DIN EN 1366-10:2022-12 (E)

Fire resistance tests for service installations - Part 10: Smoke control dampers

Contents

Page

European foreword 7

Introduction 8

1 Scope 9

2 Normative references 9

3 Terms and definitions 9

4 Test equipment 12
4.1 General 12
4.2 Test duct for surface mounted SCDs 12
4.3 Connecting duct for compartment boundary mounted SCDs 13
4.3.1 Compartmentation test 13
4.3.2 Maintenance of opening test 13
4.4 Cycling equipment 13
4.5 Condensing unit 13
4.6 Gas temperature measuring devices 13
4.7 Exhaust fan system 13
4.8 Perforated plate 14
4.9 Volume and flow measurement for duct mounted SCDs 14
4.10 Volume flow measurement for compartment boundary mounted SCDs 14
4.10.1 Compartmentation test 14
4.10.2 Maintenance of opening test 14
4.11 Ambient leakage measurement equipment 15
4.12 Pressure sensors for differential pressure control 15
4.12.1 Duct mounted smoke control dampers 15
4.12.2 Compartment boundary mounted smoke control dampers 15
4.13 Welded connecting tube 15
4.14 Extract fan connecting duct 15
4.15 Extraction fan 15
4.16 Thermocouples 15
4.17 Oxygen measuring equipment 15
4.18 Observation windows 16

5 Test specimens 16
5.1 Cross-section 16
5.2 Design 16
5.2.1 General 16
5.2.2 Supporting constructions 16
5.2.3 Inclusion of grilles 17

6 Test methods 17
6.1 General 17
6.2 Test sequence 17
6.3 Ambient leakage 19
6.3.1 Units of the largest size 19
6.3.2 Units of smallest size 19
6.4 Cycling requirements 19
6.4.1 General 19

6.4.2 Smoke control damper to be used in dedicated smoke control systems, operated only in the case of emergency 19
6.4.3 Smoke control damper to be used as part of a general HVAC system as well as a smoke control system, or as part of a smoke control systems that is cycled every day to check operation 19
6.4.4 Smoke control damper to be used as part of a general HVAC system as well as a smoke control system, that uses a modulating actuator 20
6.5 Selection of elevated temperature and fire resistance tests 20
6.6 Fire resistance tests and elevated temperature tests 21
6.6.1 Duct mounted smoke control dampers 21
6.6.2 Compartment boundary mounted smoke control dampers 22
6.6.3 Additional test information 25
6.7 Initiation regime 26
6.7.1 Smoke control dampers for systems with automatic activation (AA) 26
6.7.2 Smoke control damper for systems with manual activation (MA) 27
6.8 HOT400/30 extension test 29
6.9 Special constructions 29

7 Test procedure 29
7.1 Fire resistance or elevated temperature and maintenance of opening test for duct mounted smoke control dampers 29
7.1.1 General 29
7.1.2 Pre-test calibration 29
7.1.3 Ignition of furnace 31
7.1.4 Operate the damper 31
7.1.5 Furnace conditions 31
7.1.6 Thermocouples for insulation (I) 31
7.1.7 Oxygen measurements 32
7.1.8 General observations 32
7.1.9 Reduction of cross-section/maintenance of opening 32
7.1.10 Leakage calculations 32
7.1.11 Termination of test 32
7.2 Fire resistance tests for smoke control dampersmounted in a compartment boundary 33
7.2.1 General 33
7.2.2 Pre-test calibration 33
7.2.3 Ignition of furnace 33
7.2.4 Operate the damper 33
7.2.5 Furnace conditions 33
7.2.6 Thermocouples for insulation (I) 33
7.2.7 General observations 34
7.2.8 Leakage calculations 34
7.2.9 Termination of test 34
7.3 Maintenance of opening test for compartment boundary mounted smoke control dampers 34
7.3.1 General 34
7.3.2 Pre-test calibration 34
7.3.3 Ignition of furnace 35
7.3.4 Operate a damper 35
7.3.5 Furnace conditions 35
7.3.6 Thermocouples for insulation (I) 35
7.3.7 General observations 35
7.3.8 Reduction of cross-section/maintenance of opening 36
7.3.9 Termination of test 36

8 Performance criteria 36
8.1 Integrity 36
8.1.1 General 36
8.1.2 Integrity at perimeter 36
8.2 Insulation 40
8.2.1 General 40
8.2.2 Thermocouples at the compartment boundary outside of the furnace 40
8.3 Reduced leakage 40

8.4 Times and observations 41
8.5 Other 41

9 Test report 41
9.1 General 41
9.2 Duct mounted single and multi-compartment tests 42
9.3 Compartment boundary compartmentation test 43
9.4 Compartment boundary maintenance of opening test 43

10 Direct field of application of test results (DIAP) 44
10.1 Compartment boundary mounted smoke control dampers 44
10.2 Smoke control damper sizes 44
10.3 Duct mounted smoke control damper mounting positions 44
10.4 Distance between mounting positions in compartment boundary applications 44
10.5 Blade pivot axis 44
10.6 Pressure difference 45
10.7 Elevated temperatures 45
10.8 Cycling tests 45
10.8.1 Smoke control dampers meeting the cycling requirements for modulating applications ...45
10.8.2 Smoke control dampers meeting the cycling requirements for use with combined smoke control and general HVAC applications and for smoke control systems that are cycle checked every day 45
10.8.3 Smoke control dampersmeeting the cycling requirements for smoke control dampers that are operated only in the case of emergency 45
10.8.4 Load application 45
10.9 Initiation method 45
10.10 Duct mounted smoke control dampers - application to ducts other than that tested 46
10.10.1 Single compartment smoke control dampers 46
10.10.2 Multi compartment smoke control dampers 46
10.11 Compartment mounted smoke control dampers - application to shafts, walls and constructions other than that tested 47
10.11.1 Single compartment smoke control dampers 47
10.11.2 Multi compartment smoke control dampers 47
10.12 Standard damper open or closed position 47

Annex A (normative) Cycling test 74

A.1 General 74
A.2 Purpose of the test 74
A.3 Method of Application for loading 74
A.3.1 General 74
A.3.2 Smoke control damper with single blade 74
A.3.3 Smoke control damper with multi blades of smaller area 75
A.3.4 Circular smoke control dampers load calculation 75
A.3.5 Test arrangement for dampers with horizontal blade pivot axis 76
A.3.6 Test arrangement for dampers with vertical blade pivot axis 77
A.3.7 Report 80
A.4 Background for the torque value (informative) 80
A.4.1 Threshold rates of the working condition of the system 80
A.4.2 Previous experience 80

Annex B (informative) Leakage calculation from oxygen measurement 82

B.1 General 82
B.2 Supporting information on leakage flowrate calculations 83
B.2.1 Components in mixed fluids (mass and volume ratios) 83
B.2.2 Application to oxygen in air 84
B.2.3 Volume ratios and conservation of the mass during the smoke exhaust test 84
B.2.4 Assumptions and reworking 86

Annex C (normative) Maintenance of opening calculation 88

C.1 Calculation of the theoretical total mass Mmax of hot gases during the fire test 88
C.1.1 Basis 88
C.1.2 Method 88
C.1.3 Summary 89
C.2 Calculation of the actual total mass Mactual of hot gases during the fire test 90
C.2.1 Basis 90
C.2.2 Method 91
C.2.3 Summary 92
C.2.4 Graphical representation of typical integral calculation from data 92

Annex D (normative) Optional High Operating Test HOT 400/30 classification 94

D.1 General 94
D.2 Tests 94
D.2.1 General 94
D.2.2 Equipment 94
D.2.3 Ambient leakage test 95
D.2.4 Cycling test 95
D.2.5 Ambient leakage test 95
D.2.6 Standby temperature test 95
D.2.7 HOT 400/30 Test 95
D.2.8 Performance criteria 96

Annex E (informative) Leakage and pressure classification clarification 99

Bibliography 100