow velocity
Δt = transit time difference between the signal in the direction of flow and against the direction of flow
Q = volumetric flow
A = pipe cross-sectional area



Operational safety
The Prosonic Flow measuring system fulfills all the following safety requirements:
- EN 61010
- EN 61000-4-6
- General EMC requirements according to EN 50081 Part 1 and 2 as well as EN 50082 Part 1 and 2
- as well as the NAMUR recommendations.

Extensive self-monitoring of the measuring system gives complete operational safety.

Ex version
Prosonic Flow is available in various Ex versions for instrument category 2G/3G (to ATEX guidelines for operation in Ex zones 1 and 2). The sensor loops are intrinsically safe (EEx ib IIB). The transmitter is available in an explosion-proof housing (EEx d/de).
More detailed information is found in the corresponding Ex documentation.
Your E+H representative will be pleased to assist you.

Function of the Transmitter

Function of the Prosonic Flow DMU 93

The Prosonic Flow transmitter DMU 93 converts the measured values supplied by the sensors into standardised output signals. Several outputs are available depending on configuration:

- 1 current output (with HART protocol) and pulse / frequency output
- 2 current outputs (Current output No. 1 with HART protocol)
- Relay 1 (can be configured, e.g. fault) Relay 2 (can be configured, e.g. limit value)
- Optional outputs for intrinsically safe version available

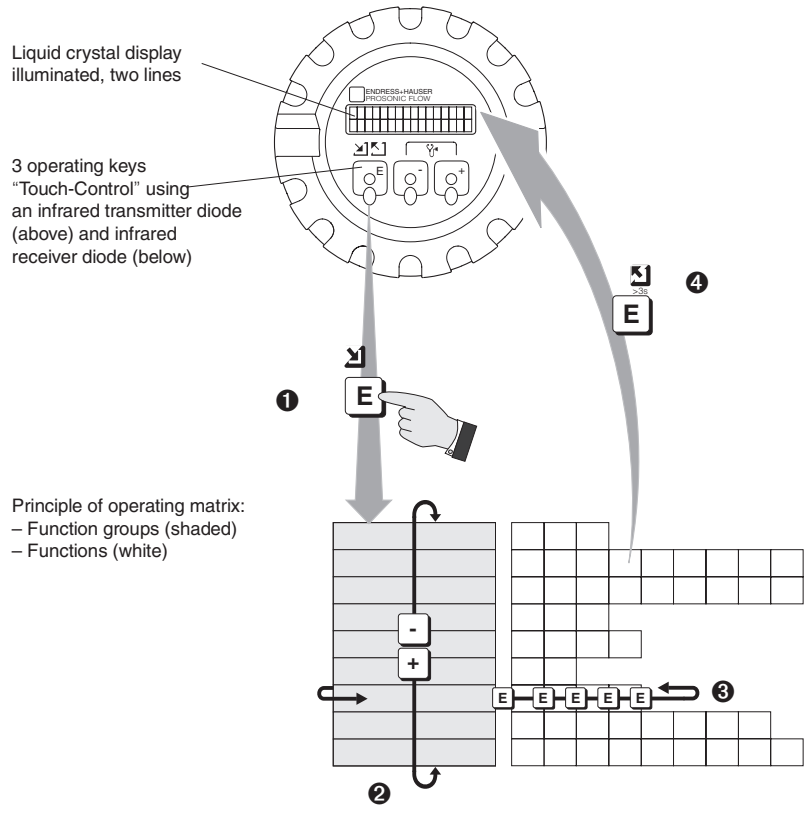
Display

Prosonic Flow DMU 93 has a two-line, illuminated LC display. This enables any two of the following measured values to be read off simultaneously:

- Actual volumetric flow
- Signal strength
- Actual sound velocity
- Totaliser value

Additional indications:

- Alarm messages (process errors)
- Fault messages (instrument errors)
- Status messages
- Programming messages
- Diagnosis and help functions



Selecting functions in the operating matrix

Communication

The Prosonic Flow DMU 93 can communicate with higher level control systems and be configured via a HART handheld programmer or PC:

- The HART protocol uses the current output (SMART technology).

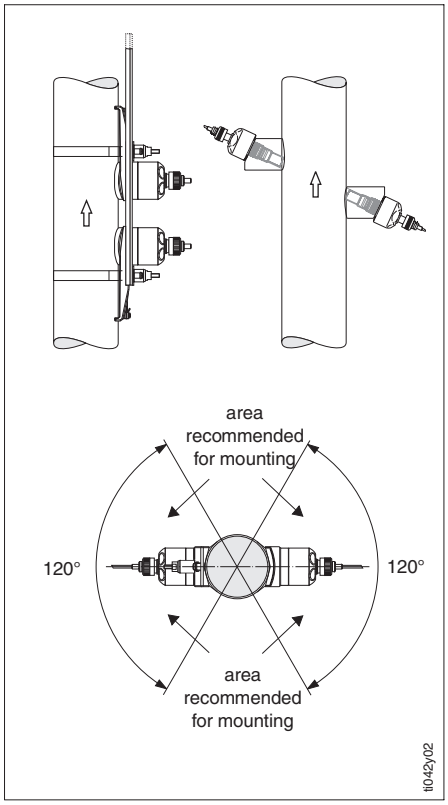
Planning

For the Clamp On version there are three methods available to fasten the sensors to the piping:

1. Tensioning bands for nominal diameters DN 50...200
2. Tensioning bands for nominal diameters DN 250...3000
3. Mounting by welding bolts instead of tensioning bands.

For the Insertion version, the sensor is installed in the measuring pipe by the means of a weld-in sensor holder.

Mounting and assembly of the ultrasonic sensors is described in full in the operating manual.

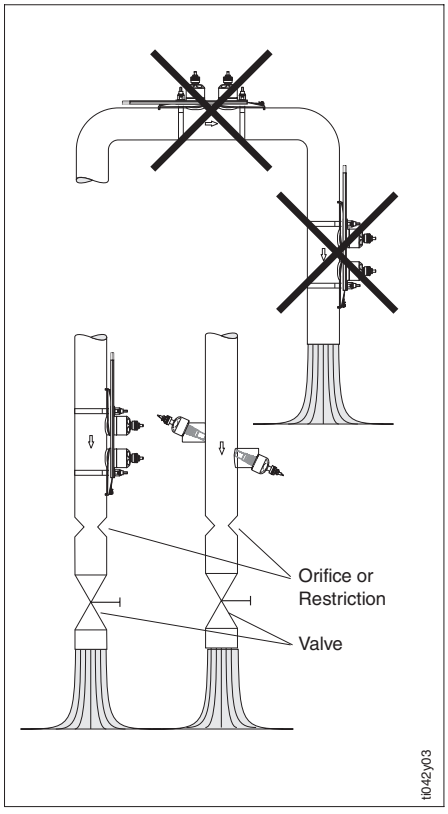


Positioning

Mounting

Vertical
The recommended flow direction in a vertical pipe is upwards. Entrained solids sink downward and gases rise away from the measuring section. This also allows the pipe to be completely drained and protects it from solids build-up.

Horizontal
Sensors are to be mounted on a horizontal pipe in the areas shown in the adjacent figure.
This ensures that gases in the upper or solids in the lower part of the pipe have minimum affect on the measurement.



Mounting location (vertical piping)

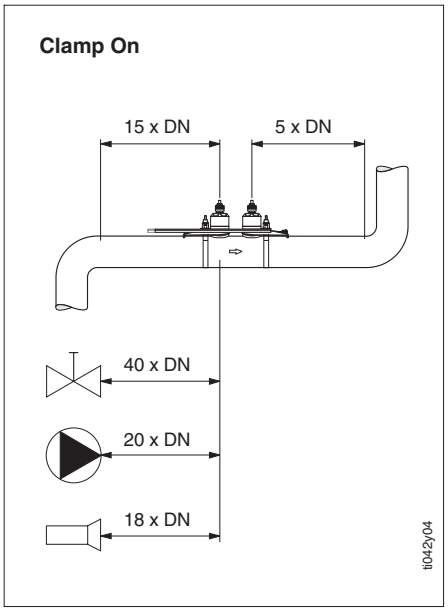
Mounting location
Air or entrained gases in the liquid may cause errors. Interruption of the measurement is avoided when the following recommendations are observed:

- Do not install at the highest point of the piping.
- Do not install in a vertical pipeline directly upstream of a free pipe outlet.

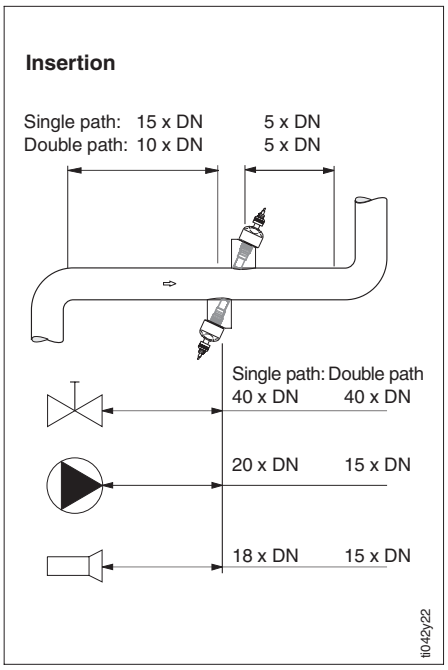
Correct installation is still possible in a vertical pipeline using the recommendation in the adjacent figure. Restrictions in the piping or an orifice with a smaller cross section than the measuring instrument can prevent the sensor from running empty during measurement.

Insulation
The piping mounted with ultrasonic sensors may at any time be fully insulated whether heated or carrying cryogenics.

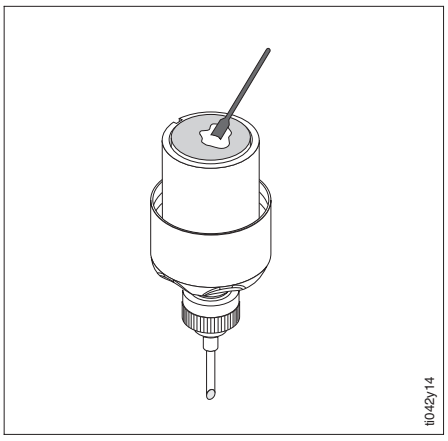
Planning



Inlet / outlet
CLAMP ON



Inlet / outlet
INSERTION



Applying the coupling medium

Inlet and outlet

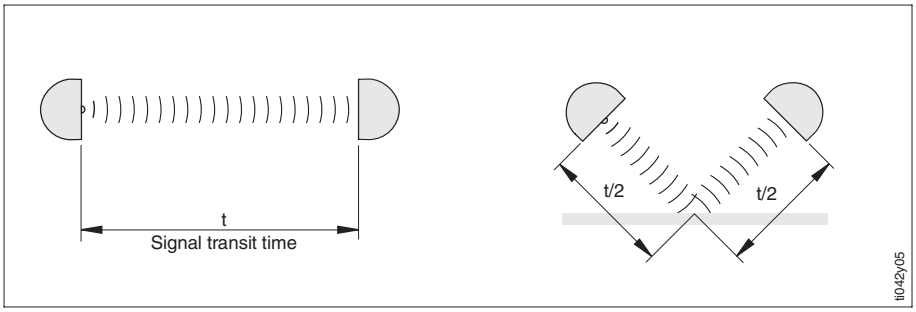
To ensure a fully developed flow profile, the ultrasonic measuring system should be installed upstream from flow obstacles such as bends, reducers or actuators. It should also be ensured that the longest possible straight pipe should be between the obstacle and the measuring instrument. The adjacent figure shows the minimum length of straight pipe downstream from an obstruction as a multiple of the nominal diameter DN of the pipe. The accuracy of measurement can be affected if these values are lower than those given.
If there are several obstacles in the flow, then the longest inlet or outlet path must always be used.

Coupling medium (Clamp On only)
A coupling medium is required in order to ensure good acoustic contact between the sensor and piping.
This is applied to the sensor during commissioning. Renewing the coupling medium is usually not required.

Planning
Clamp On

Signal transit time
The ultrasonic signal requires a minimum transit time [t] for optimum measurement.

The time differential is proportional to the flow velocity.

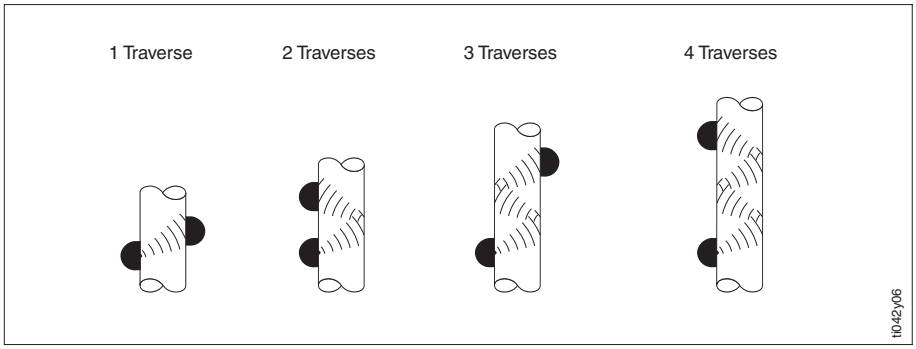


Example of an ultrasonic transit time

The measurement accuracy, i.e. the actual detected difference in measurement time, increases with the signal transit time [t] in the liquid.

With small pipe sizes it is recommended to use more than one traverse.

Selecting the number of traverses
The transmitter offers 1...4 traverses as standard.



Traverse versions

Please note that every additional reflection will reduce the signal strength (2 traverses = 1 reflection point, etc.).

To maintain the best possible signal quality, the least possible number of traverses should be used.

Recommendations
To obtain the best possible signal strength and quality, the following options are recommended:

DN 50...65	2...4 traverses
DN 80...600	2 traverses
DN 650...3000	1 traverse

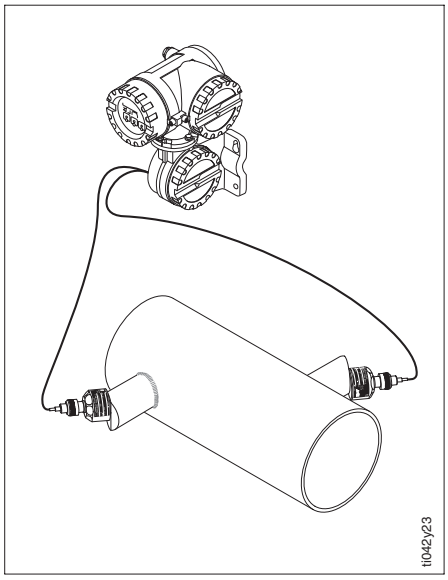
Accessories used for commissioning
Information about the liquid and the precise pipe dimensions and material is required for commissioning and determining the sensor spacing (for mounting). The most common liquids and pipe materials are already stored in the DMU 93. These are:

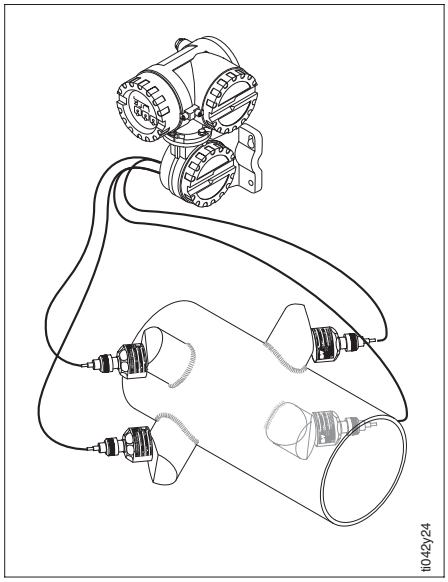
for liquids:
WATER – SEAWATER – AMMONIA – ACETONE – ALCOHOL – BENZENE – BROMIDE – ETHANOL – GLYCOL – KEROSENE – MILK – METHANOL – TOLUENE

for pipe materials:
CARBON STEEL – STAINLESS STEEL – HASTELLOY C – PA – PE – LDPE – HDPE – PP – PVC – PTFE – PVDF – ABS – GLASS FLINT – GLASS PYREX – GLASS CROWN

If other liquids or pipe materials are used other than those programmed, their values can be determined using the DDU 18 sound velocity sensors and the DDU 19 wall thickness sensor, available as accessories from E+H.

Planning
Insertion





Installation of Prosonic Flow DDU 15 insertion sensor.
The Prosonic Flow DDU 15 insertion sensor is installed in the measuring pipe by the means of a weld-in sensor holder. The measuring point should be chosen at a site allowing good accessibility to the pipeline.

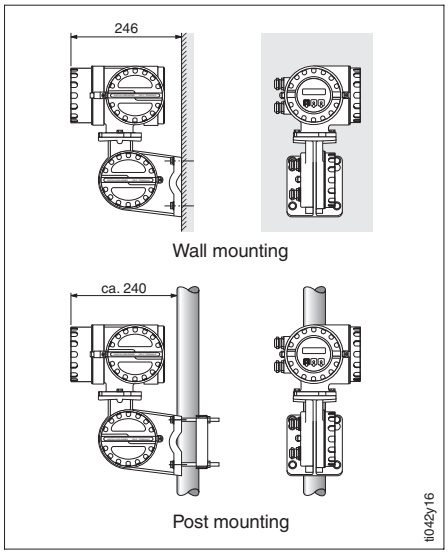
The system is available as:
- Single path model
- Dual path model

The dual path system offers measurement redundancy, improved linearity and reduces the requirement for upstream straight piping.

Observe the required distances between the measuring point and equipment obstructing the flow. The measuring system requires approximately 1 diameter of straight pipe.

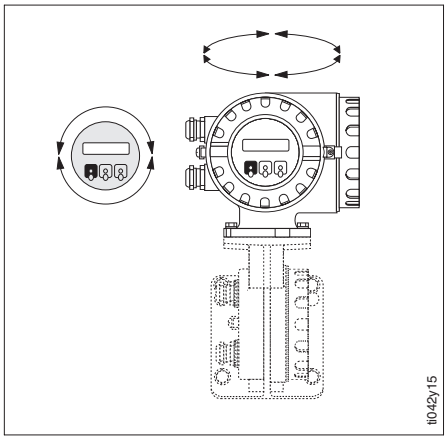
Installation information
Prosonic Flow DMU93 provides the installation dimensions based on pipe diameter respectively circumference and wall thickness.

Mounting Transmitter



Mounting the transmitter housing

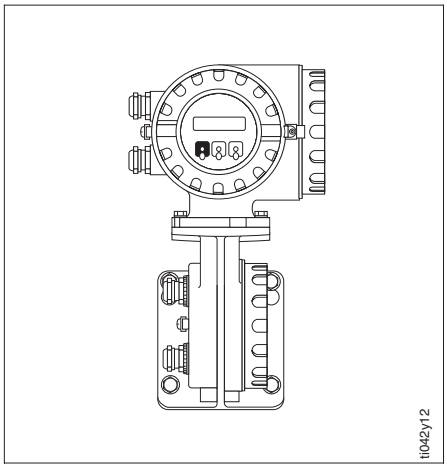
Mounting the transmitter
The wall mounting set is delivered with the transmitter. A special post mounting set can be provided.
- Observe carefully the electrical connection diagram on page 11.
- Fix the cable gland or lay armoured cabling.
- Do not mount cable next to electrical machinery or switching elements.
- The transmitter housing has to be protected from direct sunlight by suitable materials.



Rotating the local display and transmitter housing

Rotating the transmitter housing and the local display
To ensure that the local display is positioned correctly for viewing both, the transmitter housing and the local display can be rotated 360°.

Electrical Connection

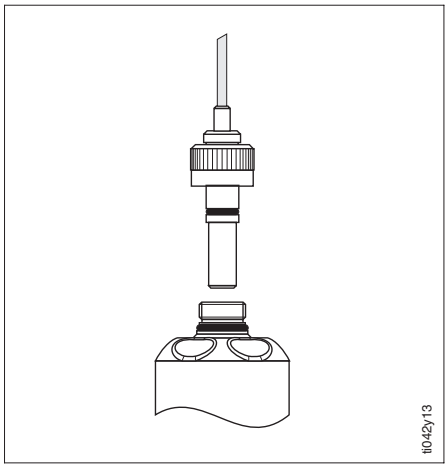


Transmitter housing DMU 93

Type of protection for the Prosonic Flow

Transmitter Prosonic Flow DMU 93

The transmitter meets the IP 67 requirements (EN 60529).
After opening the housing or cable glands, the operator must ensure that all gaskets are dry and clean and inserted back in to the groove of the gasket.



Flow sensors DDU 10 / DDU 15
Sound velocity sensor DDU 18

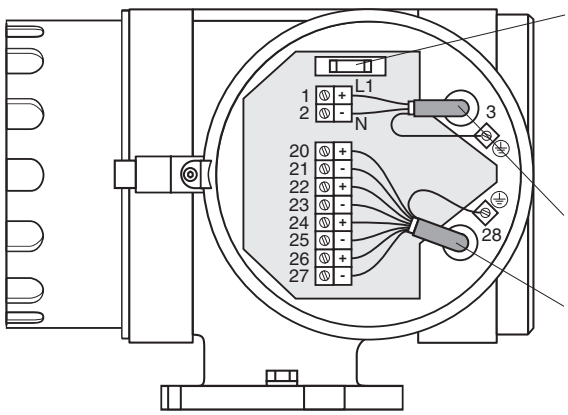
Wall thickness sensor DDU 19

Flow sensors DDU 10 / DDU 15
and
sound velocity sensors DDU 18

Both types of sensor meet the IP 68 requirements (EN 60529).
The sensors are well protected from the entry of moisture resulting from cleaning procedures.

Wall thickness sensor DDU 19
The sensor meets the IP 67 requirements (EN 60529).

Electrical Connection



Power supply / fuse:

20...55 V AC / 16...62 V DC
2.0 A slow-blow / 250 V;
5.2 x 20 mm

85...260 V AC
1.0 A slow-blow / 250 V;
5.2 x 20 mm

Power supply cable

Signal cable:
Shielded signal cable is recommended.
Ground signal cable shield at terminal 28.

t042y07

Cabling of the HART-/2 CUR.boards

"HART" current output and pulse / frequency output		
1 **2**	L1 N for AC power supply	L+ L- for DC power supply
3	Ground connection (ground wire)	
20 **21**	Pulse / frequency output	active / passive, f = 2...10,000 Hz (max. 16383 Hz) active: 24 V DC, 25 mA (250 mA / 20 ms) passive: 30 V DC, 25 mA (250 mA / 20 ms)
22 **23**	Relay 1	max. 60 V AC / 0.5 A max. 30 V DC / 0.1 A can be configured, e.g. for fault
24 **25**	Relay 2	max. 60 V AC / 0.5 A max. 30 V DC / 0.1 A can be configured, e.g. for limit value
26 **27**	Current output 1	active, 0/4...20 mA, R_L < 700 Ω with HART protocol
28	Ground connection (screen of signal cable)	

"HART" current output and 2nd current output		
1 **2**	L1 N for AC power supply	L+ L- for DC power supply
3	Ground connection (ground wire)	
20 **21**	Current output 2	active, 0/4...20 mA, R_L < 700 Ω
22 **23**	Relay 1	max. 60 V AC / 0.5 A max. 30 V DC / 0.1 A can be configured, e.g. for fault
24 **25**	Relay 2	max. 60 V A C/ 0.5 A max. 30 V DC / 0.1 A can be configured, e.g. for limit value
26 **27**	Current output 1	active, 0/4...20 mA, R_L < 700 Ω with HART protocol
28	Ground connection (screen of signal cable)	

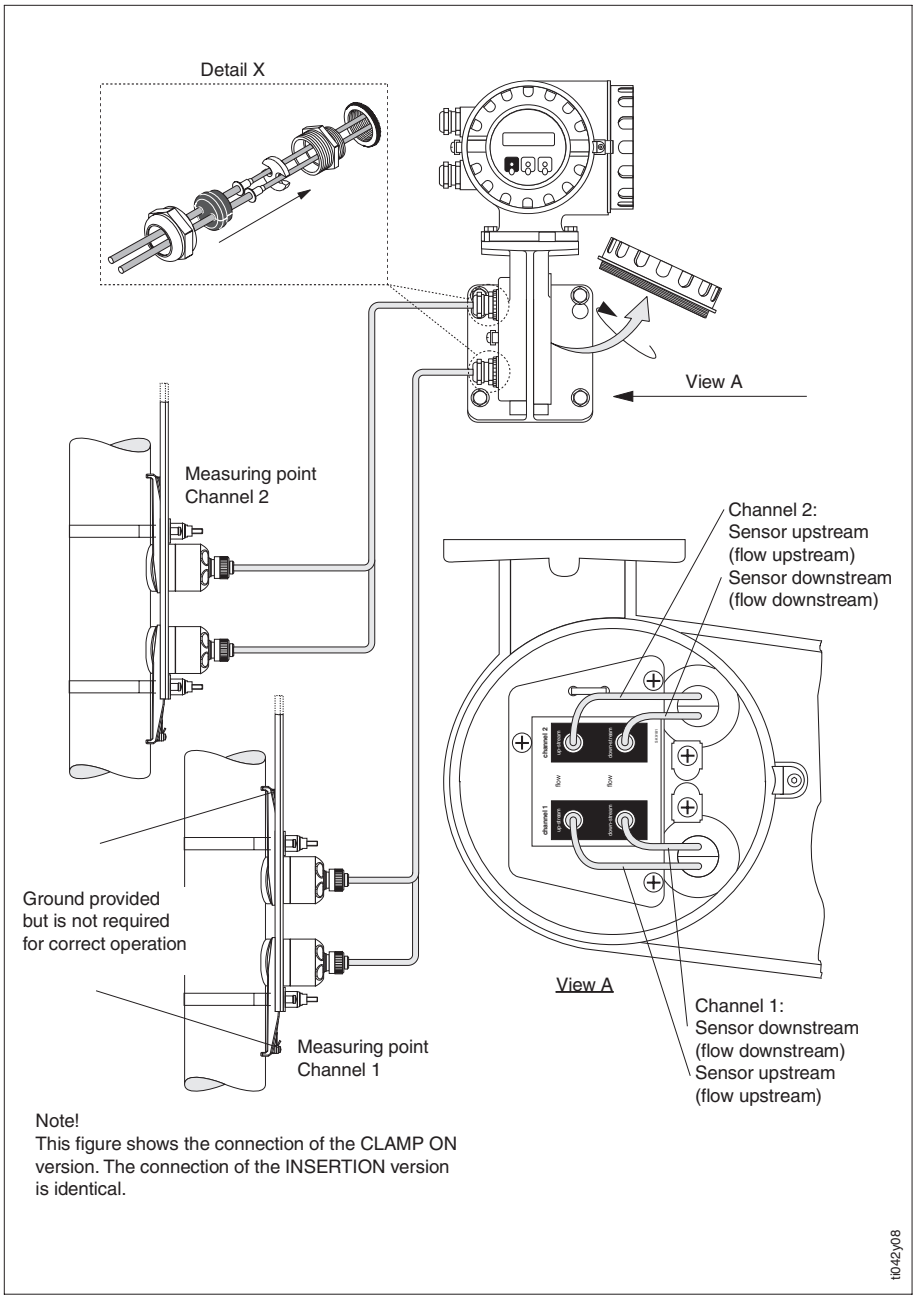
Note!
Technical data on Ex instruments is found in separate Ex documentation available on request from E+H.

Electrical Connection

Connection cables
Sensors / Transmitter

The two connection cables for sensor / transmitter, including connectors, are ready for use and available in the lengths of 5, 10, 15, or 30 meters.

Both sensor cables enter through a single cable entry to the terminal area of the wall bracket (see detail X in the figure below).



Note!

Signal cable connection sensors / transmitters

Dimensions
Clamp On

Prosonic Flow measuring system

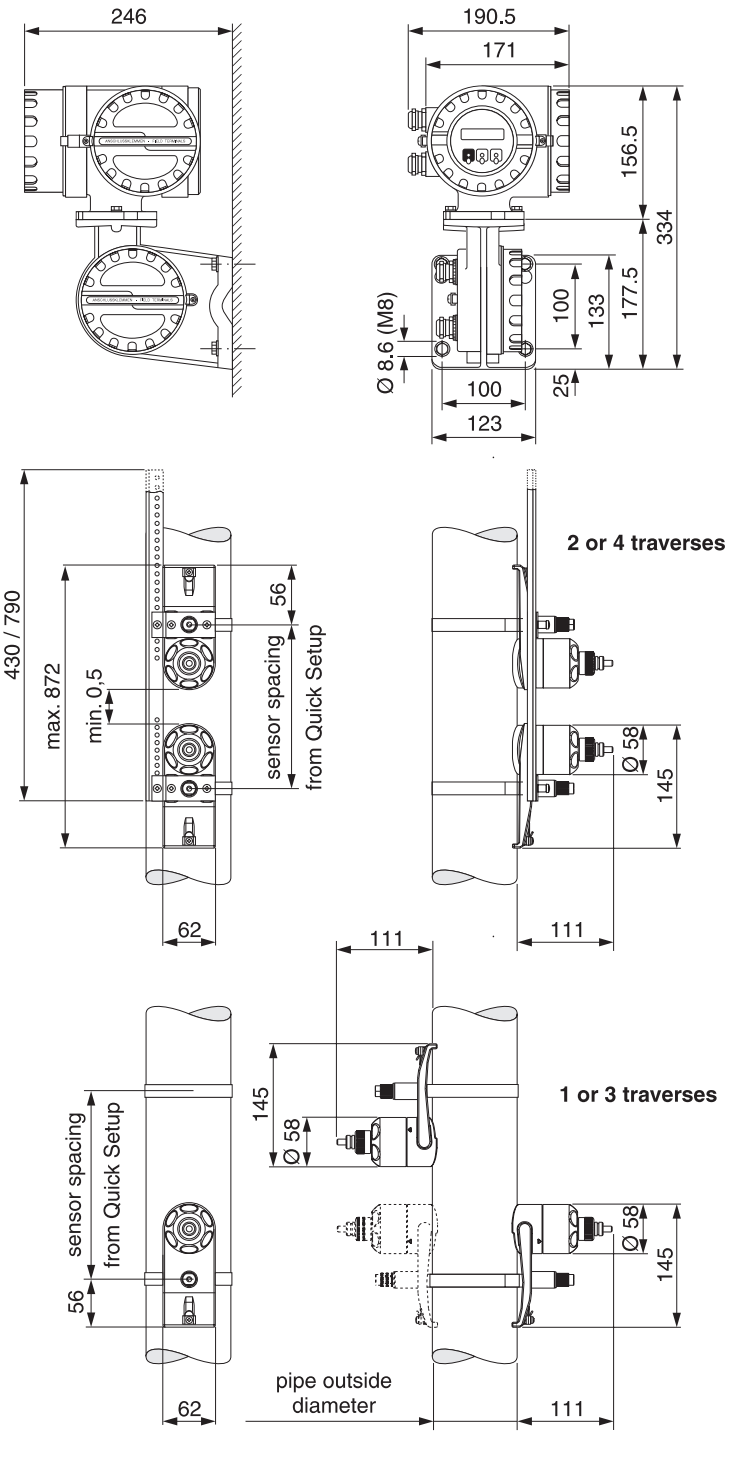
Note!

Dimensions and weights given for the transmitter with expolsion proof housing may differ from those given in this specification.

Please note therefore the separate Ex documentation.

Weight:

- DMU 93 transmitter . . . . . = 4.7 kg
- DDU 10 sensor incl. mounting rail and tensioning bands . . . . . = 2.8 kg
- DDU 18 sensor incl. tensioning band . . . . . = 2.4 kg
- DDU 19 sensor incl. tensioning band . . . . . = 1.5 kg



Dimensions of the CLAMP ON version

Dimensions
Insertion

Prosonic Flow measuring system

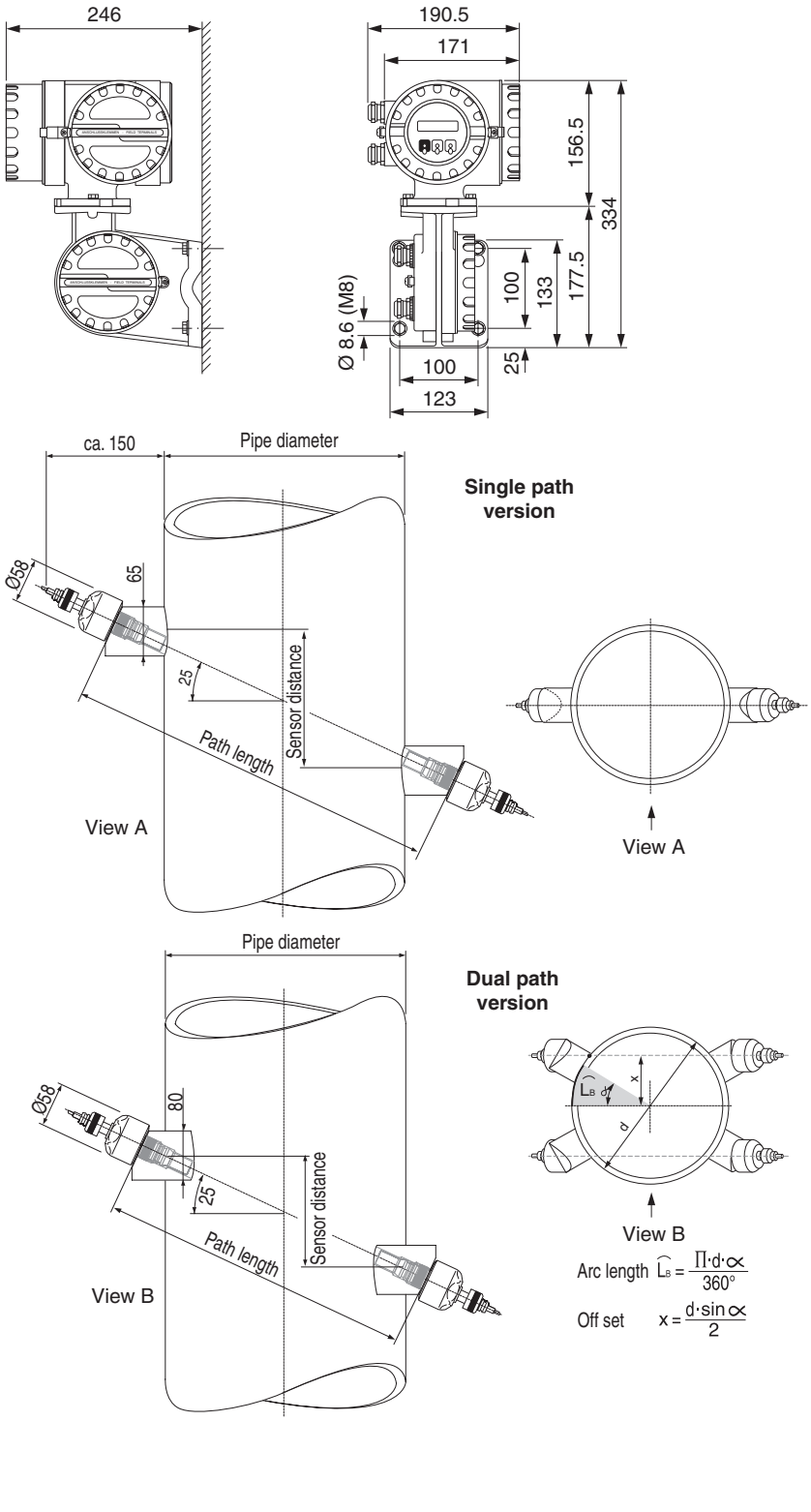
Note!

Dimensions and weights given for the transmitter with expolsion proof housing may differ from those given in this specification.

Please note therefore the separate Ex documentation.

Weight:

- DMU 93 transmitter . . . . . = 4.7 kg
- DDU 15 sensors
  Single path version . . . . . = 4.5 kg
- DDU 15 sensors
  dual path version . . . . . = 12.0 kg



Dimensions of the INSERTION version

Technical Data

Application	
Instrument name	"Prosonic Flow" ultrasonic measuring system
Instrument function	Prosonic Flow DMU 93 transmitter processes and displays measuring data supplied by the Prosonic Flow sensors DDU 10/15/18/19.
Function and system design	
Measuring principle	Measuring system according to the ultrasonic transit time principle
Measuring system	The complete measuring system consists of: • Transmitter Prosonic Flow DMU 93 • Sensors Prosonic Flow DDU 10 Flow sensors (Clamp On) DDU 15 Flow sensor (Insertion) DDU 18 Sound velocity sensors (accessory) DDU 19 Wall thickness sensor (accessory)
General	
Measured variables	• Volumetric flow (proportional to time differential) • Sound velocity • Signal strength
Measuring range	Freely adjustable from 0...1 m/s to 0...15 m/s. DN [mm] — Maximum measuring range 50 (2") — 0...118 m^3/h (Clamp On only) 100 (4") — 0...420 m^3/h (Clamp On only) 200 (4") — 0...1,875 m^3/h 1000 (40") — 0...42.400 m^3/h 2000 (80") — 0...169.600 m^3/h 2500 (98") — 0...265.000 m^3/h 3000 (120") — 0...380.000 m^3/h
Operable flow range	150 : 1
Outputs	
Outputs	• *Current output 1* 0/4...20 mA (also acc. to NAMUR recommendations), R_L <700 Ω (R_L >250 Ω with HART), freely assignable to different measured values, time constant freely selectable (0.5...100.00 s), full scale value selectable, with HART protocol. • *Current output 2* 0/4...20 mA (also acc. to NAMUR recommendations), R_L <700 Ω, freely assignable to different measured values, time constant freely selectable (0.5...100.00 s), full scale value selectable. • *Relay output 1* max. 60 V AC / 0.5 A or max. 30 V DC / 0.1 A NC or NO contact available Configurable for: fault, full scale switching, flow direction, limit values • *Relay output 2* max. 60 V AC / 0.5 A or max. 30 V DC / 0.1 A; NC or NO contact available Configurable for fault, full scale switching, flow direction, limit values (continued next page)

Technical Data

Outputs (continued)	
Outputs (continued)	• *Pulse / frequency output* active / passive selectable, one measured variable freely assignable active: 24 V DC, 25 mA (250 mA for 20 ms), R_L >100 Ω, passive: 30 V DC, 25 mA (250 mA for 20 ms) – *Frequency output:* f_{End} selectable up to 10000 Hz, On / off ratio 1:1, pulse width max. 2 s – *Pulse output:* pulse weighting adjustable, pulse polarity adjustable, pulse width adjustable (50 ms...2 s). Above a frequency of $^1/_{(2 \times \text{pulse width})}$ the on / off ratio is 1:1
Signal on alarm	The following applies until the fault has been cleared: • Current output → failure mode selectable • Pulse / frequency output → failure mode selectable (coupled with totalisers) • Relay 1 or 2 → de-energised, if configured to fault detection failure mode selectable
Load	R_L <700 Ω (current output) R_L >250 Ω (current output with HART)
Creep suppression	Selectable switch points for low flow cut-off. Hysteresis: –50 %
Accuracy (process data)	
Measured error	For flow velocities >0.3 m/s and a Reynolds number >10000 Dry calibration better than ±2% o.r. typical. • Verification of accuracy: ±0.5% o.r. plus ±0.05% o.f.s. under reference conditions • Reference conditions: Pipe Clamp On: DN 100 Pipe Insertion: Single path DN 250 Dual path DN 400 Pipe material Stainless steel Fluid Water Fluid temperature +30 °C o.r. = of reading o.f.s. = of full scale (15 m/s) • Repeatability: ±0.4%
Operating conditions	
Installation conditions	
Installation instructions	For further details see page 6 ff
Sensor cable length	max. 30 m between sensors / transmitter, screened cable is to be used
Ambient conditions	
Ambient temperature (transmitter)	DMU 93 –20...+60 °C (An all-weather cover should be used to protect the housing from direct sunlight when mounting in the open. This is especially important in warmer climates and with high ambient temperatures).
Ambient temperature (sensors incl. cable)	DDU 10 –40...+80 °C / 0...+170 °C DDU 15 –40...+80 °C DDU 18 –40...+80 °C / 0...+170 °C DDU 19 0...+60 °C

Technical Data

Operating conditions (continued)	
Storage temperature (transmitter)	DMU 93 –40...+80 °C
Storage temperature (sensors incl. cable)	DDU 10 –40...+80 °C / 0...+170 °C DDU 15 –40...+80 °C DDU 18 –40...+80 °C / 0...+170 °C DDU 19 0...+60 °C
Degree of protection to EN 60529	Transmitter DMU 93 IP 67 / (NEMA 4X) Sensors DDU 10 IP 68 / (NEMA 6P) DDU 15 IP 68 / (NEMA 6P) DDU 18 IP 68 / (NEMA 6P) DDU 19 IP 67 / (NEMA 4X)
Shock resistance	according to IEC 68-2-31
Vibrational resistance	up to 1 g, 10...150 Hz according to IEC 68-2-6
Electromagnetic compatibility	According to EN 50081 Part 1 and 2 / EN 50082 Part 1 and 2 as well as to the NAMUR recommendations. Interference resistance to EN 61000-4-6; 3 V for sensor cable ≥ 30 m.
Process conditions	
Fluid temperature	Sensors DDU 10 –40...+80 °C / 0...+170 °C DDU 15 –40...+80 °C DDU 18 –40...+80 °C / 0...+170 °C DDU 19 0...+60 °C
Nominal pressure	DDU 10/18/19: not applicable DDU 15 PN16
Pressure drop	not applicable
Fluid properties	Homogenous liquid max. gas content <1% vol. max solid content <5% vol.
Mechanical construction	
Design, dimensions (L x W x H)	Dimensional drawings → see page 13 and 14
Weights	see page 13 and 14
Materials	• *Transmitter Housing DMU 93:* – Powder coated die-cast aluminum • *Sensor DDU 10/18/19:* – Sensor holder W1.4301 (AISI 304) – Sensor housing W1.4301 (AISI 304) – Connector W1.4301 (AISI 304) – Tension band W1.4310 (AISI 301) – Sensor face chemically resistant plastic – Sensor cable PVC or PTFE • *Sensor DDU 15:* – Sensor holder W1.4301 (AISI 304) – Sensor housing W1.4301 (AISI 304) – Wetted part W1.4435/1.4404 (AISI 316L) – Connector W1.4301 (AISI 304) – Sensor cable PVC or PTFE

Technical Data

Mechanical construction (continued)	
Electrical connection	• *Wiring diagrams:* see page 11 *Transmitter cable entries:* PG 13.5 (5...15 mm) cable gland or thread for cable glands NPT ½ ", M20 x 1.5 (8...15 mm), G ½ " • *Galvanic isolation:* All circuits for outputs, power supply and sensors are galvanically isolated from one another. • *Cable specifications:* The ready-to-use factory supplied cables are to be used for every pair of sensors. Connection of sensors / transmitter see page 12. Cables are available in PTFE or PVC.
User interface	
Operation	On-site operation: • 3 operating keys for interactive programming of all instrument functions in the instrument operating matrix (see page 5) • Diagnosis and help function (⊡)
Display	LC display, illuminated, two 16-character lines
Communication	• E+H Commuwin II (via HART protocol over a communications box, e.g. E+H Commubox FXA 191) • HART protocol via current output
Power supply	
Supply voltage *Frequency*	*Transmitter:* 20... 55 V AC (50...60 Hz), 16...62 V DC 85...260 V AC (50...60 Hz) *Sensor:* • supplied by the transmitter
Power consumption	AC: <15 VA (incl. sensors) DC: <15 W (incl. sensors)
Power supply failure	Bridges min. 1 power cycle (22 ms). • EEPROM saves measuring system data on power failure (no batteries required).
Certificates and approvals	
Ex approvals	Information on available Ex versions (e.g. ATEX, CENELEC, FM, CSA) can be supplied by your E+H Sales Centre on request. All explosion protection data are given in separate documentation available on request.
CE mark	By attaching the CE mark, Endress+Hauser confirms that the instrument has been successfully tested and fulfils all legal requirements of the relevant EC directives.

Technical Data

Ordering	
Accessories	• Post mounting for transmitter housing (Order No. 50076905) Clamp On: • Coupling material -40...+80 °C (Order No. 50091705) • Coupling material 0...+170 °C (Order No. 50091706) • Tensioning bands for DN 50... 200 (Order No. 50091709) • Tensioning bands for DN 200... 600 (Order No. 50091710) • Tensioning bands for DN 600...1200 (Order No. 50091711) • Tensioning bands for DN 600...3000 (Order No. 50091712) Insertion: • Alignment tool (Order No. 50095132) • Alignment rod (Order No. 50094911) • Insertion depth adjustment tool (Order No. 50095088 • Spare sensor element (Order No. 50095133)
Supplementary documentation Prosonic Flow	System Information SI 025D/06/en Operating Manuals: Clamp On version BA 038D/06/en Insertion version BA 044D/06/en Ex documentations: ATEX/CENELEC XA001D/06/ (II2G/Zone 1) ATEX XA002D/06/ (II3G) FM EX 042D/06/a2 CSA EX 043D/06/d2

Other standards and guidelines	
EN 60529	Degree of protection by housing (IP code)
EN 61010	Protection Measures for Electronic Equipment for Measurement, Control, Regulation and Laboratory Procedures
EN 50081	Part 1 and 2 (interference emission)
EN 50082	Part 1 and 2 (interference immunity)
NAMUR	Association of Standards for Control and Regulation in the Chemical Industry

Registered trademark:

HART®
Registered trademark of HART Communication Foundation, Austin, USA

HASTELLOY®
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Subject to modification

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