INTERNATIONAL STANDARD

ISO 4975

First edition
2022-06

Railway applications — Braking system — Quality of compressed air for pneumatic apparatus and systems

Applications ferroviaires — Système de freinage — Qualité de l'air comprimé destiné aux appareils et systèmes pneumatiques

Reference number
ISO 4975:2022(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 269, *Railway applications*, Subcommittee SC 2, *Rolling stock*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The quality of the compressed air is determined from the quality classes specified in this document, derived from ISO 8573-1:2010.

This document is dedicated to railway specific applications and special need for air generation and treatment units (AGTUs) and air treatment units.

Railway applications — Braking system — Quality of compressed air for pneumatic apparatus and systems

1 Scope

This document defines the quality classes of compressed air produced by air generation and treatment units (AGTUs) and/or used in pneumatic apparatus and systems of rail vehicles.

This document is applicable to compressed AGTUs and also to all pneumatic equipment and systems of rail vehicles.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 8573 (all parts), *Compressed air — Contaminant measurement*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 8573-1 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
coalescence
process in which liquid suspended particles group together to form larger particles

3.2
filter
apparatus for separating contaminants from a fluid vein where they are suspended

3.3
contaminant
substances or combinations of solids, liquids or gaseous materials that can adversely affect a system

3.4
condensate
liquid formed by condensation

3.5
ambient temperature
temperature around the air generation and treatment unit (AGTU)

Note 1 to entry: See also Figure 2, position 16 in the key.

4 Units and abbreviated terms

4.1 Units

This document uses SI units. However, in accordance with standard railway practice with regard to compressed air, some non-SI units are used, such as:

— for pressure indication, the unit used is “bar”: 1 bar = 10^5 Pa;

— for volume indication, the unit used is “litre”: 1 l = 10^{-3} m^3.

Units used for the various contaminants are given in the Table 1. For further specification of contaminants, see Annex A.

Table 1 — Units used for the various contaminants

Contaminant	Dewpoint under pressure °C	Particle size or droplets (grain size) µm	Vapour pressure mbar	Mass concentration mg/m^3	Relative vapour pressure -
Particles:					
— size		X			
— mass concentration				X	
Water:					
— liquid				X	
— vapour	X		X	X	X
Oil:					
— liquid		X		X	
— vapour			X	X	

4.2 Abbreviated terms

AGTU air generation and treatment unit

DOT device on test

5 Compressed air system

5.1 General

The breakdown of the compressed air system presented in this document is theoretical. However, it corresponds to constructive provisions commonly adopted on rail vehicles.

5.2 Breakdown of the system into functional units

The compressed air system of a rail vehicle is divided into functional units, as shown in Figure 1.

The presence of each functional unit is determined by the type of vehicle.

NOTE The requirements in this document can also apply to external air supply systems used with rail vehicles.

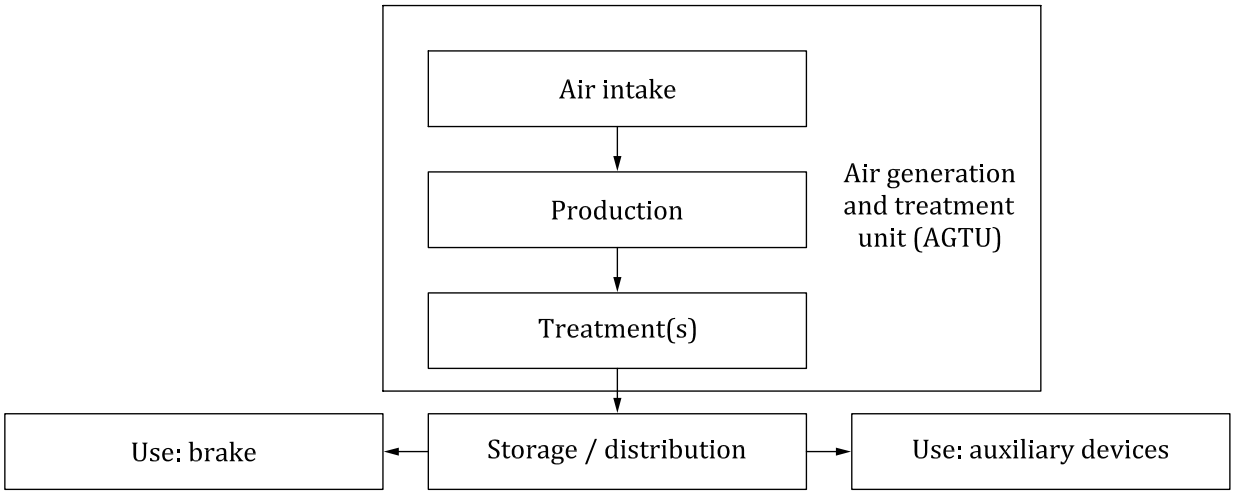


Figure 1 — Compressed air system functional units

6 Characteristics of the devices constituting the functional units

6.1 Air generation and treatment unit (AGTU)

6.1.1 Air intake

Air intake functional unit can include:

— intake filter: to prevent damage to the compressor by reducing atmospheric air contaminants.

6.1.2 Production of compressed air

Production of compressed air functional unit can include:

— compressors (e.g. piston, screw, vane);

— outlet filter(s).

6.1.3 Treatment of compressed air

Treatment of compressed air functional unit is used to achieve the air quality required for the reliability of pneumatic apparatus and systems of rail vehicles under predefined environmental conditions.

It can include the following:

— liquid separator and filter, to remove some contaminants coming from the compressor;

— air dryers, characterized by the dewpoint, to reduce the humidity level in the compressed air;

— outlet filter for retention of impurities coming from the air dryer.

6.2 Compressed air storage and distribution

Air system consisting of reservoirs and pipes for distribution and main reservoirs for air storage.

6.3 Use of compressed air for the brake

Brake system: assembly consisting of all the pneumatic equipment intended for braking the rail vehicle.

6.4 Use of compressed air for auxiliary devices

Auxiliary devices: assembly consisting of all the pneumatic equipment present on the rail vehicle except that used for ensuring braking.

7 Determination of the air quality classes

For determination of the air quality classes, a sample of the total compressed air flow at the outlet of the AGTU is used.

Measurements shall be made with an air intake temperature of the compressor of 20 °C ± 5 °C (position 1 in Figure 2), except measurements to determine the classes of humidity for which air intake temperatures of the compressor are defined (see Table 3). When the AGTU is tested alone, then the cooling air (position 4 in Figure 2) and the air dryer ambient air (position 16 in Figure 2) shall be the same as the air at the compressor intake (position 1 in Figure 2). The AGTU outlet pressure (position 19 in Figure 2) shall be set at 9 bar ± 0,5 bar.

The mass concentration of water, oil and solid particles in compressed air varies due to sudden variations in the air flow rate, wear of the elements, and changes in flow rate, pressure, temperature and ambient conditions.

NOTE Liquid phase oil and water partially adhere to the walls and form a film or thin trails.

The air quality for particles shall be measured in accordance with the test methods defined in ISO 8573-4 (for classes 0 to 5 of Table 2).

The humidity (dewpoint) shall be measured in accordance with the test methods defined in ISO 8573-3 except the AGTU outlet pressure shall be 9 bar ± 0,5 bar and temperature conditions defined in this document.

The air quality for oil shall be measured in accordance with the test methods defined in ISO 8573-2 and ISO 8573-5.

All measurements shall be done in a stabilized system in accordance with ISO 8573 (all parts). The results of the measured quality classes of a compressed air system are usually based on the average of a defined number of measurements made over a defined period of time during qualification.

The air quality is considered as degraded if one or more purity class is increased by one grade or more.

A demonstration should be performed to establish that the air quality is not degraded during the life of the AGTU.

If a demonstration is performed, it shall take into account:

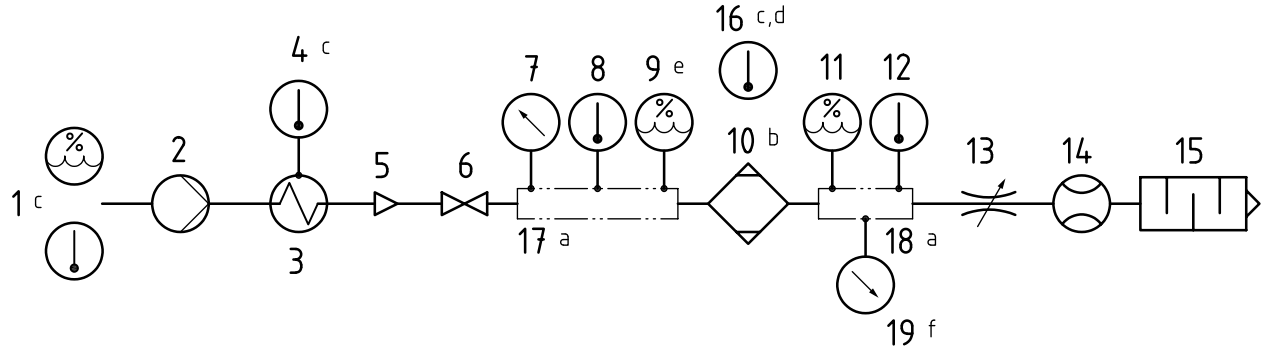
— the operational condition (duty cycle, the regulation of pressure);

— the environmental condition (vibration, range of ambient temperature);

— the maintenance plan.

If a demonstration is not performed, a monitoring system shall be used to detect failures which can lead to a degradation of air quality.

Some options for demonstrating air quality are shown in Annex B.



Key

1 air intake of compressor, air intake temperature, intake humidity (air temperature directly before the compressor air intake)
2 compressor
3 cooler
4 cooling air, cooling air temperature
5 check valve
6 isolation cock
7 air treatment inlet pressure
8 air treatment inlet temperature
9 air treatment inlet moisture content meter
10 air treatment
11 air treatment pressure dewpoint sensing/measuring, see ISO 8573-3 for different sampling techniques
12 air treatment outlet temperature
13 flow control valve
14 flow meter
15 silencer
16 air treatment ambient temperature sensing/measuring
17 air treatment inlet pressure measuring tube
18 air treatment outlet pressure measuring tube
19 AGTU outlet pressure

a Details of a pressure measuring tubes are given in ISO 8573-1 and ISO 7183.
b Air treatment can consist of air dryer and pre-/post-filtration units depending on the specific system layout.
c Temperatures at compressor intake (1), cooling air (4) and air dryer ambient temperature (16) can be different depending on the specific application.
d Air dryer ambient temperature shall not exceed the maximum permissible temperature of equipment.
e Inlet moisture content to air dryer 100 %.
f 9 bar (can be adapted to the system pressure of the rail vehicle).

Figure 2 — Example of AGTU test configuration

8 Air quality classes

8.1 Reference conditions

To normalize the test results, the following reference conditions shall be applied:

— temperature 20 °C;

— absolute air pressure 1 bar;