

DIN EN 54-31:2016-12 (E)

Fire detection and fire alarm systems - Part 31: Multi-sensor fire detectors - Point detectors using a combination of smoke, carbon monoxide and optionally heat sensors (includes Amendment A1:2016)

Contents		Page
European foreword.....		6
Introduction		8
1	Scope.....	9
2	Normative references.....	9
3	Terms and definitions	10
4	Requirements	10
4.1	General.....	10
4.2	Categorization	10
4.3	Nominal activation conditions/sensitivity	11
4.3.1	Individual alarm indication.....	11
4.3.2	Response to slowly developing fires, aging and contamination	11
4.3.3	Rate sensitive CO response.....	11
4.3.4	Repeatability of smoke response	12
4.3.5	Directional dependence of smoke response	12
4.3.6	Repeatability of CO response.....	12
4.3.7	Directional dependence of CO response.....	12
4.3.8	Directional dependence of heat response.....	12
4.3.9	Lower limit of heat response	12
4.3.10	Reproducibility of smoke response.....	12
4.3.11	Reproducibility of CO response	12
4.3.12	Reproducibility of heat response	12
4.3.13	Air movement.....	12
4.3.14	Dazzling	12
4.4	Operational reliability.....	13
4.4.1	Connection of ancillary devices	13
4.4.2	Monitoring of detachable detectors	13
4.4.3	Manufacturer's adjustments.....	13
4.4.4	On-site adjustment of response behaviour.....	13
4.4.5	Protection against the ingress of foreign bodies	13
4.4.6	Software controlled detectors	13
4.4.7	Long term stability.....	15
4.5	Tolerance to supply parameters - Variation in supply parameters	15
4.6	Performance parameters under fire conditions - Fire sensitivity	15
4.7	Durability of nominal activation conditions/sensitivity	15
4.7.1	Temperature resistance	15
4.7.2	Humidity resistance	15
4.7.3	Shock and vibration resistance.....	16
4.7.4	Electrical stability - EMC, immunity (operational)	16
4.7.5	Resistance to chemical agents.....	16
4.8	Detector sensitivity to single fire phenomena.....	17
4.8.1	Sensitivity to smoke	17
4.8.2	Sensitivity to carbon monoxide	17
4.8.3	Sensitivity to heat.....	17
5	Testing, assessment and sampling methods	17

5.1	General	17
5.1.1	Atmospheric conditions for tests.....	17
5.1.2	Operating conditions for tests	17
5.1.3	Mounting arrangements.....	18
5.1.4	Tolerances.....	18
5.1.5	Measurement of smoke response value.....	18
5.1.6	Measurement of CO response value.....	19
5.1.7	Measurement of heat response value	20
5.1.8	Provision for tests	20
5.1.9	Test schedule.....	21
5.2	Nominal activation conditions/sensitivity.....	22
5.2.1	Individual alarm indication	22
5.2.2	Response to slowly developing fires, aging and contamination.....	22
5.2.3	Rate sensitive CO response	23
5.2.4	Repeatability of smoke response.....	23
5.2.5	Directional dependence of smoke response.....	24
5.2.6	Repeatability of CO response	24
5.2.7	Directional dependence of CO response	25
5.2.8	Directional dependence of heat response	25
5.2.9	Lower limit of heat sensitivity	26
5.2.10	Reproducibility of smoke response	26
5.2.11	Reproducibility of CO response.....	27
5.2.12	Reproducibility of heat response.....	27
5.2.13	Air movement.....	27
5.2.14	Dazzling.....	28
5.3	Operational reliability	29
5.3.1	Connection of ancillary devices.....	29
5.3.2	Monitoring of detachable detectors.....	29
5.3.3	Manufacturer's adjustments.....	29
5.3.4	On-site adjustment of behaviour	29
5.3.5	Protection against the ingress of foreign bodies.....	29
5.3.6	Software controlled devices	29
5.3.7	Long term stability	29
5.4	Tolerance to supply parameters.....	30
5.4.1	Variation in supply parameters	30
5.5	Performance parameters under fire conditions	31
5.5.1	Fire sensitivity	31
5.6	Durability of nominal activation conditions/sensitivity.....	33
5.6.1	Temperature resistance.....	33
5.6.2	Humidity resistance.....	36
5.6.3	Shock and vibration resistance	41
5.6.4	Electrical stability.....	46
5.6.5	Resistance to chemical agents.....	47
5.7	Non-response to single fire phenomena	50
5.7.1	Sensitivity to smoke.....	50
5.7.2	Sensitivity to carbon monoxide.....	51
5.7.3	Sensitivity to heat.....	51
6	Classification and designation	52
7	Marking, Labelling and Packaging.....	52
Annex A	(normative) Smoke tunnel for smoke response values	54
Annex B	(normative) Test aerosol for smoke response value measurements	55

Annex C (normative) Smoke measuring instruments.....	56
C.1 Obscuration meter.....	56
C.2 Measuring ionization chamber (MIC).....	56
Annex D (normative) Gas test chamber for CO response threshold value and cross-sensitivity to chemical agents.....	60
Annex E (normative) Heat tunnel for heat response value.....	61
Annex F (normative) Measuring instruments for CO.....	62
F.1 General.....	62
F.2 CO measuring instrument.....	62
Annex G (informative) Establishing exposure levels of chemical agents.....	63
G.1 General.....	63
G.2 Establishing concentration of chemical agents for test gases 1 to 9 of 5.6.5.3.....	63
G.3 Verification of test chamber leakage.....	63
G.4 Establishing concentration of ozone.....	63
Annex H (normative) Apparatus for dazzling test.....	64
Annex I (informative) Apparatus for impact test.....	66
Annex J (normative) Fire test room.....	68
Annex K (normative) Open wood fire (TF1).....	70
K.1 Fuel.....	70
K.2 Arrangement.....	70
K.3 Method of ignition.....	70
K.4 Variables.....	70
K.5 End-of-test condition.....	70
K.6 Test validity criteria.....	70
Annex L (normative) Smouldering (pyrolysis) wood fire (TF2).....	74
L.1 Fuel.....	74
L.2 Hotplate.....	74
L.3 Arrangement.....	74
L.4 Heating rate.....	74
L.5 End-of-test condition.....	74
L.6 Test validity criteria.....	74
Annex M (normative) Glowing smouldering cotton fire (TF3).....	79
M.1 Fuel.....	79
M.2 Arrangement.....	79
M.3 Ignition.....	80
M.4 End-of-test condition.....	81
M.5 Test validity criteria.....	81
Annex N (normative) Open plastics (polyurethane) fire (TF4).....	84
N.1 Fuel.....	84
N.2 Conditioning.....	84
N.3 Arrangement.....	84
N.4 Ignition.....	84
N.5 Method of ignition.....	84
N.6 End-of-test condition.....	84
N.7 Test validity criteria.....	84
Annex O (normative) Liquid (heptane) fire (TF5).....	87
O.1 Fuel.....	87

0.2	Arrangement	87
0.3	Ignition	87
0.4	End-of-test condition.....	87
0.5	Test validity criteria	87
Annex P	(normative) Low temperature black smoke (decalene) liquid fire (TF8).....	90
P.1	Fuel	90
P.2	Arrangement	90
P.3	Ignition	90
P.4	End-of-test condition.....	90
P.5	Test validity criteria	90
Annex Q	(informative) Information concerning the construction of the smoke tunnel	93
Annex R	(informative) Information concerning the construction of the gas test chamber	96
Annex S	(informative) Construction of the heat tunnel	98
Annex T	(informative) Information concerning test procedures and requirements for response to slowly developing fires, aging and contamination.....	101
Annex U	(informative) Information concerning the construction of the measuring ionization chamber	105
Bibliography	107