2.2.3 Dual version and twofold reliability

This is a genuine redundant system with two independent flow sensors and two signal converters.
This provides twofold functional reliability and availability of the measurement. This variant is ideally suited for measurements in multi-product pipelines. In such pipelines, two different products are moved through one after the other. One signal converter can be programmed for one product, and the other signal converter for the other product.

2.2.4 Remote version

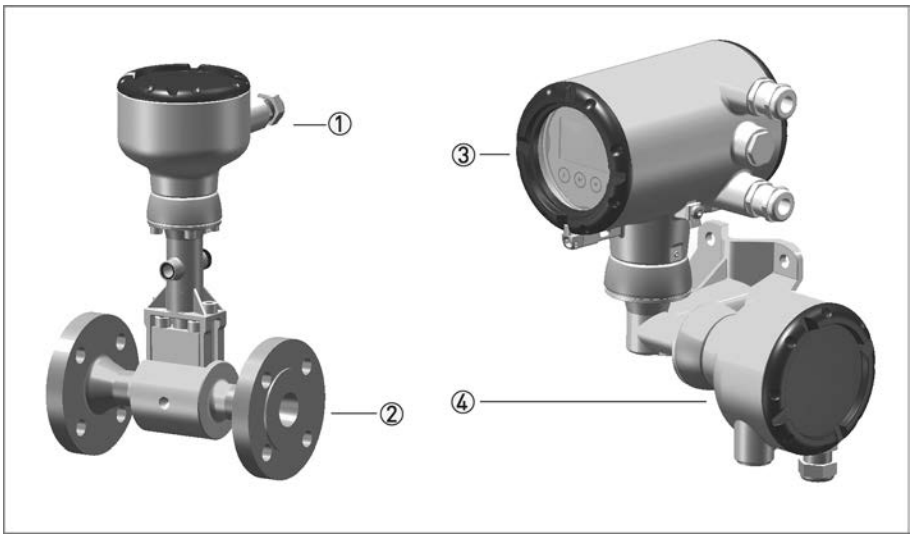

Figure 2-3: Remote version

① Flow sensor connection box
② Flow sensor
③ Signal converter
④ Wall mount bracket connection box

With the remote version, the flow sensor and signal converter are installed separately in different places. The 6-pin, shielded connection cable is available with a length up to 50 m / 164 ft.

2.2.5 Devices with integrated nominal diameter reduction

The device versions F1R and F2R offer an integrated nominal diameter reduction up to two nominal diameter sizes to assure best results in accuracy and optimum measuring ranges; even in pipelines with large diameters, which have been designed for a low pressure loss.

Nominal diameter of flow sensor	Nominal size of process connections									
	DN15	DN25	DN40	DN50	DN80	DN100	DN150	DN200	DN250	DN300
DN15	StV ①	F1R	F2R	-	-	-	-	-	-	-
DN25	-	StV ①	F1R	F2R	-	-	-	-	-	-
DN40	-	-	StV ①	F1R	F2R	-	-	-	-	-
DN50	-	-	-	StV ①	F1R	F2R	-	-	-	-
DN80	-	-	-	-	StV ①	F1R	F2R	-	-	-
DN100	-	-	-	-	-	StV ①	F1R	F2R	-	-
DN150	-	-	-	-	-	-	StV ①	F1R	F2R	-
DN200	-	-	-	-	-	-	-	StV ①	F1R	F2R
DN250	-	-	-	-	-	-	-	-	StV ①	F1R
DN300	-	-	-	-	-	-	-	-	-	StV ①

① Standard version

2.2.6 Device description

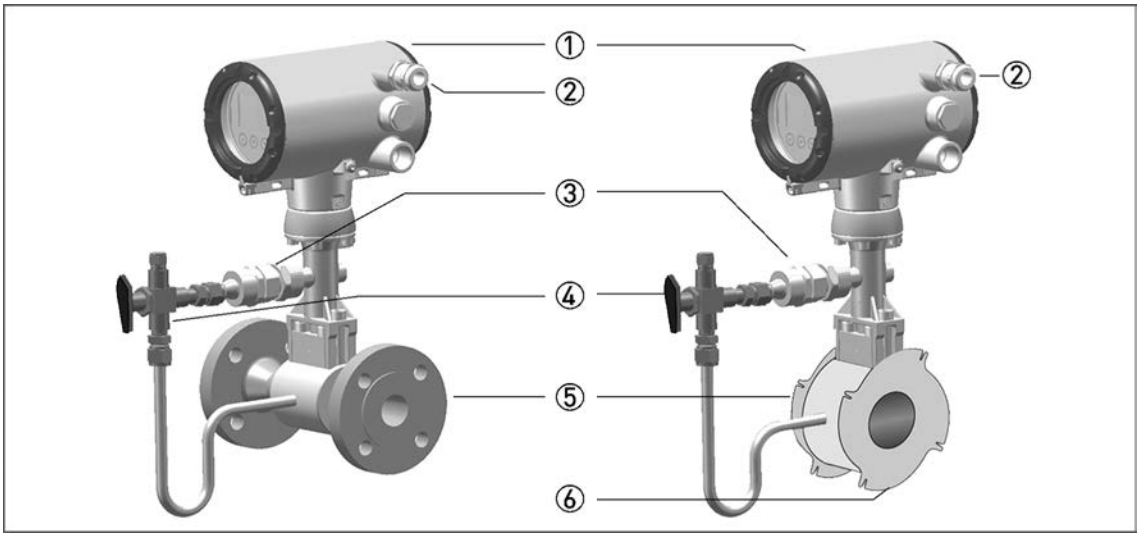

Figure 2-4: Device description

① Signal converter
② Cable feed through
③ Pressure sensor, optional
④ Shut-off valve, optional
⑤ Flow sensor
⑥ Centering ring

2.2.7 Free air delivery measurement - FAD (optional)

To create compressed air, a compressor draws in air from the ambient atmosphere, compresses it and delivers it at the required pressure. Since the ambient atmosphere also contains water vapour, the compressor draws in a mixture of air and water vapour. In addition to the moisture in the air, the ambient temperature and pressure conditions on the inlet side and the process conditions on the outlet side also influence the compressor capacity.

That is why most manufacturers specify compressor capacity as free air delivery at standard intake conditions. To compare the capacity of different compressors or to compare the capacity of a compressor at different points in time, the measurement of the air supplied by the compressor must be corrected by the influences of the process and of the environment and converted to these standardised suction conditions.

The vortex flowmeter with optional FAD function (FAD - Free Air Delivery) can measure the free air delivery online, regardless of its function as standard flowmeter. For this the device needs the process and ambient conditions, as well as the compressor data. When installed on the outlet side, it measures the air volume generated by the compressor and the process conditions. The menu-driven, user-friendly software prompts the operator to enter the following values:

- Ambient temperature (inlet)
- Atmospheric pressure (inlet)
- Air humidity (inlet and outlet)
- Motor speed (rated speed and actual speed)
- Pressure loss of the air filter

The FAD value is calculated from the measured and entered parameters using the vapour and compressibility tables stored in the measuring device.

- *For correct FAD measurement the compressor must run at full capacity.*
- *FAD measurement is an optional feature, which can be unlocked subsequently in menu "C6.3 Extras" if not unlocked by order.*
  Please contact the manufacturer to obtain the four digit code required to enable this feature.
  For programming example refer to Settings for free air delivery measurement - FAD on page 84.

2.2.8 Gross heat measurement (optional)

This functionality enables the calculation of the heat amount, which is carried by hot water, saturated or superheated steam in energy supply systems without external flow calculators.

The gross heat calculation is based on the temperature-depending enthalpy of steam or hot water and the mass flow rate. The exact mass flow rate is measured by the vortex flowmeter, and the enthalpy tables are programmed in the device. The gross power flow rate is calculated within the device according to the following formula:

Gross power [Q_H] = mass flow [Q_m] x enthalpy [H]

The absolute hot water and steam supply, as well as the energy, can be monitored internally via a totalizer by integration of the measured heat flow over time.

Heat quantity calculation is an optional feature, which can be unlocked subsequently in menu "C6.3 Extras" if not unlocked by order. Please contact the manufacturer to obtain the four digit code required to enable this feature.
For programming example refer to Gross heat measurement on page 85.

2.2.9 Net heat measurement (optional)

By installing a vortex flowmeter in the inlet line of a particular system section and adding an additional temperature sensor in the return section, the amount of energy, which is consumed by the considered system section can be determined directly by the vortex flowmeter. The temperature value can be fed into the vortex flowmeter either via the current input or via HART®.

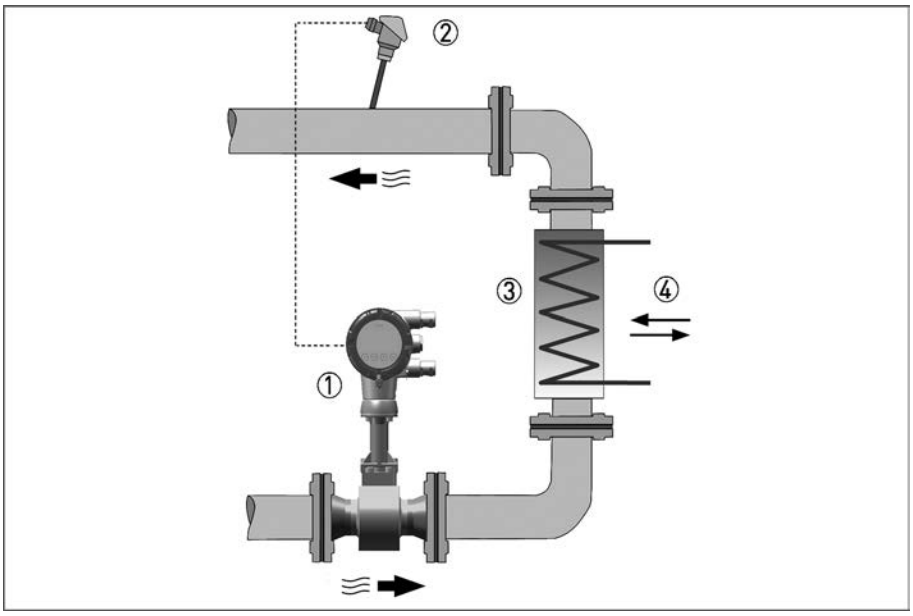

Figure 2-5: Measuring heat difference

① Flowmeter with built-in temperature sensor
② Temperature sensor
③ Heat exchanger
④ Heat flow

- *The net heat measurement can be realised for the inlet line media saturated steam, superheated steam and hot water. The medium in the return line must always be water.*
- *Heat quantity calculation is an optional feature, which can be unlocked subsequently in menu "C6.3 Extras" if not unlocked by order. Please contact the manufacturer to obtain the four digit code required to enable this feature.*
  For programming examples refer to Net heat measurement on page 86.

2.2.10 Dual seal

To comply with the requirements of ANSI/ISA 12.27.01 "Requirements for Process Sealing Between Electrical Systems and Flammable or Combustible Process Fluids", a membrane vent is integrated in the neck of the device. This vent is located between the primary seal (process) and the secondary seal (electronics compartment) and works to prevent pressure build-up in the device neck, thus preventing product from penetrating the electronics compartment in the unlikely event of a leak in the primary seal.

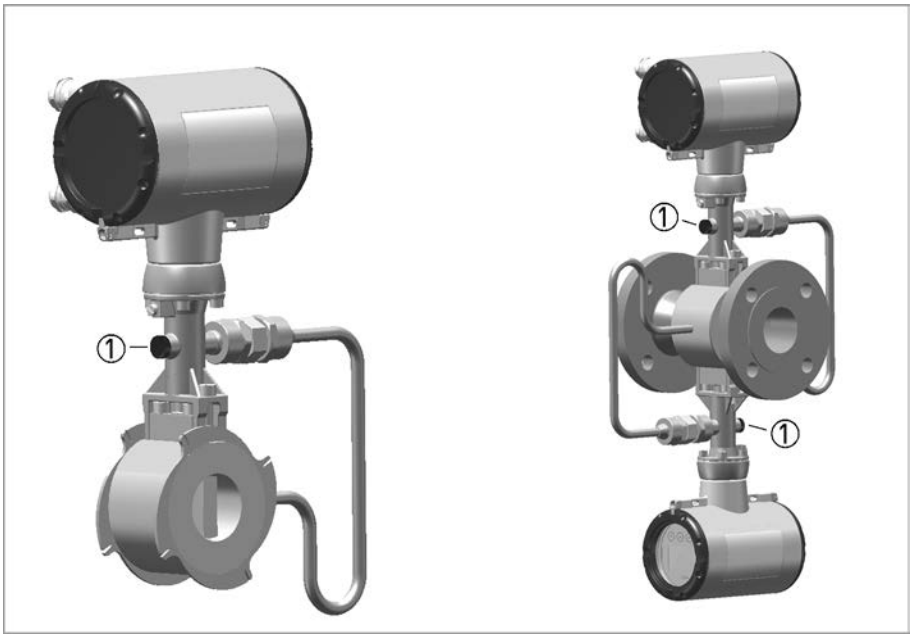

Figure 2-6: Dual Seal

① Membrane vent

The seal between the pick-up and the measuring tube is considered as the primary seal. The material used for this is always the same as that used for the measuring tube itself (e.g. 1.4435 / 316L for measuring tube made of stainless steel 1.4404 / 316L or Hastelloy® C-276 for measuring tube made of Hastelloy® C-22). When selecting the material, corrosion resistance depending on process parameters (product, temperature) must be taken into account.
By using the membrane vent, all requirements for a "DUAL SEAL" version in terms of the above mentioned standards are met.

- It protects the electronics from the process media.
- Any leak in the primary seal can be detected.

Even though there is no reason to expect the seal to fail, regular visual checks should still be carried out to detect any possible leak as early as possible.

In the event of a leak, contact the manufacturer's service department to service or replace the device.

2.3 Nameplate

Check the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

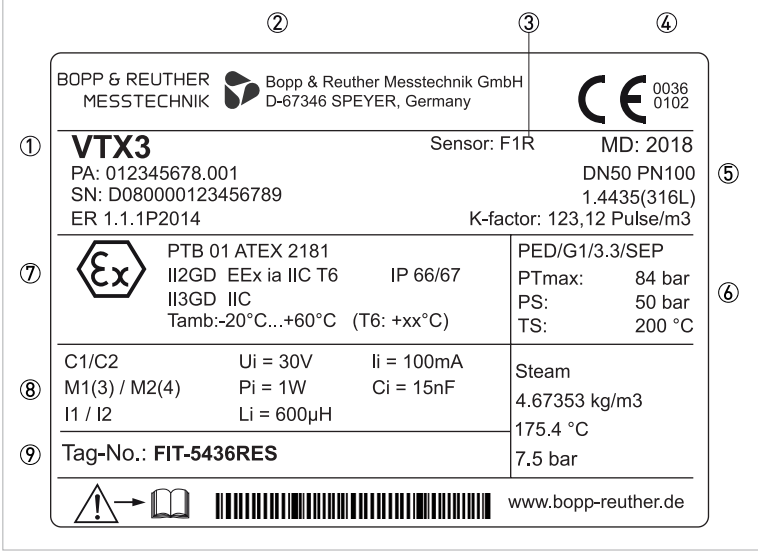

Figure 2-7: Example of nameplate

① Meter type
② Manufacturer
③ Flow sensor
S - Sandwich
F - Flange
F1R - Flange, single reduction
F2R - Flange, double reduction
④ Notified bodies for PED & ATEX (only available if this option was ordered)
⑤ Connection data: nominal diameter and pressure rating
⑥ PED data
⑦ Ex data (only available if this option was ordered)
⑧ Electrical connection data
⑨ Tag no. - Measuring point identifier

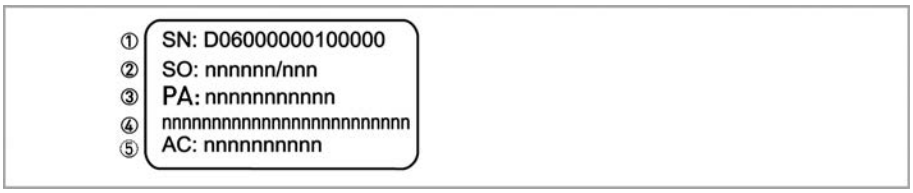

Figure 2-8: Example of nameplate

① Serial number
② Order number
③ Production order number
④ Type code
⑤ Article code

3.1 General notes on installation

Inspect the packaging carefully for damages or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.

Do a check of the packing list to make sure that you have all the elements given in the order.

3.2 Storage

- Store the device in a dry, dust-free location.
- Avoid extended direct exposure to the sun.
- Store the device in the original packaging.
- The permissible storage temperature for standard devices is -40...+85°C / -40...+185°F.

3.3 Transport

- Use lifting straps wrapped around both process connections for transport.
- Do not lift measuring devices by the signal converter housing for transport.
- Never lift the measuring device by the pressure sensor.
- Do not use lifting chains as they may damage the housing.

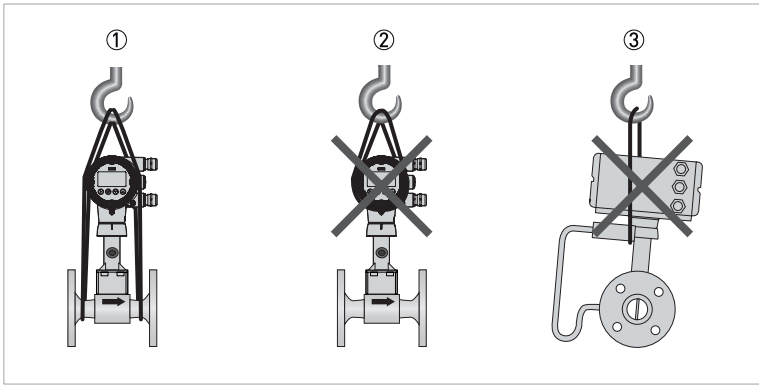

Figure 3-1: Transport instructions

CAUTION!
Non-secured devices can pose risk of injury. The centre of mass of the device is often higher than the point at which the lifting straps are attached.
Prevent the measuring device from sliding or rotating accidentally.

3.4 Installation conditions

For accurate volumetric flow measurement the measuring device needs a completely filled pipe and a fully developed flow profile.

CAUTION!
Any vibrations may distort the measuring result. That is why any vibrations in the pipeline must be prevented through suitable measures.

CAUTION!
Procedures to carry out before installing the device:

- *Nominal diameter of connection pipe flange = nominal flange diameter of pipe!*
- *Use flanges with smooth holes, e.g. welding neck flanges.*
- *Align carefully the holes of the connecting flange and the flowmeter flange.*
- *Check the compatibility of the gasket material with the process product.*
- *Make sure that the gaskets are arranged concentrically. The flange gaskets must not project into the pipe cross-section.*
- *The flanges have to be concentric.*
- *There must not be any pipe bends, valves, flaps or other internals in the immediate inlet run.*
- *Devices in sandwich version may only be installed using centering rings.*
- *Never install the device directly behind piston compressors or rotary piston meters.*
- *The device must not be heated by radiated heat (e.g. exposure to the sun) to a electronics housing surface temperature above the maximum permissible ambient temperature. If it is necessary to prevent damage from heat sources, a heat protection (e.g. sun shade) has to be installed.*
- *Do not lay signal cables directly next to cables for the power supply.*
- *At product temperatures or ambient temperatures >+65° C / +149° F, a connection cable and cable glands with a minimum service temperature of +80° C / +176° F must be used.*

If there is a risk of water hammers in steam networks, appropriate condensate separators must be installed. Suitable measures must be taken to avoid water cavitation if it is a possible risk.

The pressure sensor must be protected against ambient effects of frost.