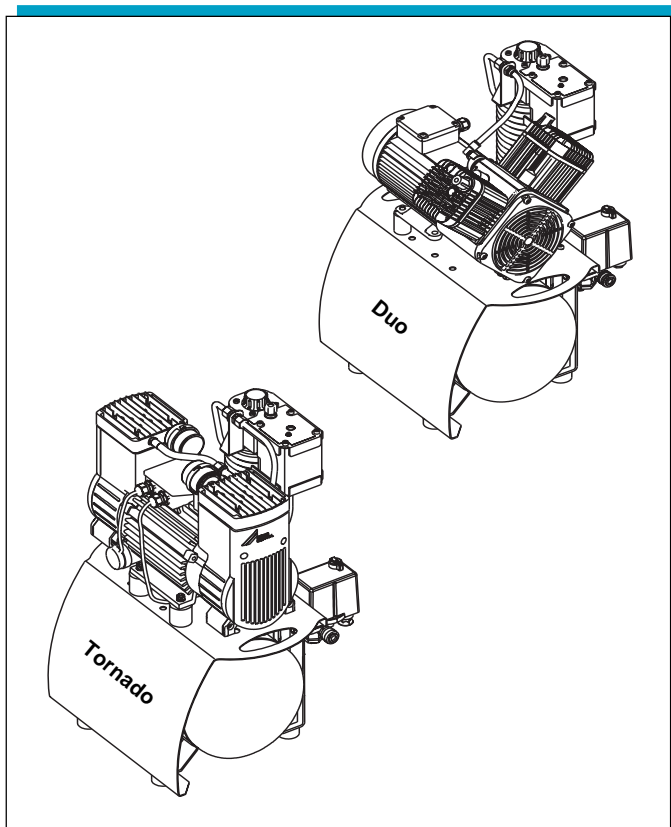


INSTALLATION AND OPERATION INSTRUCTIONS

DÜRR COMPRESSORS

Tornado • Primo • Duo • Trio • Quattro • Duo-Tandem • Quattro Tandem

GB



CE

9000-610-38/30



2004/12

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* For spare parts list please see the end of this manual.

IMPORTANT INFORMATION

1. NOTE

1.1 CE-Marking

All products bear the CE Conformity Marking. This marking denotes that the products conform to the safety guidelines and directives laid down by the European Union.

1.2 Guidelines and Directives

The products comply with the following guidelines and directives:

- Machinery Directive 98/37/EC including amendments.
- Electromagnetic Compatibility 89/336/EEC including amendments.
- Low-Voltage Directive 73/23/EEC, including amendments.
- Pressure Vessel Regulation 87/404/EEC.

1.3 General Information

- The Instructions for Assembly and Use form an integral part of the machine. They must be kept close to the machine and in readiness whenever required. Precise observance of these instructions is a prior condition for use of the machine for the intended purpose and for its correct operation.
These Instructions for assembly and use should be passed on to future users if necessary.
- Safety for the operator as well as trouble-free operation of the machine are only ensured if use is made of original equipment parts. Moreover, use may only be made of those accessories that are specified in the technical documentation or that have been expressly approved and released by Dürr Dental for the intended purpose.
If and where use is made of accessories or consumer supplies from outside sources, Dürr Dental are unable to assume any guarantee for safe operation or safe functioning.
- No warranty claims are accepted in respect of damage arising from the use of accessories or consumer supplies from outside sources.

- Dürr Dental only regard themselves as being responsible for the unit from the angle of safety, reliability and proper functioning if assembly, resettings, changes or modifications, extensions and repairs have been carried out by Dürr Dental or an agency authorised by Dürr Dental and if the machine is used in conformity with the Instructions for Assembly and Use.
- The Instructions for Assembly and Use conform to the relevant version of the machine and the underlying safety standards valid at the time of going to press. All proprietary rights are reserved in respect of the specified circuitry, methods, names, software programs and equipment.
- Any reprinting of the technical documentation, in whole or in part, is subject to prior written approval of Dürr Dental.

1.4 General Information Concerning Safety

The compressor has been designed and constructed by Dürr Dental in such a way that hazards occurring when using the machine for the intended purpose are ruled out to the fullest extent possible. Even so, we feel obliged to draw attention to the safety precautions described below as a means of ruling out any remaining hazards.

- When operating the compressor the laws and regulations in force in the place of use must be observed! In the interest of safe operation, the operator and user are responsible for observing such regulations.
- The original packaging has to be kept in a safe place in case of having to return the unit.
Ensure that the packaging is kept out of the reach of children. Only the original packaging warrants optimum protection of the unit during transport.
In the event of the unit having to be returned during the period of guarantee Dürr Dental does not assume any liability for damage in transit due to faulty or improper packing!
- Each time prior to using the machine the user must check to ensure that it is functionally safe and in proper condition.
- The user must be familiar with how to operate the machine.
- The product is not intended for use in areas

of rooms that are exposed to risk of explosion. Explosion hazards may result from the use of inflammable anaesthetics, skin cleansing agents, oxygen and skin disinfectants.

- The machine is not suitable for operation in a combustion-stimulating atmosphere.

1.5 Safety Instructions on Protection from Electric Current

- The compressor may only be connected to a properly installed earthing contact-type socket or CEE-power socket.
- Prior to connecting up the machine a check must be carried out to see whether the mains voltage and mains frequency specified on the machine conform to the data applicable to the supply mains.
- Prior to being put into operation, the machine and the lines need to be inspected for damage. Damaged lines, socket outlets and plugs must be replaced immediately.
- In hazardous situations or in the event of technical faults occurring, disconnect the machine from the mains immediately (disconnect plug from mains).
- When carrying out repair or maintenance work of any kind, the mains plug must always be disconnected from the socket. In addition, air must be removed from all pressure lines and the pressure tank depressurised.
- All installation work must be carried out by a suitably qualified engineer.

1.6 Warning Information and Symbols

In the Instructions for Assembly and Use, as well as on the packaging and the product itself, use is made of the following terms or symbols to denote data or information of special importance:



Information and/or mandatory regulations or prohibitions for the prevention of personal injury or substantial property damage.



Warning of dangerous electrical voltage.



Special information regarding the economical use of the machine and other information.



CE-Marking



Disconnect mains plug.



Caution! Hot surface.



Caution! Compressor can start up automatically!



Make due allowance for environmental effects. Do not operate the machine in a damp or wet environment!



Recycling



Observe Instructions for Assembly and Use!



Date of manufacture

2. PRODUCT INFORMATION

2.1 Use for the Intended Purpose

The compressor is intended to be used for generating compressed air required for operating dental units of equipment or for similar applications.

Installation in medical care facilities:

In designing and constructing the compressor, allowance has been made for the requirements of medical products where applicable. Accordingly, the unit can be used for installation in medical care facilities.

If the unit is installed in medical care facilities, the requirements stipulated in Directive 93/42 EEC IEC 601-1 as well as the relevant norms must be observed as applied to installation and assembly.

2.2 Use other than that for the Intended Purpose



The compressed air produced by the compressor is unsuitable for operating breathing equipment or similar facilities without additional filters required for the operating area.

- The compressors are designed to be operated in dry, ventilated rooms, ambient temperature +10 to +40 °C.
- Do not expose the compressor to rain. The machine must not be operated in a damp or wet environment. Use is also prohibited in proximity to gases or combustible liquids.
- Prior to installing the compressor in medical facilities, it must be ensured that the available medium complies with the requirements stipulated for the relevant purpose in each individual case. Observe the particulars given in Chapter 4. "Technical Data". When installing, classification and conformity rating must be carried out by the manufacturer of the ultimate product.
- Any other use or use beyond what is specified is deemed to be not for the intended purpose. The manufacturer accepts no liability for damage resulting therefrom. All risk is borne solely by the operator/user.

2.3 Product Description

The compressor generates an oil-free, dry and filtered compressed air required for operating units of dental equipment.

3. SCOPE OF DELIVERY

Compressor with / without dry-air system

Instructions for assembly and use 9000-610-38/30

Accessories incl. pressure hose
ø 8x3x14, length 1 m 5410-002-00

Only for compressors with dry-air system:
Collecting trough 3413-001-00

3.1 Special Accessories

The parts listed below are **not** included in the scope of delivery.

Please order as required!

5150, 5151, 5170, 5171,
5250, 5251, 5270, 5271 5110-500-00
4151, 4251, 5351, 5451 4251-500-00
Pressure reducer 6040-992-00

3.2 Consumables

Filter cartridge suitable for compressor model:
Primo, Duo, Duo-Tandem,
Trio, Quattro, Quattro Tandem 0832-982-00
Tornado 5430-982-00

Fine-mesh filter for
dry-air system 1610-121-00

Sterilisation filter for
dry-air System 1640-981-00

4. TECHNICAL DATA

Model	Primo		Duo		Trio	Quattro
	5150-01a 5151-01b	5250-01a 5251-01b	5250-01a 5251-01b	5250-01a 5251-01b	5351-01b	5450-01a 5451-01b
Voltage	V	230	230	400	230	400
Frequency	Hz	50 – 60	50 – 60	50 – 60	50	50 – 60
Current Consumption at 8 bar	A	4,3 ^c – 4,4 ^c	6,3 ^c – 7,0 ^c	3,1 ^c – 2,5 ^c	8,6	4,4 ^c – 4,8 ^c
Motor Protection Switch max. permissible setting	A	6,3	8,5	3,5	10,0	6,3
recommended setting		5,6 ^c – 4,4 ^c	6,5 ^c – 7,6 ^c	3,2 ^c – 2,5 ^c	8,6	4,4 ^c – 5,0 ^c
Rated Output	kW	0,80 ^c – 0,98 ^c	1,30 ^c – 1,60 ^c	1,40	1,90	2,20 ^c – 2,95 ^c
Speed	min ⁻¹	1440 ^c – 1710 ^c	1360 ^c – 1600 ^c	1410 ^c – 1690 ^c	1350	1440 ^c – 1700 ^c
Mains Fuse		LS-10A ^d	LS-10A ^d	LS-10A ^d	LS-10A ^d	LS-10A ^d
Protection System		IP54	IP54	IP54	IP54	IP54
Noise Level	dB(A)	67 ^c – 72 ^c	71 ^c – 75 ^c	72 ^c – 76 ^c	77	75 ^c – 77 ^c
Number of Cylinders	Zyl.	1	2	2	3	4
Delivery at 5 bar	l/min					
w. DAS ^b		60 ^c – 70 ^c	110 ^c – 120 ^c	110 ^c – 120 ^c	165	230 – 260
w/o. DAS ^a		60 ^c – 70 ^c	115 ^c – 130 ^c	115 ^c – 130 ^c	–	235 – 270
Switch-on/off Pressure	bar	5,5/7,5	5,5/7,5	5,5/7,5	5,5/7,5	5,5/7,5
Safety Valve - Admissible						
Operating Pressure	bar	10	10	10	10	10
Volume of Pressure Tank	l	20	20	20	50	50
Duty cycle	%					
w. DAS ^b		50	50	50	50	50
w/o. DAS ^a		100	100	100	–	–
Grade of Filtration, Cartridge for compressor	µm	10	10	10	10	10
Grade of Filtr., Fine-mesh Filter for DAS	µm	1	1	1	1	1
Grade of Filtr., Sterilised Filter for DAS	µm	0,01	0,01	0,01	0,01	0,01
Weight w. DAS ^b	kg	56	57	57	87	90
w/o. DAS ^a		47	49	49	87	–
Dimensions (H x W x D)	cm					
w. DAS ^b		64 x 49 x 46	64 x 49 x 47	64 x 49 x 47	86 x 74 x 51	86 x 74 x 51
w/o. DAS ^a		64 x 49 x 44	64 x 49 x 45	64 x 49 x 45	–	70 x 74 x 50
Charging Time 0 – 7.5 bar	s					
w. DAS ^b		135 ^c – 120 ^c	75 ^c – 65 ^c	75 ^c – 65 ^c	130	95 ^c – 80 ^c
w/o. DAS ^a		125 ^c – 105 ^c	65 ^c – 55 ^c	65 ^c – 55 ^c	–	–

^a w/o. DAS (without dry-air system)

^b w. DAS (with dry-air system)

^c depending on mains frequency

^d mains fuse: 10 A LS-switch, characteristics B, C, and D according to DIN EN 60898

Duo Tandem		Quattro Tandem		Tornado 70	Tornado 130	
4251-01b / 4151-51b	4251-51b	4641-51b	4680-51a / 4681-51b	5170-01a / 5171-01b	5270-01a / 5271-01b	5270-02a / 5271-02b
2 Aggregate 1 Aggregate	2 Aggregates	1 Aggregate	2 Aggregates			
230/400	400	400	400	230	230	220
50–60	50–60	50–60	50–60	50–60	50	60
12,2 ^c –14,3 ^c 3,1 ^c –2,5 ^c	6,2 ^c –5,0 ^c	4,4 ^c –4,8 ^c	8,8 ^c –9,6 ^c	4,9 ^c –4,3 ^c	6,7	7,9
- / 3,5 6,5 ^c –7,6 ^c /3,2 ^c –2,5 ^c	3,5 3,2 ^c –2,5 ^c	6,3 4,4 ^c –5,0 ^c	6,3 4,4 ^c –5,0 ^c	6,3 5,1 ^c –4,3 ^c	8,5 7	10,0 8,0
2,7 ^c –3,3 ^c / 1,40	2,80 ^c –2,84 ^c	2,2 ^c –2,95 ^c	4,4 ^c –5,9 ^c	0,92 ^c –0,97 ^c	1,42	1,70
1410 ^c –1690 ^c	1410 ^c –1690 ^c	1440 ^c –1700 ^c	1440 ^c –1700 ^c	1420 ^c –1700 ^c	1380	1710
LS-10A ^d	LS-10A ^d	LS-10A ^d	LS-10A ^d	LS-10A ^d	LS-10A ^d	LS-10A ^d
IP54	IP54	IP54	IP54	IP54	IP54	IP54
72 ^c –76 ^c	75 ^c –77 ^c	74 ^c –76 ^c	76 ^c –79 ^c	67 ^c –70 ^c	70 ^b –72 ^a	72 ^b –75 ^a
2 x 2 / 2	2 x 2	4	2 x 4	1	2	2
215 ^c –240 ^c / 110 ^c –120 ^c	220 ^c –240 ^c –	230 ^c –260 ^c –	460 ^c –520 ^c 470 ^c –540 ^c	67 ^c –69 ^c 70 ^c –80 ^c	115 130	125 150
5,5 / 7,5	5,5 / 7,5	6,5 / 8,5	6,5 / 8,5	5,5 / 7,5	5,5 / 7,5	5,5 / 7,5
10	10	10	10	10	10	10
50	50	90	90	20	20	20
50	50	50	50	50	50	50
–	–	–	–	100	100	100
10	10	10	10	10	10	10
1	1	1	1	1	1	1
0,01	0,01	0,01	0,01	0,01	0,01	0,01
87	97	114	175	52	67	67
71	–	–	–	44	59	59
86 x 76 x 51	86 x 76 x 51	86 x 103 x 63	86 x 103 x 63	64 x 49 x 46	64 x 49 x 46	64 x 49 x 46
–	–	–	75 x 103 x 63	64 x 49 x 44	64 x 49 x 44	64 x 49 x 44
171 ^c –147 ^c	86 ^c –76 ^c	165 ^c –135 ^c	76 ^c –66 ^c	130 ^c –115 ^c	65	55
–	–	–	–	100 ^c –85 ^c	45	40

Climatic Conditions for Storage and Transport

Temperature –25 °C to +55 °C, 24h to +70 °C

Relative Atmospheric Humidity 10 % to 90 % (without condensation)

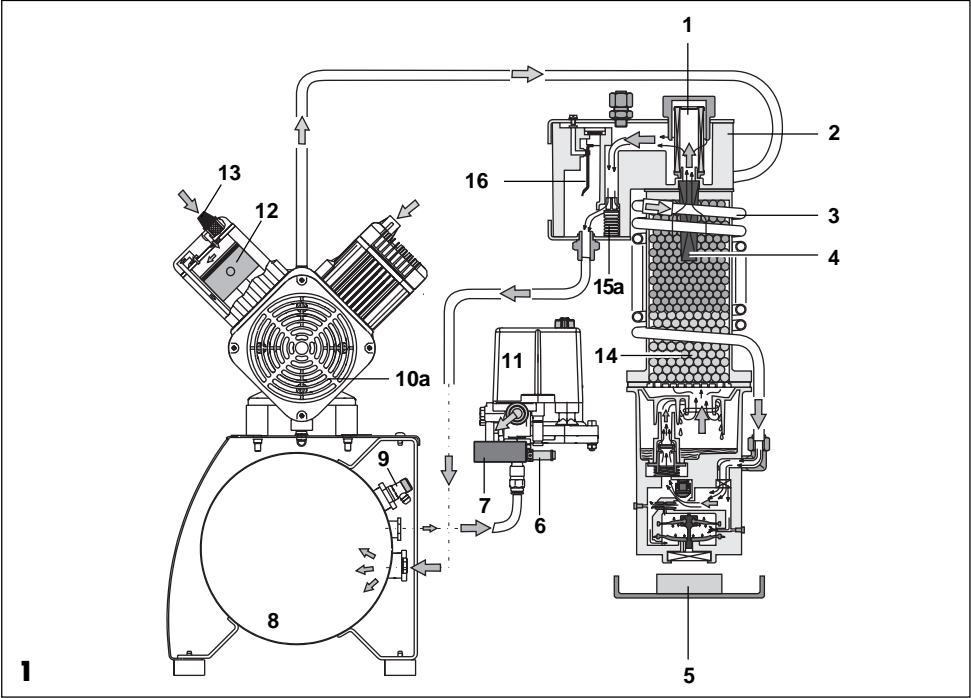
Climatic Conditions for Operation

Temperature +10 °C to 40 °C

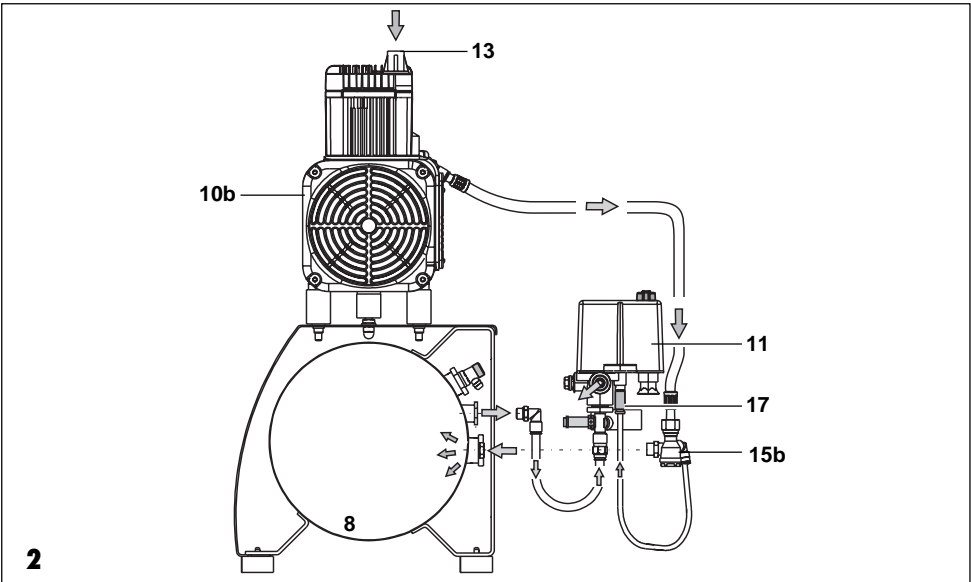
Relative Atmospheric Humidity up to +70 %

5. OVERVIEW OF FUNCTIONS OF COMPRESSORS

5.1 Compressor with Dry-air System



5.2 Compressor without Dry-air System



6. FUNCTIONAL DESCRIPTION

6.1 Compressor with Dry-air System

Concise Functional Description:

The compressor aggregate (10a) draws in atmospheric air which is then compressed without any contamination by oil.

The compressor feeds the compressed oil-free air to the dry-air system (2).

The dry-air system removes moisture from the compressed air.

Now in an dry state, the clean, oil-free air is made available in the pressure tank (8) to the consumers (e.g., turbine).

Detailed Functional Description:

• Compressor Set

Atmospheric air is drawn in via the intake filter (13). The cylinder piston (12) of the compressor set (10a) then compresses the air. The inlet valve/outlet valve blocks the direction of flow so that the compressed air is forced to the dry-air system (2).

• Dry-air System

The compressed air is conducted round the dry-air system via the spiral-shaped cooling tube (3).

Inside the cooling tube, the compressed, heated air cools down and a large percentage of the moisture present in the air is extracted in the form of condensation water.

This pre-dried air then passes into the pressure tank (8) via the drier (14), sintered metal filter (4), fine-mesh or sterilisation filter (1) and non-return valve (15a).

The non-return valve (15a) serves to prevent any backflow of the compressed air emerging from the pressure tank.

Each time the compressor is switched off, the condensation water is blown into the water collecting (5) through by means of the dry-air system and the pressure hoses are vented on the compressor.

• Regeneration of the Dry-air System

The polyamide band (16) fitted inside the hygrostat expands due to the presence of humidity. If the permissible relative humidity inside the pressure tank (8) is exceeded, the valve on the hygrostat responds by opening, causing air to flow out of the pressure tank in the opposite direction. This can be heard blowing out underneath the dry-air

system (2). In this phase, the system undergoes a process of regeneration, for which purpose the compressor must be at a standstill. This process of regeneration will continue to repeat itself until the relative humidity originally set on the hygrostat (16) is attained.

• Valve Unit with Pressure Switch

Whenever compressed air is withdrawn for a certain consumer (e. g., turbine), the pressure inside the tank is reduced. When the minimum tank pressure set on the pressure switch (11) is attained, the compressor will be switched on again via the pressure switch. As soon as the maximum tank pressure (7.5 bar) set on the pressure switch is attained (5,5), the compressor will switch itself off. The maximum permissible tank pressure of 10 bar is marked in red on the pressure gauge (7).

The safety relief valve (6) serves to prevent the maximum permissible tank pressure of 10 bar from being exceeded.

The drain cock (9) is used for draining off condensation water from the pressure tank, this being done by opening the valve.

Also refer to Section 12.3 "Draining Off Condensation Water".

6.2 Compressor without Dry-air System

• Compressor set

The compressor set (10b) draws in atmospheric air via the suction filter (13) which is then compressed without any contamination by oil by means of the cylinder piston. The inlet valve/outlet valve blocks the direction of flow so that the compressed air is forced through the non-return valve (15b) into the pressure tank (8).

• Pressure Switch

The compressor set (10b) continues to feed compressed air until the maximum pressure preset on the pressure switch (11) is attained inside the pressure tank (8) and the compressor set switches itself off.

After the compressor set has switched itself off, the pressure hoses are vented via vent valve (17).

• Valve Unit with Pressure Switch

Refer to previous section, "Detailed Functional

ASSEMBLY

7. STORAGE AND TRANSPORT CONDITIONS



The compressor leaves the factory packed in a transport carton which serves to prevent damage to the unit in transit.

For transportation, always use the original packing materials of the compressor where possible. Always transport the compressor upright.



When transporting the compressor protect against damp, dirt and extreme temperatures.

Compressors packed in original cartons can be stored in warm and dry rooms not exposed to dust.



As far as possible store the packing materials in a safe place.

If storage of the packing materials is not possible, ensure that they are disposed of in a manner serving to protect the environment. The transport carton can be disposed of in the paper recycling bin.



The compressor must always be transported in the depressurised state.

Prior to transport evacuate all air from the pressure tank and pressure hoses and definitely drain off condensation water that is present (refer to Section 8.8 "Draining Off Condensation Water").

8. INSTALLATION AND PLACING IN INITIAL SERVICE



On compressors assigned to Test Group 3 according to German Pressure-tank Regulations, e.g., models Trio 5351-01 or Quattro 5451-51, installation and initial placing in service must only be carried out by a suitably qualified engineer who is required to provide an appropriate record documenting such installation in the form of an Installation Certificate and to enclose this document along with the other

compressor records.



Prior to placing in service for the first time, all transport security devices must be removed.

8.1 Environmental Conditions

- The unit may only be installed and operated in dry rooms that are well ventilated and free of dust.
- The compressor must be installed in such a way that ease of access is warranted for operation and maintenance as well as for the rating plate.
- The unit must be mounted on a level floor base revealing adequate stability. Observe weight of compressor (refer to Chapter 4. "Technical Data").



The suction side of the air filter as well as the ventilation slats must be kept unobstructed and reveal adequate spacing distance away from walls (approx. 20 cm).



The mains connection line and the air hoses must not reveal any bends or kinks.

The room temperature must not be allowed to fall below +10 °C as otherwise proper functioning of the compressor will not be warranted on account of the possibility of undesirable condensation.

The room temperature must not be allowed to exceed +40 °C. If room temperatures exceed +40 °C provision must be made for additional means of ventilation by a fan (see Fig. 3). The ideal room temperature is from +10°C to +25 °C.



Due to technical reasons, approx. 70 % of the electricity consumed by the compressor set is converted to heat and released into the environment.

The motor fan caters for effective ducted cooling of the unit. To ensure this, the air must be allowed to flow in and away without obstruction of any kind. In unfavorable cases or circumstances a forced ventilation system will need to be installed (see Fig. 3).



No objects of any kind must be allowed to come into contact with the compressor since, at a room temperature of, e.g., +40 °C, the cylinders and cylinder heads are liable to heat up to temperatures exceeding +110 °C.

Fire Hazards!

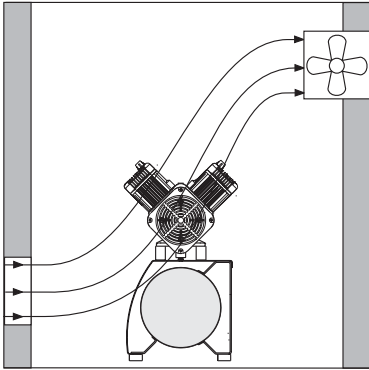
8.2 Compressed-air Connection

A standard feature of the compressor is a control unit comprising the following: pressure switch (11), safety valve (6), compressed-air connection coupling (20) and pressure gauge (7).

- Slip flexible pressure hose (ø 8x3x14) onto connecting socket of pressure reducer and secure with hose clip (21) to prevent slipping off.



A flexible pressure hose fitted between the firmly installed compressed-air tube and the compressor serves to prevent transmission of vibration and thus reduces noise.



3

8.3 Electrical Connection



Connection up to the voltage supply system may only be carried out by a suitably qualified electrician

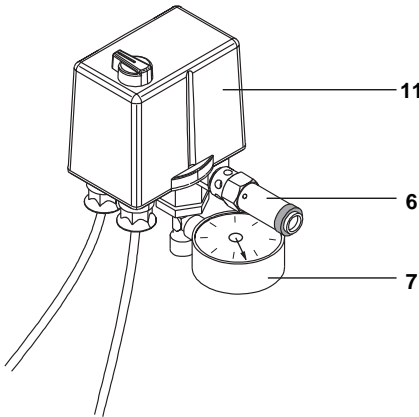
(with exception of those stations supplied ready for plugging into an earthing-contact type socket or CEE socket, depending on the version of the compressor).

The 400 V version of the compressor is supplied fitted with a CEE connector, and the 230 V version with an earthing-contact type plug. The regulations of local power supply companies must definitely be observed. The mains voltage and frequency must conform to the data specified on the rating plate.

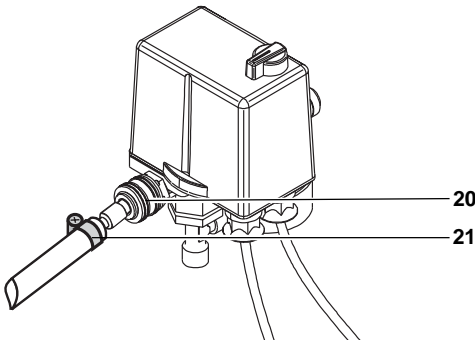


No connecting cable must be allowed to run across the unit. The hot surfaces of the compressor might otherwise cause damage to the cable insulation.

- If the unit is permanently connected up to the voltage supply system, provision must be made for a power disconnecting device with a contact opening width of at least 3 mm (e.g., a power circuit breaker).
- If the unit is connected up to the voltage supply system by means of a plug-type connector, ease of access must be provided to the socket for safety reasons, enabling the unit to be disconnected safely from the mains in cases where danger situations arise.
- The corresponding circuit must be protected by a fuse consisting of an LS-switch 10 A (characteristics B, C, and D) supplied and



4



5

fitted by the client.

8.4 Placing in Initial Service

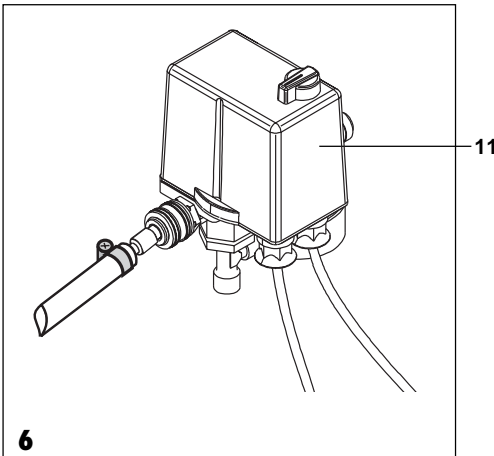
- Check to ensure that all transport security devices have been removed from the compressor.
- Check to ensure proper connection of the compressed-air lines.
- The compressor must be properly connected up to the voltage supply system.
- Check air filter for proper assembly.
- Switch on the compressor at the pressure switch (11) by turning the rotary switch to position "I AUTO" (refer to Fig. 6).



During the initial running hours, the compressor may continue to switch itself on again after shorter periods of disuse – even if no air has been withdrawn from the pressure tank. During this phase, drying of the pressure tank takes place while it reveals excessive moisture content. A blow-off noise can be perceived on the silencer (dry-air system), from which the absorbed moisture emerges in the form of water vapor.

8.5 Setting the Motor Protection Switch

In all compressor models except Duo-, Quattro Tandem, motor protection switch and pressure switch are combined into one component (see Fig. 7). The motor protection switch can be set by adjusting the setscrew



(31). Model Duo-, Quattro Tandem features two separate motor protection switches which are built into the control box of the compressor set. These switches each have a setscrew (35) as well as a start and stop button (36 and 37).

All motor protection switches have been set at the factory to certain values. These values are equal to the recommended values given in Chapter 4. "Technical Data" for a frequency of 50 Hz. The factory settings need to be checked during installation. They should only be changed if necessary.



When changing the settings, the maximum values given in Chapter 4. "Technical Data" must not be exceeded.

For checking or resetting the motor protection switch please proceed as follows:

- Remove protective housing of the pressure switch (11) or, respectively, of the control box of model Duo-, Quattro Tandem.
- Measure the maximum current (value shortly before switch-off pressure is attained).



Measurements and adjustments can only be carried out with the compressor in the live state.

- Set the motor protection switch by adjusting the setscrew (31 or 35, depending on model) to the measured value.

8.6 Checking the Safety Valve



The safety valve has been set at the factory to 10 bar, tested and confirmed by an endorsement stamp.

The valve must not be altered.

When placing the compressor in service for the first time, the safety valve must be checked for proper functioning.

Give screw (6) a couple of turns in the counter-clockwise direction until blow-off occurs on the safety valve (refer to Fig. 9).

The safety valve should **only** be allowed to blow freely **for a short time**.

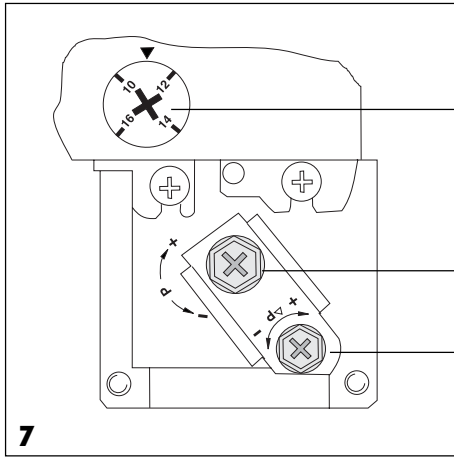
Turn screw (8-2) in clockwise direction to full extent; the valve should now be in the fully closed state once more (refer to Fig. 8).



During this check, the pressure tank should be under pressure (maximum 7.5 bar).



The safety valve should never be used for venting the pressure tank.



8.7 Checking and Adjusting the Pressure Switch

The pressure switch has been set at the factory. At 5.5 bar tank pressure the unit switches itself on.

At 7.5 bar the unit switches itself off.



If required, the working pressure of the compressor can be modified at the pressure switch.

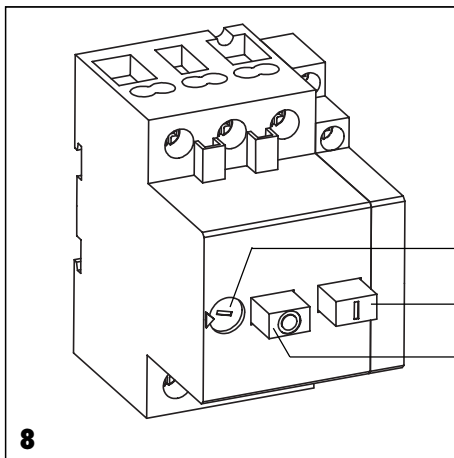
To do this, it is necessary to first set the switch-off pressure and afterwards the switch-on pressure via pressure-difference (Δp).



When carrying out this work, the protective housing of the pressure switch (11) needs to be removed. Settings can only be carried out with the compressor in the live state.

Proceed to set the **switch-off pressure p** on the adjusting screw (32, refer to Fig. 7): plus (+) direction of arrow = higher and minus (-) direction of arrow = lower. When making this adjustment, the pressure difference also undergoes modification (readjust if necessary). Observe maximum pressure (10 bar) on safety valve. The switch-off pressure must be at least 0.5 bar below the value of the safety valve as otherwise the safety valve would open and the compressor set would then fail to attain the switch-off pressure, thus continuing to run all the time.

The pressure difference Δp between switch-on and switch-off pressure can be modified. This is done by turning the adjusting screw (33) in the plus (+) or minus (-) direction. When carrying out this adjustment, the pressure tank must be under pressure.

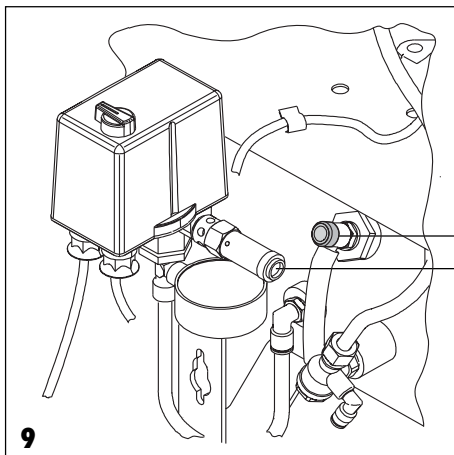


8.8 Draining off Condensation Water

During transportation, condensation water may form inside the pressure tank due to differences in temperature. Each time a compressor is installed, always drain off the condensation water first; this also applies to compressors incorporating a dry-air system.

When doing this, proceed as follows:

- With the **compressor in the switched-on state** and at tank pressure, proceed to screw open the condensation-water drain cock (9).
- Wait until the condensation water has completely drained off from the pressure tank.
- Close drain cock (9) again.



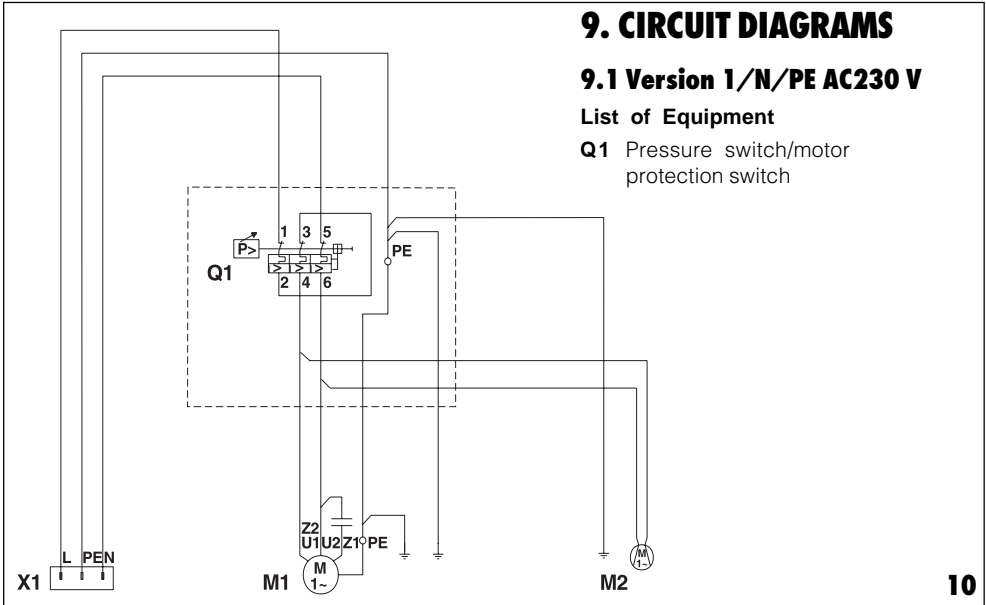
This may otherwise impair proper functioning of the safety valve.

9. CIRCUIT DIAGRAMS

9.1 Version 1/N/PE AC230 V

List of Equipment

Q1 Pressure switch/motor protection switch



10

X1 Mains connection 1/N/PE AC 230 V

M1 Compressor motor

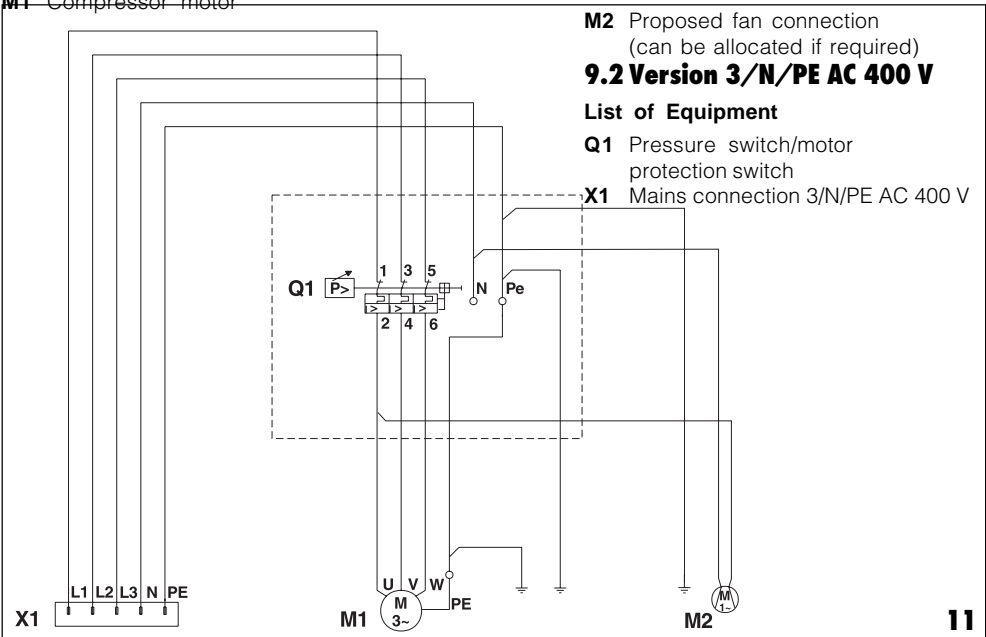
M2 Proposed fan connection
(can be allocated if required)

9.2 Version 3/N/PE AC 400 V

List of Equipment

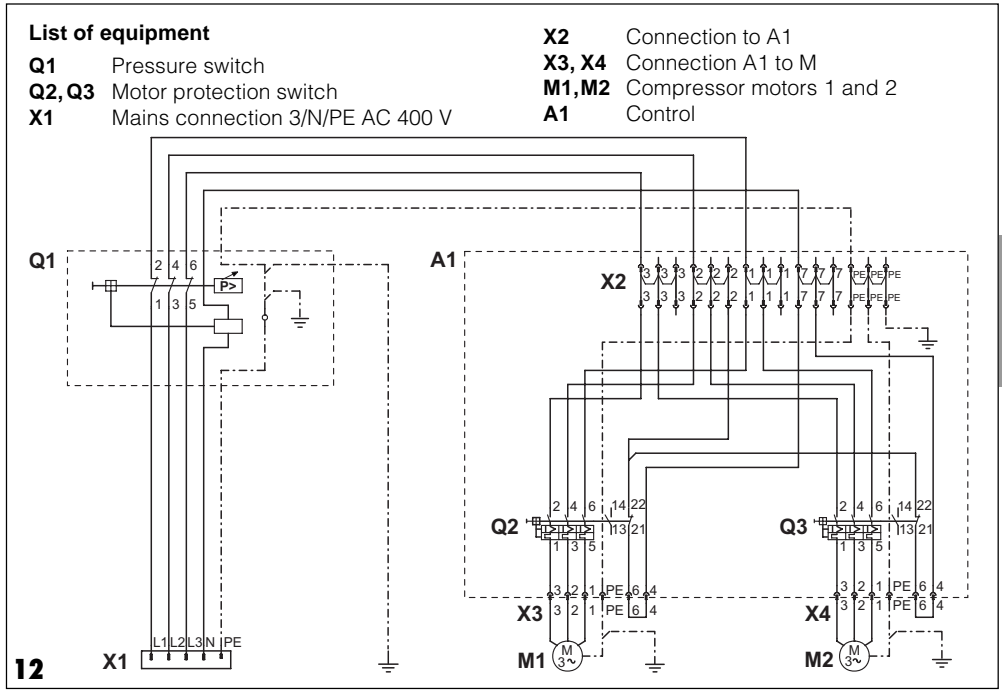
Q1 Pressure switch/motor protection switch

X1 Mains connection 3/N/PE AC 400 V

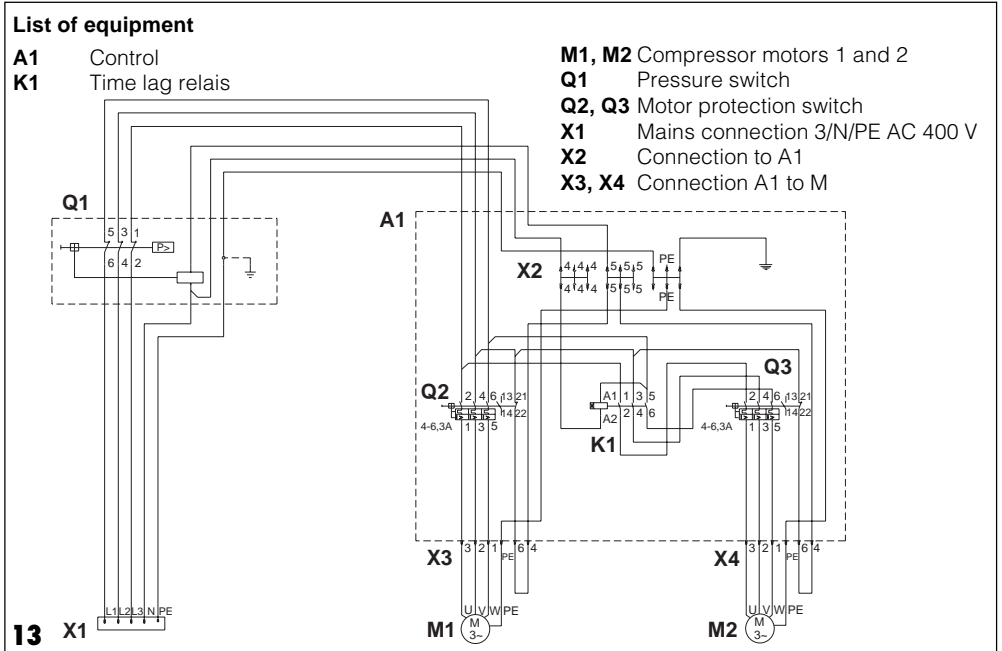


11

9.3 Version 3/N/PE AC 400 V, 2 Aggregates, Duo Tandem



9.4 Version 3/N/PE AC 400V, 2 Aggregates, Quattro Tandem



- M1** Compressor motor
M2 Proposed fan connection
 (can be allocated if required)

USE

10. OPERATION



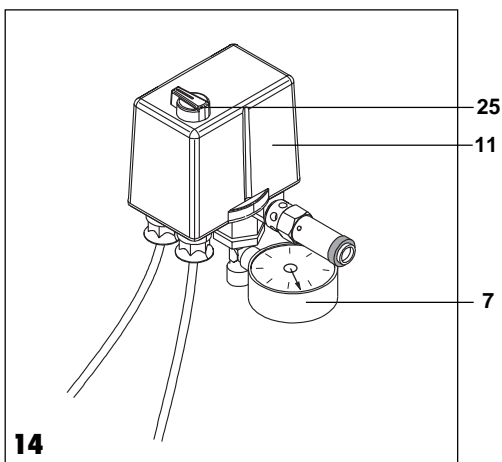
In dangerous situations always unplug the unit from the mains (disconnect plug from mains).



The surfaces of the compressor are hot. There is a risk of burns being sustained if these surfaces are touched.



Automatic start-up. Whenever the pressure inside the pressure tank drops, this will result in the compressor being switched on automatically and remaining on until the maximum operating pressure of 7.5 bar is attained once more.



10.1 Switching on the Compressor

- Switch on the compressor at the pressure switch (11) by turning the switch (25) to position "I AUTO".

This starts up the compressor set and the pressure tank is filled. As soon as the switch-off pressure is attained, the compressor set will switch itself off automatically.

The maximum permissible operating pressure must not be exceeded. The permissible operating pressure is marked by a red stroke on the mounted pressure gauge (7).



In the event of the maximum operating pressure (10 bar) being exceeded, the compressor set must be switched off and disconnected from the mains (disconnect mains)



plug). Inform the technician responsible.

11. MAINTENANCE INTERVALS – USER / TECHNICIAN

Maintenance due to be carried out	Chapter	Interval
• Setting the pressure reducer	12.2	Once a year
• Draining off condensation water	12.3	Once a month Once a day
Compressors without dry-air system At a high degree of humidity		Check every six months, draining if necessary
Compressors with dry-air system		
• Safety-valve check	12.4	Every six months
• Filter replacement	12.5	Once a year

12. MAINTENANCE



Repair work exceeding normal maintenance operations may only be carried out by a suitably qualified engineer or our customer service staff.

Only use spare parts licensed by the manufacturer as well as accessories destined for the purpose.



Prior to performing any maintenance or repair work, be absolutely sure to switch off the compressor first and disconnect from mains (pull out mains plug).

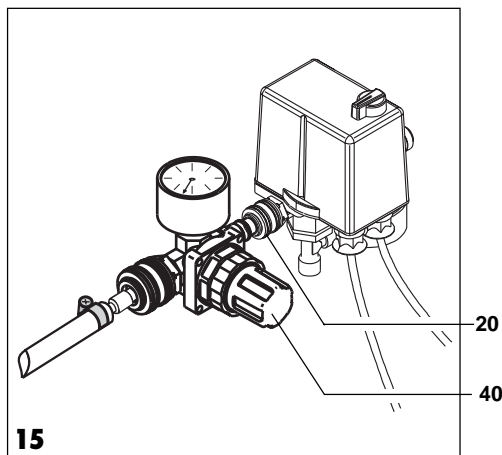
To ensure proper functioning of the compressor, be sure to regularly carry out maintenance as described in Sections 12.1 to 12.5.

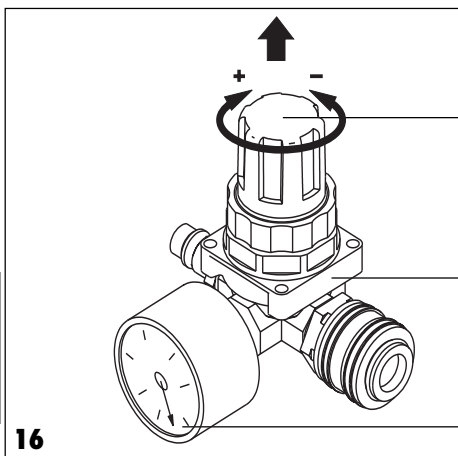
12.1 Pressure Reducer



This part is sold as a special accessory item and is therefore not included in the scope of delivery.

The pressure reducer (40) serves to control the flow pressure in alignment with the desired working pressure. The pressure reducer is connected to the pressure switch via an express coupling (20).





12.2 Setting the Pressure Reducer

To set the flow pressure, place the syringe, turbine, etc. in operation. Lift the rotary adjusting knob (41) and continue to turn in the direction of the + arrow (to increase flow pressure) or in the direction of the - arrow (to reduce pressure) until the required flow pressure is indicated on the pressure gauge (42). Afterwards push the adjusting knob back in position making sure that it firmly engages in place so as to prevent displacement of the pressure reducer. The set pressure is now fixed.

For flow pressure refer to data specified by the manufacturer of the consumers (e.g., turbine).

12.3 Draining off Condensation Water

On compressor versions fitted **with** a dry-air system, the condensation water is discharged automatically through the dry-air system.

On compressor versions **without** a dry-air system it is necessary to drain off the condensation water at least once a month! In countries having a high degree of atmospheric humidity, the condensation water needs to be drained off every day!

Procedure:

- With the compressor in the switched-on state and maximum tank pressure, proceed to screw open the condensation-water drain cock (9) as far as possible.
- Wait until the condensation water has completely drained off from the tank.
- Close drain cock (9).

12.4 Checking the Safety Valve



The safety valve (6) has been set at the factory to 10 bar, tested and confirmed by an endorsement stamp. The valve must not be altered.

Give screw (26) a couple of turns in the counter-clockwise direction until blow-off occurs on the safety valve.

The safety valve should **only** be allowed to blow off **for a short time**.

Turn screw (26) in clockwise direction to full extent; the valve should now be in the fully closed state once more.

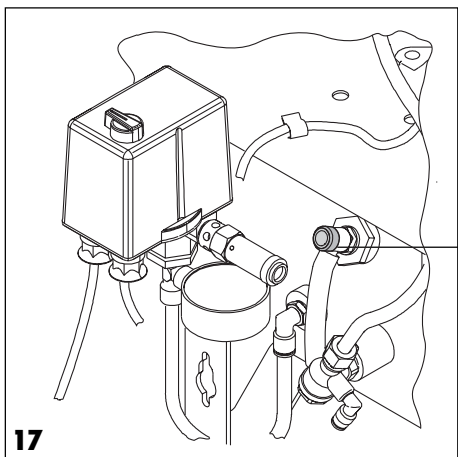


During this check, the pressure tank should be under max. pressure (7.5 bar).

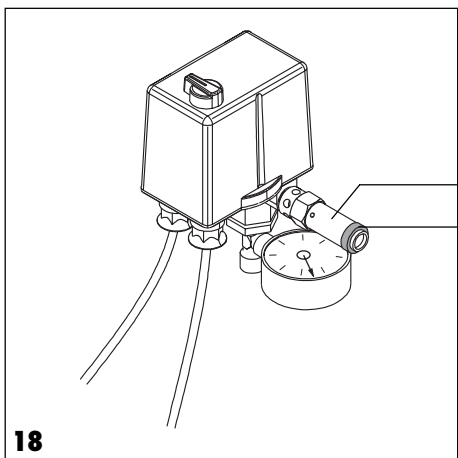
The safety valve should never be used for venting the pressure tank.



This may otherwise impair proper functioning of the safety valve.



17



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12.5 Filter Replacement



Used filters must not be cleaned but must be replaced by new ones. Attempting to clean destroys filters.



The intervals in which the filter cartridges need replacing will depend essentially on the amount of dust contained in the air. Regular filter replacement serves to preserve the high quality of the compressed air over a longer period of time apart from enhancing the service life of the compressor. Subject to proper installation (refer to Section 8.1 "Environmental Conditions"), we recommend that all filters on the compressor and the dry-air system be replaced **once a year**.

Order numbers for filter cartridges:

Compressor types 5170, 5171, 5270, 5271

Suction filter (13a) 5430-982-00

Compressor types

4151, 4251, 4641, 4681, 5150, 5151, 5250, 5251, 5351, 5451

Suction filter (13b) 0832-982-00

Compressors with dry-air system types

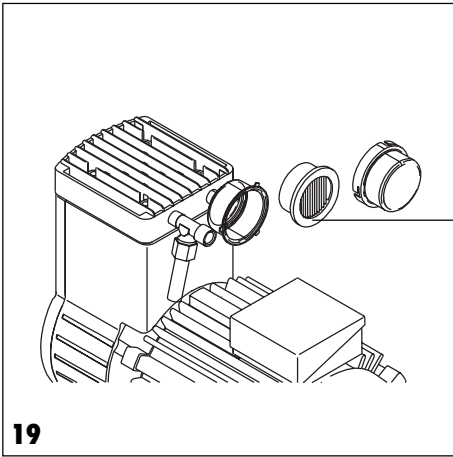
4151, 4251, 4641, 4681, 5151, 5171, 5251, 5271, 5351, 5451

Fine-mesh filter (1) 1610-121-00
or

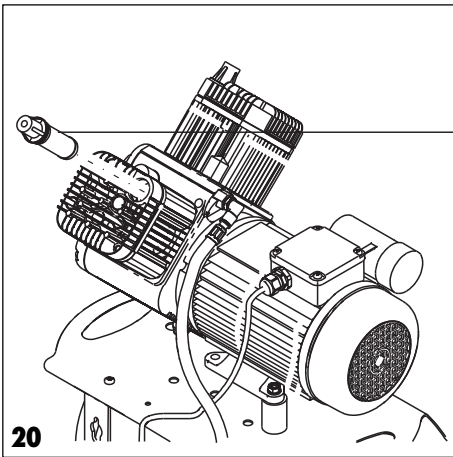
Sterilisation filter* (1) 1640-981-00



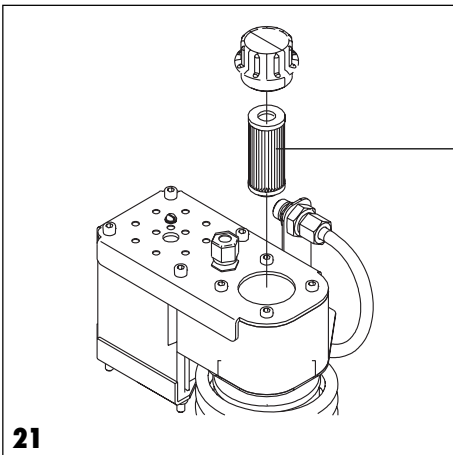
When replacing filters, the supplied sticker and documentation recording the last filter replacement should be filled out with the appropriate information and stuck in a visible place. Also refer to the information enclosed in the pack containing the new filters.



13a

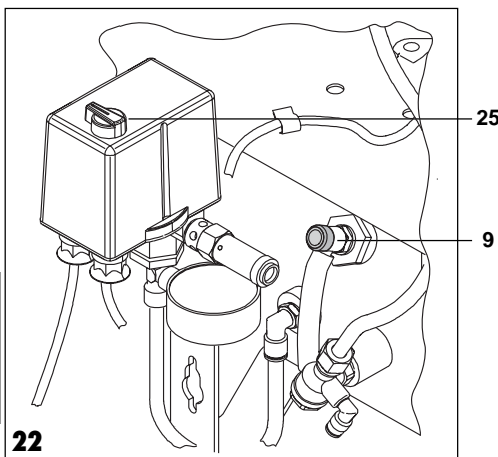


13b



1

* A sterilisation filter serves to eliminate any additional contamination caused by micro-organisms such as bacteria, fungus spores and viruses which may be present in the ambient atmosphere.



13. SHUTTING DOWN THE UNIT

If the compressor is not used for a longer period of time, it is recommended that the condensation water be drained off from the pressure tank. Afterwards put the compressor into operation for approximately 10 minutes with the condensation-water drain cock (9) in the open state. Then switch off the unit on the pressure switch (25), close the condensation-water drain cock and disconnect the mains plug.

DISPOSAL

14. DISPOSAL OF THE MACHINE

- Disconnect mains plug.
- Let off air pressure in compressed-air tank by opening the condensation-water drain cock (9).
- Dispose of the compressor in accordance with local valid regulations.


TROUBLE SHOOTING

15. TIPS FOR USERS

Fault	Possible Cause	Removal of Fault
1. Compressor fails to start up.	<ul style="list-style-type: none">• Absence of mains power.• Pressure switch not switched on.	<ul style="list-style-type: none">• Check mains fuse, if necessary, switch unit back on again (if fuse is defective, replace).• Switch on pressure switch.• Notify technician.
2. Compressor fails to switch off.	<ul style="list-style-type: none">• Compressor under-dimensioned, excessive air withdrawal (per treatment site approximately 50 ltr/min)• Leakage in compressed-air line system.	<ul style="list-style-type: none">• Ascertain air requirements, using a larger compressor if necessary.• Detect leak and seal.• Notify technician.
3. Compressor switches on from time to time without air being withdrawn for any consumer.	<ul style="list-style-type: none">• Air escaping downwards via the dry-air system (regeneration phase).• Leakage in compressed-air line system.	<ul style="list-style-type: none">• Dry-air system is in regeneration phase, humidity being reduced in tank.• Detect leak and seal.• Notify technician.
4. Sound of knocking or loud noises coming from compressor.	<ul style="list-style-type: none">• Bearing damage.	<ul style="list-style-type: none">• Notify technician.
5. Decline in feed performance, compressor runs longer to charge tank. For charging times refer to Chapter 4 "Technical Data".	<ul style="list-style-type: none">• Suction filter contaminated.	<ul style="list-style-type: none">• Replace suction filter once a year at least. Never clean the suction filter.
6. Water is dripping out of the air consumers (e.g., turbine).	<ul style="list-style-type: none">• Condensation water in pressure tank.	<ul style="list-style-type: none">• Drain off condensation water from tank at least once a month. This should be done once a day in areas where a high degree of humidity prevails or in tropical countries. Carefully observe ambient temperature of compressor (refer to Section 8.1 "Environmental Conditions").

16. TIPS FOR TECHNICIANS

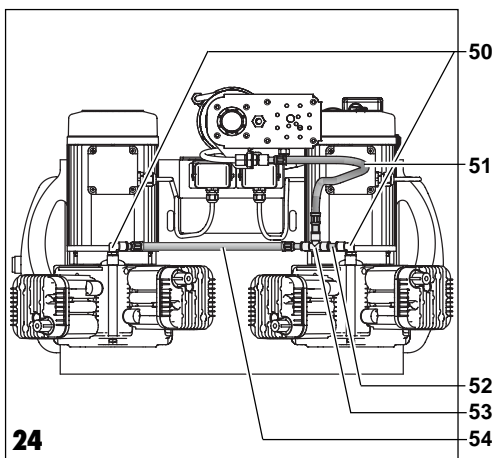
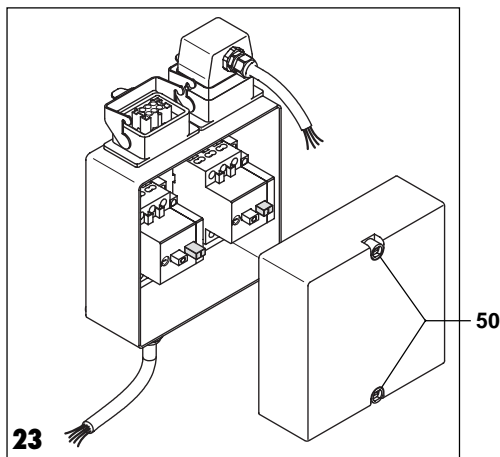
The following trouble shooting guide is intended solely for technical staff. Repairs may only be carried out by technicians.

Fault	Possible Cause	Removal of Fault
<p>1. Compressor fails to start up.</p>	<ul style="list-style-type: none"> • Absence of mains power. • Pressure switch not switched on. • Under voltage/Over voltage. • Motor protection switch set too low. • Motor protection switch defective. • Air-relief valve defective, compressor set starting up against pressure (only compressors without dry-air system). • Set reveals mechanical sluggishness, piston stuck (motor protection switch trips) 	<ul style="list-style-type: none"> • Check mains fuse, switch unit back on again if necessary (if fuse is defective, replace). Check mains voltage. • Switch on pressure switch. If the pressure switch remains switched on for a brief duration and does not switch the motor off until afterwards, the current consumption on the 3-phase current needs to be checked in all three phases or in one phase on AC current. • Measure voltage, notifying the electrician if necessary.  For a detailed description refer to Section 8.5 "Setting the Motor Protection Switch". • Measure current. Set motor protection switch accordingly (refer to Chapter 4. "Technical Data"). • Check motor protection switch, replacing if necessary. • Check to see whether the air-relief valve produces blowoff after the set is switched off. Render operable or replace. • Disconnect mains plug, remove crankcase cover on compressor that has heated and turn fan wheel; if this is not possible, replace piston and cylinder or complete set.



Users of model Duo-, Quattro Tandem may temporarily utilize only one aggregate.





To do this, please proceed as follows:

– Remove mains connection.
When one of the aggregates of model Duo-, Quattro Tandem is malfunctioning, the button "I" of its motor protection switch is released. In addition, the rotary switch of the pressure switch jumps into position "0 OFF". To disconnect the defective aggregate, please pull one of the mains plug on top of the control box which is directly above the released switch (see Fig. 23). In order to temporarily operate the remaining aggregate set, set the rotary switch of the pressure switch back to position "I AUTO".

– Disconnect defective aggregate pneumatically.

Remove pressure hose (54), T-connector (53) and connector (52). Connect functioning aggregate and dry-air system by directly joining pressure hose (51) and the elbow (50) fitted to this aggregate.

• Substitute for defective aggregate.



Unplug the unit from the mains.

- Turn rotary switch of the pressure switch to position "0 OFF".
- Depressurize tank via condensate-water drain cock. Afterwards close cock again.
- Replace defective aggregate by a new one.
- Replug unplugged plug on top of the control box.
- Remove cover of the control box. To do this, turn the two screws(55) counterclockwise to the stop.
- Press button "I" of the released motor protection switch.
- Put cover back on and screw tight.
- Plug in mains plug.
- Turn rotary switch of the pressure switch to position "I AUTO".
- Test run the system.

Fault	Possible Cause	Removal of Fault
2. Compressor fails to switch off.	<ul style="list-style-type: none"> • Lamellar valve (inlet / outlet valve) between cylinder and cylinder head defective. • Air escaping on air-relief valve (only on compressors without dry-air system). • Air blowing through dry-air system into collecting trough. • Leakage in compressed-air line system. • Compressor under-dimensioned; excessive air withdrawal, • Compression collar worn on piston. • Air escaping downwards via the dry-air system. 	<ul style="list-style-type: none"> • Dismantle cylinder head and install new lamellar valve. • Replace air-relief valve. • Check control head on dry-air system. • Bring pressure to act upon lines. Seal leak, if necessary. • Ascertain air requirements (per treatment site approx. 50 ltr/min). Use a larger compressor, if necessary. • Replace piston and cylinder or complete set.
3. Compressor switches on from time to time without air being withdrawn for any consumer.	<ul style="list-style-type: none"> • Non-return valve defective. Air escaping via the dry-air system. • Air escaping at relief valve on compressors not incorporating a dry-air system. • Leakage in compressed-air line system. 	<ul style="list-style-type: none"> • Dry-air system is in regeneration phase; atmospheric humidity being reduced in tank. • Check non-return valve to see whether air is escaping. Clean or replace non-return valve. • Detect leak and seal.
4. Sound of knocking or loud noises coming from compressor.	<ul style="list-style-type: none"> • Bearing damage. 	<ul style="list-style-type: none"> • Check motor shaft bearings and crankshaft bearings, replacing if necessary.
5. Decline in feed performance, compressor runs longer to charge tank. (For charging times refer to Chapter 4. "Technical Data").	<ul style="list-style-type: none"> • Suction filter contaminated. • Lamellar valve (inlet/outlet valve) defective. • Compression collar worn on piston. 	<ul style="list-style-type: none"> • Replace suction filter once a year at least. Never clean suction filter. • Replace cylinder head and valve plate. • Replace piston and cylinder or complete set.

Fault

Possible Cause

Removal of Fault

6. Water is dripping out of the air consumers (e.g., turbine).

- Condensation water in tank.

- Drain off condensation water from tank at least once a month. This should be done once a day in areas where a high degree of humidity prevails or in tropical countries.



Refer to Section 12.3 "Draining off Condensation Water".

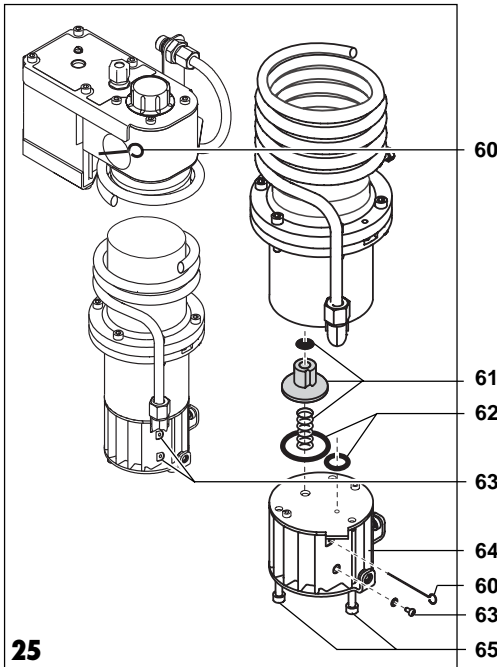
Carefully observe ambient temperature of compressor. Refer to Section 8.1 "Environmental Conditions".

7. Compressor is running and compressed air is being blown off via the dry-air system.

- Congestion of control nozzle on dry-air system.
- Control unit defective.

- Remove screws (63) from control unit and clean control nozzles using cleaning pin (60).

- Replace control unit. For maintenance work or in the event of defects occurring, the control unit (64) can be dismantled on the dry-air system.
 - Dismantle dry-air system on compressor.
 - Remove three hexagon socket screws (65) from base of dry-air system.
 - Remove control unit (64).
 - Remove O-rings (62) from base of water collecting chamber and replace by new ones.
 - Remove valve together with sealing washer and compression spring (61) and substitute by supplied parts.



Fault

8. Failure on dry-air system.

Possible Cause

- Control unit defective.

Removal of Fault

- Replacement of control unit; alternatively and temporarily:
- Bridge over the dry-air system.



In the event of failure occurring on the dry-air system, this can be bridged over so to enable work to continue with the compressor. If the dry-air system is bridged over, action should be taken to ensure its speedy repair. Meanwhile condensation water should be drained off at least once a day.

Draining off condensation water:

- Switch on compressor and wait for a short time until switch-off pressure is attained.
- Open drain cock (9) by turning in the counter-clockwise direction until escaping air is able to entrain water from the pressure tank.



Refer to Section 12.3 "Draining off Condensation Water".

- Wait until no further water is blown out of the drain cock.
- Close drain cock again.

Bridging over the dry-air system:

- Disconnect compressor from mains so as to prevent it from starting up while rebuilding operations are in progress.
- For this:



Unplug the unit from the mains.

- Drain compressed air from pressure tank (open drain cock (9), refer to Fig. 16).
- Remove screw (74). Remove washer and save for later use (needed again after repair). Fit screw (74) again, screwing back in to full extent.

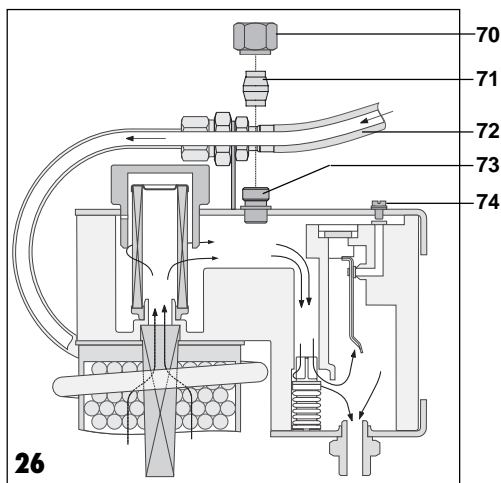


By removing the washer, the screw presses against a metal plate and thus closes the duct governing regeneration.

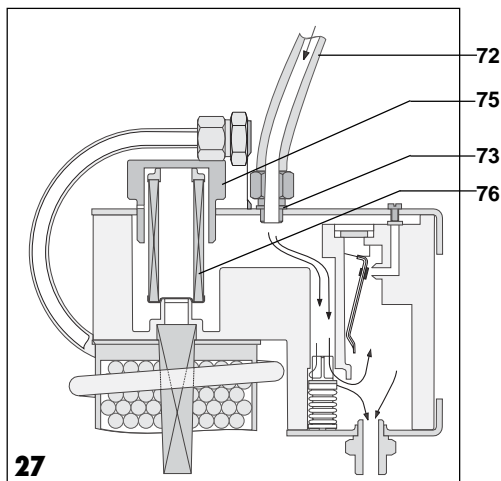
- Screw off cap nut (70) and remove conical nipple (71) from threaded joint (73).



To prevent loss of cap nut and conical nipple, these parts should be attached to the threaded joint of the cooling tube during bridge-over.



26



27

Fault**Possible Cause****Removal of Fault**

- Screw off pressure hose (72) from compressor set on dry-air system and screw onto threaded joint (73).
- Remove screw plug (75) along with filter (76), turn 180° and insert. Tighten screw plug (75).



This action serves to seal off the duct to the dry-air system, and the control head on the dry-air is vented during stoppage through a small borehole drilled into the plug screw (75).