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Fluidna tehnika - Sušilniki stisnjenega zraka – Specifikacije in preskušanje

Compressed air dryers -- Specifications and testing

Sécheurs à air comprimé -- Spécifications et essais

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International Standard 7183

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Compressed air dryers — Specifications and testing

Sécheurs d'air comprimé — Spécifications et essais

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 7183 was prepared by Technical Committee ISO/TC 118, *Compressors, pneumatic tools and pneumatic machines*.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition unless otherwise stated.

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Compressed air dryers — Specifications and testing

1 Scope and field of application

This International Standard specifies reference conditions, acceptance test methods and the most important characteristic data of different dryers.

It is applicable to compressed air dryers working in the effective (gauge) pressure range of 0,16 to 40 MPa (1,6 to 400 bar), but excluding:

a) liquid absorption types;

b) cooling with aftercooler;

c) overcompression.

2 Units

General use of SI units (Système International d'Unités, see ISO 1000) as given throughout this International Standard is recommended.

However, in agreement with accepted practice in the pneumatic field, some non-preferred SI units, accepted by ISO, are also used; these are given in table 1.

Table 1 — Non-SI units

Measurement	Unit name	Unit symbol	Definition
pressure	bar	bar	1 bar = 10^5 Pa
volume	litre	L	1 L = 1dm^3
time	minute hour	min h	1 min = 60 s 1 h = 60 min = 3 600 s

3 References

ISO 131, *Acoustics — Expression of physical and subjective magnitudes of sound or noise in air.*

ISO 266, *Acoustics — Preferred frequencies for measurements*

ISO 1000, *SI units and recommendations for the use of their multiples and of certain other units.*

ISO 1217, *Displacement compressors — Acceptance tests.*

ISO 1219, *Fluid power systems and components — Graphic symbols.*

ISO 5167, *Measurement of fluid flow by means of orifice plates, nozzles and Venturi tubes inserted in circular cross-section conduits running full.*

ISO 5388, *Stationary air compressors — Safety rules and code of practice.*

ISO 5389, *Turbocompressors — Performance test code.* [1)]

ISO 5941, *Compressors, pneumatic tools and machines — Preferred pressures.*

IEC Publication 51, *Recommendations for direct acting indicating electrical measuring instruments and their accessories.*

IEC Publication 651, *Sound level meters.*

4 Definitions

4.1 moisture content (gram per cubic metre): Ratio of water and water vapour by mass to the total volume.

4.2 vapour concentration (gram per cubic metre): Ratio of water vapour by mass to the total volume.

NOTE — Vapour concentration was earlier called "absolute humidity" and has been used to describe what is more correctly termed "water load", i.e. the water content of the desiccant expressed as a mass ratio.

4.3 vapour ratio: Mass ratio of water vapour (gram) to dry air (gram).

NOTE — It is not recommended to express the vapour ratio in parts per million (PPM). When parts per million are used (at very low dew points) it should be clearly stated whether it is on a mass or a volume ratio basis.

4.4 partial pressure (millibar): Absolute pressure exerted by any component in a mixture.

4.5 saturation pressure (millibar): Total pressure at which moist air at a certain temperature can coexist in neutral equilibrium with a plane surface of pure condensed phase (water or ice) at the same temperature (see annex B).

1) At present at the stage of draft.

4.6 relative vapour pressure: Ratio of the partial pressure (millibar) of the water vapour to its saturation pressure (millibar) at the same temperature.

NOTE — Relative vapour pressure is often called "relative humidity".

4.7 relative vapour concentration: Ratio of the actual water vapour concentration (gram per cubic metre) (see 4.2) to its saturation value (gram per cubic metre) at the same temperature and pressure.

4.8 relative vapour ratio: Ratio of the actual vapour ratio (see 4.3) to the saturation vapour ratio at the same temperature.

NOTE — Relative vapour ratio was earlier called "degree of saturation".

4.9 dew point (degree Celsius): Temperature, referred to a specific pressure, at which the water vapour begins to condense.

4.9.1 atmospheric dew point: Dew point measured at atmospheric pressure.

NOTE — Atmospheric dew point should not be used in connection with compressed air drying.

4.9.2 pressure dew point: Dew point measured at the actual pressure, which should be stated.

4.9.2.1 pressure dew point, nominal value: Dew point obtained in a dryer, which would not normally be exceeded when operating under the stated conditions.

4.10 flow-rate of a dryer: Volume flow-rate of condensed gas referred to a standard reference atmosphere condition of an absolute pressure of 1 bar and a temperature of 20 °C (see ISO 1217).

4.10.1 volume flow at dryer inlet: Maximum volume of flow air accepted by the dryer (under the conditions given in 4.10) including air required for regeneration, pressurizing or cooling purposes.

4.10.2 volume flow at dryer outlet: Maximum volume flow of air delivered by the dryer (under the conditions given in 4.10) available for use, i.e. after purge air, pressurizing air and cooling air flows have been deducted.

4.11 desiccant: Substance with the ability to retain water without change of state; for example, silica gel SiO_2, activated alumina Al_2O_3. The term thus excludes deliquescent substances.

4.12 adsorption: Physical process in which the molecules of a gas or a vapour adhere to the surface of a solid.

4.13 desorption: Driving off of water held by a desiccant.

4.13.1 regeneration: Desorption and preparation of desiccant to enable it to enter a new period of operation.

4.14 absorption: Process of attracting one substance into the mass of another, so that the absorbed substance disappears physically.

4.14.1 liquid absorption: Drying of air or gas by means of a liquid desiccant (for example, triethyleneglycol or sulfuric acid).

4.14.2 deliquescence: Spontaneous process whereby a soluble solid material absorbs water and becomes liquid.

4.15 drying by cooling: Method of liquifying part of the condensable vapours by reducing the temperature.

4.16 drying by overcompression: Method of drying air by compressing it to a pressure higher than the intended working pressure.

5 Types of compressed air dryers

5.1 Absorption dryers

5.1.1 Compressed air dryers, which extract water vapour from the compressed air, where the absorbent combines chemically with the water vapour and goes into solution. The hydrous solution is drained off; the absorbent is normally not recovered.

5.1.1.1 Liquid desiccant

5.1.1.2 Deliquescent substances

5.2 Adsorption dryers

5.2.1 Compressed air dryers, which extract water vapour from the compressed air by attraction and adhesion of molecules in a gaseous or liquid phase to the surface of a solid. The adsorbent can be regenerated by removing the adsorbed water.

5.2.1.1 heatless: Regeneration is achieved with non-heated, expanded, previously dried air.

5.2.1.2 directly heated: Regeneration is achieved by heating elements applied to or embedded in the desiccant.

5.2.1.3 regeneration air heated: Regeneration is achieved by passing heated ambient air through the desiccant.

5.2.1.4 regeneration: Achieved by adsorption and absorption.

5.3 Refrigeration dryers

5.3.1 Compressed air dryers, which extract water vapour by means of cooling with a refrigeration circuit.

5.3.1.1 chilled water: Drying is achieved by cooling the air in a heat exchanger using chilled fluid.

5.3.1.2 heat absorbing mass: Drying is achieved by indirect cooling via thermal storage.

5.3.1.3 direct expansion: Drying is achieved by evaporating the refrigerant at high velocity inside the heat exchanger tubes.

5.3.1.4 flooded evaporator: Drying is achieved by evaporating the refrigerant from a pool surface within a closed vessel.

5.4 Drying achieved by combination of several systems

6 Reference (standard rating) conditions and performance rating parameters

6.1 Reference (standard rating) conditions and performance rating parameters are both necessary in defining the performance of an air dryer and in comparing one make of dryer with another.

The reference conditions in table 2 shall form an invariable part of any statement that performance is to ISO 7183, option A or B also being quoted.

The performance rating parameters in table 3 shall form the second and variable part of such a statement.

Table 2 — Reference conditions

Quantity	Unit	Value [1]		Tolerance
		Option A	Option B	
Inlet temperature	°C	35	38	± 1
Inlet pressure	bar	7	7	± 7 %
Inlet pressure dew point	°C	35	38	± 2
Cooling air inlet temperature	°C	25	38	± 3
Cooling water inlet temperature	°C	25	30	± 3
Ambient air temperature	°C	25	38	± 3

1) The choice between options A and B will be influenced by the intended geographical location of the equipment.

Table 3 — Performance rating parameters

Quantity	Unit	Value
Outlet pressure dew point	°C	As specified
Outlet air flow	L/s or m^3/s	As specified
Pressure drop across dryer	bar	As specified
Frequency of electrical power supply	Hz	As specified

7 Specification

The data given in table 4 shall, when applicable, be stated when specifying and inspecting a compressed air dryer. Other relevant details such as explosion proof properties, hazardous area, etc. shall also be included.