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Dentistry — Central compressed air source equipment

Médecine bucco-dentaire — Centrale d'air comprimé

Reference number
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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

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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. 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 106, *Dentistry,* Subcommittee SC 6, *Dental equipment*.

This first edition of ISO 22052 cancels and replaces ISO/TS 22595-2:2008.

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

Central compressed air source equipment is nearly universally present in modern dental treatment facilities. It consists of components located separate from treatment rooms used to compress air, prepare the air to meet quality requirements and to store the dental air for eventual use by treatment room pneumatic devices such as air powered hand pieces and air-water syringes as well as for cooling purposes.

Since the output of central compressed air source equipment is used in dental treatment, the equipment characteristics as well as the quality characteristics of the dental air becomes the subject of this document.

The requirements specified in this document have been developed with consideration for the dental air requirements specified in ISO 7494-2.

In medical applications the quality of "air for medical use" is carefully defined. For example, in the European Pharmacopeia and in other countries there are similar definitions. Air for medical use is used for artificial breathing, anaesthetic, endoscopic and other applications inside the human body, also for long term therapy. Also, it is used in sterile environments like operating rooms. For these applications it is necessary to have a precise definition of the quality of the air. The European Pharmacopeia gives values and limits for the contents of the air as well as limits for dangerous contaminants.

In dental applications, compressed air is used to supply driving power for treatment room pneumatic devices such as air powered hand pieces ("drills") and for drying an operating site. Air used for these purposes intermittently enters a patient's mouth and to a significant degree, can be quickly removed by dental suction equipment. As the ambient air in the dental treatment room is not sterile, there is no need for dental air to be sterile nor is there a need for the contents of dental air to be controlled beyond the requirements of normal ambient air.

Nevertheless, there are some essential quality characteristics for the air used in dentistry:

a) to protect sensitive dental instruments and apparatus (from oil, water, particles);

b) to provide clean and dry air and to avoid that dental procedures are compromised (because oil is a release agent that affects e.g. dental adhesion systems);

c) to protect against high humidity in the dental air that creates corrosion in the air receivers and air lines and that can result in technical difficulties in dental instruments; also to protect against the growth of microorganisms in the dental air system.

The test method in this document has been developed in response to the need for clear specification in determining the quality of the dental air.

Up to now, there is no international standard available which defines the quality of "air for dental use".

Dentistry — Central compressed air source equipment

1 Scope

This document specifies requirements and test methods for central compressed air source equipment supplying dental air for dental units and various dental air consuming devices in the dental office.

It also specifies quality requirements and test methods for the dental air produced by the central compressed air source equipment, such as requirements for the purity level of dental air.

It also specifies requirements for information to be supplied by the manufacturer on the performance, installation, operation and maintenance of the central compressed air source equipment.

This document applies only to central compressed air source equipment located outside of the dental treatment room.

This document does not apply to central compressed air source equipment located in the dental treatment room and facility piping. This document does not include requirements for dental laboratory applications (e.g. CAD/CAM systems).

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 1942, *Dentistry — Vocabulary*

ISO 2151, *Acoustics — Noise test code for compressors and vacuum pumps — Engineering method (Grade 2)*

ISO 7494-2, *Dentistry — Dental units — Part 2: Air, water, suction and wastewater systems*

ISO 8573-1, *Compressed air — Part 1: Contaminants and purity classes*

ISO 8573-2, *Compressed air — Contaminant measurement — Part 2: Oil aerosol content*

ISO 8573-3, *Compressed air — Part 3: Test methods for measurement of humidity*

ISO 8573-4, *Compressed air — Contaminant measurement — Part 4: Particle content*

ISO 9687, *Dentistry — Graphical symbols for dental equipment*

IEC 60335-1, *Household and similar electrical appliances — Safety — Part 1: General requirements*

IEC 61000-6-2, *Electromagnetic compatibility (EMC) — Generic standards — Immunity for industrial environments*

IEC 61000-6-3, *Electromagnetic compatibility (EMC) — Generic standards — Emission standard for residential, commercial and light-industrial environments*

IEC 60417, *Graphical symbols for use on equipment*

ISO 7000, *Graphical symbols for use on equipment — Registered symbols*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1942, ISO 7494-2 and the following apply.

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

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

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

3.1
air cooler
device designed to reduce the temperature of *compressed air* (3.9) to a desired level

3.2
air delivery flow rate
performance of *central compressed air source equipment* (3.8) defined as Normal litres per minutes

3.3
air dryer system
system designed to reduce the humidity of *compressed air* (3.9) to a desired level

EXAMPLE Adsorption dryer, membrane dryer, refrigeration dryer.

3.4
air filter
air treatment system component used to lower *compressed air* (3.9) particulate content

3.5
air intake filter
device designed to remove particles from intake air

3.6
air receiver
component used to store *compressed air* (3.9)

3.7
bacterial filter
device designed to restrict the passage of bacteria and to reduce bacteria in the *dental air* (3.14)

3.8
central compressed air source equipment
all components located between air intake and the *central compressed air source equipment connection point* (3.17), excluding the *suction tube* (3.32) if present

3.9
compressed air
ambient air compressed to a higher-pressure level than ambient pressure

3.10
compressed air filter
device designed to remove solid particles from the *compressed air* (3.9) after the air dryer

3.11
compressor head
collection of mechanical components used to compress ambient air

Note 1 to entry: Compressor heads may be of various mechanical types such as piston and rotary screw.

3.12
compressor motor set
collection of components including one or more *compressor heads* (3.11) along with one or more electrical drive motors

3.13
condensate drain
device to drain off condensed water from the *air receiver* (3.6), water separator, air dryer, *air filter* (3.4)

3.14
dental air
compressed air (3.9) for powering, controlling, and/or assisting various dental instruments and equipment, as well as for assisting practitioners with procedures in the oral cavity, but not for procedures requiring medical air or sterile air, such as endoscopy, oral surgery, analgesia, and life support

[SOURCE: ISO 7494-2:2015, 3.7, modified.]

3.15
dental air outlet
location at *central compressed air source equipment* (3.8) where the *dental air* (3.14) lines or additional devices are connected to central compressed air source equipment

3.16
dental compressor
collection of components used to compress, treat and store air that meets *dental air* (3.14) specifications for dental procedures

3.17
central compressed air source equipment connection point
location where the *central compressed air source equipment* (3.8) is connected to the *main line for dental air* (3.25)

3.18
dewpoint
temperature at which water vapour begins to condense

3.19
exhaust air outlet
point where the cooling air exits *central compressed air source equipment* (3.8) location room

3.20
fittings
components that are used to connect the *dental compressor* (3.16), valves and devices with the pipes

3.21
flexible tube
hose or tube which connects the compressor with the *central compressed air source equipment* (3.8) or with the connection point to the *main line for dental air* (3.25) or, if applicable the quick release coupling device

3.22
fresh air inlet
location where *central compressed air source equipment* (3.8) can draw in the atmospheric air from a source, where appropriate located outside the building

3.23
fresh air ventilation
place, where fresh air can enter *central compressed air source equipment* (3.8) location for ventilation, cooling and compressing

3.24
intake muffler
device which reduces the noise level caused by the suction action of the compressor

3.25
main line for dental air
components of a piping installation in a dental facility used to transport *dental air* (3.14) from *central compressed air source equipment* (3.8) to the dental treatment room and other rooms with various dental air consuming devices

3.26
oil separator
device that is installed in oil-lubricated *central compressed air source equipment* (3.8) in order to reduce the oil content of the *compressed air* (3.9)

3.27
central compressed air source equipment location
area outside the dental treatment room in a dental facility where equipment which supplies *dental air* (3.14) to one or more treatment rooms are installed

3.28
pressure dewpoint
dewpoint (3.18) of the air at the specified pressure

3.29
pressure-regulating valve
device that controls the maximum air pressure delivered to the *main line for dental air* (3.25)

3.30
quick-release coupling device
device that is installed at the *central compressed air source equipment* (3.8) connection point to disconnect the central compressed air source equipment from the *main line for dental air* (3.25) for maintenance and measurement of *air delivery flow rate* (3.2), air humidity and noise level

3.31
shut-off valve
device that is used for maintenance to isolate *central compressed air source equipment* (3.8) from the *main line for dental air* (3.25) installed between the *air receiver* (3.6) and the *dental air outlet* (3.15)

3.32
suction tube
component for connecting the *fresh air inlet* (3.22) with the compressor fresh air inlet

3.33
water separator
component of the *air dryer system* (3.3) used to remove liquid water from *compressed air* (3.9)

4 Classification

Central compressed air source equipment shall be classified according to the type of compressor lubrication methods into the following two types:

Type 1: oil-lubricated compressor heads

Compressor heads are oil-lubricated.

For typical central compressed air source equipment arrangements of oil-lubricated compressor, see B.1.1 and B.1.2, and Figures B.1 and B.2.

Type 2: non-oil-lubricated compressor heads

Compressor heads are not oil-lubricated.

For typical central compressed air source equipment arrangements of non-oil-lubricated compressor, see B.1.3 and B.1.4, and Figures B.3 and B.4.

5 Requirements

5.1 Electrical safety

Dental compressors and other parts of the central compressed air source equipment are designed as stationary equipment to be installed in a location separate from dental treatment rooms.

To prevent electrical conduction between central compressed air source equipment and the main line for dental air in case of fault condition, hoses or tubes (flexible tubes), which connect the dental compressor with the central compressed air source equipment connection point or, if applicable the quick release coupling device, shall be made from an electrical insulating material.

For central compressed air source equipment, the safety requirements of IEC 60335-1 apply.

Testing shall be carried out in accordance with IEC 60335-1.

5.2 Electromagnetic compatibility

For electromagnetic compatibility (EMC), the following requirements shall apply.

Immunity requirements of IEC 61000-6-2 shall apply.

Testing shall be carried out in accordance with IEC 61000-6-2.

Emission requirements of IEC 61000-6-3 shall apply.

Testing shall be carried out in accordance with IEC 61000-6-3.

5.3 Quality of dental air

The dental air produced by the central compressed air source equipment shall conform to purity class [2:4:2] according ISO 8573-1.

Explanation of purity class [2:4:2]:

Particle class 2: The numbers of particle in the dental air are as follows:

Particle size	Number of particles per cubic metre
0,1 µm < d ≤ 0,5 µm	≤ 400 000
0,5 µm < d ≤ 1,0 µm	≤ 6 000
1,0 µm < d ≤ 5,0 µm	≤ 100

Humidity class 4: The pressure dewpoint is ≤ +3 °C at 20 °C medium temperature and at 0,7 MPa constant system pressure (this is equivalent to an atmospheric dewpoint of ≤ −21 °C).

Oil content class 2: The oil content of the dental air is ≤ 0,1 mg/m^3.

Testing shall be carried out in accordance with 7.2.3.1, 7.2.3.2, 7.2.3.3.

NOTE 1 In ISO 8573-1 the classification for humidity is defined in relation to the gas temperature.

NOTE 2 Several air dryer systems create a dewpoint depression in relation to the ambient temperature. To make the measuring simpler, the pressure dewpoint is defined in relation to the ambient temperature in this document

NOTE 3 According to ISO 8573-3:1999, 8.1, the reference conditions for humidity statements are defined as:

a) compressed air temperature 20 °C;

b) compressed air pressure 0,7 MPa.

5.4 Performance

5.4.1 Air delivery flow rate of central compressed air source equipment

The manufacturer of central compressed air source equipment shall specify the maximum air delivery flow rate that the equipment is intended to deliver continuously at 0,5 MPa and at the air quality requirement specified under 5.3.

Measurements shall be carried out in accordance with 7.2.1 and 7.2.2.

5.4.2 Condensate drain

The system shall be equipped with a mechanism to drain off condensate water from all points where condensation may occur, for example a condensate drain at the lowest point of the air receiver, filter and/or dryer.

Conformity shall be checked in accordance with 7.1.2.

5.4.3 Bacterial filter

If the central compressed air source equipment includes a bacterial filter it shall be rated to restrict the passage of contaminants larger than 0,22 µm with a retention of 99,99 %.

The manufacturer shall specify the method and interval for the filter element replacement.

Conformity shall be checked in accordance with 7.1.3

5.4.4 Sound level of central compressed air source equipment

The sound pressure level of central compressed air source equipment shall be measured and reported.

Testing shall be carried out according to 7.2.4.

5.5 Test report

A test report shall be prepared to report the results of all applicable testing and inspection requirements specified in this document. Annex C gives a suggested template for the test report.

6 Sampling

One representative sample of the central compressed air source equipment shall be tested.

7 Measurement and test methods

7.1 Visual inspection

7.1.1 General

Visual inspection shall be carried out at normal visual acuity.

7.1.2 Visual inspection of equipment

Visually inspect the equipment to determine conformity with the requirements.

7.1.3 Visual inspection of documentation

Visually inspect the documentation provided by the manufacturer to determine conformity with the requirements.

7.2 Equipment performance

7.2.1 General test conditions

The tests shall be carried out under the following test conditions:

a) The output pressure of the central compressed air source equipment shall be set to the required pressure by using the pressure regulating valve;

b) the flow rate shall be set as specified in 5.4.1;

c) ambient temperature of (20 ± 2) °C;

d) the relative humidity, as specified in the instructions for use;

e) the atmospheric pressure, as specified in the instructions for use.

NOTE According to ISO 8573-3:1999, 8.1 the reference conditions for humidity statements are defined as:

a) compressed air temperature 20 °C;

b) compressed air pressure 0,7 MPa.

7.2.2 Air delivery flow rate at the central compressed air source equipment connection point

Install a pressure regulating valve at the central compressed air source equipment connection point or, if applicable the quick release coupling device. Set the pressure to the value given in the technical data of the central compressed air source equipment (e.g. 0,5 MPa).

Activate the system and run it for (30 ± 2) min with the flow set to the maximum continuous flow performance stated by the manufacturer.

If maximum time specified by the manufacturer is less than 30 min, activate the system and run it for (30 ± 2) min or maximum running time without stops with the flow set to the maximum flow performance stated by the manufacturer.

Measure the air delivery flow rate, gas temperature and humidity at the central compressed air source equipment connection point or, if applicable the quick release coupling device; convert the measured values to Normal litres under following conditions:

Pressure	0,1 MPa (abs)
Temperature	20 °C or 293,15 K
Gas constant of air	288 J/kgK
Density of air	1,185 kg/m^3
Rel. Humidity of air	65 % RH

Include in the test apparatus a flow measuring device capable of ± 5 % accuracy traceable to an international or national standard.

7.2.3 Air treatment system performance

Connect a measuring device behind the central compressed air source equipment connection point or, if applicable the quick release coupling device. Activate central compressed air source equipment by setting the air consumption to the maximum flow rate specified by manufacturer according to 5.4.1.

7.2.3.1 Particles

Carry out the test in accordance with ISO 8573-4.

7.2.3.2 Humidity

Carry out the test in accordance with ISO 8573-3.

7.2.3.3 Oil content

Carry out the test in accordance with ISO 8573-2.

7.2.4 Sound generation

Measure the sound pressure level in a hemi-anechoic chamber at 0,5 MPa.

Carry out the test in accordance with ISO 2151.

8 Information to be supplied by the manufacturer

8.1 General

All central compressed air source equipment shall be accompanied by documents containing at least the information specified in 8.2, and 8.3.

Compliance shall be checked in accordance with 7.1.2.

8.2 Instructions for use

If used, graphical symbols in the instructions for use shall be in accordance with ISO 9687. The instructions for use shall contain the following information:

a) name and address of the manufacturer;

b) type of central compressed air source equipment according to Clause 4;

c) description of what type 2 means and a statement that the oil content of the ambient air is not modified by the central compressed air source equipment;

d) warning and safety notes;

e) description of graphic symbols;

f) intended use;

g) description of the central compressed air source equipment;

h) technical data in accordance with IEC 60335-1;

i) functional description;

j) operating conditions (temperature, humidity, max. altitude above sea level);

k) installation instructions;

l) for type 2: a statement that central compressed air source equipment shall not be installed in a location where oil of other equipment contaminates the air;

m) instructions for routine maintenance by the user and maintenance intervals (e.g. for condensed water drain);

n) functional description of control lamps, switches;

o) quality of delivered dental air according to 5.3.

8.3 Technical description

The technical description shall contain:

a) name and address of the manufacturer;

b) flow rate performance curve or table;

c) purity class of dental air produced, including

   1) particle class;

   2) humidity class;

   3) oil content class.

d) sound generation as measured in 7.2.4;

e) the maximum continuous air flow rate at the specified air quality (acc. 5.4.1);

f) functional compatibility considerations (such as temperature extremes);

g) environmental conditions for use (such as ambient temperature, available heat removal, altitude);

h) rate at which heat is produced by the central compressed air source equipment;

i) overall dimensions and weight of the central compressed air source equipment;

j) details of plumbing;

k) electrical supply requirements (e.g. voltage, current, frequency);

l) oil consumption, if applicable;

m) installation instructions including information about fresh air connection point, central compressed air source equipment connection point and internal diameter of the main line for dental air, flexible tubes, fittings, pipe materials, pipe diameters, design or layout of the fresh air inlet, to prevent liquids and solids from entering the ventilating pipe system;

n) schematic wiring diagrams;

o) classification of central compressed air source equipment according to Clause 4;

p) specification or part number for parts required for maintenance;

q) information for disposal or recycling of equipment at the end of its useable life;

r) measures needed to ensure inlet air quality;

s) attachments that central compressed air source equipment is designed to accept;

t) list of spare parts required for repairs and consumables that would be required in general use;

u) specification of replacement elements for all the filters used in the system;

v) technical data according to IEC 60335-1.

8.4 Information about the central compressed air source equipment location

The following information about the required central compressed air source equipment location shall be provided by the manufacturer for planning purposes:

a) information about fresh air connection point, central compressed air source equipment connection point and internal diameter of the main line for dental air, flexible tubes, fittings, pipe materials, and pipe diameters;

b) design or layout of the fresh air inlet, to prevent liquids and solids from entering the ventilating pipe system;

c) minimum size of doorway and room clearance, to allow placement and maintenance of the equipment;

d) desired location of piping between central compressed air source equipment location and dental units / air consuming devices;

e) recommendations and specifications for temperature alarms and ventilation for the central compressed air source equipment location;

9 Marking

9.1 Marking on the central compressed air source equipment

In accordance with IEC 60335-1, mains-operated central compressed air source equipment, including separable components thereof that are connected to the mains, shall be provided, with permanently affixed and clearly legible markings on the outside of the major part giving at least the following information:

a) name and address of the manufacturer;

b) model or type reference;

c) serial number;

d) year of manufacture;

e) supply voltage;

f) supply frequency (in hertz);

g) connection to the supply;

h) power input;

i) fuses (if applicable);

j) head lubrication;

k) maximum pressure.

Conformity shall be checked in accordance with 7.1.2.

9.2 Marking of controls

IEC 60335-1 applies. The main switch shall be clearly identified.

Conformity shall be checked in accordance with 7.1.

9.3 Graphical symbols

Where used, graphical symbols used for controls and performances shall be in accordance with IEC 60417, ISO 7000 and IEC 60335-1.

Conformity shall be verified according to 7.1.

Annex A
(informative)

Example of design of central compressed air source equipment

A.1 General

The central compressed air source equipment should be designed, constructed and manufactured so that, when properly transported, stored, installed, used and maintained according to the information supplied by the manufacturer in normal use and in single-fault condition, they will cause no danger, which could reasonably be foreseen, to the operating personnel and service personnel, or to the surroundings. These requirements cannot be objectively assessed.

They are considered fulfilled if all of the applicable requirements of Clause 5 are fulfilled. The central compressed air source equipment should have the strength and rigidity necessary to resist the stresses to which they may be subjected in normal dental practice without causing fire, electric shocks or accident hazards.

A.2 Minimum recommended air flow rate

The flow rate of a central compressed air source equipment should be given for a standard pressure of 0,5 MPa.

As a minimum requirement the central compressed air source equipment should provide a continuous air flow at atmospheric pressure of at least 50 Nl/min while maintaining a pressure of 0,5 MPa. If additional air consuming devices are installed the necessary delivery rate of the central compressed air source equipment may be higher than the basic recommendation. In this case, the performance of the central compressed air source equipment should be defined according to the average operation mode of the entire practice.

A.3 Typical components of a central compressed air source equipment

A central compressed air source equipment includes:

a) one or more compressor motor sets;

b) one or more inlet mufflers and air inlet filters;

c) an air dryer system;

d) an air filter;

e) a bacterial filter (optional);

f) an air receiver;

g) a condensed water tap;

h) a pressure-regulating valve (optional);

i) a shut-off device;

j) a quick-release coupling device (optional);

k) oil-lubricated dental compressors should include an oil separator.

A.4 Fresh air inlet

The air inlet for a dental compressor should be located so as to avoid intake of inflammable gases, contamination from combustion motor exhausts and discharges from dental suction systems, anaesthetic-gas-scavenging systems, ventilation systems or other potential sources of contamination.

A.5 Air treatment system performance — Humidity

The optimal range for ambient temperature of the device is between 10 °C and 25 °C. It is recommended that the pressure dewpoint, defined in ISO 8573-1, class 4 as ≤ +3 °C is also achieved at an ambient temperature of +40 °C. Under the worst conditions the device should be designed to withstand a maximum ambient temperature of 50 °C. In this case the pressure dewpoint may exceed the specified value.

If the central compressed air source equipment and/or piping is installed in an area where temperatures fall below the freezing point of water, condensed water is frozen and will damage the central compressed air source equipment, pipes and receiver.

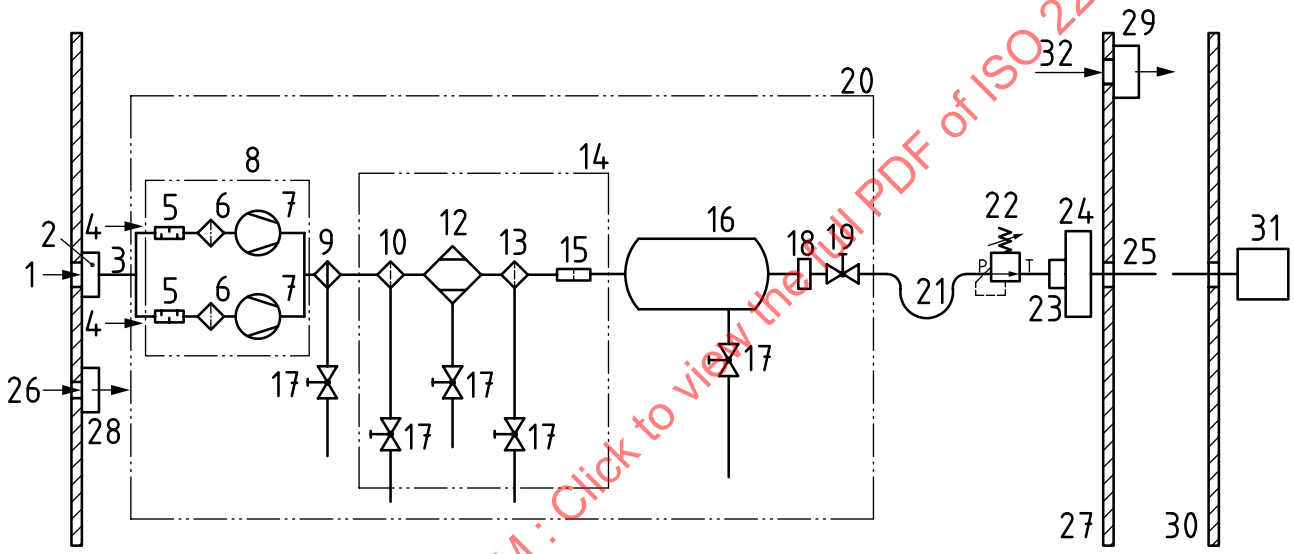
If installation of a compressor below the freezing point is inevitable, precautionary measures such as heating devices should be installed to prevent damage.

Annex B
(informative)

Typical arrangements of central compressed air source equipment in the dental facility and recommendations for construction and installation

B.1 Typical arrangements of central compressed air source equipment

B.1.1 Oil-lubricated dry receiver

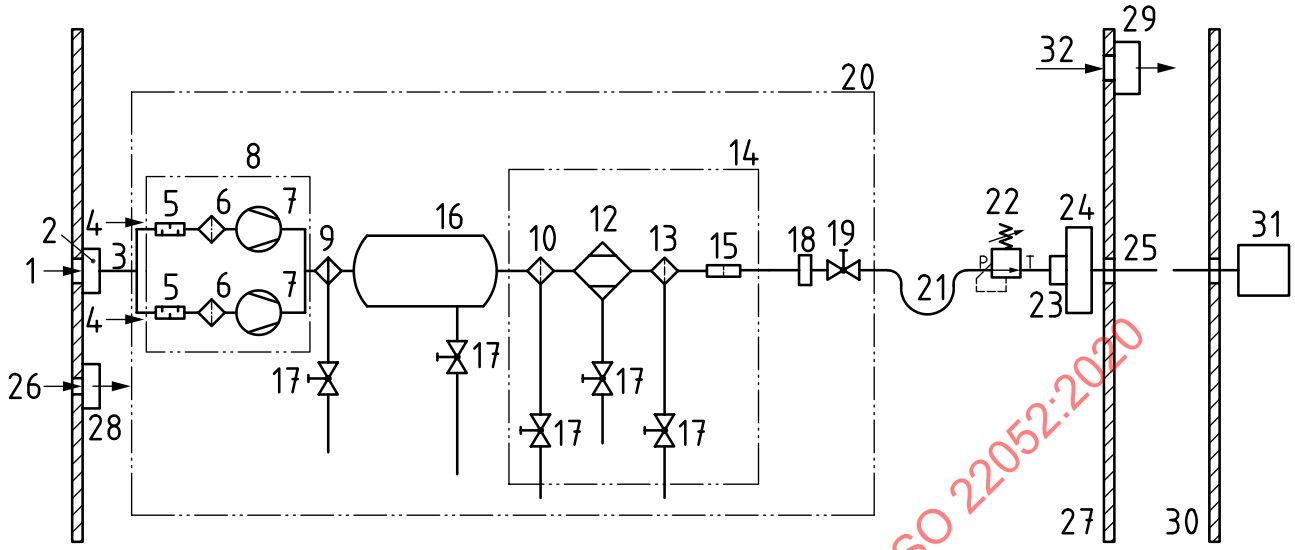


Key

1	fresh air inlet (optional)	17	condensate drain (automatic drain optional)
2	air filter (optional)	18	dental air outlet
3	flexible suction tube (optional)	19	shut-off valve
4	compressor fresh air inlet	20	central compressed air source equipment
5	intake muffler	21	flexible tube (optional on site)
6	air intake filter	22	pressure regulating valve (optional)
7	compressor head	23	quick release coupling device (optional)
8	compressor motor set (key 4 – 7)	24	central compressed air source equipment connection point
9	air cooler	25	main line for dental air
10	aerosol (oil, water, …) filter	26	compressor location fresh air inlet
11	*not used*	27	compressor location wall
12	air dryer	28	fresh air fan (optional)
13	compressed air filter	29	exhaust air outlet
14	air treatment system	30	surgery wall
15	bacterial filter (optional)	31	dental unit and various dental air consuming devices in the dental office
16	air receiver	32	exhaust air fan (optional)

Figure B.1 — Schematic diagram for oil lubricated dry receiver

B.1.2 Oil-lubricated wet receiver

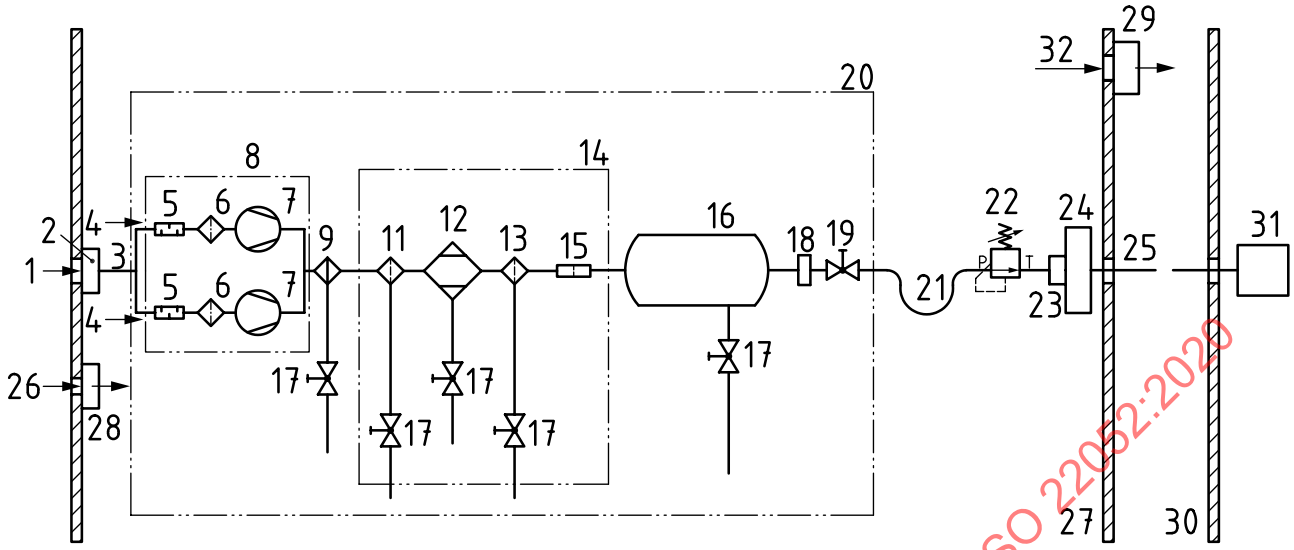


Key

1	fresh air inlet (optional)	17	condensate drain (automatic drain optional)
2	air filter (optional)	18	dental air outlet
3	flexible suction tube (optional)	19	shut-off valve
4	compressor fresh air inlet	20	central compressed air source equipment
5	intake muffler	21	flexible tube (optional on site)
6	air intake filter	22	pressure regulating valve (optional)
7	compressor head	23	quick release coupling device (optional)
8	compressor motor set (key 4 – 7)	24	central compressed air source equipment connection point
9	air cooler	25	main line for dental air
10	aerosol (oil, water, …) filter	26	compressor location fresh air inlet
11	*not used*	27	compressor location wall
12	air dryer	28	fresh air fan (optional)
13	compressed air filter	29	exhaust air outlet
14	air treatment system	30	surgery wall
15	bacterial filter (optional)	31	dental unit and various dental air consuming devices in the dental office
16	air receiver	32	exhaust air fan (optional)

Figure B.2 — Schematic diagram for oil lubricated wet receiver

B.1.3 Non-oil-lubricated dry receiver

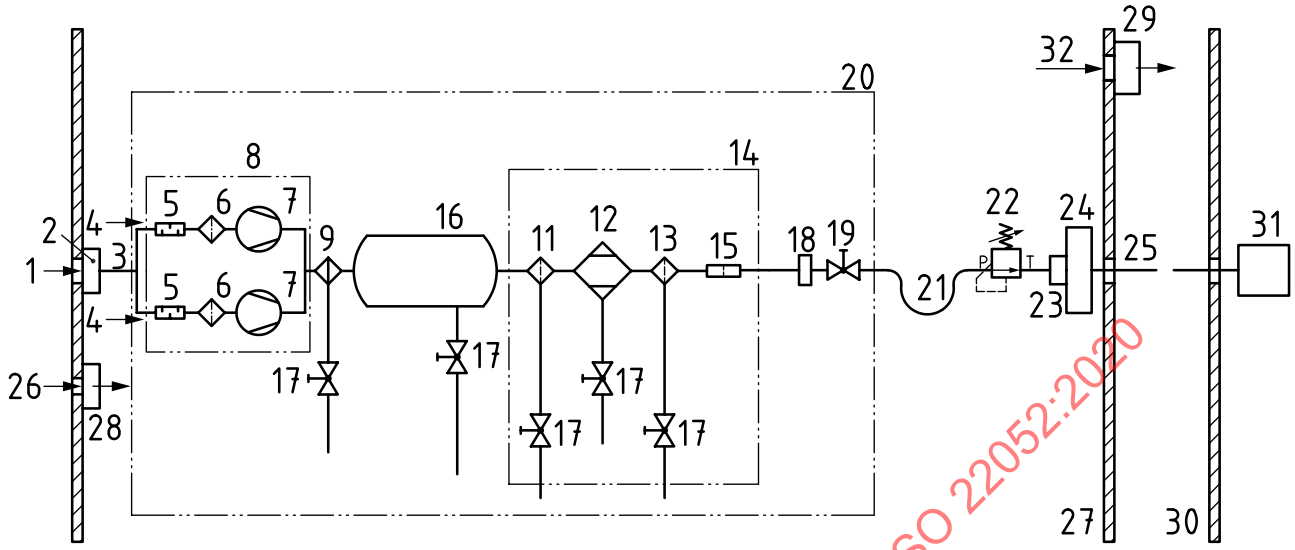


Key

1	fresh air inlet (optional)	17	condensate drain (automatic drain optional)
2	air filter (optional)	18	dental air outlet
3	flexible suction tube (optional)	19	shut-off valve
4	compressor fresh air inlet	20	central compressed air source equipment
5	intake muffler	21	flexible tube (optional on site)
6	air intake filter	22	pressure regulating valve (optional)
7	compressor head	23	quick release coupling device (optional)
8	compressor motor set (key 4 – 7)	24	central compressed air source equipment connection point
9	air cooler	25	main line for dental air
10	*not used*	26	compressor location fresh air inlet
11	liquids separator	27	compressor location wall
12	air dryer	28	fresh air fan (optional)
13	compressed air filter	29	exhaust air outlet
14	air treatment system	30	surgery wall
15	bacterial filter (optional)	31	dental unit and various dental air consuming devices in the dental office
16	air receiver	32	exhaust air fan (optional)

Figure B.3 — Schematic diagram for non-oil lubricated dry receiver

B.1.4 Non-oil-lubricated wet receiver



Key

1 fresh air inlet (optional)
2 air filter (optional)
3 flexible suction tube (optional)
4 compressor fresh air inlet
5 intake muffler
6 air intake filter
7 compressor head
8 compressor motor set (key 4 – 7)
9 air cooler
10 *not used*
11 liquids separator
12 air dryer
13 compressed air filter
14 air treatment system
15 bacterial filter (optional)
16 air receiver
17 condensate drain (automatic drain optional)
18 dental air outlet
19 shut-off valve
20 central compressed air source equipment
21 flexible tube (optional on site)
22 pressure regulating valve (optional)
23 quick release coupling device (optional)
24 central compressed air source equipment connection point
25 main line for dental air
26 compressor location fresh air inlet
27 compressor location wall
28 fresh air fan (optional)
29 exhaust air outlet
30 surgery wall
31 dental unit and various dental air consuming devices in the dental office
32 exhaust air fan (optional)

Figure B.4 — Schematic diagram for non-oil lubricated wet receiver

B.2 Suction tube

If a pipe between the fresh air inlet and the compressor fresh air inlet is necessary to supply the dental compressor with fresh air, the internal diameter of the pipes, the material and the fittings should be installed according to the manufacturer's instructions.

The manufacturer should specify the technical data of the suction tube.

B.3 Fresh air inlet

If the fresh air is drawn from a dusty area it is recommended to install an air filter to protect the compressor motor set from being contaminated with particles. The installed filter should be frequently checked, cleaned or changed to ensure proper air flow to the compressor motor set.

The manufacturer should give recommendations for filter type and maintenance in the instruction manual.

B.4 Dental compressor ventilation

The dental compressor and auxiliary equipment should be ventilated with the help of a sufficiently large fresh air ventilation and exhaust air outlet, according to manufacturer's instructions.

On average approximately 70-90 % of the total power consumption of a compressor set is transformed into heat. During compressor operation, the temperature in the compressor location should not exceed 35 °C; recommended normal temperature of the room 20 °C.

EXAMPLE With 70 % of total power consumption transformed into heat and the total power consumption of the compressor set to P_{tot} = 2 kW, the formula for the total heat output is:

$$Q_{tot} = P_{tot} \times 70\,\% = 2 \times 70\,\% = 1,4\ \text{kW}$$

where

P_{tot} is the total power consumption, in kW;

Q_{tot} is the total heat output, in kW;

The calculation of the required mass flow of cooling air is:

— basic formula:

$$Q = m \times c \times \Delta T$$

where

Q is the heat output, in kW;

c is the specific heat capacity of air [0,285 Wh/(kg×K)];

m is the air mass, in kg/h;

ΔT is the temperature difference of the measured temperature to the standard temperature, in K;

— required mass-flow:

$$m = \frac{Q}{\Delta T \times c} = \frac{1,4}{15 \times 0,285} = 327\ \text{kg/h}$$

The required air flow of ventilation fan is:

$$V = \frac{m}{P_L} = \frac{327}{1,29} = 253,5\ \text{m}^3/\text{h}$$

where