

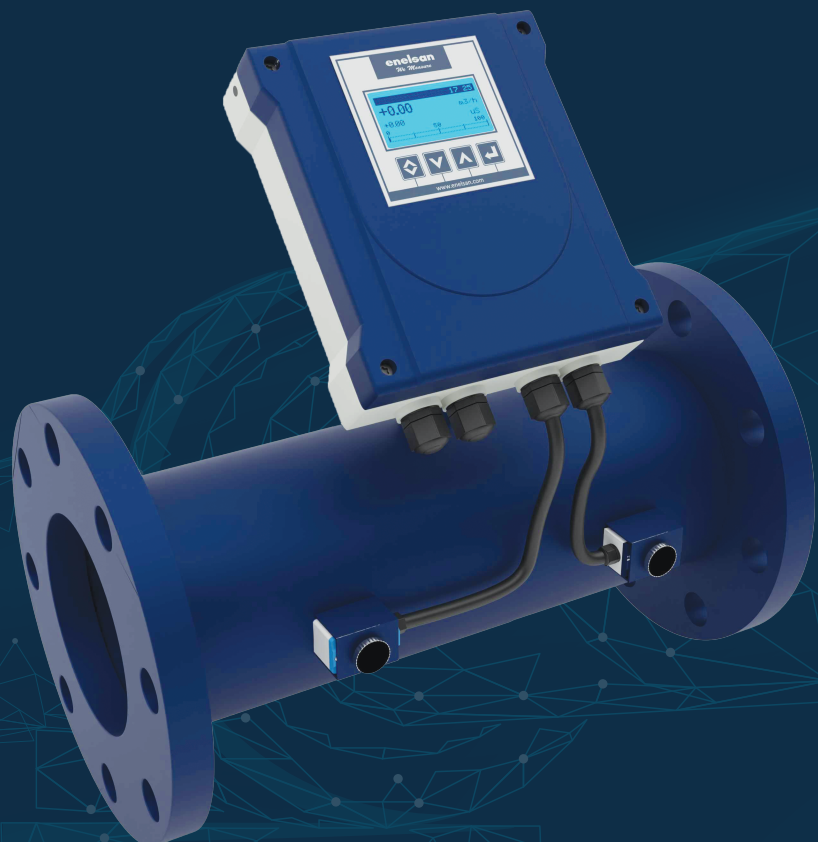
ULTRASONIC FLOWMETER

ETRANS –UD SERIES FIXED TYPE Datasheet

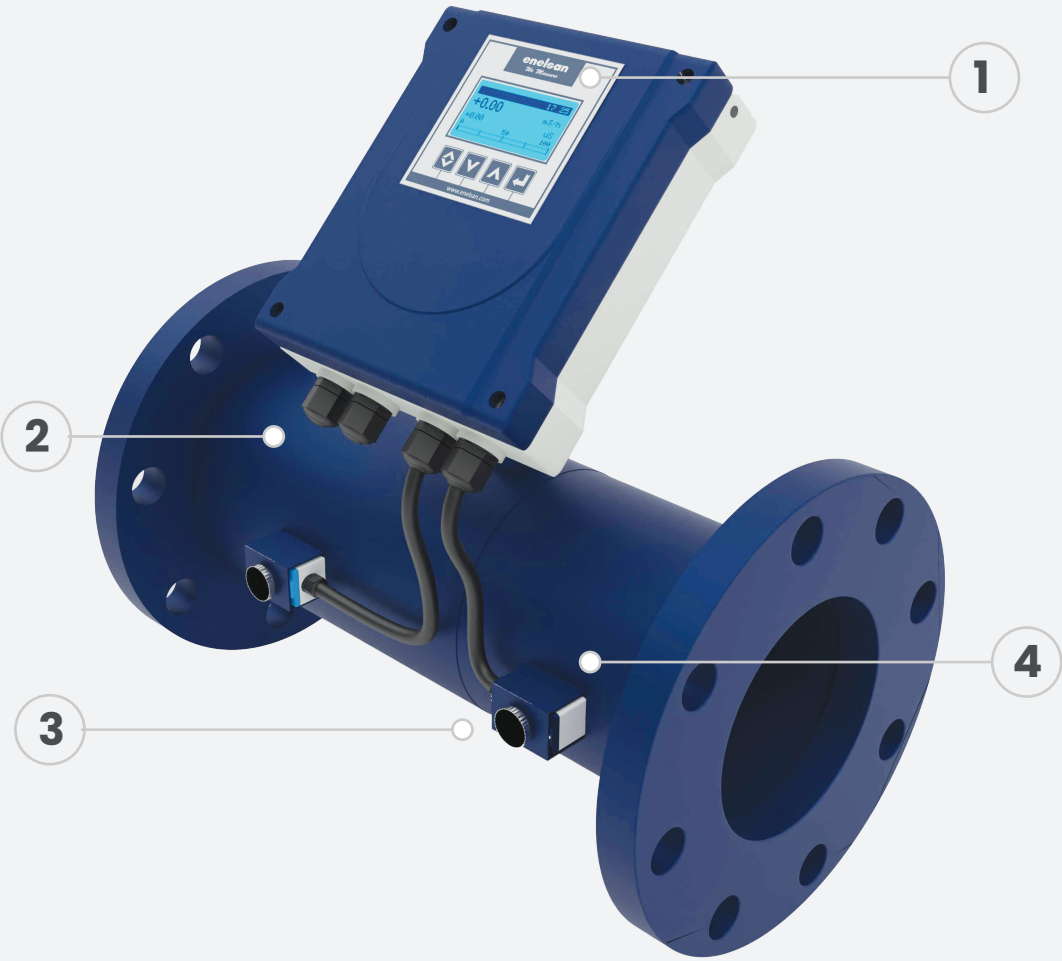
PULSE | FREQUENCY |
RS485 MODBUS | 4...20MA
(OPTIONAL HART)

Precise Measurement,
Ultimate Control

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ULTRASONIC
FLOWMETER



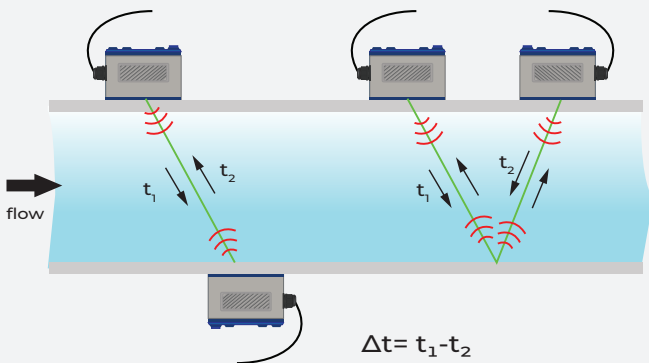
- 1 TOUCH CAPACITIVE KEYPAD PANEL
- 2 CORROSIONRESISTANT OUTER COATING
- 3 TRANSDUCER / SENSOR
- 4 CORROSIONRESISTANT OUTER COATING

WORKING PRINCIPLE /TRANSIT-TIME

In this method, the sensors operate in pairs. One or more sensor pairs are mounted on the pipe, and they alternately transmit and receive ultrasonic pulses (represented as t_1 and t_2 signals in the figure below).

In a "zero flow" condition, the t_1 signal is similar to t_2 , meaning there is no transit-time delay. However, when the fluid is in motion, the time it takes for the ultrasonic waves to reach the opposite sensor changes depending on the flow direction. This creates a transit-time difference ($t_2 - t_1$).

If the distance between the two sensors is known, the measured transit-time difference is directly proportional to the flow velocity. Both sensors are connected to a transmitter, which excites the sensors to generate sound waves and measures the time it takes for these waves to travel from one sensor to the other.



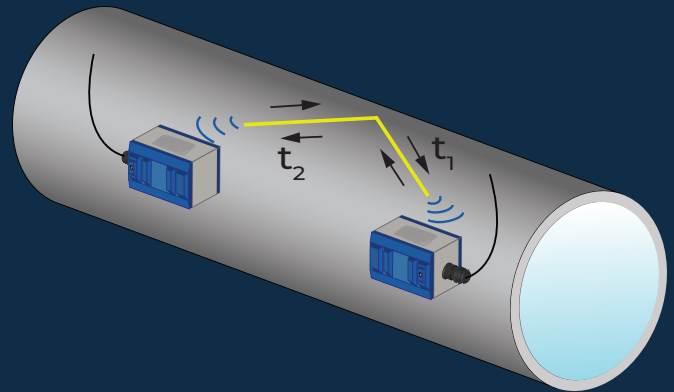
- The device contains a pair of ultrasonic transmitters/receivers (transducers).
- These transducers send ultrasonic signals both in the flow direction and against it.
- The signal traveling in the flow direction reaches the receiver in a shorter time due to the fluid's velocity.
- The signal traveling against the flow takes longer to reach the receiver, as it moves counter to the fluid's motion.

Advantages of the Transit-Time Method:

- Clamp-on installation without cutting the pipe
- High accuracy in clean liquids with low solid particle content
- Applicable over a wide pipe diameter range (DN15 – DN6000)
- Causes no pressure loss

Formula (simplified):

$$Q = K \cdot \Delta t$$



Q = Flow rate (m^3/h)

K = Calibration coefficient

Δt (Delta t) = The difference between the ultrasonic signal transit times measured in the flow direction and against the flow.

t_1 = Transit time (in the flow direction)

t_2 = Transit time (against the flow)

The difference between these two transit times determines the average velocity of the fluid. The velocity value is then multiplied by the pipe diameter and cross-sectional area to calculate the volumetric flow rate.

Points to Consider:

- The liquid must be homogeneous (dense sediment or air bubbles can disrupt the measurement).
- The pipe must be completely full during installation to ensure measurement accuracy.

APPLICATION AREAS



- Chemical Industry: Offers reliable and accurate flow measurement of gases, liquids, and steam, ensuring efficiency in complex chemical processing.



- Power Plants: Highly effective for monitoring high-temperature steam and cooling water flows that are critical to energy production and plant efficiency.



- Food Industry: Provides precise flow measurement for utility fluids like steam, compressed air, and clean gases used during food processing and sterilization.



- Water and Wastewater: Easily used for volumetric flow measurements of aeration gases and treated water in municipal and industrial treatment facilities.



- Petrochemicals: Delivers robust and stable flow measurement solutions for hydrocarbons, process gases, and high-pressure steam in demanding refinery environments.



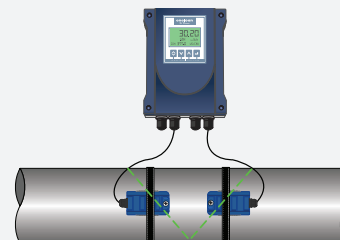
- Pharmaceutical Industry: Ensures high-accuracy measurement of pure steam and clean utilities, meeting the strict hygienic standards required in pharmaceutical manufacturing.

TYPES OF ULTRASONIC FLOW METERS

Ultrasonic flow meters are modern measurement devices that use sound waves to measure the flow rate of fluids. Offering non-contact and high-accuracy measurement, these devices come in various designs such as Clamp-On (externally mounted), Flanged, Insertion, and Inline types. Clamp-On flow meters provide fast and easy installation without the need to modify the pipe, while Flanged and Inline types are preferred for more permanent and high-accuracy industrial applications. Insertion-type sensors offer flexible installation and can be used with pipes of different diameters.

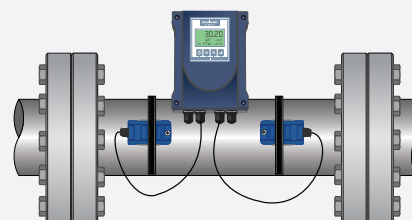
■ Fixed Type

- Installation: Permanently mounted on the pipeline.
- Connection: Typically welded or threaded.
- Application: Used in processes requiring continuous measurement (e.g., power plants, water treatment, chemical facilities).
- Advantage: Long service life, high accuracy, and reliability.
- Disadvantage: Requires pipeline cutting for installation.



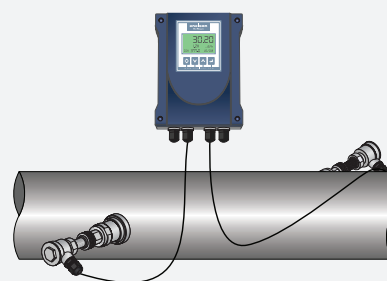
■ Flanged Type

- Installation: Connected to the pipeline via flanges.
- Connection Standard: DIN, ANSI, JIS flange standards.
- Application: Suitable for large-diameter pipes and high-pressure systems.
- Advantage: High sealing reliability and easy maintenance.
- Disadvantage: Requires opening the pipeline for installation.



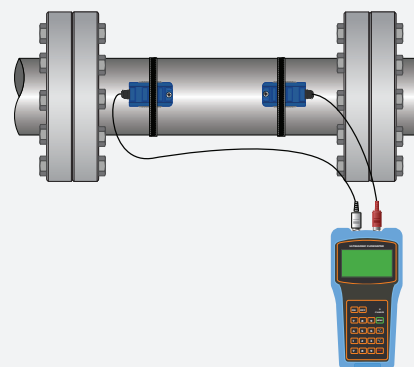
■ Insertion Type

- Installation: The sensor is inserted into a connection point (nozzle or clamp fitting) on the pipeline.
- Connection: Available with flanged, threaded, or clamped connection options.
- Application: Used in large-diameter pipes, or in applications where fixed installation is difficult or cost reduction is desired (e.g., municipal networks, cooling water circuits).
- Advantage: Can be installed without cutting the entire pipeline and is cost-effective for large pipe sizes.
- Disadvantage: Since the sensor is in direct contact with the fluid, it may require maintenance and cleaning; also, special equipment is needed for installation under line pressure.

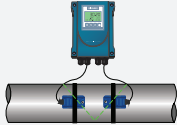
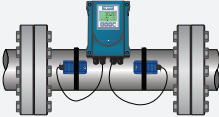
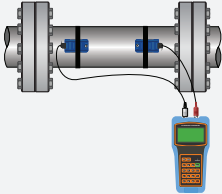


■ Portable (Clamp-On) Type

- Installation: Clamp-on sensors are mounted on the outer surface of the pipe.
- Application: Used in field applications where the measurement point varies, or for maintenance and testing purposes.
- Advantage: Allows measurement without cutting the pipe and offers easy portability.
- Disadvantage: Not suitable for continuous measurement; accuracy may be lower compared to fixed types.



ULTRASONIC FLOW METER TYPES – COMPARISON TABLE

				
Feature / Type	Clamp-On Type	Flanged Type	Insertion Type	Portable Type
Installation Method	Mounted on the outside of the pipe using clamps	Mounted to the pipeline with a flange connection	The sensor is inserted through an opening drilled on the pipe	The sensor is inserted through an opening drilled on the pipe
Pipe Diameter Range	Ø15 – Ø6000 m	Ø25 – Ø2000 mm	Ø50 – Ø6000 mm	Ø15 – Ø6000 mm (Clamp-On based)
Fluid Contact	None (sensor contacts externally)	Body in contact with the fluid	Sensor tip in contact with the fluid	None (works on the Clamp-On principle)
Measurement Accuracy	Accuracy ±1...2 %	±0.5...1 %	around ±1 %	±1.5...2 %
Repeatability	±0.2 %	±0.15 %	±0.2–0.5 %	±0.2–0.5 %
Maintenance Requirement	Very low	Medium	Medium (sensor cleaning may be required)	Very low (no fixed maintenance as it is portable)
Suitable Fluids	Clean or low-particle liquids	Suitable for clean liquids and chemicals	Clean and slightly contaminated liquids	Water, HVAC, energy, temporary field measurements
Operating Temperature	-30°C ~ +160°C (depending on sensor type)	-40°C ~ +200°C	-20°C ~ +160°C	-20°C ~ +120°C
Operating Pressure	No pressure limitation (external mounting)	PN10 – PN40	PN10 – PN40	No pressure limitation (external mounting)
Installation Ease	Very easy, can be installed within minutes	Moderate, may require line shutdown	Moderate, requires drilling the pipe	Very easy to install, can be installed in minutes
Portability	Fixed type	Fixed type	Fixed type	Yes, specially designed for field measurements
Application Areas	Power plants, HVAC, water treatment, continuous monitoring	Continuous process control, chemical and petrochemical plants	Cost-effective flow measurement in large-diameter pipelines	Cost-effective flow measurement in large-diameter pipelines

TECHNICAL SPECIFICATIONS

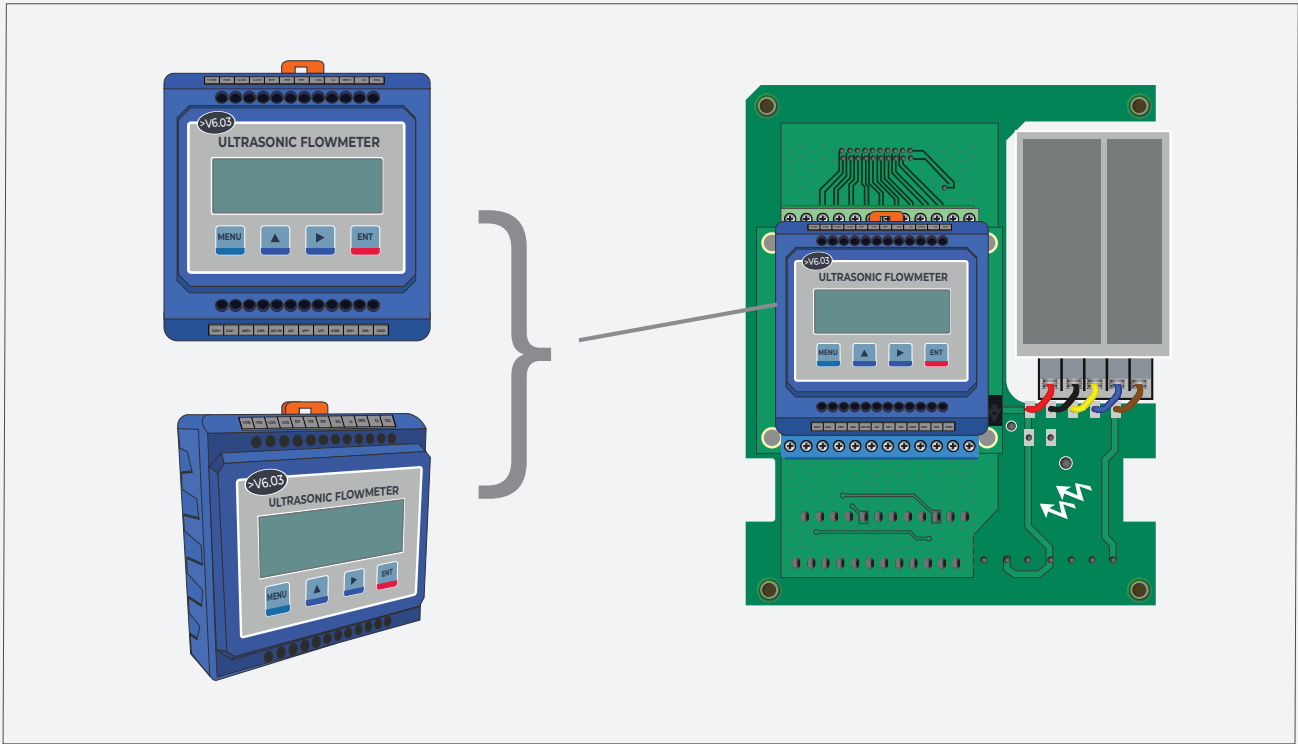
SQUARE COMPACT TYPE DEVICE (RELATION BETWEEN SQUARE / COMPACT DESIGN AND RAIL MOUNTING)

Enelsan's Etrans-MS / Etrans-M0S Series Square Compact Type Ultrasonic Flow Meters feature a compact structure, direct pipe connection design, and full integration into the flow line. These devices are typically mounted using flanged or inline (between-pipe) connections.

However, if the device's electronic module (transmitter) is designed with an optional DIN rail mounting alternative, the concept of "alternative rail-type mounting" can be applied as follows:

- The electronic module (transmitter) of the device is typically integrated into the main body. Alternatively, this module can be detached and configured as a rail-mounted module.
- In the rail-mounted configuration, the electronic section can be installed inside a control panel on a DIN rail, while the sensor (flow measurement section) remains either in the main body or as a separate sensor unit.
- In this setup, the square compact body and the sensor section remain in the field (on the pipeline), while the transmitter is mounted in the control panel and integrated into the main control system.

In summary, for Enelsan's square compact devices, if rail-type mounting is to be applied, the electronic module must be designed to be rail-compatible.



SELECTION OF INSTALLATION METHOD

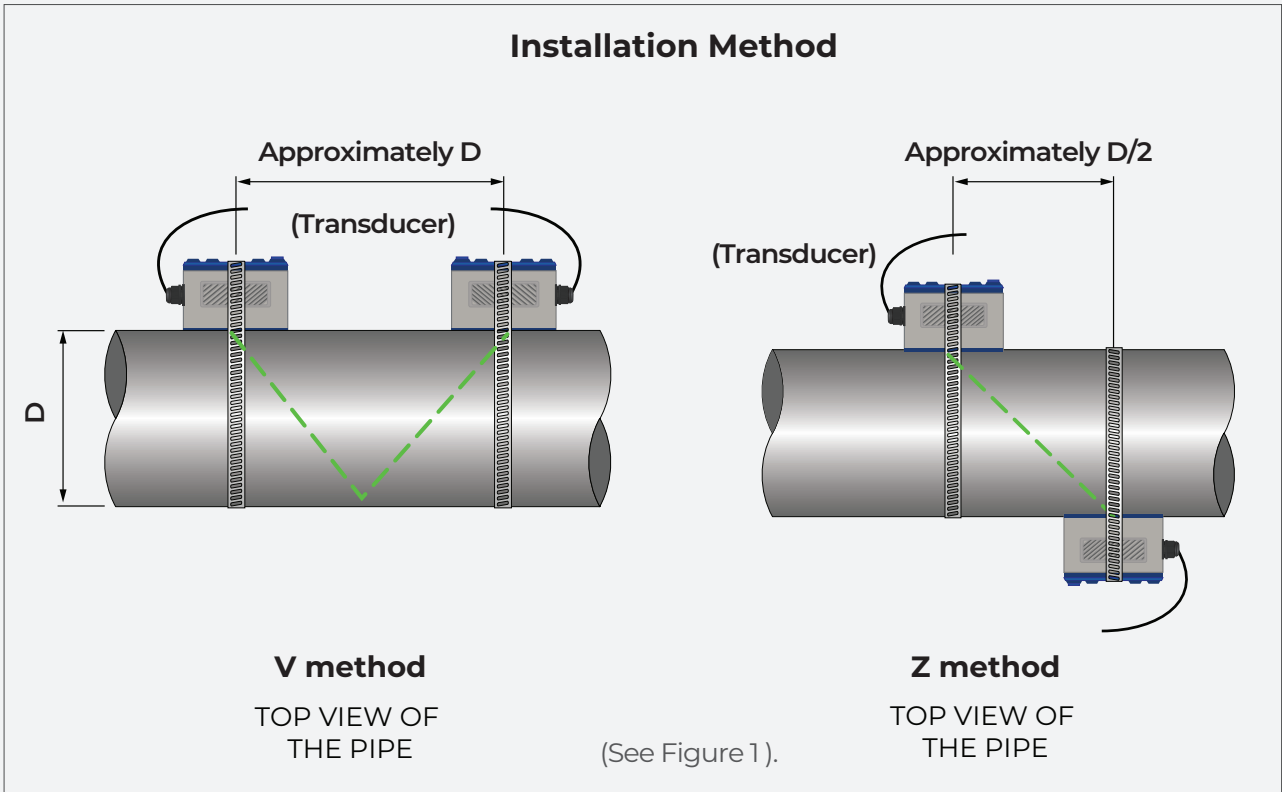
There are two installation methods for the sensors: the V method and the Z method (see Figure 1).

They are mounted on the outer surface of any type of pipe capable of transmitting ultrasonic signals, to measure the flow of clean liquids such as chemicals, oils, and water that do not contain air bubbles. The installation of clamp-on sensors can be performed without stopping the flow, ensuring there is no pressure loss or blockage in the pipeline. This provides significant savings in labor and time.

The measurement system consists of a pair of ultrasonic sensors acoustically coupled to the outer surface of the pipe, and a transmitter unit that interprets the transmitted and received signals from the sensors. This unit communicates with control and process systems through its interface.

The Z Method should be preferred in the following cases:

- In locations where the installation space is limited.
(As shown in the figure, the installation distance of the Z method is approximately half the length of the V method.)

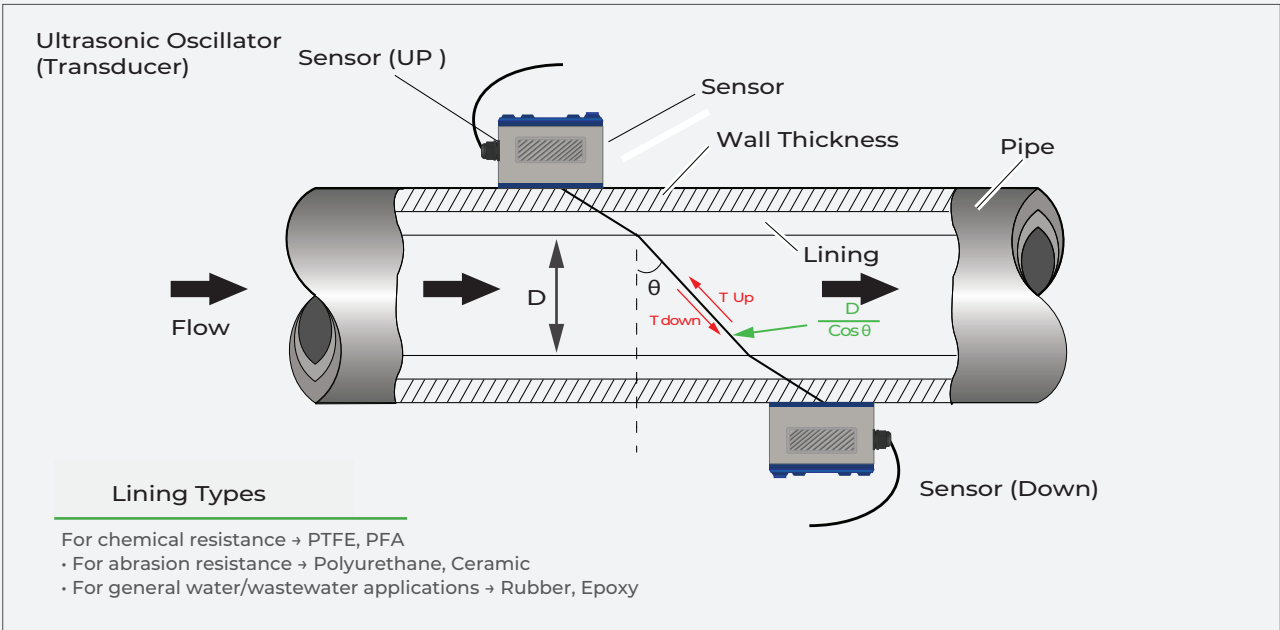


- When measuring highly turbid fluids such as wastewater.
- When the pipe has a mortar coating on its inner surface.
- When the pipe is old and has a thick deposit or lime layer on its inner surface.

Selection Criteria

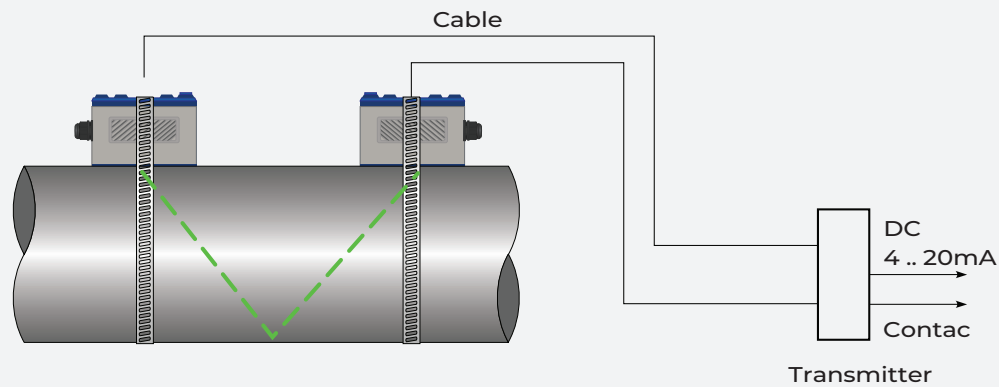
- For sensors used on pipes with an inner diameter greater than 12 inches (300 mm), the Z method installation is recommended.

SENSOR INSTALLATION

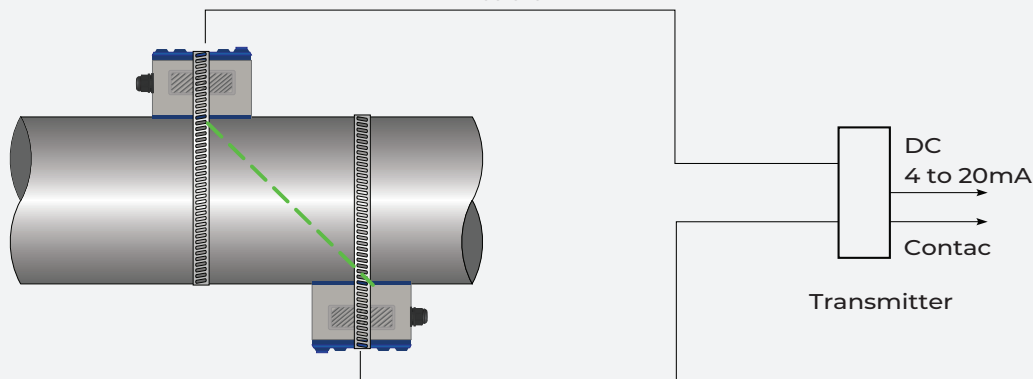


CONSTRUCTION

- (1) Single Path Measurement System (V Method)

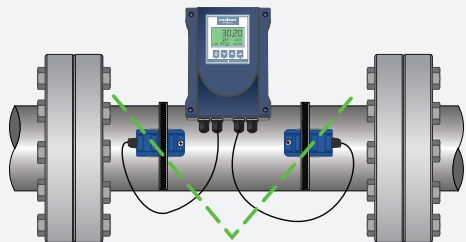


- (2) Single Path Measurement System (Z Method)



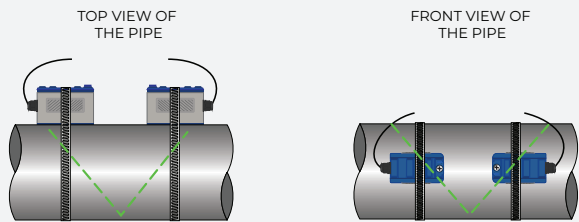
ETRANS-U SERIES FLANGED TYPE

V Method (V-Path)



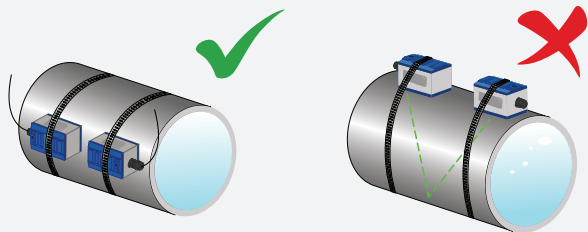
How It Works:

The ultrasonic signal travels across the pipe in a V-shaped path, reflecting bidirectionally between one sensor and the other.



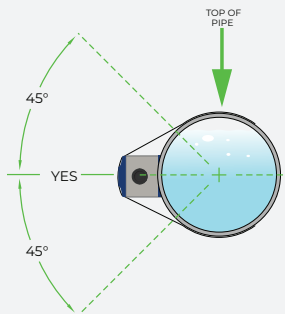
When to Use:

- When the pipe length is sufficient (typically 10–20 diameters upstream and downstream)
- When turbulence within the pipe cross-section is minimal
- When there is a long straight section of pipe available



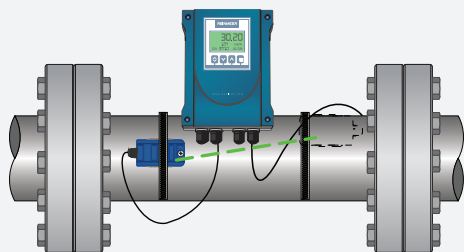
Advantage:

- Provides the most accurate measurement



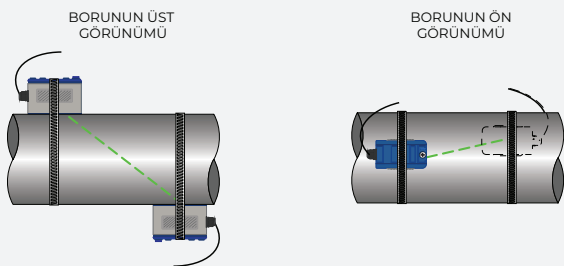
ETRANS-U SERIES FLANGED TYPE

Z Method (Z-Path / Single Path)



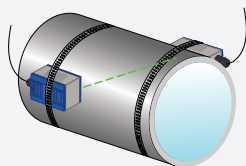
How It Works:

The ultrasonic signal passes through the inside of the pipe along a single straight path.



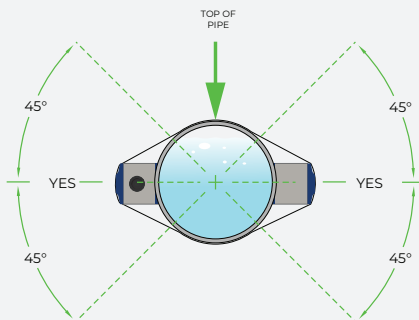
When to Use:

- When the pipe installation space is limited (insufficient straight pipe length at the inlet or outlet)



Advantage:

- Enables measurement even when the pipe length is short
- Provides flexibility in installation

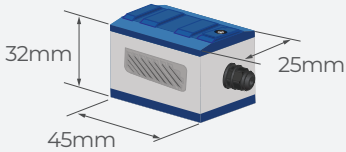
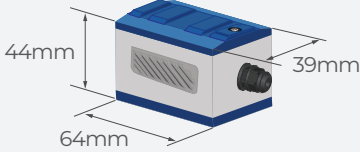
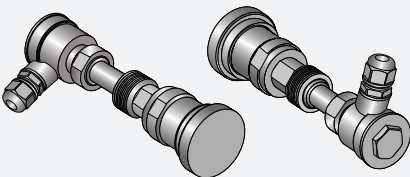


TECHNICAL SPECIFICATIONS

Standard Body

Measurement Range	0,3 ... 15 m/s
Accuracy	± %0,5 (ölçülen değer)
Process / Temperature	-40 ... +110 °C (Standart) -40 ... +160 °C (Opsiyonel)
Power Supply	24 VDC, 220 VAC
Output	4-20 mA, Pulse, RS485 MODBUS
Protection Class	IP67, IP68
Diameter (Pipe Size)	DN15 ... DN6000
Record	SD Kart 4GB (opsiyonel)

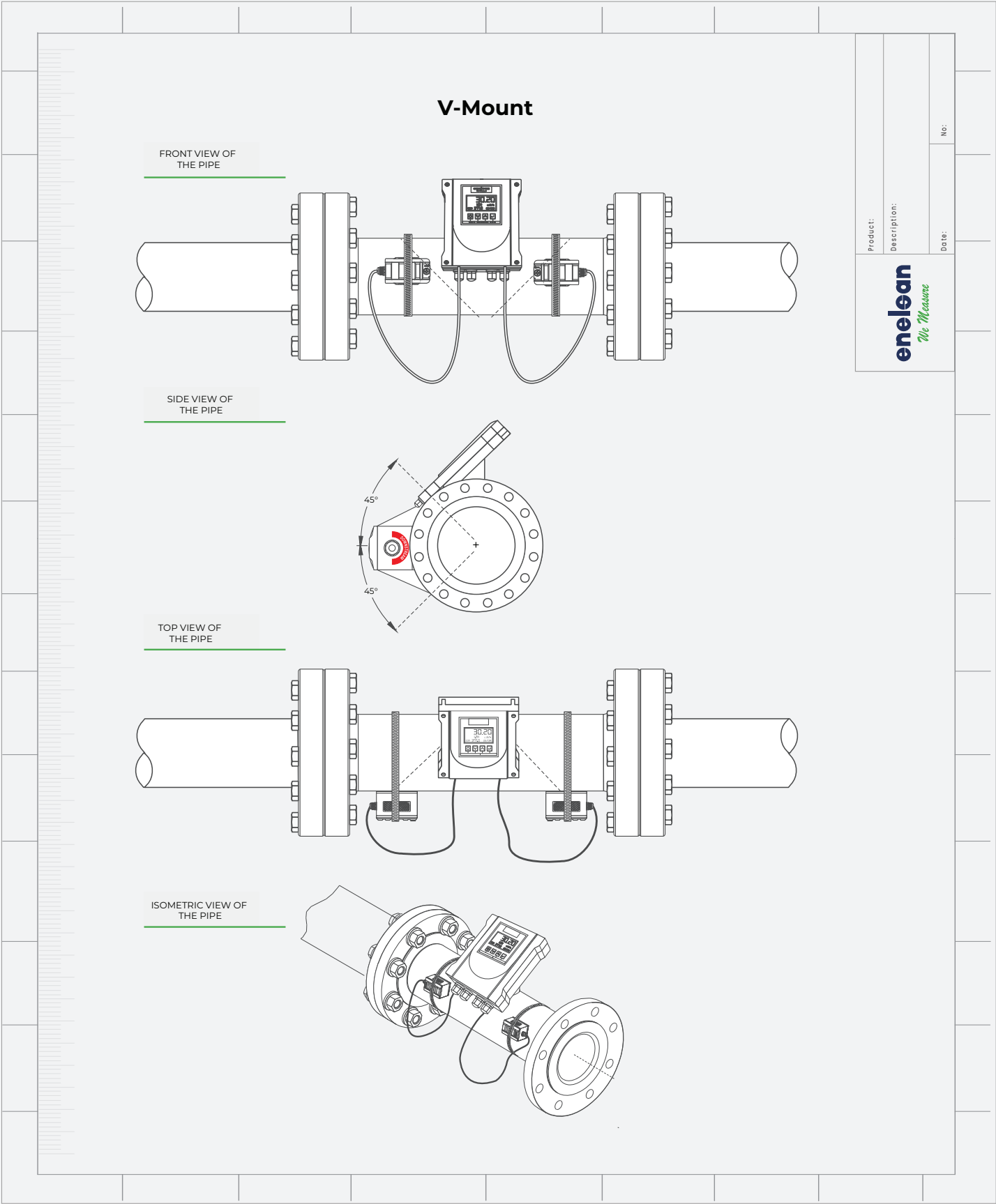
Sensor Types	TS2 Small Size	Meas. Range	DN25...DN100	Dimensions	45x25x32 mm
	TM1 Medium Size		DN50...DN800		64x39x44 mm
	TL1 Large Size		DN600...DN6000		-

TS2 	TM1 	Vreznoy tip (insertion) 
-30 ... +90 °C	-30 ... +90 °C	-30 ... +90 °C

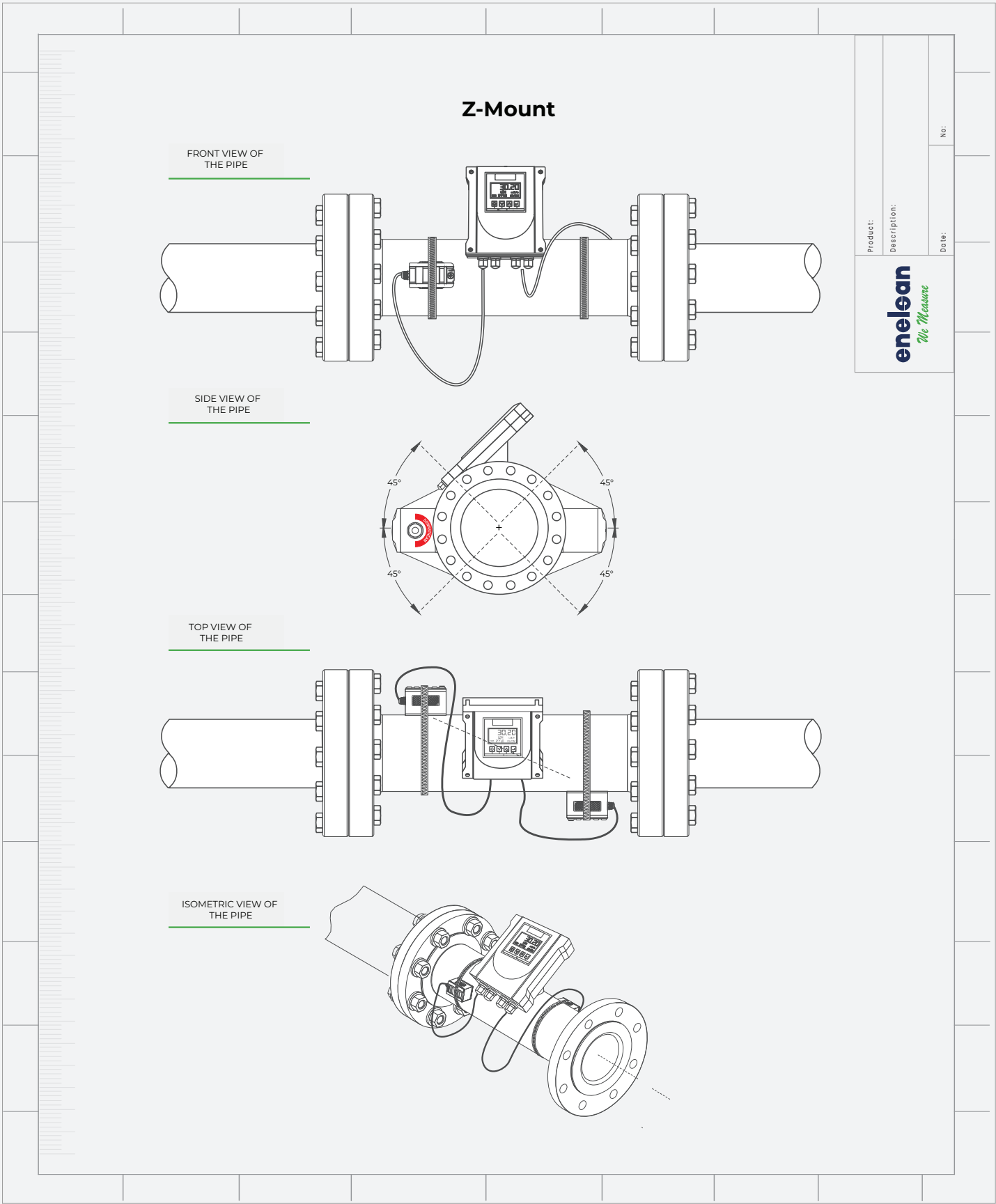
Square Transmitter

Body Material	Cast Aluminium	
Mounting Type	Compact	
Power Supply	220 VAC / 24 VDC. (selectable)	battery (optional)
Local Display	Backlit LCD Screen 64×128	
Display Languages	Turkish, English, German, Spanish (2 languages selectable)	
Output Signals	Standard (4–20 mA, 0–10V, Frequency, Pulse), Alarm/ Status = 2×Relay Output	
Digital Input	3 channels 4–20 mA Analog, 2 channels 3-wire Resistance (PT100)	
Ambient Temperature	-20...110°C (depending on process temperature)	
Communication	RS485, MODBUS, M-BUS	
Data Logging	Available	
Protection Class	IP 20	
Dimensions	90x90x36 mm	

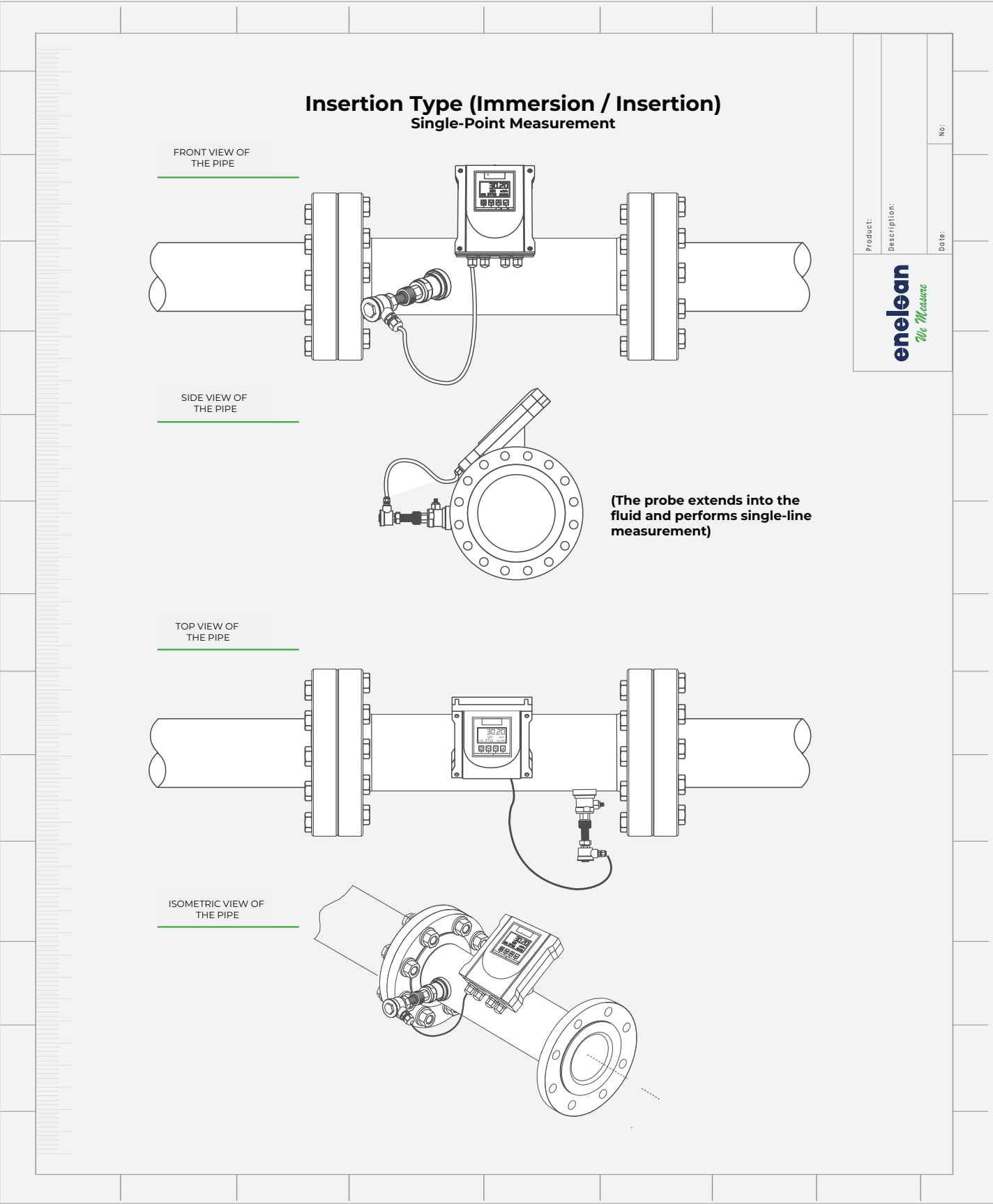
TECHNICAL DRAWING



TECHNICAL DRAWING



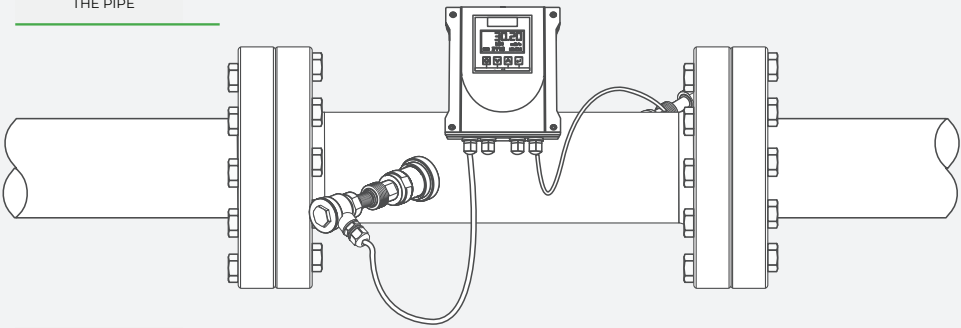
TECHNICAL DRAWING



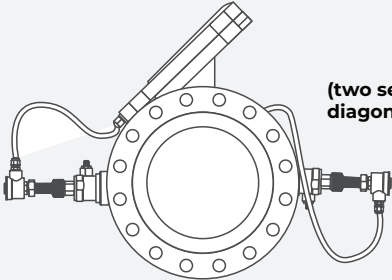
TECHNICAL DRAWING

Insertion Type (Immersion / Insertion)
Dual-Point Measurement

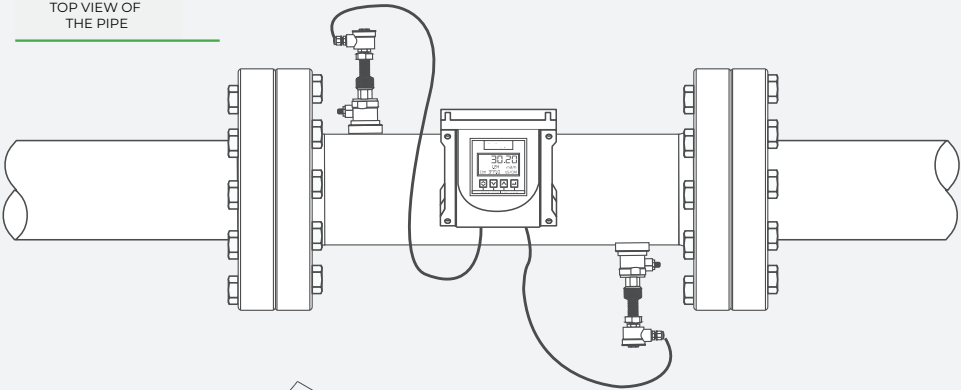
FRONT VIEW OF
THE PIPE



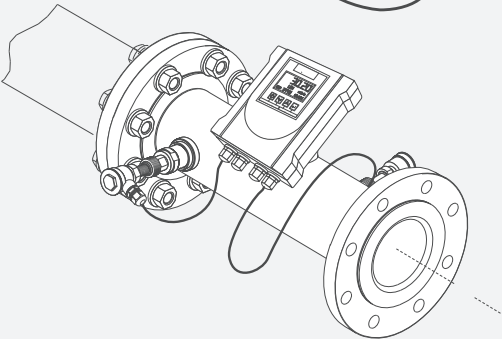
SIDE VIEW OF
THE PIPE



TOP VIEW OF
THE PIPE



ISOMETRIC VIEW OF
THE PIPE



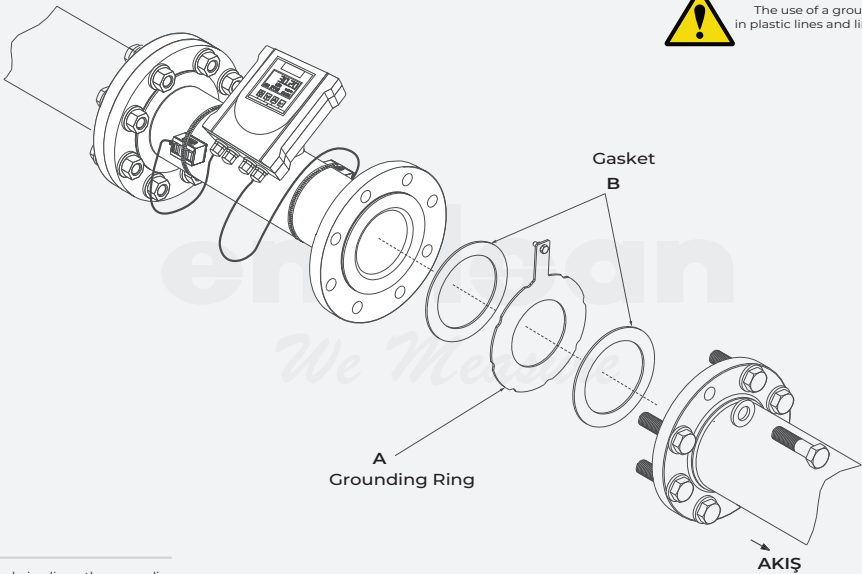
Product:	Description:	No:
enelean		Date:
We Measure		

TECHNICAL DRAWING

POSITION OF FLANGE GASKETS



The use of a grounding ring is mandatory in plastic lines and lines with internal insulation.



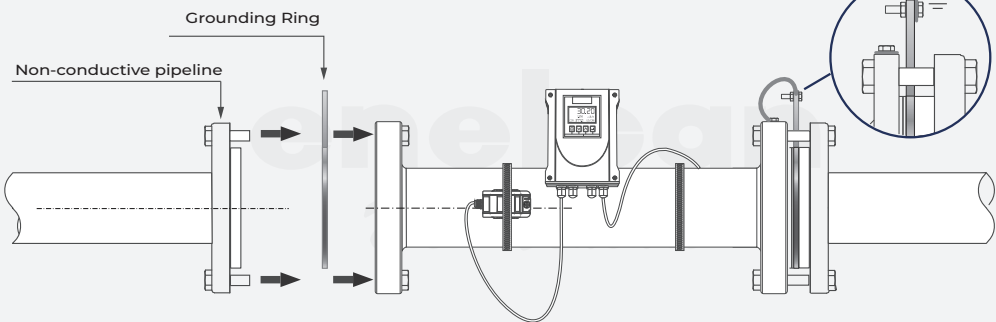
In non-grounded pipe lines, the grounding ring must be mounted between the sensor flange and the pipe.
Material: SS 316 or Hastelloy C
Thickness: 2 mm for SS 316 / 1 mm for Hastelloy C

enelean
We Measure

Product: _____
Description: _____
Date: _____ No: _____



In plastic lines and insulated pipe lines, the use of a grounding ring is mandatory.

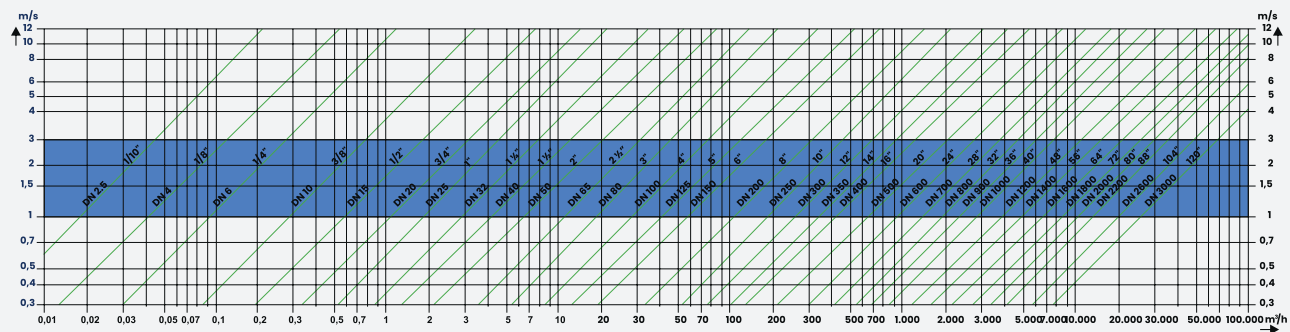


Grounding a Flow Meter in a Non-Conductive Pipe.

enelean
We Measure

Product: _____
Description: _____
Date: _____ No: _____

FLOW RATE / DIAMETER / VELOCITY TABLE

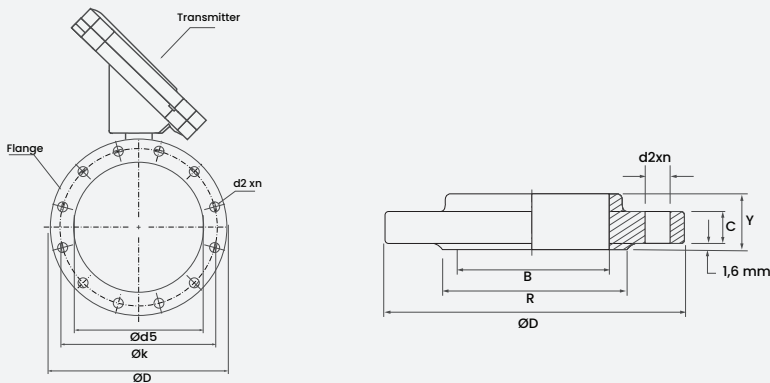


- 1- The appropriate product diameters can be selected based on the flow rate information.
- 2- The appropriate product diameters can be selected based on the velocity information.
- 3- The flow measurement range can be determined based on the diameter information.
- 4- The most stable range for measurement should be considered as 1-3 m/s.

DIAMETER / FLOW VALUES

DN (mm)	DIAMETER	MIN. FLOW RATE (m³/h)	MAX. FLOW RATE (m³/h)	PRECISE MEASUREMENT RANGE (m³/h)
DN 15	1/2"	0,18	8,5	0,6-1,8
DN 20	3/4"	0,35	15	1,2-3,2
DN 25	1"	0,6	22	1,8-4,8
DN 32	1 1/4"	0,85	35	2,8-8,0
DN 40	1 1/2"	1.3	55	4,2-15,0
DN 50	2"	2,2	85	6,8-22,0
DN 65	2 1/2"	3,6	150	13-32
DN 80	3"	5,5	210	18-48
DN 100	4"	8,5	320	28-48
DN 125	5"	13	550	42-130
DN 150	6"	18	750	58-180
DN 200	8"	32	1500	120-320
DN 250	10"	52	2020	180-480
DN 300	12"	78	3010	250-700
DN 350	14"	100	4010	350-900
DN 400	16"	140	5050	440-1400
DN 500	20"	220	7880	650-2000
DN 600	24"	300	10030	950-2800
DN 700	28"	420	18000	1500-3500
DN 800	32"	550	22000	1800-4800
DN 900	36"	700	28000	2400-6000
DN 1000	40"	850	32000	2800-8000
DN 1200	48"	1200	48000	3800-14000
DN 1400	56"	1600	58000	5000-16000
DN 1600	64"	2200	88000	6500-22000

ANSI 15 – 300 Flange Dimensions



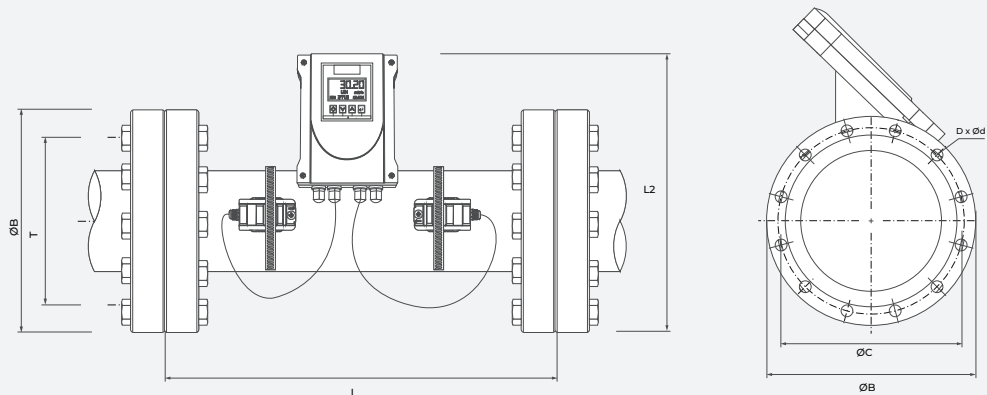
SLIP ON FLANGE CLASS 150
(ASME B 16.5 + MSS – SP 44 – 1996)
BS 3293

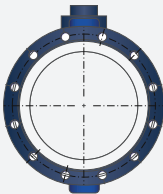
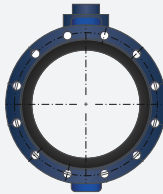
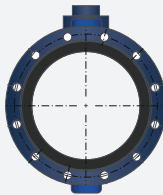
PIPE		D	C min	R	DRILLINGS			B min	X	Y	WEIGHT kg
DN	NPS				n	K	d ₂				
15	1/2"	89	11,2	34,9	4	60,3	15,8	22,4	30	16	0,8
20	3/4"	99	12,7	42,9	4	69,8	15,8	27,7	38	16	0,9
25	1"	108	14,3	50,8	4	79,4	15,8	34,5	49	17	1
32	1 1/4"	117	15,7	63,5	4	88,9	15,8	43,2	59	21	1,3
40	1 1/2"	127	17,5	73	4	98,4	15,8	49,5	65	22	1,5
50	2"	152	19,1	92,1	4	120,6	19	62	78	25	2,3
65	2 1/2"	178	22,3	104,8	4	139,7	19	74,7	90	29	3,7
80	3"	190	23,9	127	4	152,4	19	90,7	108	30	4,2
100	4"	229	23,9	157,2	8	190,5	19	116,1	135	33	5,9
125	5"	254	23,9	185,7	8	215,9	22,2	143,8	164	37	7
150	6"	279	25,4	215,9	8	241,3	22,2	170,7	192	40	8,5
200	8"	343	28,5	269,9	8	298,4	22,2	221,5	246	44	13,5
250	10"	406	30,2	323,8	12	362	25,4	276,4	305	49	19,5
300	12"	483	31,8	381	12	431,8	25,4	327,2	365	56	29

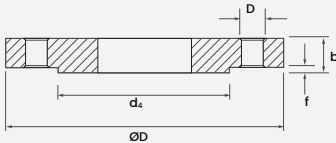
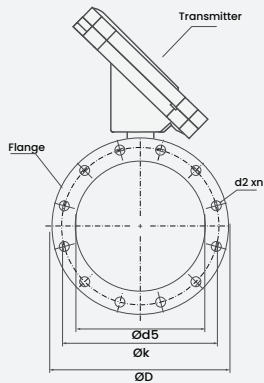
SLIP ON FLANGE CLASS 300
(ASME B 16.5 + MSS –SP 44 – 1996)
BS 3293

PIPE		D	C min	R	DRILLINGS			B min	X	Y	WEIGHT kg
DN	NPS				n	K	d ₂				
15	1/2"	95	14.2	34.9	4	66.7	15.8	22,4	38	22	1,2
20	3/4"	117	15.7	42.9	4	82.6	19	27,7	48	25	1,3
25	1"	124	17.5	50.8	4	88.9	19	34,5	54	27	1,4
32	1 1/4"	133	19	63.5	4	98.4	19	43,2	64	27	1,8
40	1 1/2"	156	20.6	73	4	114.3	22.2	49,5	70	30	2,5
50	2"	165	22.4	92.1	8	127	19	62	84	33	3
65	2 1/2"	190	25.4	104.8	8	149.2	22.2	74,7	100	38	4,5
80	3"	210	28.4	127	8	168.3	22.2	90,7	117	43	6
100	4"	254	31.8	157.2	8	200	22.2	116,1	146	48	10,1
125	5"	279	35	185.7	8	235	22.2	143,8	178	51	12,5
150	6"	318	36.6	215.9	12	269.9	22.2	170,7	206	52	17,5
200	8"	381	41.1	269.9	12	330.2	25.4	221,5	260	62	26
250	10"	444	47.8	323.8	16	387.4	28.5	276,4	320	66	28
300	12"	521	381	381	16	450.8	31.8	327,2	375	73	52

Flowmeter Connection Dimensions

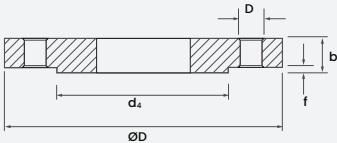
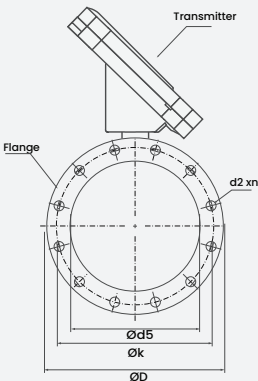


Material Type		DN (mm)	Pressure Class	Flange								
				L	L2	B	C	S	T	D	Perimeter hole Number (d)	Bolt Dia.
 Teflon  Ebonit  Kauçuk	Kalıp sistem	15	40 Bar	400	310	95	65	65	110	14	4	M12
		20		400	310	105	75	65	110	14	4	M12
		25		400	310	115	85	80	110	14	4	M12
		32		400	310	140	100	80	110	18	4	M16
		40		400	310	150	110	80	110	18	4	M16
		50		400	340	165	125	80	140	18	4	M16
		65	400	360	185	145	85	160	18	8	M16	
		80	400	360	200	160	85	160	18	8	M16	
		100	16Bar	400	410	220	180	125	210	18	8	M16
		125		400	410	250	210	125	210	18	8	M16
	150	400		470	285	240	155	270	22	8	M20	
	Kaynaklı Sistem	200	10Bar	400	520	340	295	175	320	22	8	M20
		250		400	570	395	350	235	370	22	12	M20
		300		500	650	445	400	240	450	22	12	M20
		350		500	670	505	460	240	470	22	16	M20
		400		600	730	565	515	320	530	26	16	M24
		450		600	790	615	565	320	590	26	20	M24
		500		600	830	670	620	370	630	26	20	M24
		600		600	940	780	725	400	740	30	20	M27
		700		700	1050	895	840	400	850	30	24	M27
		800		800	1170	1015	950	500	970	33	24	M30
		900		900	1270	1115	1050	600	1070	33	28	M30
		1000		1000	1350	1230	1160	700	1150	36	28	M33
1200		1200		1590	1455	1380	800	1390	39	32	M36	
1400	1400	1790	1675	1590	800	1590	42	36	M39			
1600	1600	1960	1915	1820	1000	1760	48	40	M45			
1800	1800	2170	2115	2020	1000	1970	48	44	M45			
2000	2000	2360	2325	2230	1000	2160	48	48	M45			



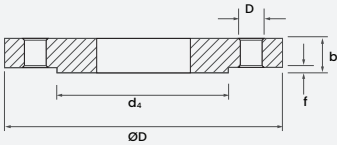
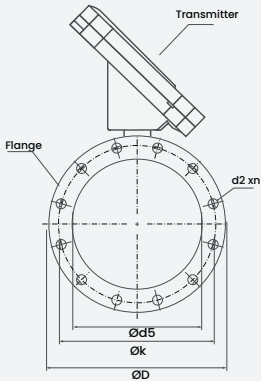
Pn 6 Steel Flat Flange
TS-EN 1092-1 /
TYPE 01/ DIN 2573

PIPE	FLANGE					FOREHEAD PROTRUSION		HOLES			WEIGHT	
DN	d ₅	D	b		k	d ₄	f	n	Screw	d ₂	EN 1092 - 1	DIN2501
			EN 1092-1	DIN2501							kg/ad - kg/pcs	kg/ad - kg/pcs
15	22	80	12	12	55	40	2	4	M10	11	0,35	0,35
20	27,5	90	14	14	65	50	2	4	M10	11	0,53	0,53
25	34,5	100	14	14	75	60	2	4	M10	11	0,65	0,65
32	43,5	120	16	14	90	70	2	4	M12	14	1,05	0,91
40	49,5	130	16	14	100	80	3	4	M12	14	1,20	1,00
50	61,5	140	16	14	110	90	3	4	M12	14	1,30	1,10
65	77,5	160	16	14	130	110	3	4	M12	14	1,60	1,40
80	90,5	190	18	16	150	128	3	4	M16	18	2,60	2,30
100	116	210	18	16	170	148	3	4	M16	18	2,90	2,50
125	141,5	240	20	18	200	178	3	8	M16	18	3,90	3,50
150	170,5	265	20	18	225	202	3	8	M16	18	4,30	3,80
200	221,5	320	22	20	280	258	3	8	M16	18	6,30	5,60
250	276,5	375	24	22	335	312	3	12	M16	18	8,20	7,50
300	327,5	440	24	22	395	365	4	12	M20	22	10,60	9,60
350	359,5	490	26	22	445	415	4	12	M20	22	15,30	12,70
400	411	540	28	22	495	465	4	16	M20	22	18,20	13,90
450	462	595	30	22	550	520	4	16	M20	22	22,70	16,10
500	513,5	645	30	24	600	570	4	20	M20	22	24,40	19,10
600	616,5	755	32	24	705	670	5	20	M24	26	31,50	22,80
700	718	860	40	24	810	775	5	24	M24	26	47,50	27,80
800	819	975	44	24	920	880	5	24	M27	30	65,30	33,50
900	920	1075	48	26	1020	980	5	24	M27	30	79,80	40,80
1000	1022	1175	52	26	1120	1080	5	28	M27	30	94,00	44,00
1100	1126	1300	54	28	1240	1202	5	28	M30	33	136,00	64,00
1200	1225	1405	60	28	1340	1295	5	32	M30	33	153,00	67,00
1300	1326	1520	65	30	1450	1400	5	32	M33	36	199,00	85,00
1400	1426	1630	72	32	1560	1510	5	36	M33	36	246,00	104,00
1500	1526	1730	74	32	1660	1610	5	36	M33	36	273,00	109,00
1600	1626	1830	80	34	1760	1710	5	40	M33	36	311,00	126,00
1800	1826	2045	88	36	1970	1920	5	44	M36	39	411,00	160,00
2000	2026	2265	96	38	2180	2125	5	48	M39	42	541,00	204,00
2200	2226	2475	Customer request Regarding it will be determined.	42	2390	2335	5	52	M39	42	-	273,00
2400	2426	2685		44	2600	2545	5	56	M39	42	-	323,00



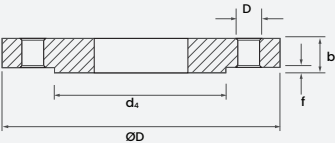
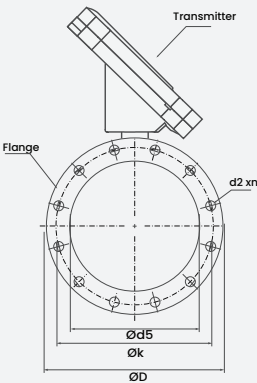
Pn 10 Steel Flat Flange
TS-EN 1092-1 /
TYPE 01 / DIN 2576

PIPE	FLANGE					FOREHEAD PROTRUSION		HOLES			WEIGHT	
DN	d ₅	D	b		k	d ₄	f	n	Screw	d ₂	EN 1092 - 1	DIN2501
			EN 1092-1	DIN2501							kg/ad - kg/pcs	kg/ad - kg/pcs
15	22	95	14	14	65	45	2	4	M12	14	0,59	0,59
20	27,5	105	16	16	75	58	2	4	M12	14	0,85	0,85
25	34,5	115	16	16	85	68	2	4	M12	14	1,01	1,01
32	43,5	140	18	16	100	78	2	4	M16	18	1,70	1,50
40	49,5	150	18	16	110	88	3	4	M16	18	1,80	1,60
50	61,5	165	20	18	125	102	3	4	M16	18	2,50	2,20
65	77,5	185	20	18	145	122	3	(1092)8/4 (DIN)	M16	18	3,00	2,70
80	90,5	200	20	20	160	138	3	8	M16	18	3,30	3,30
100	116	220	22	20	180	158	3	8	M16	18	4,00	3,60
125	141,5	250	22	22	210	188	3	8	M16	18	5,00	5,00
150	170,5	285	24	22	240	212	3	8	M20	22	6,50	6,00
200	221,5	340	24	24	295	268	3	8	M20	22	8,50	8,50
250	276,5	395	26	26	350	320	3	12	M20	22	11,00	11,00
300	327,5	445	26	26	400	370	4	12	M20	22	12,30	12,30
350	359,5	505	30	26	460	430	4	16	M20	22	20,30	17,40
400	411	565	32	26	515	482	4	16	M24	26	25,70	2,50
450	462	615	36	28	565	532	4	20	M24	26	31,50	22,20
500	513,5	670	38	28	620	585	4	20	M24	26	37,90	27,30
550	564	730	40	28	675	635	5	20	M24	26	47,60	33,00
600	616,5	780	42	28	725	685	5	20	M27	30	50,80	32,60
700	718	895	50	30	840	800	5	24	M27	30	77,10	44,50
800	819	1015	56	32	950	905	5	24	M30	33	109,50	60,10
900	920	1115	62	34	1050	1005	5	28	M30	33	133,90	70,60
1000	1022	1230	70	34	1160	1110	5	28	M33	36	179,00	83,00
1100	1126	1340	76	36	1270	1220	5	32	M33	36	224,00	102,00
1200	1225	1455	83	38	1380	1330	5	32	M36	39	280,00	123,00
1300	1326	1575	Customer request Regarding It will be determined.	38	1490	1440	5	32	M39	42	-	145,00
1400	1426	1675		42	1590	1535	5	36	M39	42	-	172,00
1500	1530	1785		44	1700	1648	5	36	M39	42	-	200,00
1600	1626	1915		46	1820	1760	5	40	M45	48	-	250,00
1800	1826	2115		50	2020	1960	5	44	M45	48	-	304,00
2000	2026	2325		54	2230	2170	5	48	M45	48	-	379,00
2200	2226	2550		58	2440	2370	5	52	M52	55	-	491,00
2400	2426	2760		62	2650	2570	5	56	M52	55	-	592,00
2600	2626	2960		66	2680	2780	5	60	M52	55	-	678,00



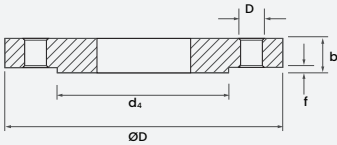
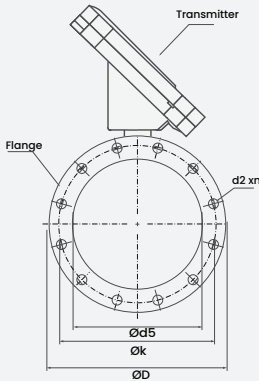
Pn 16 Steel Flat Flange
TS-EN 1092-1 /
TYPE 01 / DIN 2576

PIPE	FLANGE					FOREHEAD PROTRUSION		HOLES			WEIGHT	
DN	d ₅	D	b		k	d ₄	f	n	Screw	d ₂	EN 1092 - 1 kg/ad - kg/pcs	DIN2501 kg/ad - kg/pcs
			EN 1092-1	DIN2501								
15	22	95	14	14	65	45	2	4	M12	14	0,59	0,69
20	27,5	105	16	16	75	58	2	4	M12	14	0,85	0,97
25	34,5	115	16	16	85	68	2	4	M12	14	1,01	1,15
32	43,5	140	18	18	100	78	2	4	M16	18	1,68	1,68
40	49,5	150	18	18	110	88	3	4	M16	18	1,80	1,80
50	61,5	165	20	20	125	102	3	4	M16	18	2,50	2,50
65	77,5	185	22	22	145	122	3	8	M16	18	3,20	3,20
80	90,5	200	24	24	160	138	3	8	M16	18	4,00	4,00
100	116	235	26	24	190	162	3	8	M20	22	5,60	5,20
125	141,5	270	28	26	220	188	3	8	M24	26	7,60	7,00
150	170,5	300	30	28	250	218	3	8	M24	26	9,60	8,90
200	221,5	360	32	30	310	278	3	12	M24	26	13,50	12,60
250	276,5	425	35	32	370	335	3	12	M27	30	19,10	17,40
300	327,5	485	38	34	430	395	4	16	M27	30	25,00	22,20
350	359,5	555	42	38	490	450	4	16	M30	33	39,60	35,60
400	411	620	48	40	550	505	4	16	M33	36	55,00	45,40
450	462	670	54	42	600	555	4	20	M33	36	66,90	51,40
500	513,5	730	58	44	660	615	4	20	M33	36	83,90	62,80
600	616,5	845	68	46	770	720	5	20	M36	39	122,00	81,00
700	718	960	85	46	875	820	5	24	M39	42	184,00	97,00
800	819	1085	95	50	990	930	5	24	M45	48	257,00	131,00
900	920	1185	Customer request Regarding it will be determined.	54	1090	1030	5	28	M45	48	-	156,00
1000	1022	1320		58	1210	1140	5	28	M52	56	-	207,00
1100	1122	1420		66	1310	1240	5	32	M52	56	-	256,00
1200	1225	1530		70	1420	1350	5	32	M52	56	-	306,00
1300	1326	1640		74	1530	1455	5	32	M58	62	-	355,00
1400	1426	1755		76	1640	1560	5	36	M58	62	-	410,00
1500	1530	1865		84	1740	1670	5	36	M58	62	-	501,00
1600	1626	1975		90	1860	1780	5	40	M58	62	-	595,00
1800	1826	2195		96	2070	1985	5	44	M64	70	-	731,00
2000	2026	2425		102	2300	2210	5	48	M64	70	-	884,00



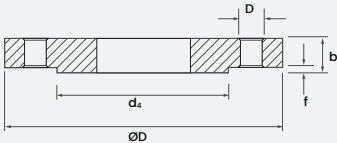
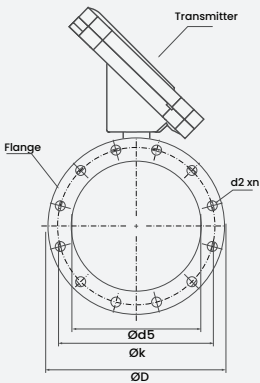
Pn 25 Steel Flat Flange
TS-EN 1092-1 /
TYPE 01 / DIN 2576

PIPE	FLANGE					FOREHEAD PROTRUSION		HOLES			WEIGHT	
DN	d ₅	D	b		k	d ₄	f	n	Screw	d ₂	EN 1092 - 1	DIN2501
			EN 1092-1	DIN2501							kg/ad - kg/pcs	kg/ad - kg/pcs
15	22	95	14	14	65	45	2	4	M12	14	0,59	0,69
20	27,5	105	16	16	75	58	2	4	M12	14	0,85	0,97
25	34,5	115	16	16	85	68	2	4	M12	14	1,01	1,15
32	43,5	140	18	18	100	78	2	4	M16	18	1,68	1,68
40	49,5	150	18	18	110	88	3	4	M16	18	1,80	1,80
50	61,5	165	20	20	125	102	3	4	M16	18	2,50	2,50
65	77,5	185	22	22	145	122	3	8	M16	18	3,20	3,20
80	90,5	200	24	24	160	138	3	8	M16	18	4,00	4,00
100	116	235	26	24	190	162	3	8	M20	22	5,60	5,20
125	141,5	270	28	26	220	188	3	8	M24	26	7,60	7,00
150	170,5	300	30	28	250	218	3	8	M24	26	9,60	8,90
200	221,5	360	32	30	310	278	3	12	M24	26	13,50	12,60
250	276,5	425	35	32	370	335	3	12	M27	30	19,10	17,40
300	327,5	485	38	34	430	395	4	16	M27	30	25,00	22,20
350	359,5	555	42	38	490	450	4	16	M30	33	39,60	35,60
400	411	620	48	40	550	505	4	16	M33	36	55,00	45,40
450	462	670	54	42	600	555	4	20	M33	36	66,90	51,40
500	513,5	730	58	44	660	615	4	20	M33	36	83,90	62,80
600	616,5	845	68	46	770	720	5	20	M36	39	122,00	81,00
700	718	960	85	46	875	820	5	24	M39	42	184,00	97,00
800	819	1085	95	50	990	930	5	24	M45	48	257,00	131,00
900	920	1185	Customer request Regarding it will be determined.	54	1090	1030	5	28	M45	48	-	156,00
1000	1022	1320		58	1210	1140	5	28	M52	56	-	207,00
1100	1122	1420		66	1310	1240	5	32	M52	56	-	256,00
1200	1225	1530		70	1420	1350	5	32	M52	56	-	306,00
1300	1326	1640		74	1530	1455	5	32	M58	62	-	355,00
1400	1426	1755		76	1640	1560	5	36	M58	62	-	410,00
1500	1530	1865		84	1740	1670	5	36	M58	62	-	501,00
1600	1626	1975		90	1860	1780	5	40	M58	62	-	595,00
1800	1826	2195		96	2070	1985	5	44	M64	70	-	731,00
2000	2026	2425		102	2300	2210	5	48	M64	70	-	884,00



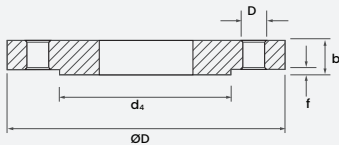
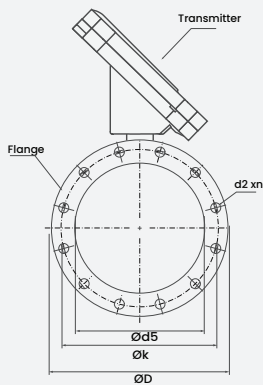
Pn 40 Steel Flat Flange
TS-EN 1092-1 /
TYPE 01 / DIN 2576

PIPE	FLANGE					FOREHEAD PROTRUSION		HOLES			WEIGHT	
DN	d _s	D	b		k	d ₄	f	n	screw	d ₂	EN 1092 - 1 kg/ad - kg/pcs	DIN2501 kg/ad - kg/pcs
			EN 1092-1	DIN2501								
15	22	95	14	14	65	45	2	4	M12	14	0,59	0,69
20	27,5	105	16	16	75	58	2	4	M12	14	0,85	0,97
25	34,5	115	16	16	85	68	2	4	M12	14	1,01	1,15
32	43,5	140	18	18	100	78	2	4	M16	18	1,67	1,67
40	49,5	150	18	18	110	88	3	4	M16	18	1,80	1,80
50	61,5	165	20	20	125	102	3	4	M16	18	2,40	2,40
65	77,5	185	22	22	145	122	3	8	M16	18	3,20	3,20
80	90,5	200	24	24	160	138	3	8	M16	18	4,00	4,00
100	116	235	26	24	190	162	3	8	M20	22	5,60	5,10
125	141,5	270	28	26	220	188	3	8	M24	26	7,60	7,00
150	170,5	300	30	28	250	218	3	8	M24	26	9,60	8,90
200	221,5	375	36	34	320	285	3	12	M27	30	17,00	16,00
250	276,5	450	42	38	385	345	3	12	M30	33	28,00	25,20
300	327,5	515	52	42	450	410	4	16	M30	33	43,10	34,50
350	359,5	580	58	46	510	465	4	16	M33	36	64,30	50,50
400	411	660	65	50	585	535	4	16	M36	39	94,10	71,70
450	462	685		50	610	560	4	20	M36	39	-	69,00
500	513,5	755		52	670	615	4	20	M39	42	-	83,10
600	616,5	890		60	795	735	5	20	M45	48	-	129,00
700	718	995		64	900	848	5	24	M45	48	-	159,00
800	819	1140		72	1030	970	5	24	M52	56	-	237,00
900	920	1250	Customer request Regarding it will be determined.	76	1140	1080	5	28	M52	56	-	285,00
1000	1022	1360		80	1250	1190	5	28	M52	56	-	343,00
1200	1224	1575		88	1460	1394	5	32	M58	62	-	454,00
1300	1324	1685		94	1570	1504	5	32	M58	62	-	545,00
1400	1424	1795		98	1680	1614	5	36	M58	62	-	624,00
1500	1528	1910		104	1790	1722	5	36	M60	64	-	732,00
1600	1624	2025		108	1900	1826	5	40	M66	70	-	827,00



Pn 64 Steel Flat Flange
TS-EN 1092-1 /
TYPE 01 / DIN 2576

PIPE	FLANGE					FOREHEAD PROTRUSION		HOLES			WEIGHT	
DN	d ₅	D	b		k	d ₄	f	n	Screw	d ₂	EN 1092 - 1	DIN2501
			EN 1092-1	DIN2501							kg/ad - kg/pcs	kg/ad - kg/pcs
15	22	105	20	20	75	45	2	4	M12	14	1,10	1,10
20	27,5	130	22	22	90	58	2	4	M16	18	1,86	1,86
25	34,5	140	24	24	100	68	2	4	M16	18	2,37	2,37
32	43,1	155	24	24	110	78	3	4	M20	22	2,70	2,70
40	49	170	26	26	125	88	3	4	M20	22	3,60	3,60
50	61,1	180	26	26	135	102	3	4	M20	22	3,90	3,90
65	71,1	205	26	26	160	122	3	8	M20	22	4,70	4,70
80	90,3	215	30	28	170	138	3	8	M20	22	5,90	5,50
100	115,9	250	32	30	200	162	3	8	M24	26	8,00	7,50
125	141,6	295	34	34	240	188	3	8	M27	30	11,70	11,70
150	170,5	345	36	36	280	218	3	8	M30	33	16,90	16,90
200	221,5	415	48	42	345	285	3	12	M33	36	30,50	26,50
250	276,2	470	55	46	400	345	3	12	M33	36	42,20	35,00
300	327,6	530	65	52	460	410	4	16	M33	36	59,00	46,80
350	359,7	600	72	56	525	465	4	16	M36	39	88,70	68,30
400	411	670	80	60	585	535	4	16	M39	42	120,90	89,90
500	513,5	800	Customer request Regarding it will be determined.	60	705	615	4	20	M45	48	-	117,00
600	616,5	930		62	820	735	5	20	M52	56	-	155,00
700	718	1045		68	935	840	5	24	M52	56	-	203,00
800	819	1165		76	1050	960	5	24	M58	62	-	270,00
900	920	1285		84	1170	1070	5	28	M58	62	-	352,00
1000	1022	1415		92	1290	1180	5	28	M66	70	-	454,00
1200	1226	1665		100	1530	1380	5	32	M74	78	-	646,00



Pn 100 Steel Flat Flange
TS-EN 1092-1 /
TYPE 01 / DIN 2576

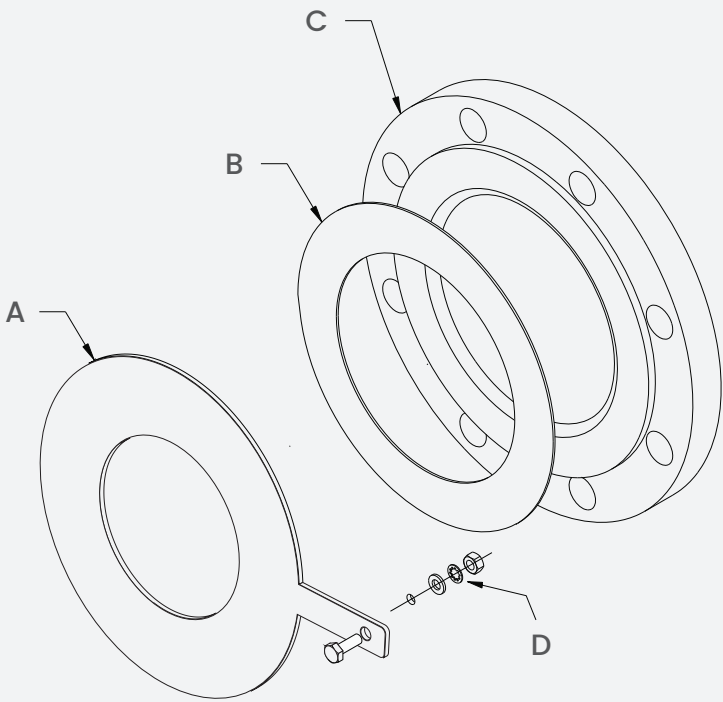
PIPE	FLANGE					FOREHEAD PROTRUSION		HOLES			WEIGHT	
DN	d ₅	D	b		k	d ₄	f	n	Screw	d ₂	EN 1092 - 1	DIN2501
			EN 1092-1	DIN2501							kg/ad - kg/pcs	kg/ad - kg/pcs
15	22	105	20	20	75	45	2	4	M12	14	1,10	1,10
20	27,6	130	22	22	90	58	2	4	M16	18	1,86	1,86
25	34,4	140	24	24	100	68	2	4	M16	18	2,37	2,37
32	43,1	155	24	24	110	78	3	4	M20	22	2,70	2,70
40	49	170	26	26	125	88	3	4	M20	22	3,58	3,58
50	61,1	195	28	28	145	102	3	4	M24	26	5,00	5,00
65	77,1	220	30	30	170	122	3	8	M24	26	6,34	6,34
80	90,3	230	34	32	180	138	3	8	M24	26	7,73	7,24
100	115,9	265	36	36	210	162	3	8	M27	30	10,33	10,30
125	141,6	315	42	40	250	188	3	8	M30	33	17,24	16,40
150	170,5	355	48	44	290	218	3	12	M30	33	23,63	21,60
200	221,5	430	60	52	360	285	3	12	M33	36	42,90	37,00
250	276,2	505	72	60	430	345	3	12	M36	39	69,12	57,20
300	327,6	585	84	68	500	410	4	16	M39	42	103,52	83,10
350	359,7	655	95	74	560	465	4	16	M45	48	149,69	115,60

CONDITIONS OF USE

In order to make precise and reliable measurements in MS Series electromagnetic flow-meters, the following conditions must be met;

- 1. The tested fluid must have a conductivity of 5 µS or higher
- 2. The pipeline must have a fully filled flow
- 3. The components within the fluid must be homogenously mixed
- 4. If the fluid induces magnetic fields, the magnetic field of the device will change, and the device will need to be recalibrated.
- 5. Installation methods complying with laminar flow regulations must be applied.
- 6. For plastic and non-conductive pipes, grounding rings and grounding connections must be included during installation.
- 7. Regardless of the pipe type, grounding connections must be made.

The dimensions of the ground loop of the flange sensor are between 15 and 300 mm.



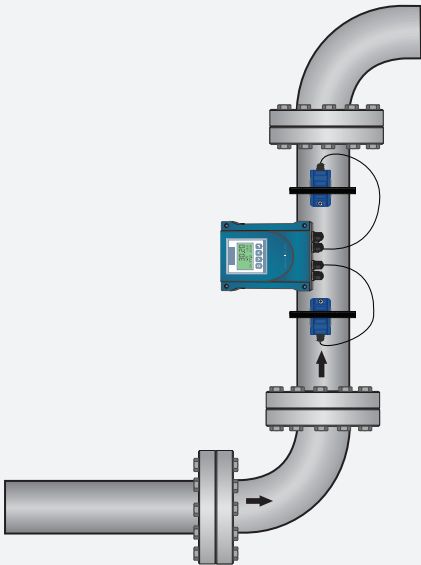
- A. Grounding ring
- B. Customer-supplied gasket
- C. Measuring flange
- D. Screw

DN	Thickness of grounding ring
15	2
20	2
25	2
32	2
40	2
50	2
65	2
80	2
100	2
125	2
150	2
200	2
250	2
300	2

TRANSDUCER INSTALLATION AND ADJUSTMENT

Vertically upwards

Full pipeline



Balanced flow

A balanced flow helps ensure stable and accurate measurements. Irregular flow can cause measurement data to become unstable or prevent measurement altogether. The standard requirements for balanced flow are as follows:

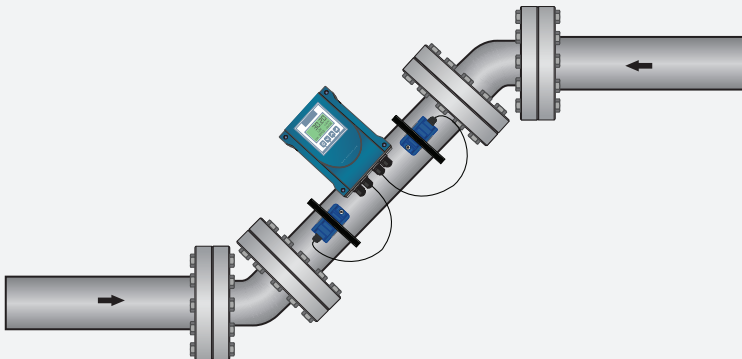
- 1 The pipe line should be located away from the pump outlet and the partially open valve. A distance of 10D upstream and 5D downstream should be maintained (D represents the outer diameter).
- 2 It should be 30D away from the pump outlet and the partially open valve.

Vibration

There should be no noticeable vibration at the mounting point; if present, it must be fixed.

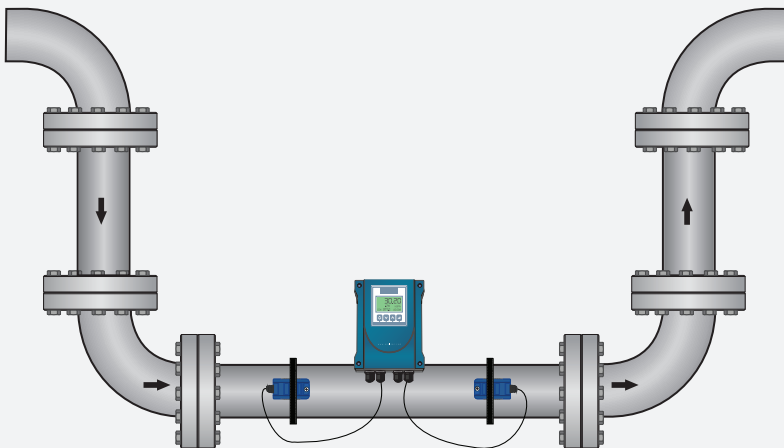
Obliquely upwards

Full pipeline

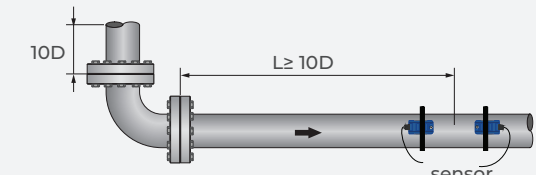
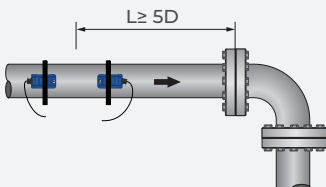
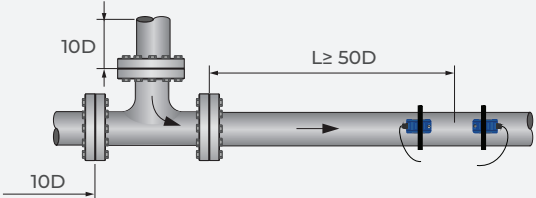
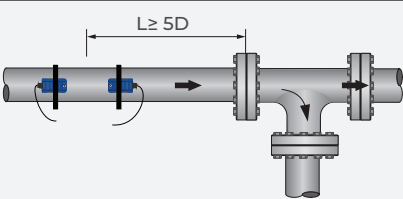
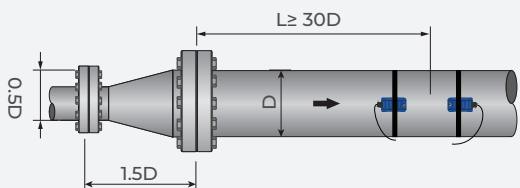
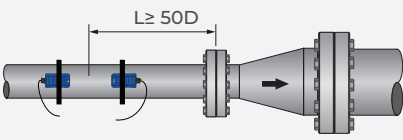
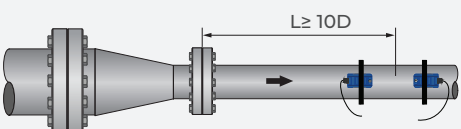
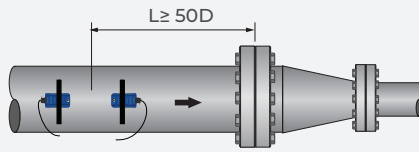
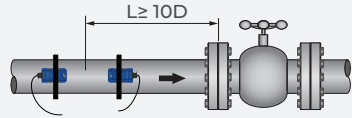
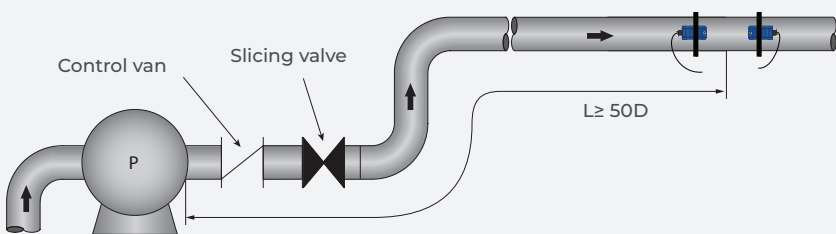


The lowest point

Full pipeline



NECESSARY STRAIGHT PASSAGES
D: Nominal diameter

Classification	Required upstream straight pipe length	Required downstream straight pipe length
90° Elbow		
T-shaped		
Expansion Pipe		
Reducer		
Valve	 Valve throttling in upstream line	 Throttling valve in downstream line
Pump		

PRECAUTIONS FOR USE



- 1 The pipe must always be filled with liquid.
- 2 In horizontal pipes, do not mount the sensor on top of or below the pipe.
- 3 When wrapping the sensor with insulation material, be careful not to exceed the sensor's ambient temperature limits.
- 4 To prevent the sensor grease from deteriorating, if the sensor is to be mounted outdoors, it is recommended to

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