DIN EN 1776:2016-05 (E)

Gas infrastructure - Gas measuring systems - Functional requirements

Contents

Page

European foreword 5

Introduction 6

1 Scope 7

2 Normative references 8

3 Terms and definitions 9

4 General requirements 14
4.1 General 14
4.2 Safety and environment 14
4.3 Quality system for gas measuring system 15

5 Basic requirements for measuring systems 15
5.1 General 15
5.2 Approach to energy measurement 16
5.3 Classification of the measuring system 16
5.4 Gas measuring system modules 18

6 Energy Determination 18
6.1 General 18
6.2 Requirements for measurements used in energy determination 19
6.3 Calculation method of energy using assigned GCV and P, T, Z values 21
6.4 Calculation method of energy using an on-site CVDD and on-site PTZ-Conversion 21
6.5 Calculation method of energy using an assigned GCV and PTZ-conversion 21
6.6 Calculation method of energy using PT-Conversion and assigned GCV and Z value 21
6.7 Calculation method of energy using T-Conversion and assigned GCV, and P, Z values 21
6.8 Gas temperature conversion 21
6.9 Gas pressure conversion 22
6.10 Compressibility conversion 22
6.11 PTZ-conversion 22
6.12 Uncertainty of energy determination 22

7 Design of gas measuring system 23
7.1 General 23
7.2 Safety provision 23
7.3 Housing 24
7.4 Gas measuring station 24
7.5 External influences 24
7.6 Gas measuring installation 25
7.7 Calorific value determination system 29
7.8 Gas pressure measurement 29
7.9 Gas temperature measurement 30
7.10 Conversion device 31
7.11 Compression factor 31
7.12 Pipework requirements 32
7.13 Valves 32
7.14 Parallel meter runs 33
7.15 Pulsations and vibrations 33
7.16 Filter 34

7.17 Gas conditioning, hydrate protection 34
7.18 Duplication of measuring instruments 34
7.19 Venting 35
7.20 Ventilation 35
7.21 Odorants and/or additives 35
7.22 Electromagnetic compatibility (EMC) 35
7.23 Documented provisions 35

8 Construction of a gas measuring installation 36
8.1 General 36
8.2 Specific requirements for thermowells 37
8.3 Specific requirements for (differential) pressure transducers 37
8.4 Specific requirements for sampling systems for CVDD's 37
8.5 Corrosion protection 37
8.6 Electrical equipment in hazardous area 38

9 Testing of the gas measuring installation/station 38
9.1 Strength and tightness test 38
9.2 Purging 38

10 Pre-commissioning and commissioning of the gas measuring installation 38
10.1 General 38
10.2 Pre-commissioning checks 39
10.3 Commissioning and re-commissioning 39
10.4 Acceptance, documentation and hand-over 41
10.5 Post-commissioning checks 41

11 Operation and maintenance 42
11.1 General 42
11.2 Reference equipment 43
11.3 Gas meters 43
11.4 Conversion devices 45
11.5 Calorific value determination device 45
11.6 Sensors 46
11.7 Calibration/verification and maintenance records 46

12 Decommissioning 46

Annex A (informative) Guideline for the selection of meters 47

Annex B (informative) Sensor test procedures 52

B.1 Differential pressure sensors 52
B.2 Pressure sensors 53
B.3 Temperature sensors 53
B.4 Density sensors 54

Annex C (informative) Set of formulae to calculate volume or mass to energy 56

C.1 General 56
C.2 Calculation of volume 56
C.3 Calculation of mass 57
C.4 Calculation of energy 57

Annex D (informative) Comformity assessment for the energy determination 58

D.1 Introduction 58
D.2 Measurement Systems 58
D.3 Energy Measurement Systems 59

Annex E (informative) Specific national examples of the assessment of conformity of the metrological performance of a gas measuring system 60

E.1 Introduction 60
E.2 Example 1 61
E.3 Example 2 64
E.4 Example 3 67
E.5 Example 4 70
E.6 Example 5 72
E.7 Example 6 74
E.8 Example 7 77

Annex F (informative) Documentation and records 81

F.1 Documentation 81
F.2 Records 81
F.3 Documentation approval 81

Annex G (informative) Typical examples of positions of gas measuring installations 82

Annex H (informative) Significant technical changes from the last edition of this standard, EN 1776:1998 83

Bibliography 84