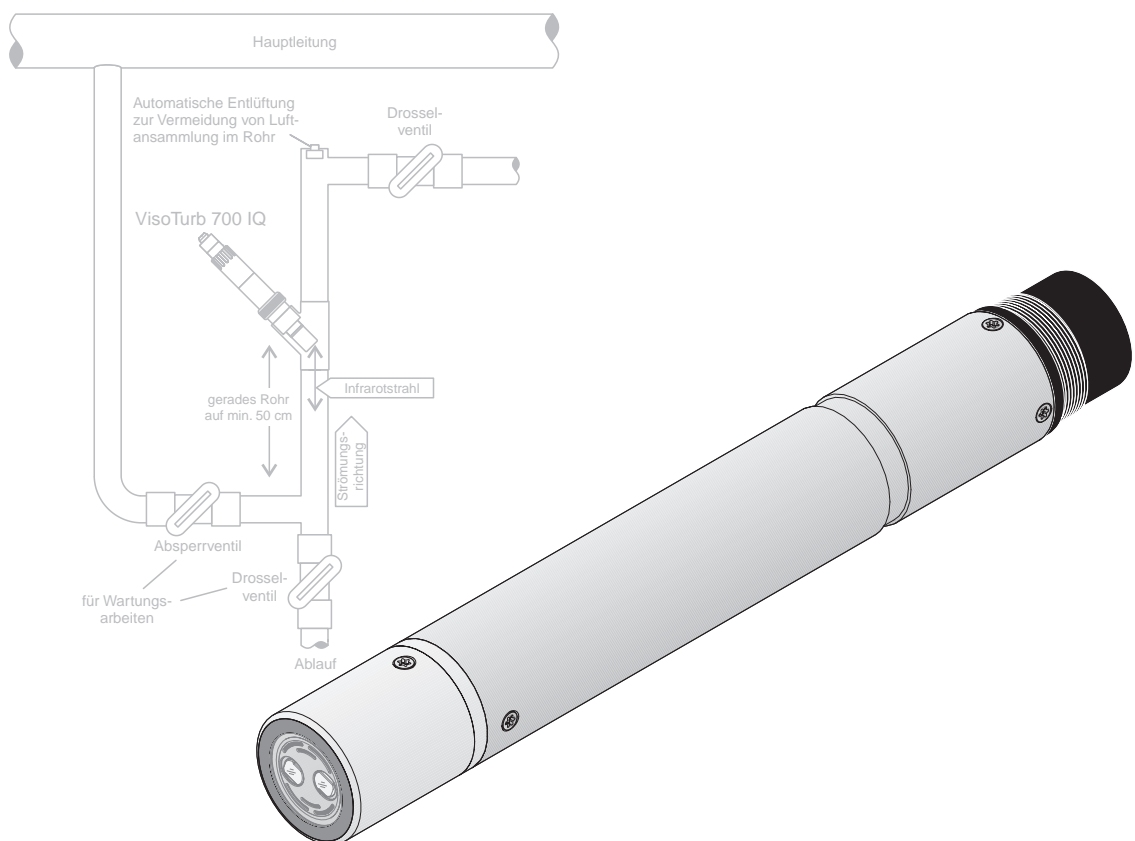


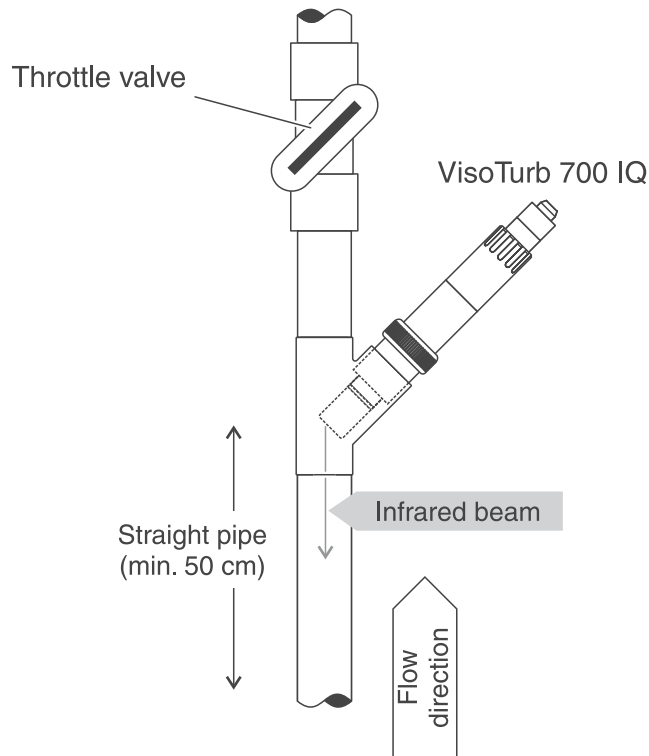
Turbidity measurement in drinking water using the VisoTurb 700 IQ in a pipeline (especially in the range < 1 FNU)



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1 General notes on pipe installation

1.1 Generally recommended design for pipe installation



Favorable factors for turbidity measurement in drinking water with this design:

- No air bubbles are collected in front of the measurement windows. The tilted installation position makes any air bubbles move upwards. The natural buoyancy of the air bubbles is supported by the upward pipe flow.
- No formation of sediment on the measurement windows due to the downward installation position.
- The dynamic pressure in front of the throttle valve prevents the bubbling of dissolved gases.



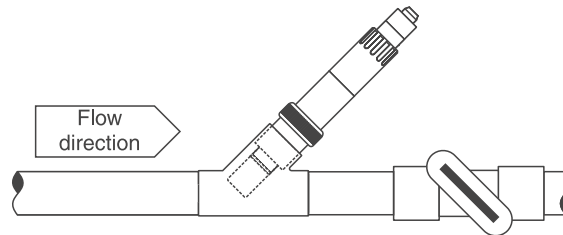
Note

For measurement in drinking water it is especially important to prevent the infrared beam of the VisoTurb 700 IQ from being scattered on a pipe wall in the vicinity of the sensor. With the shown installation this is guaranteed because the beam is parallel to the pipe axis and does not hit any obstacle over a distance of 50 cm. The VisoTurb 700 IQ has a marking on the shaft that serves to correctly align the beam. For details please refer to the operating manual of the sensor.

1.2 Examples of problematic installation situations

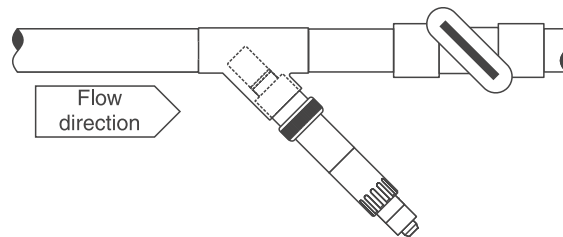
The following examples show horizontal installation situations where interferences by air bubbles or sediment are likely. Horizontal installation situations should be generally avoided for measurements in drinking water.

Example 1



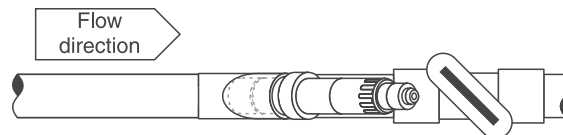
! Possible collection of air bubbles at the measurement window.

Example 2



! Possible accumulation of sediment on the measurement window.

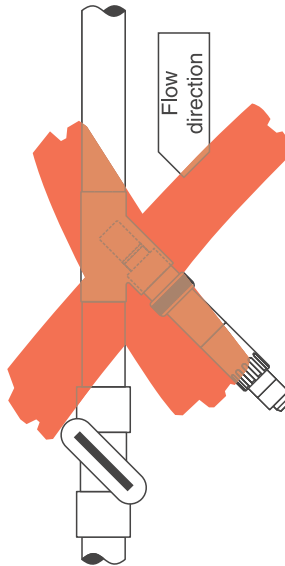
Example 3



! Insufficient evacuation of air bubbles and sediments.

1.3 Unsuitable installation situation

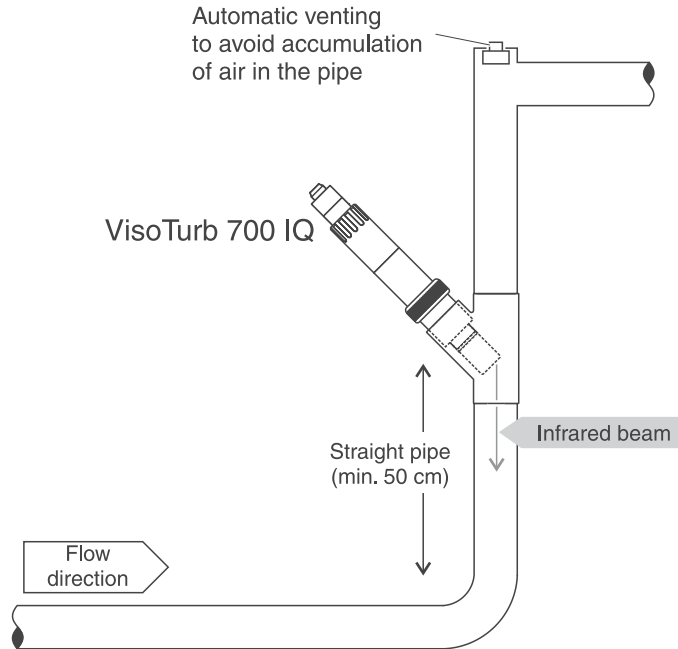
The following installation situation is unsuitable for measurements in drinking water:



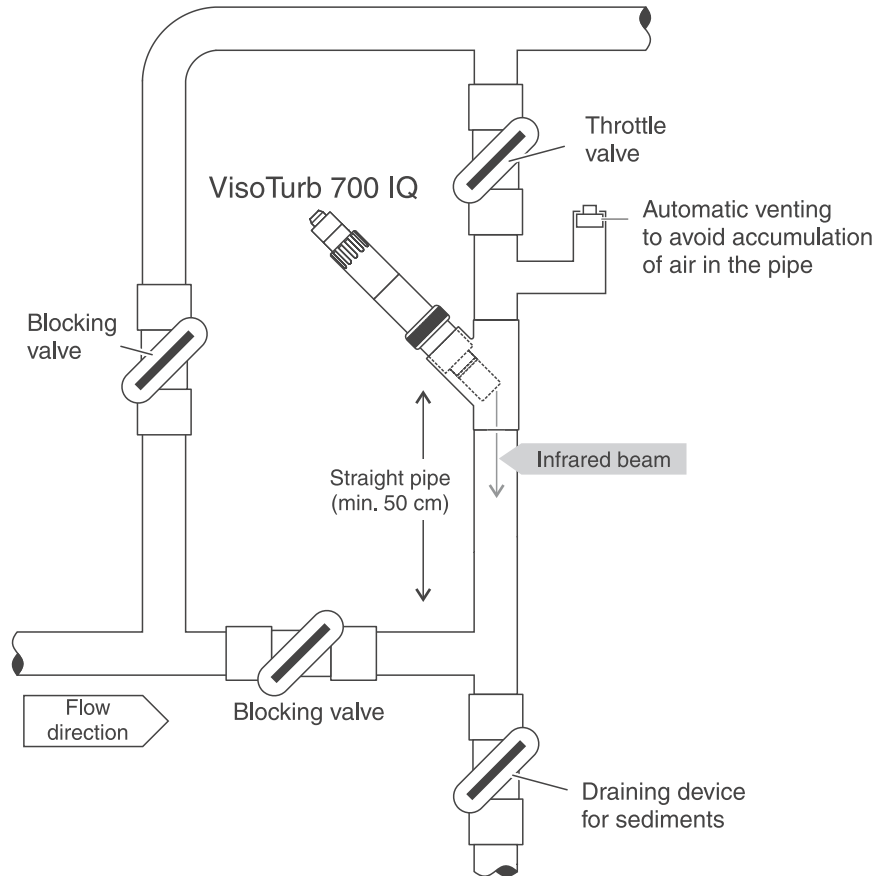
- The flow has an adverse effect on the buoyancy of air bubbles. Therefore, bad evacuation.
- Possible accumulation of sediment on the measurement window.

2 Installation in the main pipe and bypass

Installation in the main pipe



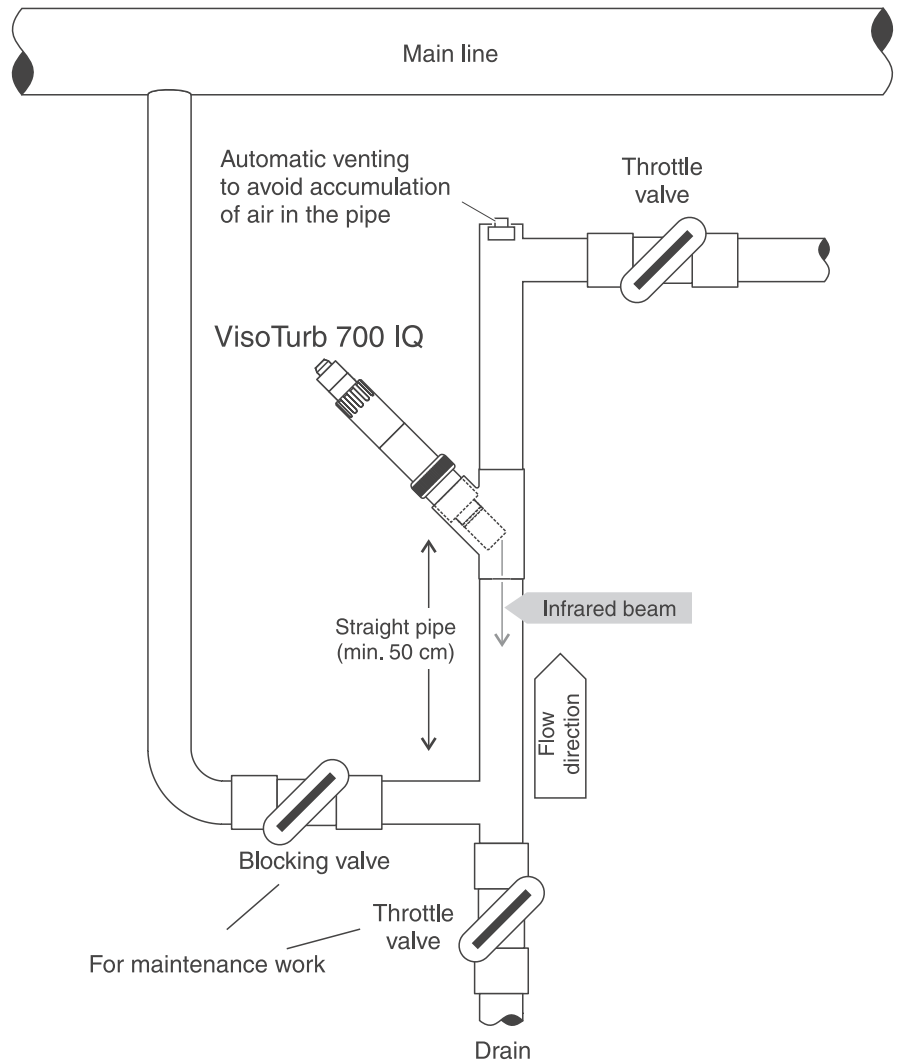
Installation in the bypass



3 Rejecting measurement (usual in drinking water applications)

3.1 Installation

Installation for optimum
suppression of
interferences by air
bubbles



Steps after installation

- Commission the sensor with the setting shown in section 3.2 (measuring range $0 \dots 40.0 \text{ FNU}$ / resolution 0.1 FNU)
- Perform application adjustment according to section 3.3
- Select the measuring range $0 \dots 4.00 \text{ FNU}$ with resolution 0.01 FNU and check the result of the application adjustment
- If necessary, correct the application adjustment.

3.2 Settings for initial commissioning

Recommended settings	Setting	Value
	<i>Measuring range</i>	<i>0 ... 40.0 FNU</i>
	<i>Signal averaging</i>	<i>60 sec</i>
	<i>Application offset</i>	<i>0 FNU</i>

The measuring range of *0 ... 40.0 FNU* serves to determine the turbidity value for the first application adjustment (see following section). It will later be decreased for the running measurement to achieve a higher resolution.

3.3 Application adjustment

First application adjustment

In the case of pipe installation and slightly turbid samples (up to 20 FNU), an application adjustment is required on principle. For this, note down the measured value of the VisoTurb 700 IQ after the initial commissioning and carry out a comparison measurement using a laboratory turbidimeter (e.g. Turb 550 IR).

From both values, the input value for the application adjustment is calculated as follows (the determined value is normally negative):

Input value for application adjustment = turbidity value (laboratory) - turbidity value (VisoTurb 700 IQ)

Example:

Turbidity value (VisoTurb 700 IQ) after commissioning = 8.0 FNU

Turbidity value (laboratory comparison measurement) = 0.2 FNU

=> Input value for application adjustment = -7.8 FNU

Enter this value in the setting table of the VisoTurb 700 IQ.

Check/correction of the application adjustment

For the check of the application adjustment and later measurement, change the following settings:

- Decrease the measuring range to 0 ... 4.00 FNU.
Note: Decreasing it even further can lead to frequent measuring range overflow (OFL) .
- Increase the signal averaging to 600 seconds.

If the deviation is still too great after checking with a laboratory turbidimeter, you can readjust the application adjustment correspondingly using the above formula.

Example:

Turbidity value (VisoTurb 700 IQ) = 0.22 FNU

Turbidity value (laboratory comparison measurement) = 0.18 FNU

=> Difference according to above formula = -0.04 FNU

Now add this value to the value already entered.

=> New input value = -7.8 FNU + (-0.04 FNU) = -7.84 FNU

Enter this value in the setting table of the VisoTurb 700 IQ.

4 Technical data

4.1 General data

Measuring principle Turbidity measurement

Procedure for scattered light measurement in accordance with EN ISO 7027 (DIN EN 27027 or ISO 7027):

- 90 ° measuring angle
- Measurement in formazine nephelometric units, FNU
- Conversion of the values to:
 - NTU
 - TEF
 - mg/l SiO₂
 - ppm SiO₂
 - g/l TSS (dry substance)

Cleaning system

Ultrasound principle

SensCheck

- Recognition of a measurement malfunction
- Failure of the cleaning system

Material

Measurement window	Sapphire
Housing shaft	V4A steel 1.4571
Plug head connector housing	Polyoxymethylene (POM)
Plug, 3-pole	ETFE (blue) Tefzel [®]

Dimensions

Shaft length	365 mm (incl. socket of the SACIQ sensor connection cable)
Shaft diameter	40 mm

Weight

990 g (without sensor connection cable)

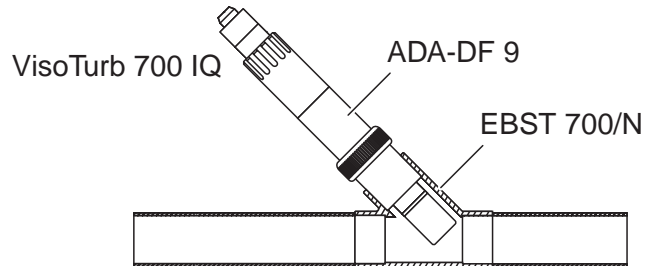
Temperature range	Measuring medium	0 °C ... + 60 °C Operation with ultrasound cleaning system possible up to 40 °C <u>Note:</u> The ultrasound cleaning system automatically switches off and on again. The switch-off above 40 °C prevents overheating, for example if the minimum immersion depth of the sensor is not maintained.
	Storage/transport	- 5 °C ... + 65 °C
Pressure resistance	Sensor including connection cable:	
	Max. allowed overpressure	10 ⁶ Pa (10 bar) The sensor meets the requirements according to article 3(3) of the directive 97/23/EG ("Pressure equipment directive").
Type of protection	Sensor including SACIQ sensor connection cable:	IP 68, 10 bar
	Sensor plug head connector without sensor connection cable	IP 67
Depth of immersion	min. 7 cm; max. 15 m depth	
Connection technique	Connection via SACIQ sensor connection cable	
Operating position	Any	
Field of application	Water and wastewater monitoring	
Instrument safety	Applicable norms	<ul style="list-style-type: none"> - EN 61010-1 - UL 3111-1 - CAN/CSA C22.2 No. 1010.1
Electrical data	Nominal voltage	max. 24 VDC
	Power consumption	5.0 W
	Protective class	III

4.2 Characteristic data on delivery

Measuring ranges and resolution	Measured variable	Measuring ranges	Resolution
	FNU, NTU, TEF	0 ... 0.400	0.001
		0 ... 4.00	0.01
		0 ... 40.0	0.1
		0 ... 400	1
		0 ... 4000	1
	mg/l SiO ₂	0 ... 0.400	0.001
		0 ... 4.00	0.01
		0 ... 40.0	0.1
		0 ... 400	1
		0 ... 4000	1
	ppm SiO ₂	0 ... 0.400	0.001
		0 ... 4.00	0.01
		0 ... 40.0	0.1
		0 ... 400	1
		0 ... 4000	1
DS	<i>0 ... 0.400 mg/l</i>	0.001 mg/l	
	<i>0 ... 4.00 mg/l</i>	0.01 mg/l	
	<i>0 ... 40.0 mg/l</i>	0.1 mg/l	
	<i>0 ... 400 mg/l</i>	1 mg/l	
	<i>0 ... 4.00 g/l</i>	0.01 g/l	
	<i>0 ... 40.0 g/l</i>	0.1 g/l	
	<i>0 ... 400 g/l</i>	1 g/l	
Accuracy	Process variation coefficient	The process variation coefficient according to DIN 38402 part 51 is < 1 % in the range up to 2000 FNU.	
	Repeatability	The repeatability or repeatability limit according to DIN ISO 5725 or DIN 1319 is < 0.015 % or min. 0.006 FNU.	

5 Accessories for pipe installation

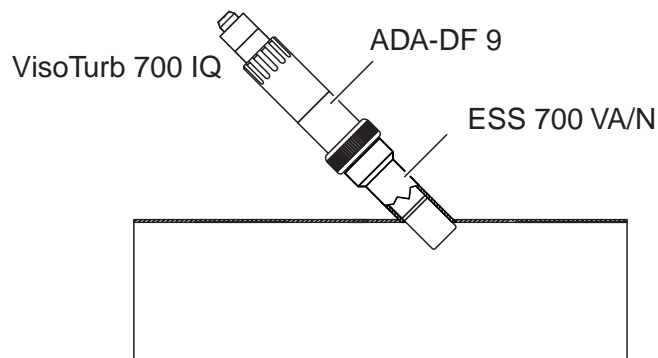
Installation in PVC pipes
(d 63 DN 50)
up to 3 bar



Ordering information:

Description	Model	Order no.
PVC flow-thru adapter (45° T-piece)	EBST 700-DU/N	203 753
Adapter for VisoTurb 700 IQ	ADA-DF 9	203 777

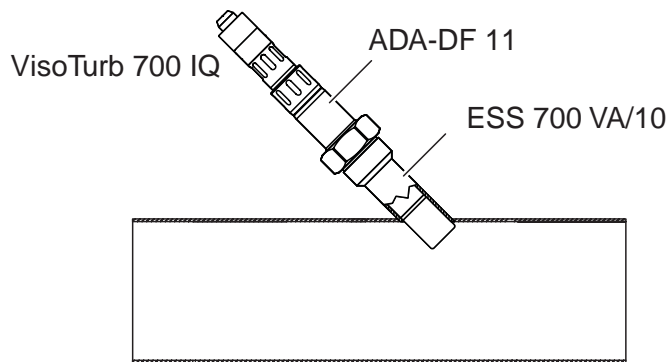
Installation in stainless steel pipes
up to 3 bar



Ordering information:

Description	Model	Order no.
Stainless steel weld-in socket	ESS 700 VA/N	203 755
Adapter for VisoTurb 700 IQ	ADA-DF 9	203 777

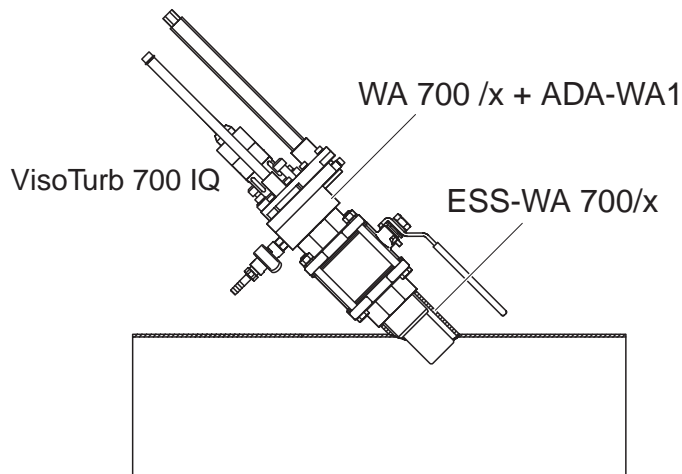
Installation in stainless steel pipes up to 10 bar



Ordering information:

Description	Model	Order no.
Stainless steel weld-in socket	ESS 700 VA/10	203 757
Adapter for VisoTurb 700 IQ	ADA-DF 11	203 781

Installation in steel and stainless steel pipes with retractable armature



Ordering information:

Description	Model	Order no.
Retractable armature:		
Application range up to 2 bar	WA 700/2	480 102
Application range up to 10 bar	WA 700/10	480 100
Weld-in socket:		
Steel	ESS-WA 700/ST	480 104
Stainless steel	ESS-WA 700/VA	480 106
Adapter for VisoTurb 700 IQ	ADA-WA 1	480 108

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