

DIN EN 12599:2013-01 (E)

Ventilation for buildings - Test procedures and measurement methods to hand over air conditioning and ventilation systems

Contents	Page
Foreword	5
1 Scope	6
2 Normative references	7
3 Test and check procedure	8
4 Completeness checks	10
5 Functional checks	10
5.1 General	10
5.2 Put system into use	10
5.3 Procedure	10
6 Functional measurements	11
6.1 General	11
6.2 Range of functional measurements	11
6.3 Procedure	12
6.4 Measuring methods and measuring devices	13
6.4.1 General	13
6.4.2 Measurement of the air flow rate	13
6.4.3 Measurement of the ductwork leakage	13
6.4.4 Measurement of the indoor air velocity	13
6.4.5 Measurement of air temperature	14
6.4.6 Measurement of the air humidity	14
6.4.7 Measurement of the sound pressure level	14
6.4.8 Measurement of the electrical power of the fan	14
6.4.9 Measurement of the pressure difference at the air filter	14
6.5 Accompanying measurements	14
7 Special measurements (see Annex E)	15
7.1 General	15
7.2 Parameters	15
7.3 Measurements of components	15
7.3.1 Fans	15
7.3.2 Filters	16
7.3.3 Heat exchangers	16
7.3.4 Air humidifiers	18
7.4 Check of regulating, control and switching systems	19
7.4.1 General	19
7.4.2 Controls	19
8 Uncertainty of measurements	20
8.1 General	20
8.2 Uncertainty of measuring devices	20
8.2.1 Instrument uncertainty (u1)	20
8.2.2 Reading uncertainty (u2)	20
8.3 Uncertainty of measurement results	21
8.4 Calculation of the error of the measuring equipment	22

9	Test Reports	22
9.1	General	22
9.2	Handing over report	22
9.3	Inspection report on the completeness check	23
9.4	Inspection report on the functional check	23
9.5	Test report on the functional measurements	24
9.6	Test report on the special measurements	24
Annex A (informative) Completeness check		25
A.1	Documents	25
A.1.1	List of agreed specifications:	25
A.1.2	Inventory documents:	26
A.1.3	Documents for operation and maintenance:	26
A.2	Tests	26
A.2.1	General inspection of:	26
A.2.2	Balancing	27
A.2.3	Separate tests of:	27
A.3	Test Report for the completeness check	30
Annex B (informative) Functional checks		31
B.1	General	31
B.2	Separate checks for components	31
B.2.1	Central devices, fans	31
B.2.2	Heat exchanger	31
B.2.3	Air filter	32
B.2.4	Humidifier	32
B.2.5	Multi leaf dampers	32
B.2.6	Fire and smoke dampers	32
B.2.7	Mixing section	32
B.2.8	Ductwork	32
B.2.9	Air flow pattern in the room as a function of the air terminal devices and geometrical obstacles	32
B.2.10	Control devices and switch cabinets	32
Annex C (normative) Determination of the extent of functional checks or measurements		34
C.1	General	34
C.2	Parameters and similar locations	34
C.2.1	Parameter	34
C.2.2	Similar locations	34
C.3	Determination of the total number n of similar locations	34
C.4	Extent of checks or measurements	35
Annex D (normative) Measuring methods and measuring devices for functional measurements		37
D.1	Measurement of the air flow rate	37
D.1.1	General	37
D.1.2	Measurement in the duct cross-section	37
D.1.3	Measurement with throttle devices	43
D.1.4	Measurement in the cross-section of a chamber, the fan-casing or device	43
D.1.5	Measurement at the air terminal devices	43
D.1.6	Measuring devices (Examples)	47
D.2	Measurement of the indoor air velocity	48
D.2.1	Measuring methods	48
D.2.2	Measuring devices	48
D.3	Measurement of air temperature	49
D.3.1	Measuring methods	49
D.3.2	Measuring devices	50
D.4	Measurement of the air humidity	50
D.5	Measurement of the sound level	51

D.6	Measurement of the electrical power of the fan	51
D.6.1	Measuring method	51
D.6.2	Measuring equipment	53
D.6.3	Measuring section	53
D.6.4	Measurement uncertainties	53
D.7	Pressure difference at the air filter	54
D.8	Air leakage	54
D.8.1	Measuring method	54
D.8.2	Measuring equipment	54
D.8.3	Measuring section	54
D.8.4	Measurement uncertainty	55
Annex E (normative) Special measurements		56
E.1	Measuring instruments	56
E.2	Measuring of parameters	56
E.2.1	Pressure	56
E.2.2	Temperature	58
E.2.3	Humidity	62
E.2.4	Air flow	62
E.2.5	Sound	69
E.2.6	Air pollution	69
E.2.7	Electric Power	72
E.3	Measurements in rooms	72
E.3.1	General	72
E.3.2	Thermal environment	72
E.3.3	Ventilation effectiveness	73
E.3.4	Acoustic environment	74
Annex F (informative) Contractual agreements		75
Annex G (informative) Examples for determination of the number of functional checks and measurements		76
G.1	Functional checks	76
G.2	Functional measurements	77
Annex H (informative) Examples for measurement uncertainty		78
H.1	Measuring equipments for measuring of the velocity and the cross-section	78
H.2	Velocity measurement by Pitot Static Tube (Prandtl tube)	78
H.3	Example as H.1 using the same references but lower velocity, larger distance	79
H.4	Example: Measurement of velocity by axial vane anemometer	79
Annex I (informative) Examples of measuring protocols for the air-flow rate		81
Bibliography		85