

ISO/TR 16219:2020 (E)

Fans — System effects and system effect factors

Contents

	Foreword
	Introduction
1	Scope
2	Normative references
3	Terms, definitions and symbols
4	Origin of fan system effects
5	Definitions of system effect factor (SEF)
5.1	Inlet SEF
5.2	Outlet system effect
6	Examples of inlet SEF
6.1	Introduction
6.2	Axial fans
6.2.1	Experimental setups
6.2.1.1	NEL
6.2.1.2	ASHRAE 1223-RP
6.2.2	Results
6.2.2.1	Introduction
6.2.2.2	NEL
6.2.2.3	ASHRAE 1223-RP
6.3	Centrifugal and mixed-flow fans
6.3.1	Experimental setups
6.3.1.1	NEL
6.3.1.2	ASHRAE 1216-RP
6.3.1.3	ASHRAE 1272-RP
6.3.1.4	ASHRAE 1420-TRP
6.3.1.5	Elbow at the inlet of a forward-curved centrifugal fan
6.3.2	Results
6.3.2.1	NEL
6.3.2.2	ASHRAE 1216-RP
6.3.2.3	ASHRAE 1272-RP
6.3.2.4	ASHRAE 1420-TRP
6.3.2.5	Elbow at the inlet of a forward-curved centrifugal fan
7	Examples of outlet SEF
7.1	Axial fans
7.1.1	General
7.1.2	Experimental setups
7.1.3	Results
7.2	Centrifugal and mixed-flow fans
7.2.1	Experimental setups
7.2.1.1	NEL
7.2.1.2	ASHRAE 1420-RP
7.2.2	Results
7.2.2.1	NEL
7.2.2.2	ASHRAE 1420-RP
8	Reducing system effects

- 8.1 General
- 8.2 Inlet effects
 - 8.2.1 General
 - 8.2.2 Non-uniform flow
 - 8.2.3 Swirl or vorticity
 - 8.2.4 Inlet blockage
- 8.3 Outlet effects
 - 8.3.1 General
 - 8.3.2 Insufficient duct length
 - 8.3.3 Outlet obstruction
 - 8.3.4 Non-uniform flow
- 8.4 Examples of the effects of poor inlet and outlet connections

9 Conclusions

Annex A (informative) Basic principles on fan performance representation

- A.1 Fan performance curves
- A.2 System resistance curves
- A.3 Operating point
- A.4 Fan performance measurement vs. calculation
- A.5 Fan performance calculations: the fan laws vs. interpolation procedures
- A.6 The fan laws
 - A.6.1 Definitions
 - A.6.2 The formulae of the incompressible fan laws
 - A.6.3 Limitations
 - A.6.4 Use of the fan laws to generate catalogue ratings
- A.7 Applications
 - A.7.1 General
 - A.7.2 Case 1: Change in fan speed
 - A.7.3 Case 2: Change in fan size
 - A.7.4 Case 3: Change in fan size and speed combined
 - A.7.5 Case 4: Change in air density only
 - A.7.6 Case 5: Change in air density and speed — constant pressure
 - A.7.7 Case 6: Change in air density and speed — constant mass flow rate
- A.8 Application examples
 - A.8.1 Example no. 1
 - A.8.2 Example no. 2
 - A.8.3 Example no. 3
 - A.8.4 Example no. 4
 - A.8.5 Example no. 5
 - A.8.6 Example no. 6
- A.9 Application of system effects

Annex B (informative) Fan system calculation

- B.1 Fan system calculation — Introduction
- B.2 Total and static pressure
- B.3 Preliminary design
- B.4 Density effects in air systems
- B.5 Duct friction losses
- B.6 Dynamic losses
- B.7 Calculating pressure losses
- B.8 Branch junctions
- B.9 Dynamic loss coefficient
- B.10 Equivalent length of duct
- B.11 System effects
 - B.11.1 General
 - B.11.2 Element system effects
 - B.11.3 Fan system effects
- B.12 The total system
- B.13 Fan performance specification
- B.14 System resistance factors
- B.15 System design and tolerances
- B.16 Point of operation
- B.17 System resistance effect on performance

- B.18** Fan performance tolerance
- B.19** Performance safety factor
- B.20** Static pressure safety factor
- B.21** Effects of system changes

Page count: 83