# DIN EN 1776:2026-11 (E)

## Gas infrastructure - Gas measuring systems - Functional requirements

## Contents

Page


European foreword ..... 7

Introduction ..... 8

1 Scope ..... 9

2 Normative references ..... 9

3 Terms and definitions ..... 11

4 General requirements ..... 18
4.1 General ..... 18
4.2 Safety and environment ..... 19
4.3 Quality and measurement management system ..... 19

5 Basic requirements for gas measuring systems ..... 20
5.1 General ..... 20
5.2 Classification of the gas measuring system ..... 20
5.2.1 General ..... 20
5.2.2 Minimum requirements Class A and Class B ..... 21
5.2.3 Minimum requirements Class C and Class D ..... 22
5.3 Gas measuring system modules ..... 22

6 Energy Determination ..... 23
6.1 General ..... 23
6.2 Requirements for measurements used in energy determination ..... 24
6.2.1 Base conditions ..... 24
6.2.2 Flow measurement ..... 24
6.2.3 Gross calorific value (GCV) ..... 24
6.3 Calculation method of energy using assigned GCV and P, T, Z values ..... 26
6.4 Calculation method of energy using an on-site CVDD and on-site PTZ-Conversion ..... 26
6.5 Calculation method of energy using an assigned GCV and PTZ-conversion ..... 26
6.6 Calculation method of energy using PT-Conversion and assigned GCV and Z value ..... 26
6.7 Calculation method of energy using T-Conversion and assigned GCV, and P, Z values ..... 26
6.8 Gas temperature conversion ..... 26
6.9 Gas pressure conversion ..... 27
6.10 Compressibility conversion ..... 27
6.11 PTZ-conversion ..... 27
6.12 Uncertainty of energy determination ..... 27

7 Design of gas measuring system ..... 28
7.1 General ..... 28
7.2 Safety provision ..... 28
7.3 Housing ..... 28
7.4 Gas measuring station ..... 29
7.5 Gas measuring installation ..... 29
7.5.1 General ..... 29
7.5.2 Continuity of supply ..... 32
7.5.3 Gas meters ..... 32
7.5.4 Gas meters with additional functionalities and remotely operated valve ..... 33
7.6 Calorific value determination system ..... 33
7.6.1 General ..... 33

7.6.2 Sampling ... 34
7.6.3 Provisions for calibration ... 34
7.7 Gas pressure measurement ... 34
7.7.1 General ... 34
7.7.2 Gas pressure measurement Class A and Class B ... 34
7.7.3 Gas pressure determination Class C and Class D ... 35
7.8 Gas temperature measurement ... 35
7.9 Conversion device ... 36
7.10 Compression factor ... 36
7.11 Pipework requirements ... 36
7.11.1 For Class A and Class B measuring installation ... 36
7.11.2 For Class C and Class D measuring installation ... 37
7.12 Valves ... 37
7.12.1 General ... 37
7.12.2 By-pass ... 37
7.13 Parallel meter runs ... 37
7.14 Pulsations and vibrations ... 38
7.14.1 General ... 38
7.14.2 Pulsating effects related to specific flow meter types ... 39
7.15 Filter ... 39
7.16 Gas conditioning, hydrate protection ... 39
7.17 Duplication/redundancy of measuring instruments ... 39
7.18 Venting ... 40
7.19 Ventilation ... 40
7.20 Odorants and/or additives ... 40
7.21 Electromagnetic compatibility (EMC) ... 40
7.22 Documented provisions ... 40
7.22.1 General ... 40
7.22.2 Data handling (Security) ... 41

8 Construction of a gas measuring installation ... 41
8.1 General ... 41
8.2 Specific requirements for thermowells ... 42
8.3 Specific requirements for (differential) pressure transducers ... 42
8.4 Specific requirements for sampling systems for CVDD's ... 42
8.5 Corrosion protection ... 42
8.6 Equipment in hazardous area ... 43

9 Testing of the gas measuring installation/station ... 43
9.1 Strength and tightness test ... 43
9.1.1 General ... 43
9.1.2 Test report ... 43
9.2 Purging ... 43

10 Pre-commissioning and commissioning of the gas measuring installation ... 44
10.1 General ... 44
10.2 Pre-commissioning checks ... 44
10.2.1 General ... 44
10.2.2 Electrical or electronic system ... 44
10.3 Commissioning and re-commissioning ... 44
10.3.1 General ... 44
10.3.2 Gas meters ... 45
10.3.3 Instrumentation ... 46
10.3.4 Initial comparison check ... 46
10.4 Acceptance, documentation and hand-over ... 46
10.5 Post-commissioning checks ... 47

11 Operation and maintenance ... 47
11.1 General ... 47
11.2 Reference equipment ... 48
11.3 Gas meters ... 49
11.3.1 General ... 49

11.3.2 Rotary displacement meters ..... 49
11.3.3 Turbine meters ..... 49
11.3.4 Vortex meters ..... 50
11.3.5 Ultrasonic meters ..... 50
11.3.6 Orifice Meters ..... 50
11.4 Conversion devices ..... 50
11.5 Calorific value determination device ..... 51
11.6 Sensors ..... 51
11.7 Calibration/verification and maintenance records ..... 51

12 Decommissioning ..... 52

Annex A (informative) Guideline for the selection of meters ..... 53

Annex B (informative) Sensor test procedures ..... 59

B.1 Differential pressure sensors ..... 59
B.1.1 General ..... 59
B.1.2 High static pressure testing ..... 59
B.1.3 "Footprint testing" ..... 59
B.1.4 Atmospheric calibration ..... 60
B.2 Pressure sensors ..... 60
B.3 Temperature sensors ..... 60
B.3.1 Platinum resistance thermometers (PRTs) ..... 60
B.3.2 Other temperature sensors ..... 60
B.4 Density sensors ..... 60
B.4.1 Density sensors for operating conditions ..... 60
B.4.2 Density sensors for base conditions ..... 62

Annex C (informative) Set of formulae to calculate volume or mass to energy ..... 63

C.1 General ..... 63
C.2 Calculation of volume ..... 64
C.3 Calculation of mass ..... 64
C.4 Calculation of energy ..... 64

Annex D (informative) Determination of the acceptance criteria for the uncertainty of the energy determination ..... 65

D.1 General ..... 65
D.2 Measurement Systems ..... 65
D.3 Energy Determination Systems ..... 66

Annex E (informative) Specific national examples of the assessment of conformity of the metrological performance of a gas measuring system ..... 67

E.1 Introduction ..... 67
E.2 Example 1 ..... 68
E.3 Example 2 ..... 72
E.4 Example 3 ..... 74
E.5 Example 4 ..... 77
E.6 Example 5 ..... 80
E.7 Example 6 ..... 83
E.8 Example 7 ..... 88

Annex F (informative) Documentation and records ..... 93

F.1 Documentation ..... 93
F.2 Records ..... 93
F.3 Responsibilities for documentation and records ..... 93

Annex G (informative) Typical examples of positions of gas measuring installations ..... 95

Annex H (informative) Significant technical changes from the last edition of this standard, Annex I (informative) Hydrogen and its blends with natural gas ..... 98

I.1 General ..... 98
I.2 5.2.2 Minimum requirements Class A and Class B ..... 98
I.3 6.2.2 Flow measurement ..... 99
I.4 6.2.3.1 Gross calorific value (GCV)/ General conciderations ..... 100
I.5 6.2.3.2 Calorific value determination device (CVDD) ..... 100
I.6 6.3 Calculation method of energy using assigned GCV and P, T, Z values ..... 100
I.7 6.4 Calculation method of energy using an on-site CVDD and on-site PTZ-Conversion ... 100
I.8 6.5 Calculation method of energy using an assigned GCV and PTZ-conversion ..... 100
I.9 6.6 Calculation method of energy using PT-Conversion and assigned GCV and Z value . 100
I.10 6.7 Calculation method of energy using T-Conversion and assigned GCV, and P, Z values ..... 100
I.11 6.10 Compressibility conversion ..... 100
I.12 6.11 PTZ-conversion ..... 100
I.13 6.12 Uncertainty of energy determination ..... 101
I.14 7.2 Safety provision ..... 101
I.15 7.5.3 Gas meters ..... 101
I.16 7.11. Compression factor ..... 101
I.17 7.11.1 Pipework requirements ..... 101
I.18 7.15.1 General ..... 102
I.19 7.15.2.1 Turbine meter ..... 102
I.20 7.15.2.2 Rotary displacement meter ..... 102
I.21 7.15.2.3 Ultrasonic meter (non-domestic) ..... 102
I.22 8.1 General ..... 102
I.23 8.2 Specific requirements for thermowells ..... 102
I.24 8.6 Electrical equipment in hazardous area ..... 102
I.25 9.1.1 General ..... 103
I.26 10.2.1 General ..... 103
I.27 10.2.2 Electrical or electronic system ..... 103
I.28 10.3.1 General ..... 103
I.29 10.3.2. Gas meters ..... 103
I.30 10.3.2.2 Non-domestic ultrasonic meters ..... 103
I.31 10.3.2.3 Orifice plate meter ..... 104
I.32 10.3.2.4 Coriolis meter ..... 104
I.33 11.2 Reference equipment ..... 104
I.34 11.3.1 General ..... 104
I.35 11.3.4 Vortex meters ..... 105
I.36 11.5 Calorific value determination device ..... 105
I.37 B 4.1.4 Hydrogen test ..... 105
I.38 G Typical examples of positions of gas measuring installations ..... 105

Bibliography ..... 107