On site ductwork airtightness measurements in standardization
(Revision of EN 12599)

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Standard EN 12599

- EN 12599: Test procedures and measurement methods to hand over air conditioning and ventilation systems
  - first published in 2000
  - revised in 2012
  - applied to ventilation systems in non-residential buildings

Intention:
Verify the fitness of purpose of ventilation systems

- Measurements intended to be executed by the installer
- Scope opened to other purposes in 2012 („primarily for handing over“)
- Ductwork leakage (airtightness) introduced in the standard in 2012

EN 12599 – overview on functional measurements

Table 2 — Functional measurements

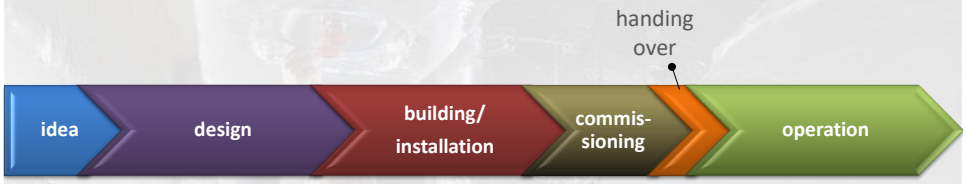
Measurement at		Total System	Central System/Appliance				Duct work	Room					
Parameters Type of Systems/Functions		Additional cleanliness test	Current drawn and power by the motor [D.6]	air flow *) [D.1]	air temperature *) [D.3]	pressure drop across filter [D.7]	**ductwork leakage test [D.8]**	supply air flow [D.1]	exhaust air flow [D.1]	supply air temperature **) and air temperature in the room [D.3]	air humidity [D.4]	sound pressure level [D.5]	Indoor air velocity [D.2]
Ventilation System	(F) Z	2	1	1	0	1	**2**	1	2	0	0	2	0
	(F) H	2	1	1	1	1	**2**	1	2	2	0	2	2
	(F) C	2	1	1	1	1	**2**	1	2	2	2	2	2
	(F) M/D	2	1	1	1	1	**2**	1	2	2	1	2	2
Partial air conditioning system	(F) HC	2	1	1	1	1	**2**	1	2	1	2	2	2
	(F) HM/HD/ CM/CD	2	1	1	1	1	**2**	1	2	1	1	2	2
	(F) MD	2	1	1	1	1	**2**	1	2	2	1	2	2
	(F) HCM/MC D/CHD/H MD	2	1	1	1	1	**2**	1	2	1	1	2	2
Air conditioning system	(F) HCMD	2	1	1	1	1	**2**	1	2	1	1	2	2

*) Outdoor air, supply and exhaust air
**) Depending on control principles, if relevant

EN 12599 – airthightness measurements

- The airtightness class according to EN 1507 and EN 12237 shall be checked
- In large systems the airtightness can only be measured in a part of the system
- The measurements shall be performed while the duct is being installed and accessible
  - Additional tests can be necessary after installation in case of malfunction e.g. excess pressure
- Measurement procedure according to the product standards (laboratory testing)
  - Defined test pressure levels

ductwork airtightness - building process



airtightness	selection	measurements	measurements	inspections
	air tightness class components		**EN 12599**	**EN 16798-17**

Idea of Lars-Åke Mattsson

Ductwork airtightness - System

- Airtightness classes for the system are defined in EN 16798-3

Classification of system air tightness class

Air tightness class		Air leakage limit (f_{max})
Old	**New**	**$m^3\ s^{-1} \bullet m^{-2}$**
	ATC 7	Not classified
	ATC 6	$0{,}067\ 5 \times p_t^{0,65} \times 10^{-3}$
A	ATC 5	$0{,}027 \times p_t^{0,65} \times 10^{-3}$
B	ATC 4	$0{,}009 \times p_t^{0,65} \times 10^{-3}$
C	ATC 3	$0{,}003 \times p_t^{0,65} \times 10^{-3}$
D	ATC 2	$0{,}001 \times p_t^{0,65} \times 10^{-3}$
	ATC 1	$0{,}000\ 33 \times p_t^{0,65} \times 10^{-3}$

Ductwork airtightness - components vs. installed systems

EN 1507 / EN 12237

- Measure the airflow and static pressure
- Surface area at least 10 m^2
- Variety of components and ducts (selection of the product range)
- Different diameters
- L/A ratio 1 - 1,5

EN 12599

- Measure the airflow and static pressure
- sufficiently large section (refers to EN 1507/12237)
- Variety of components and ducts determined by the installation *(„representative selection“)*
- L/A ratio 1 - 1,5

Ductwork airtightness - components vs. installed systems

- Airtightness of the installed ductwork system is a result of the mounting (e.g. joints)
- System can contain different components
- Tightness class of the duct components is rarely reached

Revision on EN 12599

- EN 12599 is currently under revision
- Airtightness is a main subject to be worked on

  - Clarification between the airtightness classes of systems and duct components
  - Measurement method should be applicable also for inspections
  - Take into account requirements of national guidelines

Existing national guidelines for airtightness tests

- Existing guidelines in European countries will be introduced in the 3 following presentations

Presenter	Guideline	Country
Laurent Bonnière	FD 51-767	France
Peter Rogers	DW 143	UK
Erik Osterlund	VVS & Kyl09	Sweden