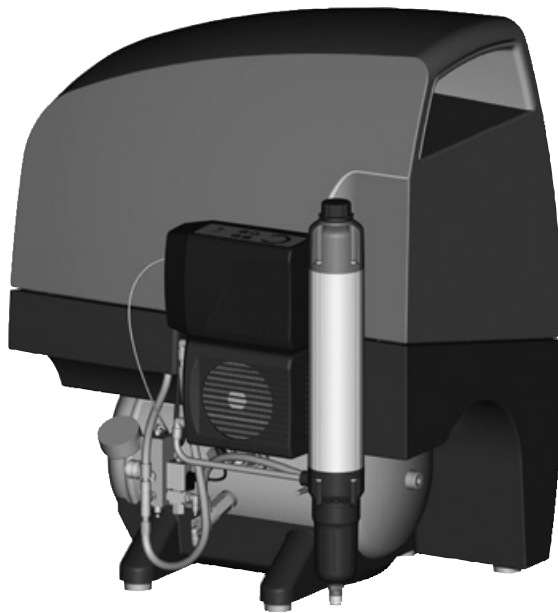


Tornado 2+

EN



Installation and Operating Instructions



5286100072L02



1701V003SE

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Important information

1 About this document

These installation and operating instructions form part of the unit.



If the instructions and information in these installation and operating instructions are not followed, Dürr Dental will not be able to offer any warranty or assume any liability for the safe operation and the safe functioning of the unit.

1.1 Warnings and symbols

Warnings

The warnings in this document are intended to draw your attention to possible injury to persons or damage to machinery.

The following warning symbols are used:



General warning symbol



Warning – dangerous high voltage



Warning – hot surfaces



Warning - automatic start-up of the unit

The warnings are structured as follows:



SIGNAL WORD

Description of the type and source of danger

Here you will find the possible consequences of ignoring the warning

- Follow these measures to avoid the danger.

The signal word differentiates between four levels of danger:

– **DANGER**

Immediate danger of severe injury or death

– **WARNING**

Possible danger of severe injury or death

– **CAUTION**

Risk of minor injuries

– **NOTICE**

Risk of extensive material/property damage

Other symbols

These symbols are used in the document and on or in the unit:



Note, e.g. specific instructions regarding efficient and cost-effective use of the unit.



Take note of the accompanying documents.



CE labelling with the number of the notified body



Manufacturer



Order number



Serial number



Dispose of correctly in accordance with EU Directive 2012/19/EU (WEEE).



Air



Switch off and de-energise the device (e. g. unplug from mains).



Filter symbol

1.2 Copyright information

All names of circuits, processes, names, software programs and units used in this document are protected by copyright.

The Installation and Operating Instructions must not be copied or reprinted, neither in full nor in part, without written authorisation from Dürr Dental.

2 Safety

Dürr Dental has designed and constructed this device so that when used properly and for the intended purpose there is no danger to people or property. Nevertheless, residual risks can remain. You should therefore observe the following notes.

2.1 Intended use

The compressor is designed to supply compressed air for dental applications.

The air supplied by the compressor is suitable for driving dental tools.

The compressed air generated by the compressor is delivered to the pipeline system of the surgery. The entire compressed air system must be designed in such a way that the quality of the compressed air generated by the compressor is not impaired.

With this prerequisite, the air provided by the compressor is also suitable for blow-drying tooth preparations.

2.2 Improper use

Any other usage or usage beyond this scope is deemed to be improper. The manufacturer accepts no liability for damages resulting from this. In these cases the user/operator will bear the sole risk.



WARNING

Risk of explosion due to ignition of combustible materials

- › Do not operate the unit in any rooms in which inflammable mixtures may be present, e.g. in operating theatres.
- › The unit is not suitable for providing an air supply to respirators.
- › This unit is not suitable for drawing up fluids or for compressing aggressive gases or potentially explosive gases.

2.3 General safety information

- › When operating this device always observe all guidelines, laws, and other rules and regulations that are applicable at the site of operation.
- › Prior to each use, check condition of the device and make sure it is in perfect working order.
- › Do not convert or modify the units.
- › Observe the Installation and Operating Instructions.
- › Make the Installation and Operating Instructions available to the person operating the device at all times.

2.4 Qualified personnel

Operation

Persons who operate the units must ensure safe and correct handling based on their training and knowledge.

- › Instruct or have every user instructed in handling the unit.

Installation and repairs

- › Installation, readjustments, alterations, upgrades and repairs must be carried out by Dürr Dental or by qualified personnel specifically approved and authorized by Dürr Dental.

2.5 Protection from electric shock

- › When working on the units observe all the relevant electrical safety regulations.
- › Immediately replace any damaged cables or plugs.

2.6 Only use genuine parts

- › Only use Dürr Dental parts or accessories and special accessories specifically approved by Dürr Dental.
- › Only use only genuine working parts and spare parts.



DÜRR MEDICAL accepts no liability for damages or injury resulting from the use of non-approved accessories or special accessories, or from the use of non-genuine working parts or spare parts.

The use of non-approved accessories, special accessories or non-genuine working parts / spare parts (e.g. mains cable) can have a negative effect in terms of electrical safety and EMC.

2.7 Transport

The original packaging provides optimum protection for the device during transport.

If required, original packaging for the unit can be ordered from Dürr Dental.



Dürr Dental does not accept any responsibility or liability for damage occurring during transport due to the use of incorrect packaging, even where the unit is still under guarantee.

- › Only transport the device in its original packaging.
- › Keep the packing materials out of the reach of children.

2.8 Disposal

Unit



The unit must be properly disposed of. Within the European Union, the unit must be disposed of in accordance with EU Directive 2012/19/EU (WEEE).

- › If you have any questions about the correct disposal of parts, please contact your dental trade supplier.



3 Overview

3.1 Scope of delivery

The following items are included in the scope of delivery (possible variations due to country-specific requirements and/or import regulations):

Tornado 2+.5286100036.

- Fabric reinforced hose
- Hose nozzle
- Hose clip
- Cable ties
- Mains cable
- Collector tray
- Network cable
- Installation and Operating Instructions
- Unit logbook

3.2 Special accessories

The following optional items can be used with the device:

Pressure reducer.6040-992-00

Sterile filter1640-981-00

3.3 Wear parts and spare parts

The following working parts need to be changed at regular intervals (refer to the "Maintenance" section):

Air intake filter.5180-982-00

Fine filter.1610-121-00

Sterile filter1640-981-00

Sintered filter.1650-101-00



Any repairs above and beyond routine maintenance must only be carried out by suitably qualified personnel or by one of our service technicians.



Information on spare parts can be found on the website portal for authorised specialist dealers under:
www.duerrdental.net.



If the mains cable of this unit is damaged it must only be replaced by an original mains cable from the manufacturer.

4 Technical data

Electrical data		5286100036	
Nominal voltage	V	230	
Mains frequency	Hz	50	60
Nominal current at 8 bar (0.8 MPa)	A	7.7	7.2
Motor protection	Motor winding overheat protector		
Speed	rpm	1390	1650
Type of protection	IP20		
Mains fusing *	A	16	
Max. permissible mains impedance in accordance with EN 61000-3-11	Ω	0.2069	

* Circuit breaker fuse characteristics C in acc. with EN60898-1

General data			
Pressure tank volume	l	20	
Delivery at 5 bar (0.5 MPa)	l/min	110	126
Pressure build-up phase 0 - 7.5 bar (0 - 0.75 MPa) c.	s	75	-
Duty cycle	%	100 (S1)	
Start-up pressure	bar (MPa)	5.5 (0.55)	
Cut-off pressure	bar (MPa)	7.5 (0.75)	
Switching hysteresis min.	bar (MPa)	1 (0.1)	
Switching hysteresis max.	bar (MPa)	3 (0.3)	
Safety valve, maximum permissible operating pressure	bar (MPa)	10 (1)	
Pressure dew point at 7 bar (0.7 MPa) *	°C	≤ +5	
Dimensions (H x W x D) **	cm	84 x 63 x 60	
Weight	kg	58	
Noise level ***	dB(A)	56	-

* Value determined at an ambient temperature of +40 °C

** Values without accessories and add-on parts

*** Noise level in accordance with EN ISO 1680 "Airborne acoustic noise"; measured in a room with sound damping. The levels are average values with a tolerance of ± 1.5 dB(A). Higher values may be obtained in rooms with reverberating sound characteristics.

Filter mesh size		
Compressor unit intake filter	μm	3
Fine filter for membrane drying unit	μm	3
Sterile filter for membrane drying unit	μm	0.01
Sintered filter for membrane drying unit	μm	35

Network connection		
LAN technology	Ethernet	
Default	IEEE 802.3u	
Data rate	Mbit/s	100
Connector	RJ45	



Network connection

Type of connection	Auto MDI-X
Cable type	≥ CAT5

Ambient conditions during storage and transport

Temperature	°C	-10 to +55
Relative humidity	%	max. 95

Ambient conditions during operation

Temperature	°C	+10 to +40
Ideal temperature	°C	+10 to +25
Relative humidity	%	max. 95

Classification

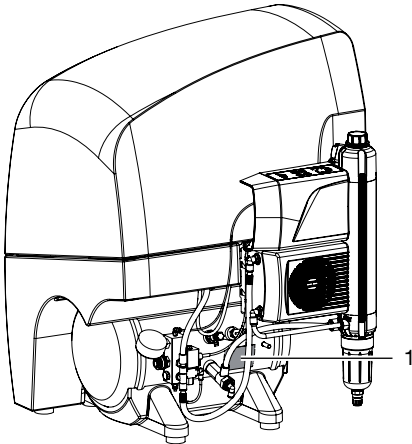
Medical Devices Directive (93/42/EU)	Class IIa
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EN

4.1 Type plate

Complete system

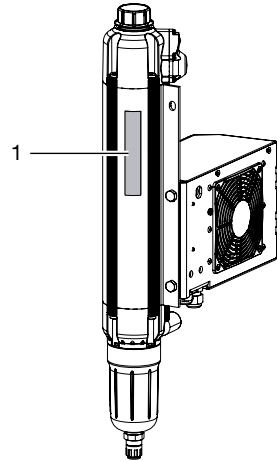
The type plate for the complete system is located on the pressure tank.



1 Type plate for the complete system

Membrane drying unit

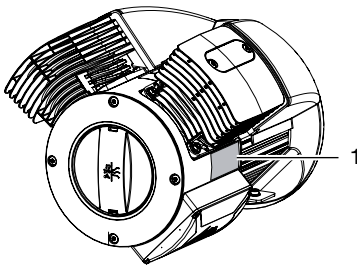
The type plate of the membrane drying unit is located on the membrane drying unit.



1 Membrane drying unit type plate

Compressor unit

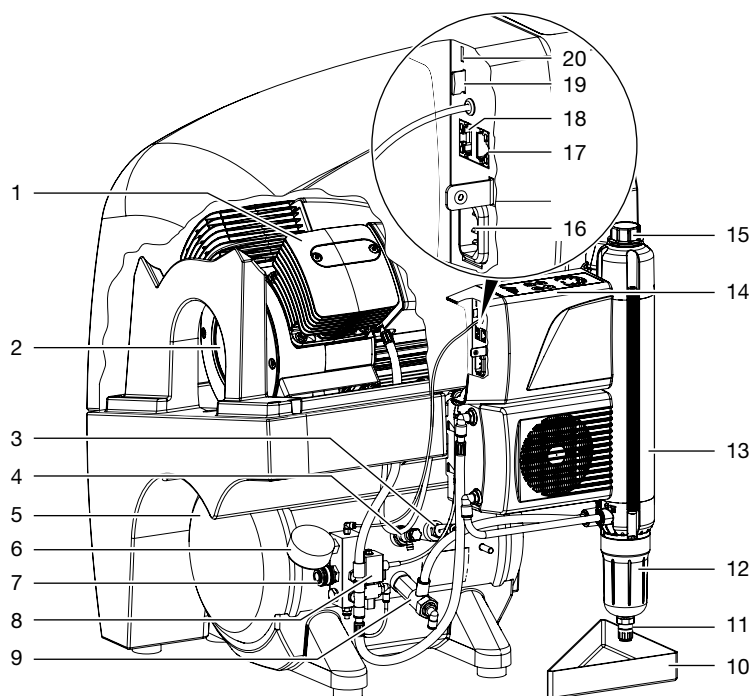
The type plate of the compressor unit is located on the crankcase below the cylinder.



1 Compressor unit type plate

5 Operation

EN

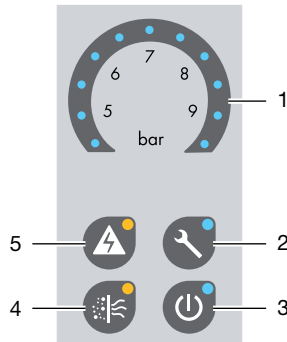


- 1 Compressor unit
- 2 Air intake filter
- 3 Safety valve
- 4 Condensate drain valve
- 5 Pressure tank
- 6 Pressure gauge/display
- 7 Compressed air connection (quick release coupling)
- 8 Pressure relief solenoid valve
- 9 Non-return valve
- 10 Condensate collector tray
- 11 Automatic/manual condensate drain valve,membrane drying unit
- 12 Sintered filter for membrane drying unit
- 13 Membrane drying unit
- 14 Electronic control with displays and operating elements
- 15 Fine filter or sterile filter, membrane drying unit
- 16 Mains connection
- 17 Network connection (LAN)
- 18 CAN bus for main device / auxiliary device
- 19 SD card slot
- 20 Switch between main device / auxiliary device

The compressor unit draws in atmospheric air and compresses it without oil. It then transports the oil-free compressed air to the membrane drying unit. The cooler and the membrane dryer extract moisture from the compressed air. The oil-free, hygienic and dry air is stored in the pressure tank ready for use in connected devices.

All of the measurement data for the appliance comes together in the controller (e.g. pressure in the pressure tank), where it is then evaluated. Likewise, various settings (e.g. switch-on/cut-off pressure) can be adjusted, or the unit can be connected via the network to Tyscor Pulse.

5.1 Operating panel



- 1 Pressure range display/adjustment
- 2 Service key with blue LED
- 3 Standby button with blue LED
- 4 Filter change button with orange LED
- 5 Fault button with orange LED

Different messages and the status of the unit are displayed on the operating panel. In addition, different functions can be started via the buttons.

5.2 Tyscor Pulse (optional)

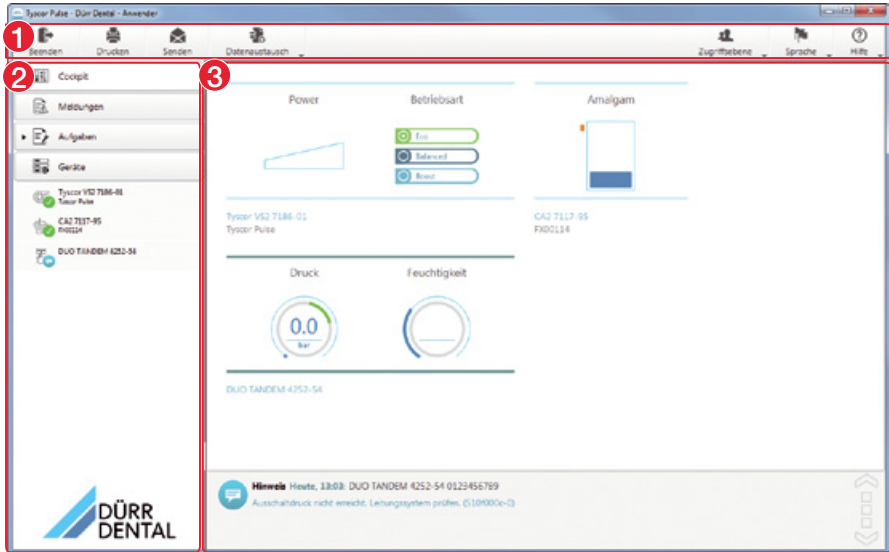
The software is connected via the network to the units from Dürr Dental and displays the current status as well as messages and errors.

All messages are logged and can be printed or sent.

Regular maintenance and upkeep is implemented in the tasks. Reminders signal when a task is due.



The **cockpit** shows the devices with the current characteristic data and provides a quick overview of the functional status of the devices.

The software interface consists of the menu bar, the side bar and the contents area.



- 1 Menu bar
- 2 Side bar
- 3 Contents area

The contents area depends on the tab selected on the side bar. The current messages are always displayed in the lower part of the contents area.

If there are several current messages, then the mouse wheel or the  or  buttons can be used to scroll through the messages.



The views and rights depend on the selected access level (Operator, Administrator or Service Technician).

While the software is running (even if the software window is closed), the access level is visible in the task bar (or Mac OS menu bar). The symbol shows the current status of the devices (see "13.1 Monitoring operation"). If a new message appears, a speech bubble tip also appears.



6 Requirements



The unit must not be set up or operated within the vicinity of the patients (within a radius of 1.5 m).

The unit can be installed either at the same level as the surgery room or on a floor below (e.g. cellar).

Due to the amount of noise generated, we recommend that the unit is installed in an adjoining room.

The pipes provided on-site must at least meet the country-specific requirements for drinking water.



Further information can be found in our separate planning information leaflet for compressed air.

6.1 Installation/setup room

The room chosen for set up should fulfil the following requirements:

- Closed, dry, well-ventilated room
- Should not be a room made for another purpose (e.g. boiler room or wet cell).
- Take environmental conditions into consideration – see "4 Technical data".
- If the unit is installed in a machine room, e.g. in an adjoining room or cellar, the requirements set out in ISO-TS 22595 must be complied with.

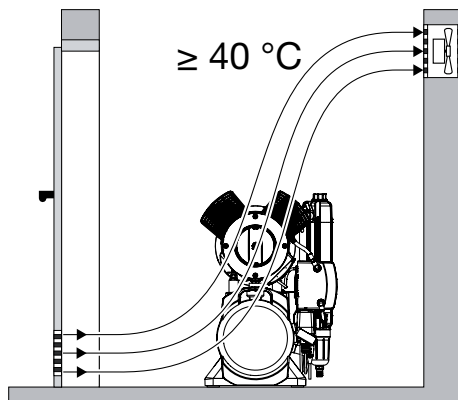


NOTICE

Risk of overheating due to insufficient ventilation

The unit generates heat. Possibility of heat damage and/or reduced service life of the unit.

- › Do not cover the unit.
- › Install a fan for auxiliary ventilation in rooms where ambient temperatures exceed $\geq 40^\circ\text{C}$ while the unit is in operation.



6.2 Setup

The following conditions must be taken into account for installation:



The air is filtered when it is sucked in.

This does not alter the composition of the air. For this reason it is important to keep the sucked-in air free of harmful substances (e.g. do not suck in exhaust gases or contaminated exhaust air).

- Clean, level and sufficiently stable subsurface (note the weight of the unit).
- Type plate easy to read.
- Unit easy to access for operation and maintenance.
- Easy-to-access power outlet to which the unit is connected.
- Maintain sufficient distance to the wall (at least 20 cm).
- The compressed air pipe should be routed as closely as possible to the place of installation (note the length of the hose supplied).

6.3 Information about electrical connections

- › Ensure that the electrical connections to the mains power supply are established in accordance with current valid national and local regulations and standards governing the installation of low voltage units in medical facilities.
- › Observe the current consumption of the devices that are to be connected.

7 Transport



WARNING **Risk of explosion of the pressure tank and pressure hoses**

- › The pressure tank and the pressure hoses must be vented before they are stored or transported.

- › Protect the unit against moisture, dirt and extreme temperatures during transport ("4 Technical data").
- › Always make sure that the condensate collector chamber is empty before transporting the unit ("15 Taking out of use").
- › Always transport the unit in an upright position.
- › Only transport the unit using the transport handles provided.
- › Check the unit for transport damage.

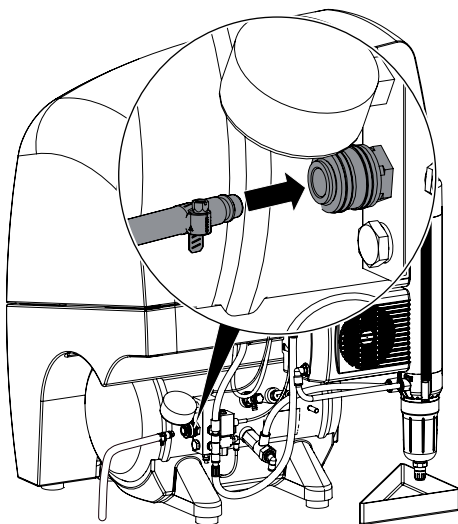
8 Installation

8.1 Establishing the compressed air connection




The supplied flexible pressure hose between the pipe system and the compressor prevents vibrations from being transmitted and thus reduces noise. This ensures safe and reliable operation.

- › Connect the pre-assembled connecting sleeve of the pressure hose to the quick release coupling.
- › Measure the required length of the pressure hose and shorten if necessary.
- › Press a fitting hose connector (not included in the scope of delivery) onto the pressure hose (internal diameter 10 mm) and secure it with a hose clip.
- › Connect the connecting sleeve of the pressure hose to the compressed air tube.

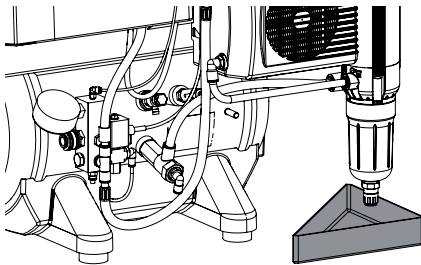


8.2 Place a collector tray underneath

During operation, condensation water on the unit is continuously separated and automatically drained. In order to prevent water damage due to drained condensation, it is collected in the collector tray.

 As an option, the condensation can also be drained through a hose into the waste water system. Always comply with applicable national regulations for waste water systems.

- Place a collector tray under the condensate separator or the membrane drying unit (depending on type).




8.3 Network connection

Purpose of the network connection

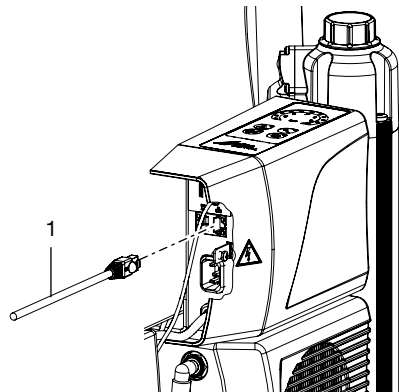
The network connection is used to exchange information or control signals between the unit and a software installed on a computer, in order to, e. g.:

- Display parameters
- Select operating modes
- Indicate messages and error situations
- Change unit settings
- Activate test functions
- Transmit data for archiving
- Provide documents concerning the units

Tyscor Pulse (optional)

 During initial installation, a router or server with DHCP is recommended so the unit is detected in the network.

- Plug the network cable into the control and into a network socket.
- Establish a connection to the computer network using the network cable.



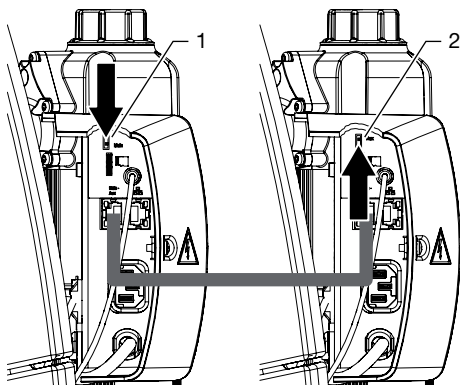
1 Network cable

CAN bus for main device / auxiliary device

Before connecting or disconnecting the network cable, switch off the device and make sure it is not connected to the power supply (e.g. disconnect the mains plug).



With the compressor it is possible for two units to be connected to a single compressed air network. To do this, the controllers of the compressors need to be connected to each other. In addition, one of the controllers needs to be set up as the main controller (MAIN) and the other as the auxiliary controller (AUX).



- 1 MAIN
- 2 AUX

8.4 Electrical connections

Electrical safety when making connections



The unit has no main power switch. For this reason it is important that the unit is set up in such a way that the plug can be easily accessed and unplugged if required.

- › The unit must only be connected to a correctly installed power outlet.
- › Make sure that none of the electrical cables leading to the unit are under any mechanical tension.
- › Before initial start-up check that the mains supply voltage and the voltage stated on the type plate match (see also "4. Technical data").

Establishing the electrical connections



DANGER

Risk of electric shock due to defective mains cable

- › Mains cables must not be allowed to come into contact with any hot surfaces on the unit.

- › Plug the male connector of the mains connection into the female mains connector on the controller.



The male mains connector is mechanically secured so that it cannot drop out. To unplug the male mains connector from the device, press the red lever on the connector in the unplugging direction. Then unplug the male mains connector from the device.

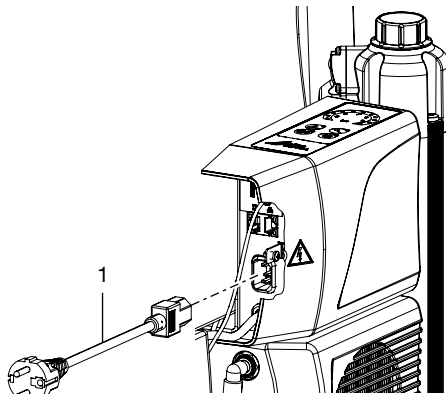
- › Connect the mains plug to an earthed power outlet.



The device will run approx. 10 s after the mains plug is plugged in.


- › Check whether the power outlet is switched via the surgery main power switch.

This ensures that the unit starts up automatically after the surgery main switch is routinely switched off and back on again.



- 1 Mains cable with socket and country-specific mains plug

9 Commissioning and first start-up

 In many countries technical medical products and electrical devices are subject to regular checks at set intervals. The owner must be instructed accordingly.

- Carry out an electrical safety check in accordance with applicable local regulations (e.g. the German Ordinance on the Installation, Operation and Use of Medical Devices / Medizinprodukte-Betreiberordnung) and record the results as appropriate, e.g. in the technical log book.

9.1 Checking the switch-on/cut-off pressure

The switch-on/cut-off pressure is preset at the factory. Check the adjustment during first start-up.

When the mains plug is connected the compressor will start up after a delay of 10 s. If the compressor was in standby mode before it was last taken out of operation, then it will be in standby mode again after the mains plug is connected.


- Read off the cut-off pressure from the pressure gauge.
- Drain the air from the pressure tank (e.g. via the condensate drain valve) until the unit starts and then close it again.
- Read off the pressure when the unit starts up.

Result:

If the readings deviate from the values preset at the factory, adjust the values to a different required pressure if necessary.

9.2 Checking the safety valve

Correct operation of the safety valve must be checked when the unit is started up for the first time and again subsequently at regular intervals.

 At the factory, the safety valve is set to 10 bar (1 hPa), checked and stamped.



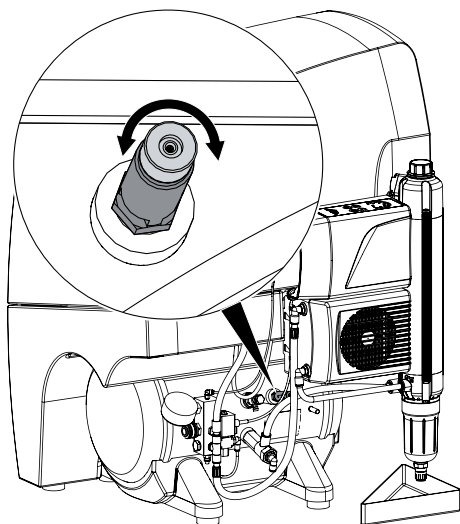
WARNING

Risk of damage to the safety valve

Risk of explosion of the pressure tank and pressure hoses due to a defective safety valve

- Do not use the safety valve to vent the pressure tank.

- To open, rotate the screw of the safety valve anti-clockwise until the valve begins to blow off. Only allow the safety valve to blow for a short period.
- Then turn the screw clockwise as far as it will go to close the valve. The valve must now be closed again.



DANGER

Risk of explosion of the pressure tank and pressure hoses

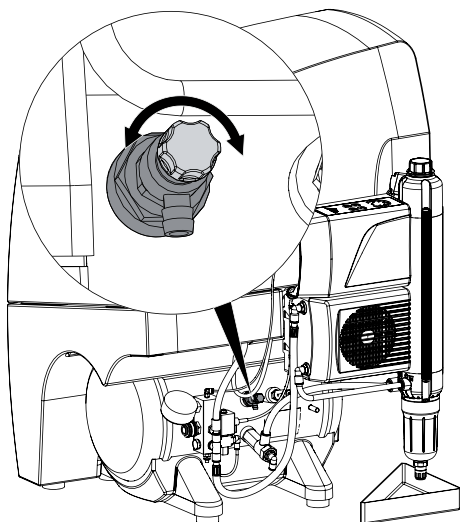
- Do not change the safety valve settings.

- Fill the pressure tank to the cut-off pressure.

9.3 Draining the condensation water

Temperature changes during transport may cause condensation water to accumulate in the pressure tank. The condensation water can only be drained from the pressurised pressure tank.

- › Start up the unit and wait until the cut-off pressure is reached.
- › At maximum tank pressure, open the condensate drain valve.
- › Close the condensate drain valve as soon as all of the accumulated condensation water has been blown out.



9.4 Monitoring the device with Tyscor Pulse

Combining devices safely

- › Safety and essential performance features are independent of the network. The device is designed for operation independent of a network. However, some of the functions are not available in this case.
- › Incorrect manual configuration can lead to significant network problems. The expert knowledge of a network administrator is required for configuration.
- › The data connection utilizes part of the bandwidth of the network. Interactions with other medical devices cannot be completely excluded. Apply the IEC 80001-1 standard for risk assessment.

- › The device is not suitable for direct connection to the public internet.
- › When connecting the unit to other devices, such as a PC system, comply with the requirements set out in section 16 of IEC 60601-1 (EN 60601-1).
- › When setting up the PC system in the vicinity of the patients:
Only connect components (e.g. computer, monitor, printer) that comply with the standard IEC 60601-1 (EN 60601-1).
- › When setting up the PC system outside of the vicinity of the patients:
Connect components (e.g. computer, monitor, printer) that comply at least with the standard IEC 60950-1 (EN 60950-1) at least.



A copy of the system manufacturer's declaration in accordance with Article 12 of Directive 93/42/EEC can be found in our download section at www.duerrendental.com (document no. 9000-461-264).

Network configuration

Various options are available for network configuration:

- Automatic configuration via DHCP (recommended).
- Automatic configuration via Auto-IP for direct connection of unit and computer.
- Manual configuration.
- › Configure the network settings of the unit using the software or, if available, the touch screen.
- › Check the firewall and release the ports, if applicable.



Further information on Tyscor Pulse can be found in the software help and in the Tyscor Pulse manual, order number 0949100001.

Network protocols and ports

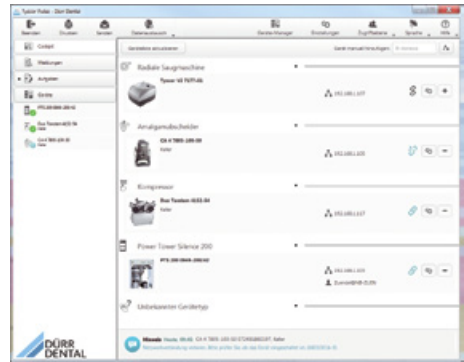
Port	Purpose	Service
45123 UDP, 45124 UDP	Unit recognition and configuration	
1900 UDP	Service detection	SSDP / UPnP
502 TCP	Unit data	
514 ¹⁾ UDP	Event protocol data	Syslog
22 TCP	Diagnosis	Telnet, SSH
123 UDP	Time	NTP

¹⁾ The port can vary depending on the configuration.


The following requirements must be met in order to monitor the unit with the software on the computer:

- Unit connected to the network
- Tyscor Pulse (version 3.1 or higher) installed on computer




Add device





Requirements:

- Unit is switched on and connected to the network
- Administrator or service technician access level selected in the software
- › Working in the menu bar, click on  **Device Manager**.

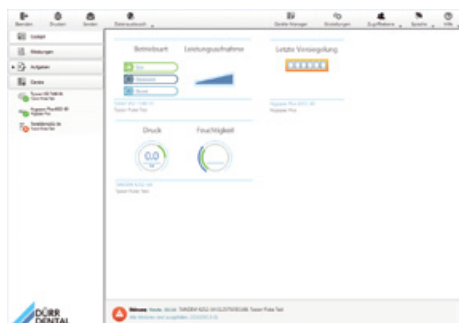
The list of units appears. A symbol displays the connection status to the software:

-  The unit is present in the network and connected to the software.
-  The unit is present in the network but not connected to the software.
-  The network connection between the software and the unit has been interrupted, e.g. the device is switched off.

The new unit that is not yet connected, is displayed with the connection status .

- › Select the unit and click on .
- The unit appears in the side bar.

Adding the device in the cockpit



All devices that are connected to the software can be added to the cockpit. When the unit is first connected to the software, the unit is automatically added to the cockpit.

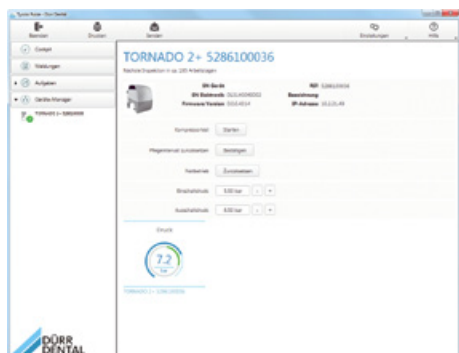
Requirements:

- Administrator or Service Technician access level selected.
- › Click on the device in the device list with the left mouse button and keep the mouse button pressed.
- › With the mouse key pressed, drag the unit onto the cockpit.
- › Release the mouse key.

The block with the current characteristic data and the name of the device appear in the cockpit.

- › To change the position of the device block, click on the block and, with the mouse key pressed, drag it to the required location.

Manually starting the device

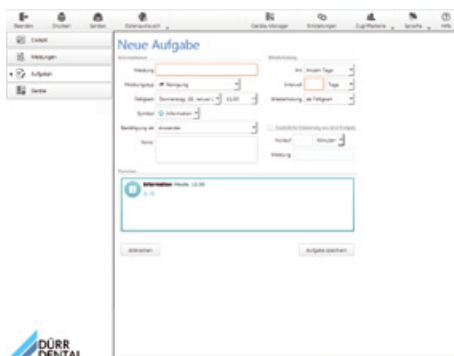


The compressor can be manually started with the aid of Tyscor Pulse.

Requirements:

- Administrator or Service Technician access level selected.
- › Select the device in the list of devices.
The block with the current button parameters and the name of the device appear in the Contents area.
- › Use the mouse to click the **Start** button next to Compressor Test.
The compressor unit will continue to run for as long as the mouse button is pressed.
- › Release the mouse button.

Transferring the maintenance schedule to the software



We recommend transferring the tasks from the maintenance schedule (see "14.1 Maintenance schedule") into the maintenance schedule of the software.

- › Select the **Tasks** view in the software.
- › Adding a task.

Result:

The task appears on the side bar and in the maintenance schedule.

10 Adjustment options

10.1 Adjustment of the switch-on/ cut off pressure





WARNING

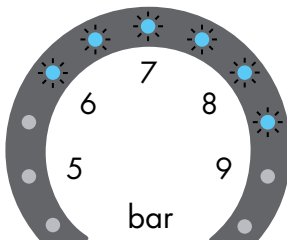
Risk of explosion of the pressure vessel


The pressure vessels used in the compressors are designed to withstand continuous pressure changes of 2 bar and can be used continuously under these pressure changes.


- › For load changes > 2 bar (max. permissible: 3 bar), comply with the maximum load change cycles specified in the operating instructions of the pressure vessel.


The pressure adjustment is performed in standby mode.

- › Standby button:  press for at least 2 seconds.
- › Service key:  press for at least 2 seconds. The blue LEDs in the operating panel flash. They are touch-sensitive and can be adjusted accordingly.



-  The pressure adjustment is performed in 0.5 bar increments by touching the LED.

- › Touch the first flashing LED with your finger and swipe to the required **switch on pressure**.
- › Touch the last flashing LED with your finger and swipe to the required **cut off pressure**.
- › Use the service key to  confirm.

-  If no touch pulse is received for 30 seconds, the system will automatically switch to standby operation. The settings are not saved.

Tyscor Pulse



With the aid of Tyscor Pulse the pressure of the compressor can be adjusted as required.

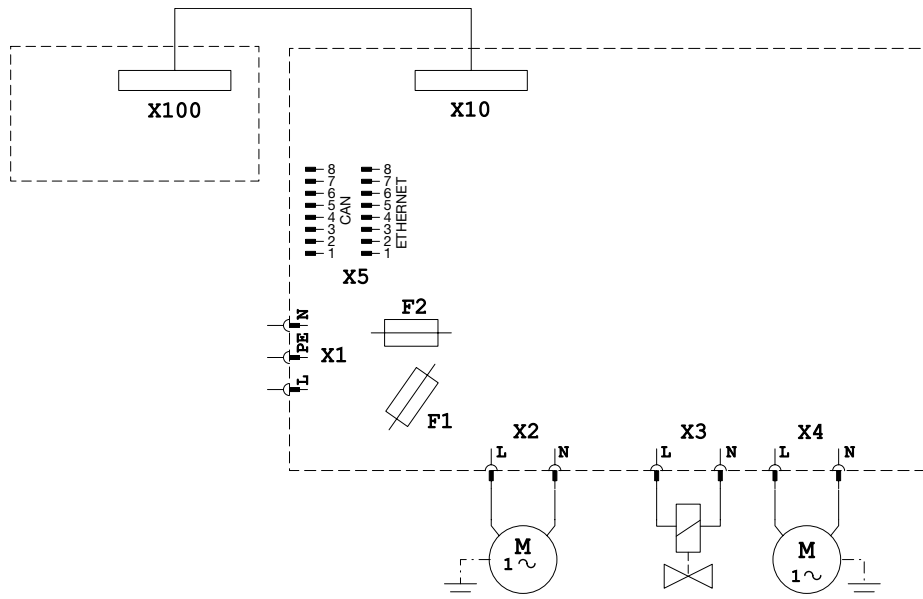
Requirements:

- Administrator or Service Technician access level selected.
- › Select the device in the list of devices. The block with the current button parameters and the name of the device appear in the Contents area.
- › Use the "+" and "-" buttons to adjust the pressure in increments of 0.1 bar.

If other pressure values are required, it is also possible to enter the value directly in the corresponding fields.

11 Controller

11.1 Circuit diagram



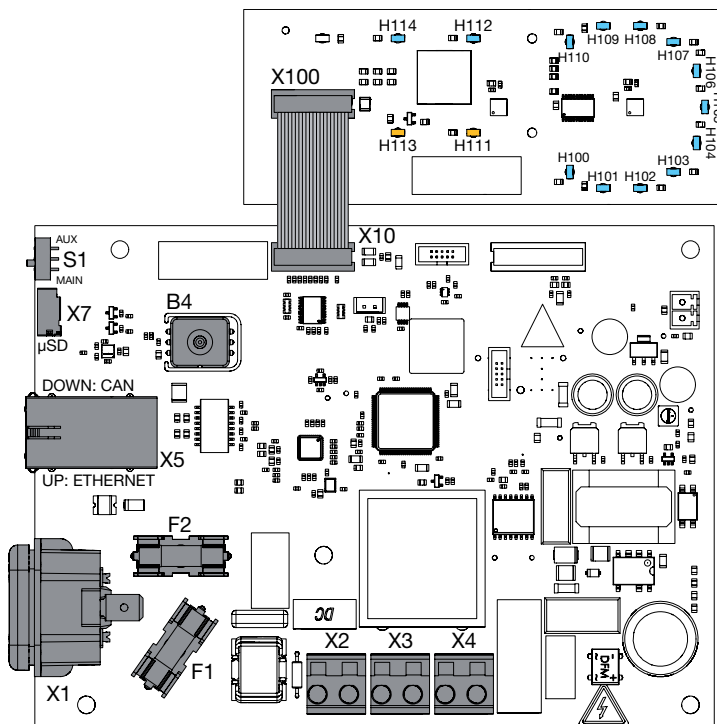
Main PCB

- X1 Supply voltage, 230 V
- X2 Compressor unit
- X3 Relief valve
- X4 Cooling fan motor, membrane drying unit
- X5 Network and CAN bus
- X10 Connector to the display PCB
- F1 Fuse for motor, valve, fan
- F2 Fuse for controller

Display/controller PCB

- X100 Connector to the main PCB

11.2 Electrical connections, controller



Main PCB (main board)

- X1 Supply voltage, 230 V
- X2 Compressor unit
- X3 Relief valve
- X4 Cooling fan motor, membrane drying unit
- X5 Network and CAN bus
- X7 SD card holder (for Micro SD), optional
- X10 Connector to the display PCB
- S1 Selector switch for main device (MAIN) / auxiliary device (AUX)
- B4 Pressure sensor
- F1 Fuse for motor, valve, and fan
- F2 Fuse for controller

Display/controller PCB

- H100-110 Pressure display
- H111 Orange display / fault button
- H112 Blue display / service key
- H113 Orange display / filter replacement button
- H114 Blue display / standby button
- X100 Connector to the main PCB

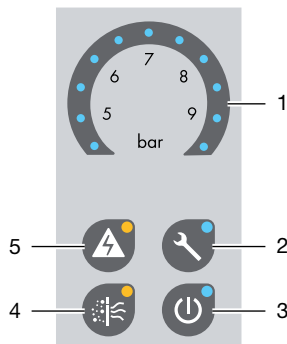


12 Operation



Prior to working on the device or in case of danger, disconnect it from the mains (e. g. pull the mains plug).

12.1 Operating panel



- 1 Pressure range display/adjustment
- 2 Service key with blue LED
- 3 Standby button with blue LED
- 4 Filter change button with orange LED
- 5 Fault button with orange LED

Different messages and the status of the unit are displayed on the operating panel. In addition, different functions can be started via the buttons.

Buttons

Fault button



Display of alarm messages with different levels of importance. This can be faults, warning messages and information.

Filter replacement button



"Maintenance required" display for the various filters.

Service key



Check of the safety valve and adjustment of the pressure range.

Standby button:



Switching between normal operation and standby mode.

Pressure range

The pressure is displayed and can be adjusted in this area.

The pressure is displayed via:

1. Blue LED (≤ 4.5 bar):
only illuminates while the pressure is building up during start-up operation
2. - 10. Blue LEDs ($\approx 5 - 9$ bar):
these indicate the pressure status in increments of 0.5 bar
11. Blue LED (≥ 9.5 bar):
the pressure in the container is too high (i.e. outside the adjustment range).


12.2 Switching the unit on/off

- › Switch the unit on and off via the surgery main switch.

The compressor unit will start up automatically and fill the pressure tank. When the cut-off pressure is reached the compressor unit switches itself off automatically.


12.3 Standby mode

In standby mode the appliance is taken out of operation without disconnecting it from the mains.

- › Press the standby button  for at least 2 seconds.


The standby button and service key are active.

Normal operation is reactivated with the standby button.


The system can switch to setting mode with the service key. To do so, press the service key for  at least 2 seconds.

12.4 Fault

The controller monitors the functions of the unit and signals faults according to their importance. Faults, warnings or information can be displayed. Faults are triggered as a result of faults in component assemblies or as a result of sensor defects. The device is switched off and the LED of the fault button flashes or lights up.

 Fault button, orange LED *flashes*

Normal mode or emergency mode can be activated.

 Fault button, orange LED *lights up*

As well as faults, the LED on the fault button also lights up to indicate warning messages and information.

The device continues to operate in normal mode.

This keeps the operator informed about emergency mode, humidity, leaks or overheating.

Warning messages and information are automatically deactivated after the fault has been rectified, with exception of emergency mode.

13 Monitoring the device with Tyscor Pulse



Further information on Tyscor Pulse can be found in the software help and in the Tyscor Pulse manual, order number 0949100001.

13.1 Monitoring operation

The device must have been added to the cockpit for the graphical device block to be shown in the cockpit.



The following is shown in the unit block of the compressor:

- Current pressure in the pressure tank

Symbols

If a message occurs for an device, the symbol next to the device in the side bar changes. The message appears in the cockpit and in the device details.

If several messages occur, the symbol of the highest message level in each case is displayed.



As soon as a message concerning a device occurs, the symbol in the task bar (or Mac OS menu bar) also changes to the relevant message symbol. If required by the message an acoustic signal also sounds.



- › To query the message details, switch to the cockpit or to the device.



Trouble-free operation



Fault

Operation of the device interrupted



Warning

Operation of the device restricted



Note

Important information about the device



Information



Establishing a connection to the device



Connection to the device interrupted

13.2 Completing the task

Due tasks appear as a message in the cockpit.





The task can be assigned to an access level (operator, administrator or service technician), which then means that it can only be confirmed from this access level.

- › Perform the task.
- › Confirm the task in the software.

Result:

The due date of the task is set to the next date.

13.3 Creating a report

You can print out a current report  or sent it via e-mail .

The report contains all messages and a screenshot of the view that is displayed when the report is created.

14 Maintenance



Prior to working on the device or in case of danger, disconnect it from the mains (e. g. pull the mains plug).



CAUTION

Risk of infection due to burst filters

Particles enter the compressed air network and can therefore enter the mouth of the patient.

- › Replace filters in accordance with the maintenance schedule.

14.1 Maintenance schedule



NOTICE

Risk of damage to the unit due to blocked filters

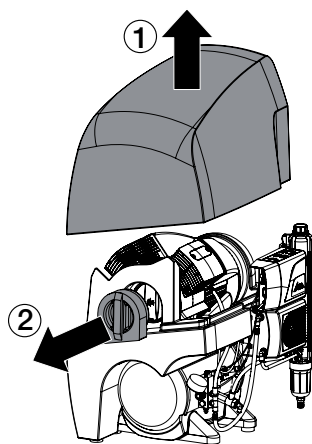
Continuous running due to reduced delivery. Damage to the unit due to burst filters.

- › Replace filters in accordance with the maintenance schedule.

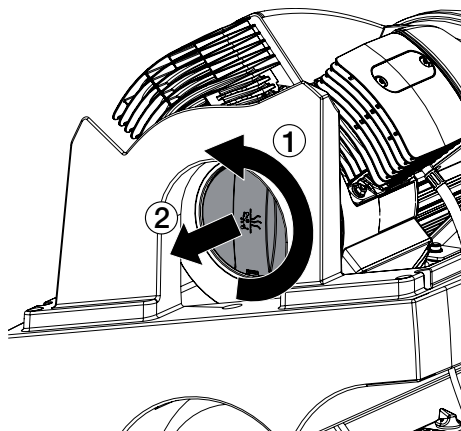
Maintenance interval	Maintenance work
At regular intervals	› Empty the collector tray under the membrane drying unit (the interval may vary depending on the ambient conditions and method of working; empty it daily if the humidity is high).
Annually	<ul style="list-style-type: none"> › Replace the air intake filter in the compressor unit – do this every six months if there is a high concentration of dust. › Replace the fine or sterile filter. › Replace the sintered filter.
Every 5 years	<ul style="list-style-type: none"> › Replace the vibration reducers. › Change the cup seal.
In accordance with national law	<ul style="list-style-type: none"> › Check the safety valve. › Carry out recurring safety inspections (e.g. pressure tank inspections, electrical safety inspections) in accordance with applicable national laws.

14.2 Replacing the air intake filter

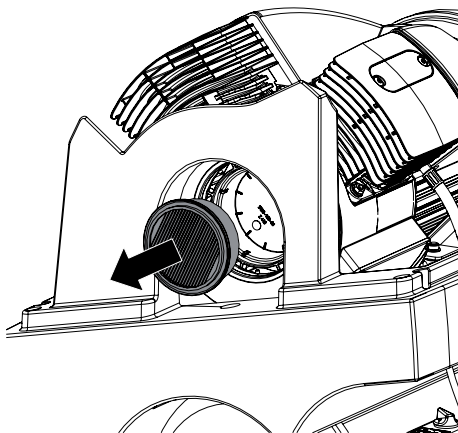
- › Switch the compressor to standby mode with the standby button.
- › Unplug the mains plug.
- › Take off the noise reducing hood and the foam filter cover.



- › Release the filter cover by rotating it **anti-clockwise** and then take it off.



- › Remove the air intake filter.

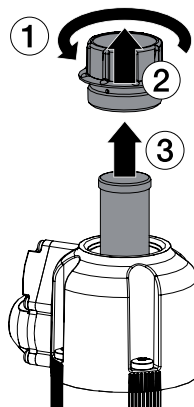


- › Insert a new air intake filter.
- › Place the filter cover in position and lock it by turning it **clockwise**.
- › Fit the the foam filter cover and the noise reducing hood.

14.3 Replacing the filter of the membrane drying unit

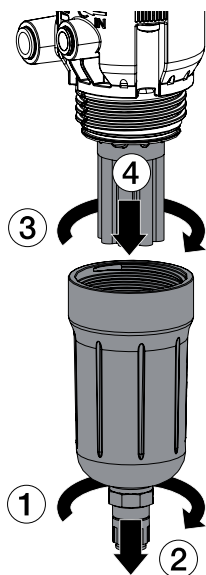
Fine/sterile filter

- › Switch off the unit.
- › Disconnect all power from the device.
- › Unscrew and remove the filter cover.
- › Remove the fine/sterile filter.
- › Insert the new fine/sterile filter.
- › Replace the filter cover and close.



Sintered filter

- › Unscrew and remove the filter housing.
- › Remove the sintered filter.
- › Insert a new sintered filter.
- › Replace the filter housing and close.

**15 Taking out of use****15.1 Taking the unit out of use**

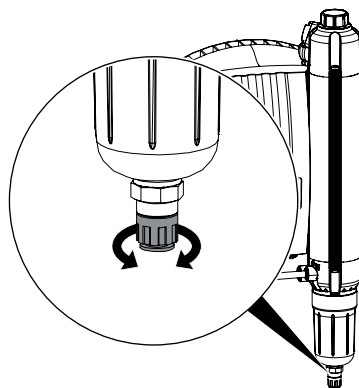
If the unit is not to be used for a prolonged period of time, we recommend that it is properly shut down and taken out of use.

To do this, the accumulated condensation water from the unit must be drained.

- › Switch on the unit and wait until the cut-off pressure is reached.

Membrane drying unit

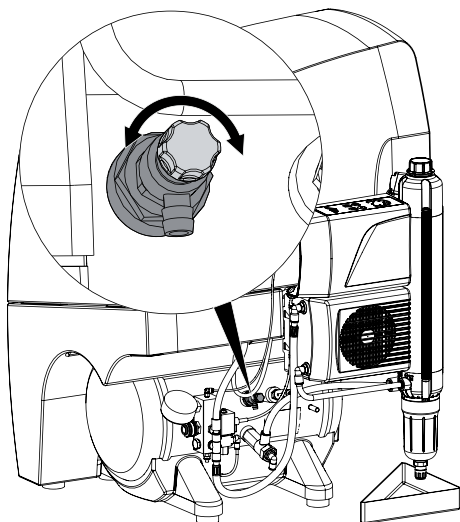
- › Open the condensate drain valve on the membrane drying unit with the compressor unit running. When no more condensation water emerges, close the condensate drain valve.
- › Switch off the unit.





Pressure tank

- › Open the condensate drain valve.
Once the start-up pressure has been reached the compressor will switch on.
- › With the compressor switched on and the condensate drain valve open, wait until no more condensation water emerges.
- › Switch off the unit.
- › Close the condensate drain valve when no more air escapes.
- › Disconnect all power from the device.
- › Disconnect the compressed air connection on the quick release coupling.



15.2 Storage of the unit



WARNING

Risk of explosion of the pressure tank and pressure hoses

- › The pressure tank and the pressure hoses must be vented before they are stored or transported.
- › Protect the unit against moisture, dirt and extreme temperatures during transport (refer to the section on "Ambient conditions").
- › Only store the unit when it has been completely emptied.



16 Tips for operators and service technicians



Any repairs above and beyond routine maintenance must only be carried out by suitably qualified personnel or by one of our service technicians.



Prior to working on the device or in case of danger, disconnect it from the mains (e. g. pull the mains plug).

Fault	Probable cause	Solution
Compressor will not start	No mains voltage	› Check the mains fuse; if necessary, switch the circuit breaker back on. If the fuse is defective, replace it.
	Undervoltage or overvoltage	› Measure the supply voltage; call an electrician if necessary.
	Device in standby mode	› Switch on the device.
Compressor does not switch off	Wrong size of compressor, air intake too high	› Calculate the air requirement (this can be up to 50 l/min per treatment unit), if necessary install a larger compressor.
	Leak in the compressed air system	› Locate and seal the leak. › Inform a service technician.
	Defective membrane drying unit	› Check whether there is an increased flow of air at the filter housing of the membrane drying unit (bottom), if necessary replace the membrane drying unit.
Compressor switches on from time to time even though no air is being taken for a consumer unit	Leak in the compressed air system	› Locate and seal the leak. › Inform a service technician.
Knocking or loud noises on the compressor	Compressor unit defective	› Disconnect all power from the device and inform a service technician.
Reduced delivery. Compressor needs longer to charge the pressure tank, see charging times in "4 Technical data"	Air intake filter dirty	› Replace the air intake filter at least 1x per year. The air intake filter must never be cleaned.
	Defective membrane drying unit	› Replace the membrane drying unit. › Inform a service technician.
Water dripping from air consumers	Maintenance work not carried out regularly (without membrane drying unit)	› Regularly drain the condensation water from the pressure tank, see "9.3 Draining the condensation water"
	Defective membrane drying unit	› Inform a service technician.

17 Tips for service technicians



The following information about troubleshooting is intended solely for service technicians. Repairs must only be carried out by service technicians.



Prior to working on the device or in case of danger, disconnect it from the mains (e. g. pull the mains plug).

Fault	Probable cause	Solution
Compressor will not start	No mains voltage.	› Check the mains fuse; if necessary, switch the circuit breaker back on. If the fuse is defective, replace it. Check the mains supply voltage.
	Undervoltage or overvoltage	› Measure the supply voltage; call an electrician if necessary.
	Relief valve defective, unit starts against pressure	› Check that the relief valve discharges after switching off the unit. Free up the movement of the relief valve operable or replace it.
	Mechanical sluggishness of a unit (piston is stuck); motor protection has tripped	› Disconnect the mains plug, remove the fan hood from the blocked compressor and turn the fan wheel. If this is not possible, replace the piston and cylinder or the complete unit.
Humming noise from motor	Motor capacitor is defective	› Replace the capacitor.



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