

### Overview



SITRANS FM TRANSMAG 2 with the SITRANS FM MAG 911/E sensor is a pulsed alternating field magnetic flowmeter where the magnetic field strength is much higher than conventional DC pulsed magnetic flowmeters.

### Benefits

- Wide range of sizes DN 15 to DN 1000 (½" to 40")
- Broad range of liner and electrode materials for extreme process medias
- Fully welded construction provides a ruggedness that suits the toughest applications and environments.
- Automatic reading of SmartPLUG for easy commissioning
- Simple menu operation with two-line display
- Comprehensive self-diagnostic with selfmonitoring and internal simulation

### Application

The main applications of the SITRANS FM transmitter TRANSMAG 2 can be found in the following sectors:

- Pulp and Paper industry
- Mining industry

The patented pulse alternating field technology is ideal for difficult applications like:

- High concentrated paper stock > 3 %
- Heavy mining slurries up to 70 % solid concentration
- Mining slurries with magnetic particles.
- Low conductive medias  $\geq 1 \mu\text{S}/\text{cm}$  ( $0.1 \mu\text{S}/\text{cm}$  depending on medium)

### Design

- Available for remote mounting
- PROFIBUS PA (profile 2.0) / HART communication
- Analog output and digital outputs for pulses, device status, limits, flow direction, frequency output 110

### Mode of operation

The flow measuring principle is based on Faraday's law of electromagnetic induction according to which the sensor converts the flow into an electrical voltage proportional to the velocity of the flow.

## Flow Measurement

### SITRANS FM (electromagnetic)

#### Flow sensors

#### Transmitter TRANSMAG 2 with sensor MAG 911/E

#### Function

The TRANSMAG 2 is a microprocessor-based transmitter with a built-in alphanumeric display in several languages. The transmitters evaluate the signals from the associated electromagnetic sensors and also fulfill the task of a power supply unit which provides the magnet coils with a constant current.

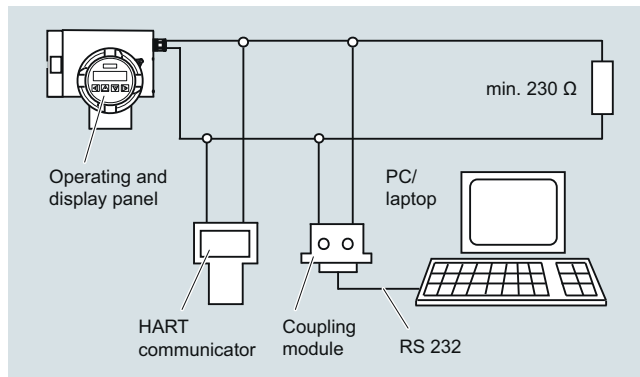
The magnetic flux density in the sensor is additionally monitored by reference coils.

Further information on connection, mode of operation and installation can be found in the data sheets for the sensors.

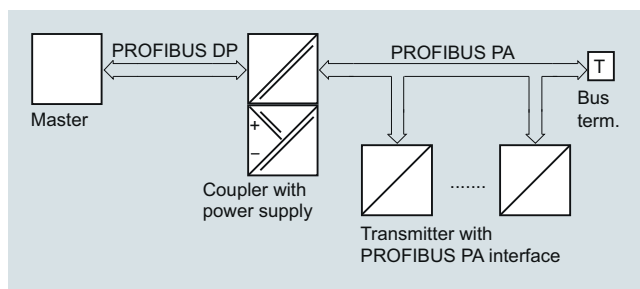
#### Displays and keypads

Operation of the transmitter can be carried out using:

- Keypad and display unit
- HART communicator
- PC/laptop and SIMATIC PDM software via HART communication
- PC/laptop and SIMATIC PDM software using PROFIBUS PA communication



HART communication



PROFIBUS PA communication

## Technical specifications

### Transmitter TRANSMAG 2

#### Mode of operation and design

Measuring principle	Electromagnetic with pulsed alternating field (PAC)
Magnetic field excitation	Automatic power supply synchronization
• 50 Hz AC power supply	Bipolar (16.7 Hz) Bipolar with prepulse (10 Hz) Unipolar (8.33 Hz)
• 60 Hz AC power supply	Bipolar (20 Hz) Bipolar with prepulse (12 Hz) Unipolar (10 Hz)

#### Accuracy under reference conditions

Measuring tolerance of pulse output	$\leq \pm 0.5\%$ of measured value $\pm 1.2$ mm/s (0.05 inch/s) $\pm 2.5$ mm/s (0.1 inch/s)
• With $v > 0.25$ m/s (0.82 ft/s)	
• With $v < 0.25$ m/s (0.82 ft/s)	$\pm 2.5$ mm/s (0.1 inch/s)
Measuring tolerance of analog output	As pulse output plus $\pm 0.1\%$ conversion error $\pm 20$ $\mu$ A
Repeatability	0.2 % of measured value
<u>Reference conditions</u>	
• Process temperature	25 °C $\pm$ 5 °C (77 °F $\pm$ 9 °F)
• Ambient temperature	25 °C $\pm$ 5 °C (77 °F $\pm$ 9 °F)
• Warm-up time	Min. 30 min
• Installation conditions	Inlet pipe section $\geq 10 \times$ DN Outlet pipe section $\geq 5 \times$ DN
• Medium	Installed centered in pipe Water without gaseous or solid components

#### Calibration

Default calibration, calibration report shipped with sensor	2 $\times$ 20 %, 2 $\times$ 50 % and 2 $\times$ 100 %
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#### Outputs

Electrical isolation	Outputs electrically isolated from one another and from the power supply, max. 60 V permissible against PE/equipotential bonding
<u>Current output</u>	0/4 ... 20 mA (7ME5034-0... or 7ME5034-2...)
• Signal	
- Upper limit	0/4 ... 20 mA, selectable
- Failure	20 ... 22.5 mA, optional 3.6; 20 or 24 mA
• Load	
- Output	max. 600 $\Omega$ , max. load voltage 15 V DC
- For HART communication	$\geq 250$ $\Omega$
Communication	Via analog output with PC coupling module or HART communicator
• Protocol	HART, version 5.1
<u>Digital output</u>	
Signal	
• Output	Configurable as active or passive signals
- Active signal	24 V DC, $\leq 24$ mA, $R_i = 170$ $\Omega$
- Passive signal	Open collector, max. 30 V DC, 200 mA
Output configuration	
• Pulse	
- Pulse significance	$\leq 5000$ pulses/s
- Pulse width	$\geq 0.1$ ms
• Limit frequency	$\leq 10000$ Hz
• Limits	Limits for flow and quantity, flow direction, alarm
<u>Digital output 2 (relay)</u>	
(only 7ME5034-0...)	
Relay	NC or NO function
• Rating	Max. 5 W, max. 50 V AC/DC, max. 200 mA
• Output configuration	Limits for flow and quantity, flow direction, alarm

### Transmitter TRANSMAG 2

<u>Digital input</u> (optional to digital output 2) (only 7ME5034-2...)	Non-intrinsically-safe
• Input function configurable as high-active or low-active	Set measured value to zero or reset totalizer
• Signal voltage	Max. 30 V DC, $R_i = 3$ k $\Omega$ High level: +11 ... +30 V DC Low level: -30 ... +5 V DC
<b>For PROFIBUS devices</b>	
PROFIBUS PA (for PROFIBUS-devices 7ME5034-1...)	Layer 1 and 2 according to PROFIBUS PA
• Communication	Transmission according to IEC 1158-2
	Layer 7 (protocol layer) according to PROFIBUS PA and DP V1 (EN 50170)
	Device Class B, device profile 2.0
	Max. 4 simultaneous C2 connections 9 ... 32 V DC permissible
• Bus voltage	10 mA; limited to $\leq 15$ mA in event of fault by electrical current limitation
• Current consumption from bus	
<b>Rated operating conditions</b>	
Ambient temperature	
• Operation	-20 ... +60 °C (-4 ... +140 °F)
• Storage	-25 ... +80 °C (-13 ... +176 °F)
Degree of protection	IP67/NEMA 4X
Electromagnetic compatibility (EMC)	
• Emitted interference	To IEC/EN 61326 for use in industrial areas
• Noise immunity	To IEC/EN 61326 for use in industrial areas
<b>Design</b>	
Weight of transmitter	4.4 kg (9.7 lb)
Remote version	Transmitter must be connected to sensor using shielded cable
Maximum cable length	100 m (328 ft)
Housing	Die-cast aluminum, painted
<b>Cables entries</b>	Remote installations
• Power supply and outputs	2 $\times$ M20 (HART)/M25 (PROFIBUS) or 2 $\times$ 1/2" NPT (HART)
• Sensor connections	2 $\times$ M16 (HART) or 2 $\times$ 1/2" NPT
<b>Displays and keypad</b>	
General display	LCD, backlid, two lines with 16 characters each
Multi-display for Keypad	Flow, totalizer, flow velocity
Keypad	4 keys for entering parameters
<b>Power supply</b>	
corresponding to rating plate	
• AC supply	100 ... 250 V AC $\pm 15\%$ , 47 ... 63 Hz
• Power consumption	Approx. 120 ... 630 VA, depending on sensor
Line fuse	100 ... 230 V AC: T1.6A
Magnet current fuse	F5A/250 V

## Flow Measurement

### SITRANS FM (electromagnetic)

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#### Transmitter TRANSMAG 2 with sensor MAG 911/E

#### Technical specifications (continued)

##### Sensor cables between sensor and transmitter

Sufficient shielding must be provided, as well as fixed routing of the signal cables (electrode and coil cable).

Signal cables must be routed free of vibration, and protected against strong magnetic and stray fields. In case of doubt, the sensor cables must be routed in grounded steel conduit. The cable length between the sensor and transmitter must not exceed 100 m (328 ft).

#### MAG 911/E sensor

##### Process connection

###### Flanges

- EN 1092-1, raised face (EN 1092-1, DIN 2501 and BS 4504 have the same mating dimensions)
  - DN 200 ... 1000 (8" ... 40"): PN 10 (145 psi)
  - DN 65 ... 1000 (2½" ... 40"): PN 16 (232 psi)
  - DN 200 ... 1000 (8" ... 40"): PN 25 (362 psi)
  - DN 15 ... 1000 (½" ... 40"): PN 40 (580 psi)
- ANSI B16.5 (BS 1560), raised face
  - ½" ... 40": Class 150 (20 bar (290 psi))
  - ½" ... 24": Class 300 (50 bar (725 psi))
  - 28" ... 40": Class D (10 bar)
  - ½" ... 24": K10
- AWWA C-207, raised face
- JIS B 2220:2004

##### Media conductivity

Minimum conductivity  $\geq 1 \mu\text{S}/\text{cm}$

##### Rated operating conditions

###### Enclosure rating

IP67/NEMA 4X  
Optional IP68/NEMA 6

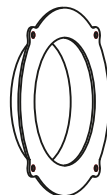
###### Temperature of medium

- Soft rubber
  - 0 ... +70 °C (32 ... 158 °F)
- Hard rubber
  - 0 ... +90 °C (32 ... 194 °F)
- PTFE
  - Option: 100°C (212°F)
  - 20 ... +150 °C (-4 ... +302 °F) at 25 bar (363 psi)
  - 20 ... +100 °C (-4 ... +212 °F) at 40 bar (580 psi)
- Linatex
  - 40 ... +70 °C (-40 ... +158 °F) (for temperatures below -20 °C (-4 °F) AISI 316L/1.4404 flanges must be used)
- Novolac
  - 130 °C (266 °F) at 40 bar (580 psi)

##### Design

Weight	See dimensional drawings
Flange and housing material	Carbon steel ASTM A 105, with corrosion resistant coating Corrosivity category C3 acc. to ISO 12944-2, or AISI 316L/1.4404 flanges and carbon steel housing ASTM A 105, with corrosion resistant coating Corrosivity category C3 according to ISO 12944-2
Measuring pipe material	Stainless steel AISI 304 or higher
Electrode material	<ul style="list-style-type: none"> <li>AISI 316/1.4571</li> <li>Hastelloy C276/2.4819</li> <li>Platinum</li> <li>Titanium</li> <li>Tantalum</li> </ul>
Grounding electrode material	Defined via the order code
Terminal box (remote version only)	<ul style="list-style-type: none"> <li>Standard: Fibre glass reinforced polyamide</li> <li>Option: Stainless steel AISI 316/1.4436</li> </ul>
Cable entries	2 x M20 or 2 x ½" NPT

#### Protection ring



Function	To protect the edges of liners from abrasion (e.g. gravel, sand etc.). Used mainly with soft rubber liners and for PTFE liners at high temperatures from 100 to 150 °C (212 to 302 °F).
Contact with medium	Yes, please always check resistance to measured medium.
Material	Stainless steel AISI 316/1.4571, optionally Hastelloy C276/2.4819
Material thickness	The overall length of the sensor is increased by 6 mm for DN 15 to DN 150 (0.24" for ½" to 6") or 10 mm for DN 200 to DN 600 (0.4" for 8" to 24")
Standard	Optional for all liners. Must be ordered separately.
Order No.	7ME5942-...

#### Grounding ring



Function	Electrical reference and grounding of the medium. Required if the pipelines are not electrically conducting or are lined (plastic pipelines, concrete pipelines etc.). All grounding rings must be connected to the grounding screw present on the sensor.
Contact with medium	Yes, please always check resistance to measured medium.
Material	Stainless steel AISI 316/1.4571 or Hastelloy C4/2.4610
Material thickness	The overall length of the sensor is increased by 2 mm (0.08") per grounding ring.
Standard	Optional for all liners. Required between the medium and sensor for equipotential bonding between non-conducting pipelines or lined pipelines.
Order No.	7ME5943-...

#### Important:

The rings must be ordered together with the sensor. Gaskets are not included. In case of replacement please include the sensor MLFB code on the order.

### Technical specifications (continued)

#### Classification according to pressure equipment directive (PED 2014/68/EU)

Nominal size		Nominal pressure		Permissible media	Category
DN	(inches)	PN	(MWP psi)		
15 ... 25	(½" ... 1")	40	580	Gases fluid group 1 and liquids fluid group 1	Article 4.3
200 ... 300	(8" ... 12")	10	(145)	Gases fluid group 1 and liquids fluid group 1	II
65 ... 250	(2½" ... 10")	16	(232)	Gases fluid group 1 and liquids fluid group 1	II
40 ... 100	(1½" ... 4")	40	(580)	Gases fluid group 1 and liquids fluid group 1	II
350 ... 1000	(14" ... 40")	10	(145)	Gases fluid group 1 and liquids fluid group 1	III
300 ... 1000	(12" ... 40")	16	(232)	Gases fluid group 1 and liquids fluid group 1	III
200 ... 600	(8" ... 24")	25	(363)	Gases fluid group 1 and liquids fluid group 1	III
125 ... 600	(5" ... 24")	40	(580)	Gases fluid group 1 and liquids fluid group 1	III

#### Notes on pressure equipment directive

The devices are designed for liquids of danger group "Gases of fluid group 1". The categories differ according to the version, and are listed in the table below.





## Flow Measurement

SITRANS FM (electromagnetic)

Flow sensors

### Transmitter TRANSMAG 2 with sensor MAG 911/E




#### Selection and ordering data (continued)

##### Operating instructions for SITRANS FM TRANSMAG 2






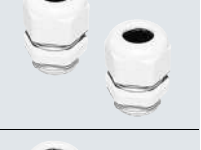


Description	Article No.
• English	A5E00102775
• German	A5E00102774

All literature is available to download for free, in a range of languages, at <http://www.siemens.com/processinstrumentation/documentation>

##### Accessories

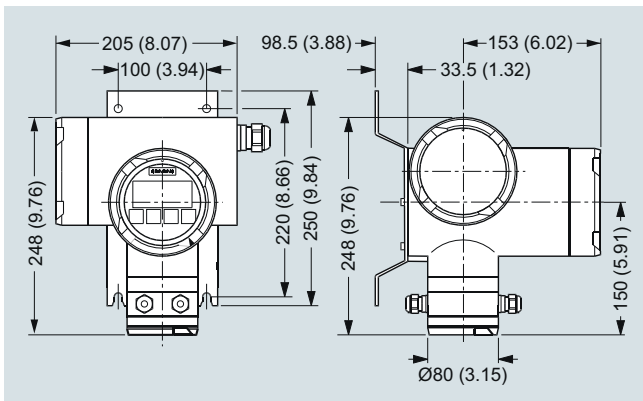
Description	Article No.	
Standard wall-mounting bracket, stainless steel AISI 316L/1.4404	7ME5933-0AC04	
Special wall-mounting bracket, BI 2.5 DIN 59382 X6Cr17	7ME5933-0AC05	
Potting kit for IP68/ NEMA 6P sealing of sensor junction box	FDK:085U0220	

##### Spare parts

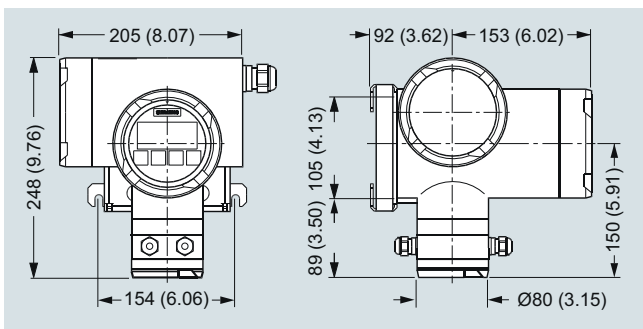
Description	Article No.	
Display unit	7ME5933-0AC00	
Display lid (Ex) in die-cast aluminum, with corrosion resistant coating (min. 60 mm)	7ME5933-0AC01	
Blind lid for sensor cables connection compartment (only remote version) in die-cast aluminum, with corrosion resistant coating (min. 60 mm) incl. O-ring seal	7ME5933-0AC02	
Blind lid (mains supply, input/outputs) in die-cast aluminum, with corrosion resistant coating (min. 60 mm)	7ME5933-0AC03	
Safety clamp for electronic cover with glass plate (7ME5933-0AC01)	7ME5933-0AC06	
M20 cable gland set for power and output connection, gray PA plastic, 2 pcs. • cables Ø 6 ... 12 mm (0.24" ... 0.47") • -40 ... +100 °C (-40 ... +212 °F)	A5E02246350	
1/2" NPT cable gland set for power and output connection, gray PA plastic, 2 pcs. • cables Ø 6 ... 12 mm (0.24" ... 0.47") • -40 ... +100 °C (-40 ... +212 °F)	A5E02246396	
M16 x 1.5 cable gland set for sensor connection, brass chrome, 2 pcs. and 2 pcs. blind • cables Ø 5 ... 9 mm (0.20" ... 0.35") • -20 ... +105°C (-4 ... +221 °F)	A5E02246369	



**Dimensional drawings**



SITRANS FM transmitter TRANSMAG 2 with wall-mounting bracket, dimensions in mm (inch)



SITRANS FM transmitter TRANSMAG 2 with special wall-mounting bracket, dimensions in mm (inch)

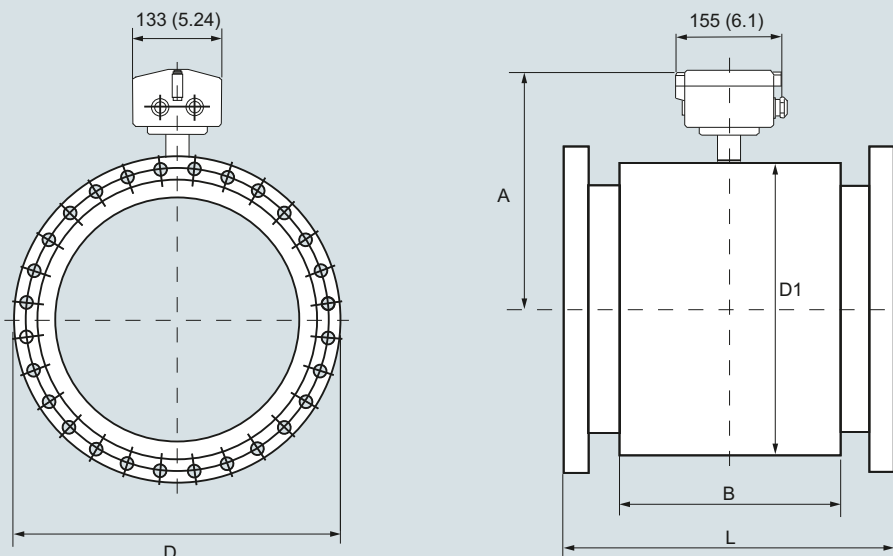
## Flow Measurement

SITRANS FM (electromagnetic)

Flow sensors

### Transmitter TRANSMAG 2 with sensor MAG 911/E

#### Dimensional drawings (continued)



SITRANS FM flow sensor MAG 911/E, compact version, dimensions in mm (inch)

Built-in length MAG 911/E [in mm and inch]

Nominal size	DN 15	DN 25	DN 40	DN 50	DN 65	DN 80	DN 100	DN 125	DN 150	DN 200	DN 250
	½"	1"	1½"	2"	2½"	3"	4"	5"	6"	8"	10"
<b>Built-in length L<sup>1)</sup></b>											
Hard rubber version	270	270	280	280	330	340	340	370	370	410	470
Linatex/soft rubber version	(10.63)	(10.63)	(11.02)	(11.02)	(12.99)	(13.39)	(13.39)	(14.57)	(14.57)	(16.14)	(18.50)
PTFE-liner without protection rings	270	270	280	280	330	340	340	370	370	410	470
	(10.63)	(10.63)	(11.02)	(11.02)	(12.99)	(13.39)	(13.39)	(14.57)	(14.57)	(16.14)	(18.50)
Novolak-version	-	-	275	275	325	335	333	362	362	401	460
			(10.83)	(10.83)	(12.79)	(13.19)	(13.11)	(14.25)	(14.25)	(15.79)	(18.11)
<b>Dimensions of sensor housing</b>											
Housing width B	170	170	170	170	170	170	170	170	170	240	240
	(6.69)	(6.69)	(6.69)	(6.69)	(6.69)	(6.69)	(6.69)	(6.69)	(6.69)	(9.45)	(9.45)
Height A	206	206	222	229	262	262	274	286	299	334	358
	(8.11)	(8.11)	(8.74)	(9.02)	(10.32)	(10.32)	(10.79)	(11.26)	(11.78)	(13.15)	(14.10)
Housing diameter D <sub>1</sub>	135	135	167	182	247	247	272	296	322	392	440
	(5.35)	(5.35)	(6.58)	(7.17)	(9.73)	(9.73)	(10.71)	(11.65)	(12.68)	(15.43)	(17.32)
Weight of PN 16 version in kg (MWP 232 psi version in lb) approx.	8.0	8.5	11.5	25.0	26	27	28	34	38	68	81
	(17.64)	(18.74)	(25.35)	(55.12)	(57.32)	(59.53)	(61.73)	(74.95)	(83.78)	(149.9)	(178.6)
Nominal size	DN 300	DN 350	DN 400	DN 450	DN 500	DN 600	DN 700	DN 750	DN 800	DN 900	DN 1000
	12"	14"	16"	18"	20"	24"	28"	30"	32"	36"	40"
<b>Built-in length L<sup>1)</sup></b>											
Hard rubber version	500	550	600	650	650	780	910	910	1040	1170	1300
Linatex/soft rubber version	(19.68)	(21.65)	(23.62)	(25.59)	(25.59)	(30.71)	(35.83)	(35.83)	(40.95)	(46.06)	(51.18)
PTFE-liner without protection rings	500	550	600	660	650	780	-	-	-	-	-
	(19.68)	(21.65)	(23.62)	(25.98)	(25.59)	(30.71)					
Novolak-version	489	538	592	638	638	772	903	903	1033	1163	1293
	(19.25)	(21.18)	(23.31)	(25.12)	(25.12)	(30.39)	(35.55)	(35.55)	(40.63)	(45.79)	(50.91)
<b>Dimensions of sensor housing</b>											
Housing width B	240	225	250	270	300	360	420	420	500	560	620
	(9.45)	(8.86)	(9.84)	(10.63)	(11.81)	(14.17)	(16.54)	(16.54)	(19.69)	(22.05)	(24.41)
Height A	383	375	400	433	453	505	558	590	608	658	713
	(15.08)	(14.76)	(15.75)	(17.05)	(17.84)	(19.88)	(21.97)	(23.23)	(23.94)	(25.91)	(28.07)
Housing diameter D <sub>1</sub>	490	474	524	591	629	734	839	904	939	1039	1150
	(19.29)	(18.66)	(20.63)	(23.26)	(24.76)	(28.90)	(33.03)	(35.59)	(36.97)	(40.91)	(45.28)
Weight of PN 16 version in kg (MWP 232 psi version in lb) approx.	95	118	161	185	233	401	420	450	500	560	620
	(209.4)	(260.2)	(354.9)	(407.9)	(513.7)	(884.1)	(925.9)	(992.1)	(1102.3)	(1234.6)	(1366.9)

<sup>1)</sup> Tolerance for built-in length: L + 0.0 mm/-4.0 mm (-0.00/-0.157 inches).

With protection rings for > DN 25 +6.0 mm, > DN 200 +10.0 mm (> 1" +0.236 inches, > 8" +0.394 inches)