Application information

Thermal Energy Meter / Energy Valve – Inlet section according to EN 1434

Edition 2025-09/B

BELIMO

Introduction

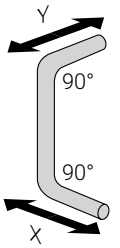
The installation conditions for thermal energy meters, flow sensors, and energy valves (EVs) can vary significantly, particularly due to the potential interference from both passive and active elements within the piping system on the flow measurement. Consequently, the design of the inlet section before and the outlet section after these devices is crucial for ensuring accurate measurements.
This document provides additional information that complements the data sheets, operating instructions, and installation instructions of the product, thereby contributing to a better understanding of the topic.

EN 1434-4:2022

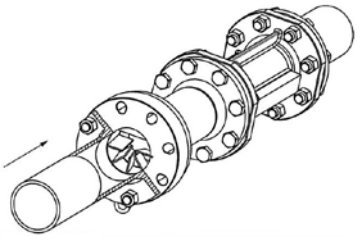
Section 7.22: Flow disturbances

Section 7.22 deals with flow disturbances which might be caused by static installation components such as pipe bends. The respective test simulates a situation of two 90° bends connected at right angles (out of plane double bends, see picture 1) at a distance of 5 × DN. An asymmetric swirl generator (ASG), which is integrated in the test setup, creates a profile similar to this installation situation. For this purpose, a flow conditioner with specially arranged water guide vanes is located inside the ASG. It is installed before the thermal energy meter (TEM) in its inlet section (upstream).
The orientation of the ASG is changed by rotating it around the pipe axis three times during the test. If this test is passed successfully, meaning the mandatory MPE (minimum permissible error) for flow accuracy is maintained, the TEM is qualified for and can be used with an inlet section of ≥0 × DN in a corresponding real system or piping setup.

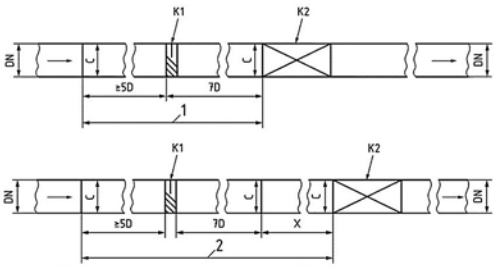
Picture 1: Out of plane double bends



Y = Plane 2
X = Plane 1



Picture 2: ASG with water guide vanes, source EN 1434-4:2022



Legend:
K1 asymmetric swirl generator (ASG)
K2 meter under test
X length of additional straight pipe (specified by manufacturer)
1 test setup OD qualified
2 test setup XD qualified

Picture 3: Test setup, source EN 1434-4:2022

EN 1434-6:2022

Annex A.4: Thermal energy meter flow circuit design.

Annex A.4 provides additional information on flow disturbance considerations as outlined in EN 1434-4:2022 section 7.22. It addresses system or piping designs that are suitable for local conditions, which may not be accounted for in the simulated tests mentioned earlier. Recognising that the situation described in EN 1434-4, section 7.22 does not always occur in practice, the recommendation is as follows (extract from EN 1434-6:2022, Annex A.4):

In order to avoid impermissible fluidic influences (e.g., flow distortions) a straight stabilizing section of at least 5 × DN in front and at least 2 × DN downstream of the flow sensor is recommended.

In addition to the previously mentioned 90° bends and other static components, there are further causes for flow disturbances, including valves, pumps, and various combinations of these in specific upstream and downstream positions. Therefore, it is crucial to closely examine the local conditions and carefully adapt the piping design. In some cases, it may be necessary to plan an appropriate calming section both upstream and downstream of the TEM to prevent measurement errors.

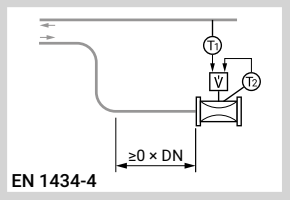
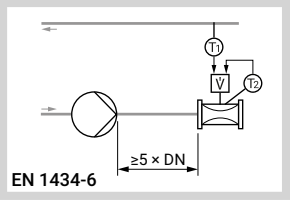
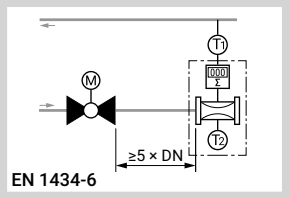
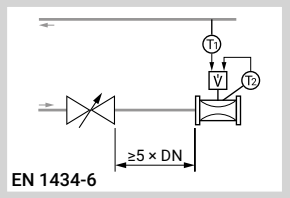
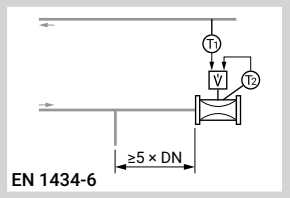
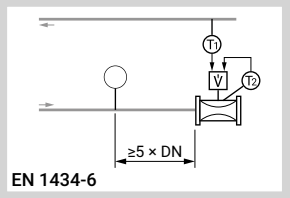
EN 1434-4:2022 / EN 1434-6:2022 Summary and conclusion:

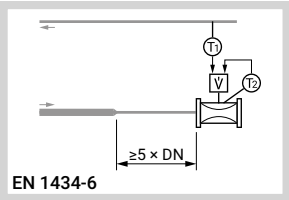
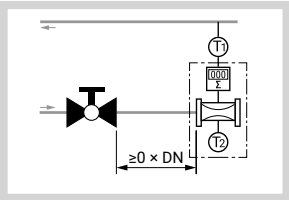
The installation conditions can vary greatly due to local factors, impacting the flow and, thus, the measurement results. Although a successful test as described in the EN 1434-4 allows an inlet section of ≥0 × DN, it cannot cover all possible installation situations. This is why additional instructions are given in the annex of EN 1434-6.
To summarise and simplify, the following points can serve as a guide.

- Installation of TEM or EV after two 90° bends or similar static piping components: Inlet section ≥0 × DN
- Installation of TEM or EV in all other situations, especially close to valves and pumps: Inlet section ≥5 × DN

Installation situation

TEM/FS/EV/EPIV inlet section definition DN 15...50 according to installation situation

Installation situation	Picture	Minimum inlet section	Comments
Out of plane single/double bends without reduction of pipe cross section and/or disturbances due to other built-in parts		≥0 × DN [1]	
Pums		≥5 × DN [2]	Please make sure that the minimum static pressure on the suction side is maintained if the device is installed before a pump, unlike what is shown in the illustration.
Controlled valves or partly closed/opened valves with reduction of pipe cross-section		≥5 × DN [2]	
Balancing valves		≥5 × DN [2]	
T-pieces/mixing points		≥5 × DN [2]	
Built-in parts such as direct immersion temperature sensors or sensors with thermowells, other similar parts that disturb the flow		≥5 × DN [2]	

Installation situation	Picture	Minimum inlet section	Comments
Cross-sectional change, such as pipe reduction		≥5 × DN [2]	
Completely open shut-off ball valves without reduction of pipe cross section and/or disturbances due to other built-in parts		≥0 × DN	

[1] According to EN 1434-4:2022
[2] According to EN 1434-6:2022

- The inlet section lengths specified above are minimum values. The installation situation must be checked carefully and, if necessary, a longer inlet section must be provided.
- Please note that the above-mentioned inlet sections are related to the heat transfer fluid water. Consequently, longer inlet sections might be needed in case of water-glycol mixtures. (e.g., an additional 5 × DN).

All inclusive.

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