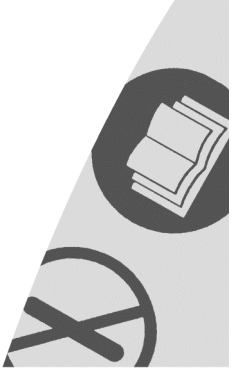
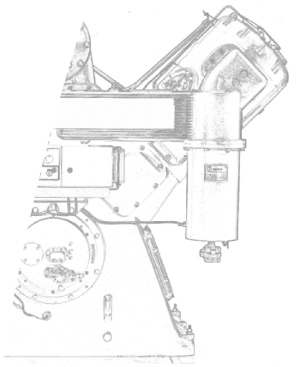
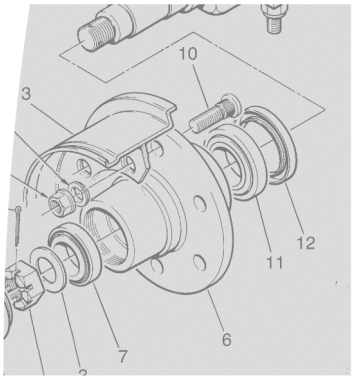
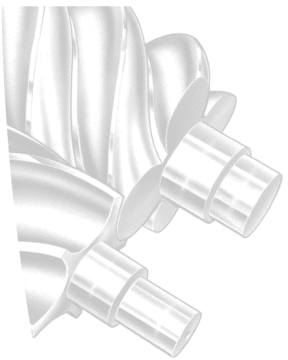
GARDNER DENVER







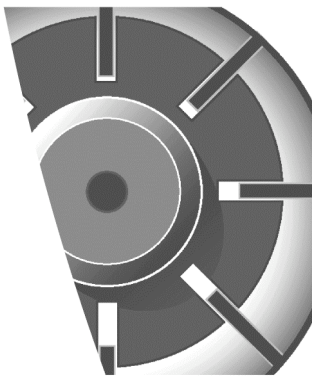


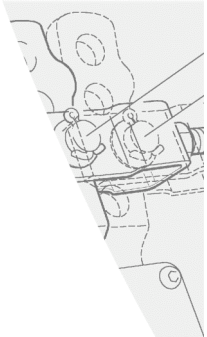
Original Operating and Service Manual

EnviroAire

15 - 22 kW

Oil-Free





USA Id. no. ZS1093133 / 00 - June 2012

General Information

These compressors are designed for compressing atmospheric air and are not suitable for compressing any other gas. They are designed and manufactured to give optimum performance with long life and reliability.

This manual gives the user all the information required to install, commission and operate the compressors and carry out the regular schedules for servicing and maintenance which will ensure a maximum satisfactory service life.

Servicing facilities and the supply of genuine replacement parts are provided through a worldwide network of Gardner Denver distributors. For individual replacement parts, please contact your local Gardner Denver office or your dealer.

The information in this manual was valid at the time of publication. However, because modifications to parts and procedures may be made at any time which could affect the servicing requirements of the compressors, always make sure that the very newest information is at hand before the compressors are serviced. New and edited publications can be obtained from your local Gardner Denver distributor or service center.

In any communication concerning the compressor it is essential to quote the MODEL and SERIAL NUMBER.

In this manual all pressures quoted are gauge pressures unless otherwise stated.

Maintenance

To ensure the continued trouble-free operation of the compressor it is important that periodic maintenance and servicing are carried out in accordance with the information given in the ‘Maintenance’ section of this manual. If you require assistance, please contact your local Gardner Denver business or Gardner Denver dealer. They can offer you a number of optional maintenance agreements suited to your requirements. These agreements provide the operator with expert knowledge from our trained technicians and the guarantee that only genuine Gardner Denver parts will be used.

Warranty

The conditions of the Gardner Denver Warranty are set out in the company's standard Conditions of Sale available from the Distributor supplying the machine.

USE ONLY GARDNER DENVER GENUINE PARTS. USING NON-GENUINE PARTS FOR SERVICING OR REPAIRS WILL INVALIDATE YOUR WARRANTY.

1 Warning -Prohibition - Mandatory Label Information

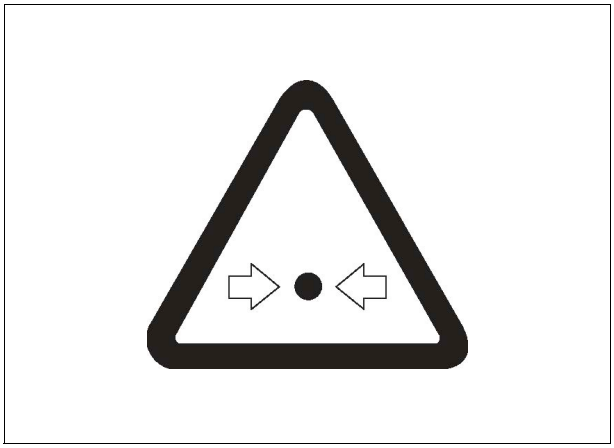
Gardner Denver Rotary Screw compressors are the result of advanced engineering and skilled manufacturing.
To be assured of receiving maximum service from this machine, the owner must exercise care in its operation and maintenance. This book is written to give the operator and maintenance department essential information for day-to-day operation, maintenance and adjustment. Careful adherence to these instructions will result in economical operation and minimum downtime.

Boxed text formats are used within this manual to alert users of the following conditions:

Safety Labels are used within this manual and affixed to the appropriate areas of the compressor package to alert users of the following conditions:

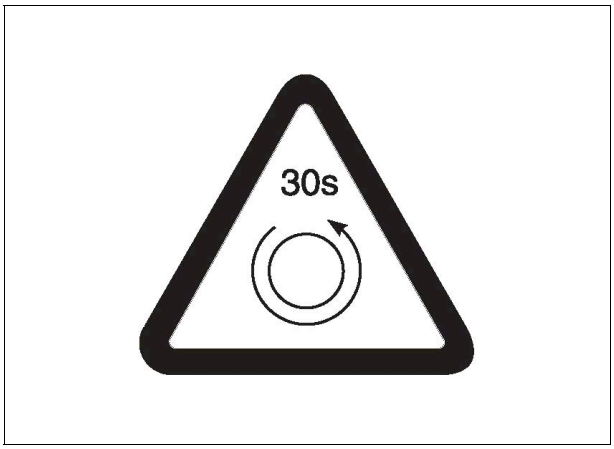
⚠ DANGER

Indicates a hazard with a high level of risk, which if not avoided, WILL result in death or serious injury.

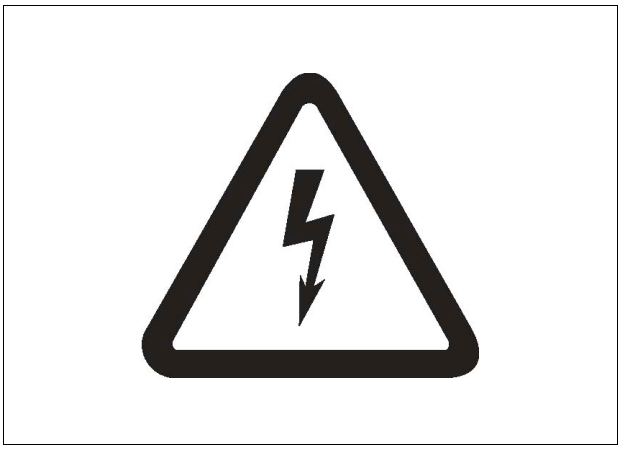


Pressurized part or system

This system can start up by means of a remote control or automatically after a power failure.

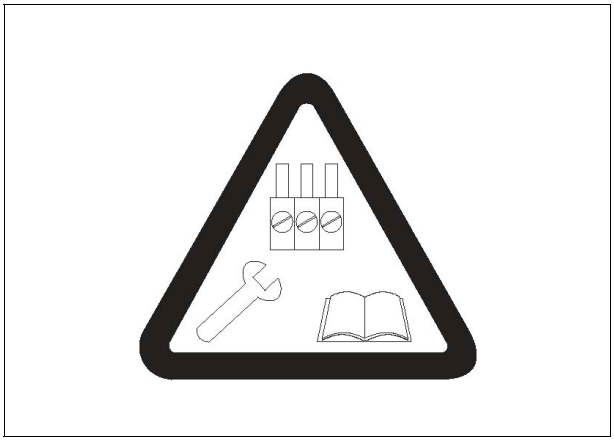


The system continues to run for 30 seconds after pressing the O-key

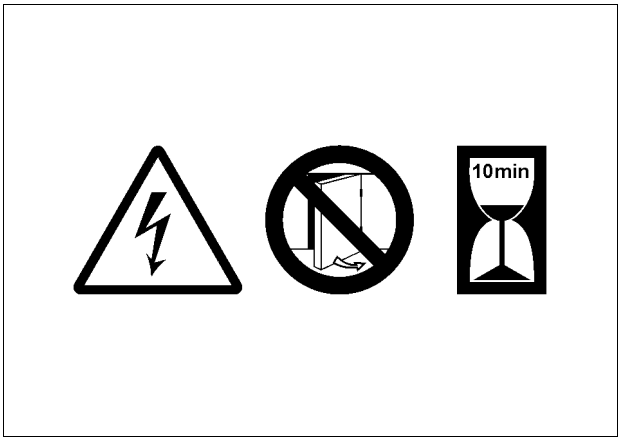


Danger of electric shock

1 Warning -Prohibition - Mandatory Label Information



Check and, if required, re-tighten connection terminals. For further details, see the operating instructions.



Danger of electric shock from loaded condensers! Please always first disconnect the system from the power supply and wait another 10 minutes before touching the electrical components. The power condensers require this time in order to discharge!

Check the DC bus voltage at the system terminal strip of the frequency converter by measuring this between the +DC and -DC terminals (the exact position can be found in the supplied operating manual of the frequency converter), between the +DC terminal and the chassis as well as between the -DC terminal and the chassis.

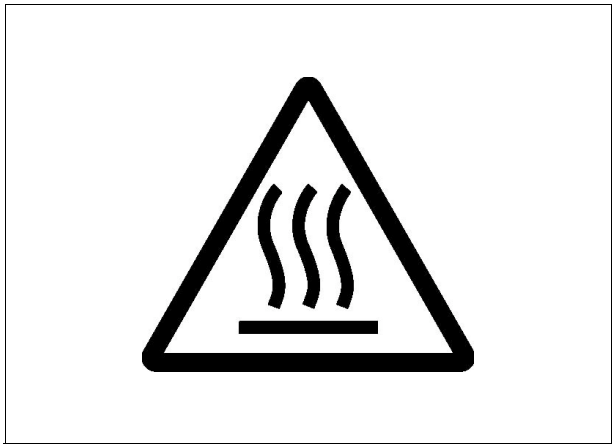
The voltage must read zero in the case of all three measurements.

⚠ WARNING

Indicates a hazard with a medium level of risk which, if not avoided, COULD result in death or serious injury.

⚠ CAUTION

Indicates a hazard with a low level of risk which, if not avoided, MAY result in a minor or moderate injury.



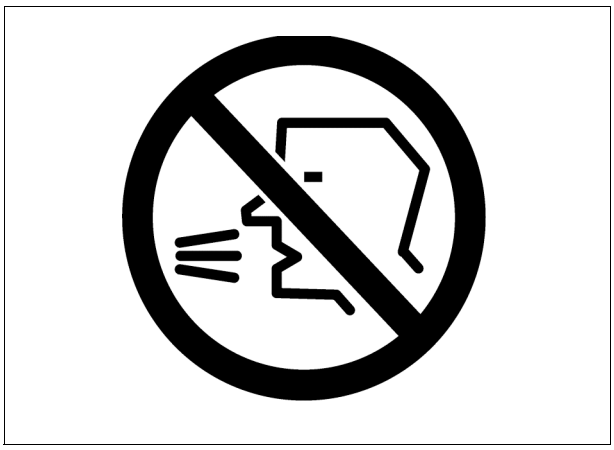
Burn Hazard – Hot surface

1 Warning -Prohibition - Mandatory Label Information

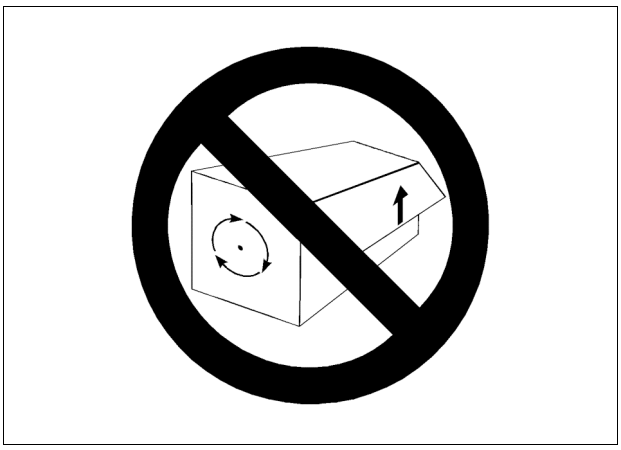
NOTICE

Indicates a property damage message.

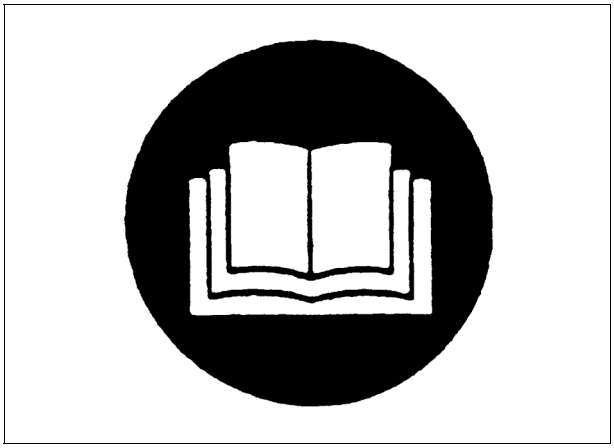
PROHIBITION/MANDATORY ACTION REQUIREMENTS



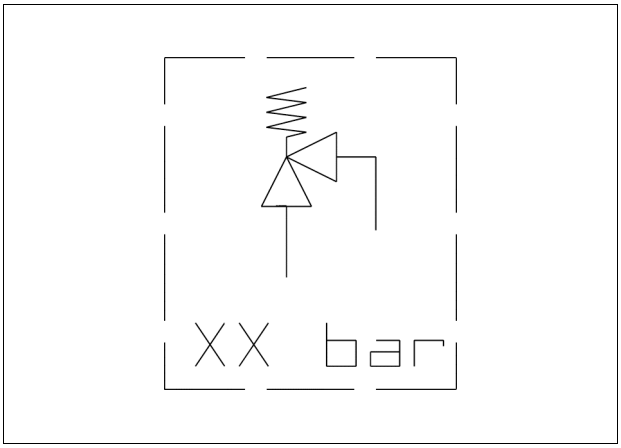
Asphyxiation Hazard – Never breathe in compressed air from this system.



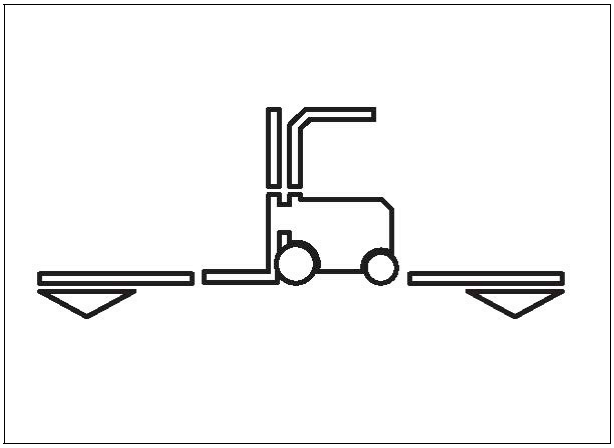
Never operate the unit with open doors or loose access panels.



Read the operator's manual before proceeding with this task



Opening pressure pressure relief valve = xx bar (value "xx" see sticker on compressor)



Handle package at forklift points only

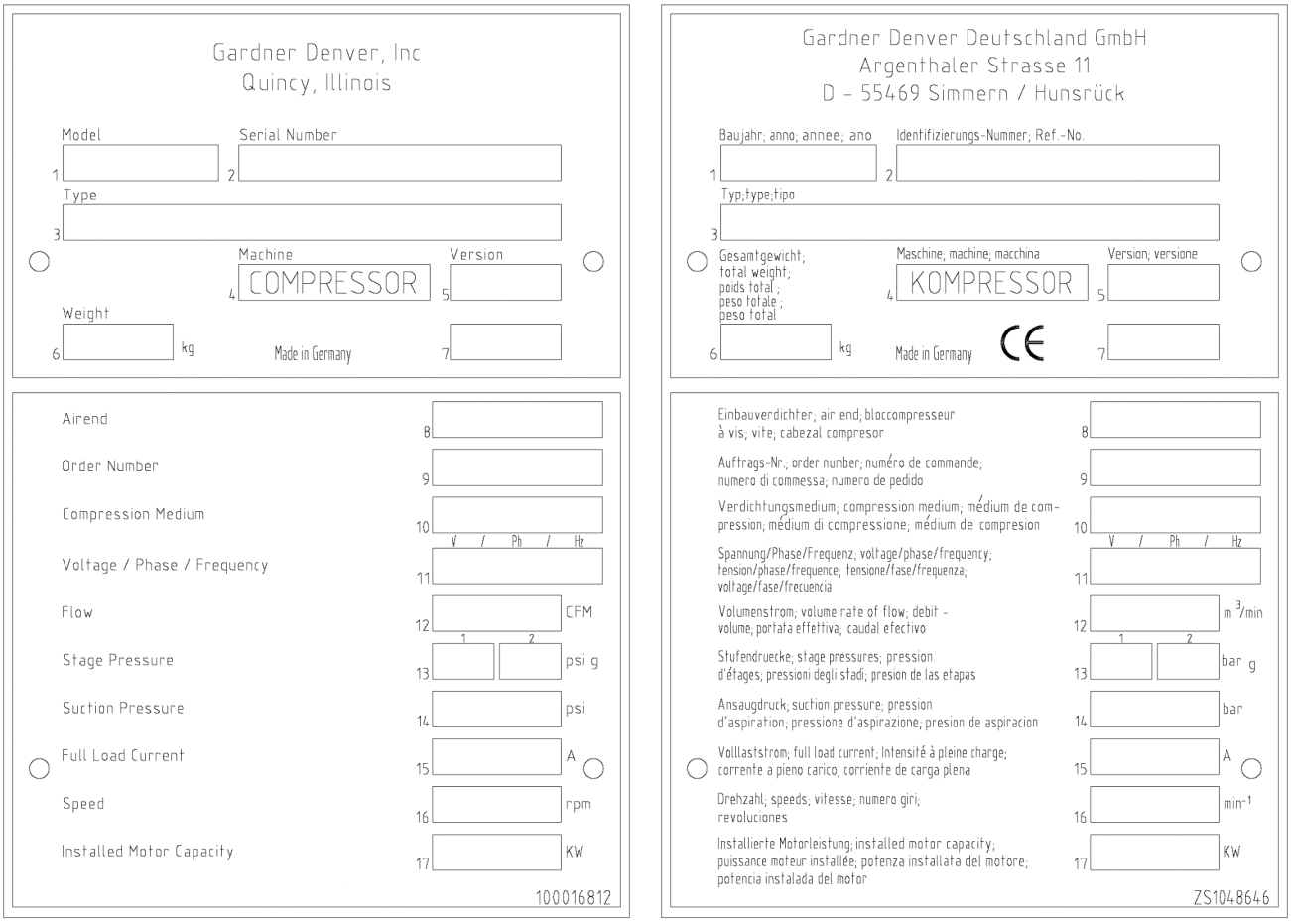


Fig. 1

Your Gardner Denver distributor

Name:	
Address: _____	
_____	
_____	
Telephone:	Fax:
Contact:	Spare Parts:
	Service:

2.1 Compressor Information

Gardner Denver screw compressors are the result of many years of research and development. This background and a high-quality standard ensure that the screw compressors we manufacture have long service lives with higher reliability and economic operation. Naturally, we also ensure that strict environmental protection requirements are met.

2.2 Intended Use

The machine/equipment is built with state of the art technology and following recognized safety regulations. However, the use of the machine can result in serious injury or death to the user or third parties, or cause damage to the machine or other valuables if:

- it is not used as intended
- it is operated by untrained personnel
- it is improperly changed or modified
- the safety instructions aren't observed.

Therefore, everyone who is involved in operating, servicing or repairing the machine must read and follow the safety rules. If necessary, this must be confirmed with a signature.

Naturally it is also necessary to follow:

- relevant accident prevention rules
- generally accepted safety rules
- country-specific regulations

The machine/equipment may only be used if it is in good working order. Always be aware of safety and potential dangers and only use the machine/equipment as directed in the user manual. In particular, faults which could affect safety must be dealt with promptly.

The machine/equipment is intended only for creating pressurized air to drive pressure equipment. Any other or extended use is not considered to be an intended use and the manufacturer/supplier shall not be held liable for any resulting damages. The user shall bear such risks alone.

Following the user manual as well as inspection and maintenance requirements are also considered to be part of proper use.

2.3 Maintenance and Care

Proper maintenance and care are necessary to ensure that the screw compressor fulfills the requirements made of it. Therefore, it is essential that the prescribed maintenance intervals are adhered to and that maintenance and upkeep are done thoroughly, especially under difficult operating conditions.

Service

If you encounter a fault or require spare parts, please contact your Gardner Denver representative. Trained expert staff will quickly and properly make repairs with genuine Gardner Denver replacement parts. Genuine Gardner Denver replacement parts are manufactured with state-of-the-art technology and guarantee reliable operation.

For important questions

Please enter the date from the nameplate of your unit into the nameplate shown (fig.1 on p. 5). With inquiries or when ordering replacement parts, please list the compressor type, the ID number, and the year of manufacture as listed on the nameplate. Providing this information helps to ensure that you will receive the right information or the necessary replacement part.

2.4 Notes

General Notes

This user manual should help you to get to know the machine/equipment and to make use of its possible approved applications. It contains important notes on how to operate the compressor in a safe, proper and economic way. Following these instructions helps to avoid dangers, minimize repair costs and downtime and increase the reliability and service life of the machine/equipment.

The user manual should be supplemented with instructions based on existing national regulations on accident prevention and environmental protection. It must always be available at the location where the machine/equipment is used. The user manual must be read and used by everyone who works on/with the machine/equipment. For example when: servicing, including setup, troubleshooting during operation, eliminating production waste, care, disposing of lubricants and additives, performing maintenance and repairs (servicing, inspection, repairs), transporting.

Aside from the user manual and respective national and local regulations for accident prevention, recognized rules for safety and proper working methods must be followed.

Warranty

You should only use the compressor after first fully learning its operation and in accordance with this manual.

Gardner Denver will not guarantee the safe operation of the machine/equipment if it is not handled in a way which corresponds to accepted use or if it is used for other applications which are not named in the manual.

You have no right to warrantee claims in case of:

- user errors
- inadequate upkeep
- the use of improper fuel
- failing to use genuine Gardner Denver replacement parts
- alterations to the equipment.

The warrantee or liability terms of Gardner Denver's Terms and Conditions are not expanded by the foregoing.

Any independent alterations to the compressor equipment/station or installing components which have not been approved by the manufacturer (e.g., separator) will result in the loss of the CE mark, or other factory certifications. As a consequence, all liability and warrantee claims against the manufacturer will be terminated.

Safety Regulations

⚠ DANGER

Always observe the safety regulations in Section 4 of the user manual.

Technical Changes

We reserve the right to make changes in the course of technical development without prior notice.

3 Table of contents

1 Warning -Prohibition - Mandatory Label Information 2

2 Preface 5

2.1 Compressor Information 6
2.2 Intended Use 6
2.3 Maintenance and Care 6
2.4 Notes 6

3 Table of contents 8

4 Safety regulations 10

4.1 General safety regulations 10
4.2 Particular dangers associated with compressed air 11
4.3 Particular dangers associated with machines 13
4.4 Particular dangers associated with water-cooled units 13
4.5 Dangers present when loading/moving machines 14
4.6 General workplace dangers 14
4.7 Dangers resulting from neglecting to perform maintenance 15
4.8 Dangers during maintenance and repairs 15
4.9 Dangers resulting from conversion work/modifications on the machine 17

5 Design and functioning 18

5.1 Design of the unit 18
5.2 Schematic diagram 19
5.3 Water circuit 20
5.4 Air circulation 20
5.5 Control 20

6 Transport and installation 22

6.1 Transport 22
6.2 Installation 23

7 Preparations for commissioning 24

7.1 Cooling air volume/minimum cross 24
7.2 Compressed-air connection 25
7.3 Electrical connection (USA/CANADA Version only) 26
7.3.1 Check setting of the fan motor protection switch 27
7.3.2 Checking the setting of the control-power transformer 27
7.4 Water supply 28
7.4.1 First-time water filling 28
7.4.2 Water supply during operation 28
7.5 Demineralisation unit 29
7.6 Extraction of water samples 29
7.7 Sound pressure level 30

8 Commissioning 31

8.1 First commissioning 31
8.2 Putting a decommissioned compressor back into operation 31
8.3 Routine commissioning 32
8.4 Commissioning after malfunction 33
8.5 Shutoff 33
8.6 Emergency stop 33

9 Storage of compressors 34

9.1 Decommissioning 34

3 Table of contents

10 Service and maintenance 35
10.1 Maintenance recommendations 35
10.2 Maintenance electric motor 35
10.3 Maintenance and inspection schedule 35
10.4 Change of air intake filter 38
10.5 Change water filter 38
10.6 Replace prefilter RO unit 39
10.7 Change the RO membrane cartridge 40
10.8 Pressure relief valve 40
10.9 Connecting terminals in the switch cabinet/control transformer setting 41
10.10 Screw connections 42
10.11 General maintenance and cleaning 42
10.12 Clean / change filter with cooling air inlet and control cabinet inlet 42
10.13 Inspection of the compressor stage 43
10.14 Inspection intervals for pressure reservoir and electrical installations 44
10.15 Checking the water level sensor 44
11 Trouble-shooting 45
12 Annex 47
12.1 Technical specifications 47
12.2 Layout plan 48

4.1 General safety regulations

Danger	Safety measure required
Working with compressors involves dangers that are not immediately apparent.	Everyone working with the machine must have first read and understood the operating manual. Don't leave this until you start work – it's too late. Please keep this operating manual handy at all times on the site of the machine / installation, in the bag provided. Pay attention to all safety and danger warnings on the machine/ installation! Deploy trained staff only. The responsibility of the personnel for operating, setting up and maintaining the machine / installation must be clearly defined. Make sure that only authorized personnel use the machine. Define who is responsible for operating the machine, and authorize him/her to ignore instructions from third parties if these instructions could compromise safety.
Symbols on the machine indicating dangers may become dirty or disappear.	Ensure that all safety and danger notices on the machine/system stay fully legible.
Faults and modifications to the machine may jeopardize safety.	In the event of malfunctions, shut down the machine/system immediately and secure it from being switched on again! Have malfunctions corrected immediately. Check the machine / installation for external damage and faults at least once per shift. Any changes noticed (including changes in operating performance) must be reported immediately to the authority or person in charge. If necessary, shut down and secure it from being switched on again.

4.2 Particular dangers associated with compressed air

Danger	Safety measure required
Compressed air is very powerful. It can be used for example to break open concrete but can also put lives at risk.	Never play about with compressed air.
Small parts propelled at high speed by compressed air can penetrate the skin or destroy an eye.	When using compressed air to clean equipment, work with extreme caution and always wear suitable eye protection. Never direct compressed air onto the skin or toward another person. Never use compressed air for cleaning clothing.
Compressed-air connections may split and put people at risk.	Only connect the compressor to the existing compressed-air system when the service temperatures and service pressures are correct and the connecting flange and connecting thread are in full working order. All connected components must be of the correct size and be suitable for the specified operating pressure and temperature (i.e. distributing pipes and pipe connections). A hose connected to an air valve must be fitted with a safety wire for operating pressures above 102 PSI; it is in fact recommended that this safety device should be used for pressures above 58 PSI. The steel wire has a diameter of 0.315" and is firmly clamped to the hose at least every 20". Both ends are fitted with cable lugs. Do not use chafed, damaged or poor-quality hoses. Only use the correct type and size of hose coupling and connection. The compressed-air line connected at the air exit of the unit must not be under strain. No force should be applied to the outlet thread or the outlet flange by, for example, pulling on the lines or by mounting additional equipment (e.g., a water separator or a pneumatic oiler, etc.)
Compressed-air lines may be breached by accident.	Compressed-air lines have to be marked distinctly according to local regulations.
Compressed-air lines get hot and expand.	Make sure that the compressed-air line from the compressor to the air network can expand as a result of heat and cannot come into contact with inflammable materials.
Loose hose ends may flog and result in injury.	Fix compressed-air lines in such a way that they do not lash if the connection is broken. Before blowing through a hose or air line, it is essential to hold the open end firmly. Before disconnecting a hose, always make sure that it is not under pressure.

Danger	Safety measure required
Compression results in high temperatures.	The system should be set up such that hazardous mixtures (inflammable solvent vapors etc. but also dusts and other dangerous or toxic materials) cannot be drawn in. The same applies to flying sparks. Never use the machine in environments where the possibility cannot be ruled out that inflammable or toxic vapors may be taken in. The installation is to be set up in such a way that it is adequately accessible and that the necessary cooling is ensured. Never block the admission of air. Compressor units must never be operated in areas subject to explosion hazards! (Exception: Special units with the corresponding technical modifications)
There is strong suction at the air inlet.	The air intake is to be designed in such a way that no loose clothing can be drawn in.
There is a risk of injury, e.g., from getting stuck or being drawn in.	Personnel must not have long, loose hair, or wear loose clothing or jewelry, including rings, due to risk of injury through catching. Personal protective equipment should be worn if necessary.
Connected compressed air tools may start up unexpectedly when switching on.	Before switching on the machine / installation, or starting it up, make sure that nobody can be injured by the machine / installation as it starts up.
Compressed air may contain substances that may damage your health if inhaled.	The compressed air produced by these compressors must not be used as breathable air, unless it has been processed specially for such an application in accordance with the “Safety requirements for breathable air.” When breathing apparatus with cartridges is used, make sure that the correct cartridge has been inserted and that its service life has not expired.
The pressure relief valves in the system only guarantee the pressure relief for the compressor unit.	The pressure devices/systems connected to the compressor must be secured allowing for the weakest pressurized component (pressure relief valve or similar).
As a rule:	If several compressors are arranged in a system, manually operated valves have to be installed so that each machine may be shut off individually. For the purpose of shutting off pressurized systems, you should never rely on the effectiveness of return valves alone. All pressure tanks located outside the unit with an approved operating pressure higher than atmospheric pressure and fitted with two or more pressure feed lines must be equipped with an additional safety device to automatically prevent the approved operating pressure from being exceeded by more than 10%. Never operate the system at temperatures and/or pressures below or above the values indicated in the technical data sheet.

4.3 Particular dangers associated with machines

Danger	Safety measure required
Risk of electric shock.	Electrical connections must meet the local regulations. Power units must be connected to earth and protected from short-circuits by means of fuses.
Insufficient power quality could have a strong effect on health & safety and may constitute a risk to life and limb of the user or third parties.	Always check a correct power supply to the compressor before commissioning. The voltage supply has to fulfill the requirements of EN60204-1/IEC60204-1 for such kind of industrial equipment.
Remote-controlled units may start up unexpectedly.	If a remote control is used, the system must carry a clearly visible sign with the following note: Attention! This installation is operated by remote control and can start up without prior warning! As an additional safety measure, persons who start remotely controlled systems have to take sufficient safety precautions in order to ensure that nobody is checking the system or working on it. For this, a label with a corresponding warning notice has to be attached to the remote control equipment.
Noise, even when it is not very loud, can make us nervous and irritated, and after a longer period of time our nervous system can suffer serious damage.	We recommend a separate machine room in order to keep the noise of the machine away from the workshop. Where necessary, wear the personal hearing protection. In order to consider all noise-relevant parameters and to adequately protect the health of the operator, the European Regulation 2003/10/EC must be satisfied completely by the user. In states outside the European Union, the respective noise protection directives must be taken into consideration. Shielding and doors must be closed during operation so that the efficiency of the sound insulating is not reduced.

4.4 Particular dangers associated with water-cooled units

Danger	Safety measure required
If open cooling towers are used in the cooling water circuit, it is possible for legionella (Legionella pneumophila) and other bacteria to grow and spread.	The growth and spread of bacteria must be prevented by corresponding service and water treatment methods.

4.5 Dangers present when loading/moving machines

Danger	Safety measure required
Loose parts may fall off when lifting.	All loose parts must first be removed or secured; parts fitted so that they can turn like doors etc. must be secured and made immobile. Parts to be removed for transport purposes must be carefully refitted and fixed again before putting the machine / installation back into operation.
The compressor may fall if mistakes are made when lifting.	Only use lifting tackle approved for the weight in question. Observe the operating manual for the lifting tackle. When heavy loads are being conveyed by means of hoisting gear, it is imperative to keep well clear of the load in order to avoid accidents. The person giving the instructions must be within sight or voice contact with the operator.
Safety components may be damaged if lifted incorrectly.	Machines may only be hoisted correctly using hoisting gear in accordance with the information in the operating manual (lifting spots for heavy-lift facilities etc.) To avoid damage to the system or external installations, the compressed-air connection, cooling water connection, condensation drain and electrical connection should be isolated from external lines and hoses. The system must be set up on a level surface with full contact between its base frame and the supporting surface.

4.6 General workplace dangers

Danger	Safety measure required
This manual only describes how to work safely with the compressor itself. But other dangers will arise during work.	Please note and pass on general statutory and other binding regulations that may supplement the operating manual for the prevention of accidents and the protection of the environment. Such obligations may be for example the handling of hazardous materials, or the provision and/or wearing of personal protective equipment, or traffic regulations. Instructions, including supervisory responsibility and duty of notification for taking account of special in-plant factors, for example regarding work organization, sequences of operations, personnel assigned to certain tasks, are to be added to the operating manual. Before starting work, make yourself familiar with the working environment at the installation site. The location and operation of fire extinguishers must be made known. Observe the instructions concerning fire alarm and fire fighting. Set up the machine in such a way that no inlets, outlets or gates are blocked. When handling chemical substances, observe the safety regulations applicable for the product. Caution when handling process materials (risk of burning / scalding).

4.7 Dangers resulting from neglecting to perform maintenance

Danger	Safety measure required
Components of importance to safety wear over time.	Observe the setting, maintenance, and inspection work and intervals stipulated in the operating manual, including information about the replacement of parts / partial sections. This work may only be carried out by specialists. Observe the intervals stipulated or those given in the operating manual for routine checks and inspections. Verify regularly that pressure relief valves and other pressure-relief devices are in perfect condition and are not blocked, for example by dirt or paint Check regularly that the safety mechanisms are fully functional. Have malfunctions corrected immediately.
Lines perish.	Check regularly that all hoses and/or pipes within the system are in good condition, firmly fixed and do not chafe.
Spurting water can result in injuries.	Check all lines, hoses, and bolted connections regularly for leaks and visible damage. Repair damage immediately and always arrange for damaged parts to be replaced!
Risk of electric shock.	Have the electrical equipment on a machine/system checked regularly. Have defects like loose connections or charred cables rectified immediately. Use only original fuses with the specified current rating. In the event of faults with the electrical power supply, switch the machine/system off immediately, and secure it from being switched on again!
In the event of faulty sensors, the system can be led into a dangerous state of operation.	Check the accuracy of pressure and temperature indicators at regular intervals. If the admissible tolerance limits have been exceeded, these devices have to be replaced.

4.8 Dangers during maintenance and repairs

Danger	Safety measure required
During maintenance and repairs, parts that may be pressurized must be removed. If you maintain the compressor and have not been trained by Gardner Denver, you will put yourself and others at risk.	The compressor can only be maintained by specially trained technicians. Contact your Gardner Denver agent.
Incorrectly configured spare parts may jeopardize safety, e.g., tear when loaded.	Spare parts must meet the technical requirements laid down by the manufacturer. This is always guaranteed when original spare parts are used.

Danger	Safety measure required
Risk of electric shock.	Work on the electrical systems of the machine / installation may only be carried out by a trained electrician in accordance with electrical regulations. The system must be secured from being switched on. Seal off the main switch and remove the key and/or attach a warning sign to the main switch. Danger of electric shock from loaded condensers! Always first disconnect the system from the power supply and wait another 10 minutes before touching the electrical components. The power condensers require this time in order to discharge!
The machine may start up unexpectedly.	Only carry out maintenance and repair work when the system is not in operation and the power supply disconnected. Ensure that the power unit cannot be switched on inadvertently. The system must be secured from being switched on. Seal off the main switch and remove the key and/or attach a warning sign to the main switch.
Risk of injury from pressurized or moving parts.	Only carry out inspection, maintenance, and repair work when the screw compressor system is at a standstill and is not under pressure. The system must be secured from being switched on. Before removing or opening pressurized components, positively isolate any source of pressure and depressurize the entire system.
During the course of maintenance and repairs, parts can be damaged which are important for safety.	Never weld any pressure reservoir or change it in any way. If work which produces heat, flames, or sparks has to be carried out on a machine, the adjacent components have to be protected by means of non-inflammable material. Motor, air filter, electrical components, and regulating equipment have to protected from the ingress of humidity, e.g., when cleaning the system by means of a steam jet. Under no circumstances must the sound-proofing material be removed or modified. Never use etching solvents which could attack the materials used. Before cleaning the machine with water or steam jet (high-pressure cleaner) or other cleaning agents, cover/mask all openings which have to be protected from the ingress of water, steam or detergents for safety and/or functional reasons, in particular electric motors and switch cabinets. After cleaning, remove the covers/masking completely.
Modifications to the machine impair safety.	After completing repair work, always check to see whether any tools, loose parts or cloths have been left in or on the machine, driving engine or driving equipment. After the work has been completed, replace any protective devices that have been removed. Operation without protective devices is not permissible. Always re-tighten screwed connections which were loosened for maintenance and repair work. Machines performing rotating movements have to be cycled several times in order to ensure that there are no mechanical faults in the machine or the drive member. Before releasing the power unit for operation after maintenance or overhaul, check that the operating pressures, temperatures and time settings are correct and that the regulating and shutdown equipment function properly.

4.9 Dangers resulting from conversion work/modifications on the machine

Danger	Safety measure required
Genuine parts are designed especially for the machine. Modifications may interfere with safety equipment or give rise to new dangers for which protection is not provided.	No alterations, additions, or modifications to the machine may be carried out without the approval of the manufacturer. Unauthorized modifications to the machine are prohibited for reasons of safety. Original parts are specially designed for our machines. We must explicitly point out that parts and special accessories not supplied by us are not approved by us. Installing or using such products may thus adversely affect active and/or passive safety. The manufacturer accepts no liability whatsoever for damage resulting from the use of non-original parts or special accessories. This also applies to the installation and adjustment of safety devices and valves as well as to welding on bearing and pressurized parts
If protective equipment is not functioning, operating the system may put lives at risk.	Only operate the machine when all protective devices, shutdown devices, sound-insulating equipment and extraction equipment are in place and working. Safety devices, protective covers, or insulations mounted on the system must not be removed or modified in any way.

5.1 Design of the unit

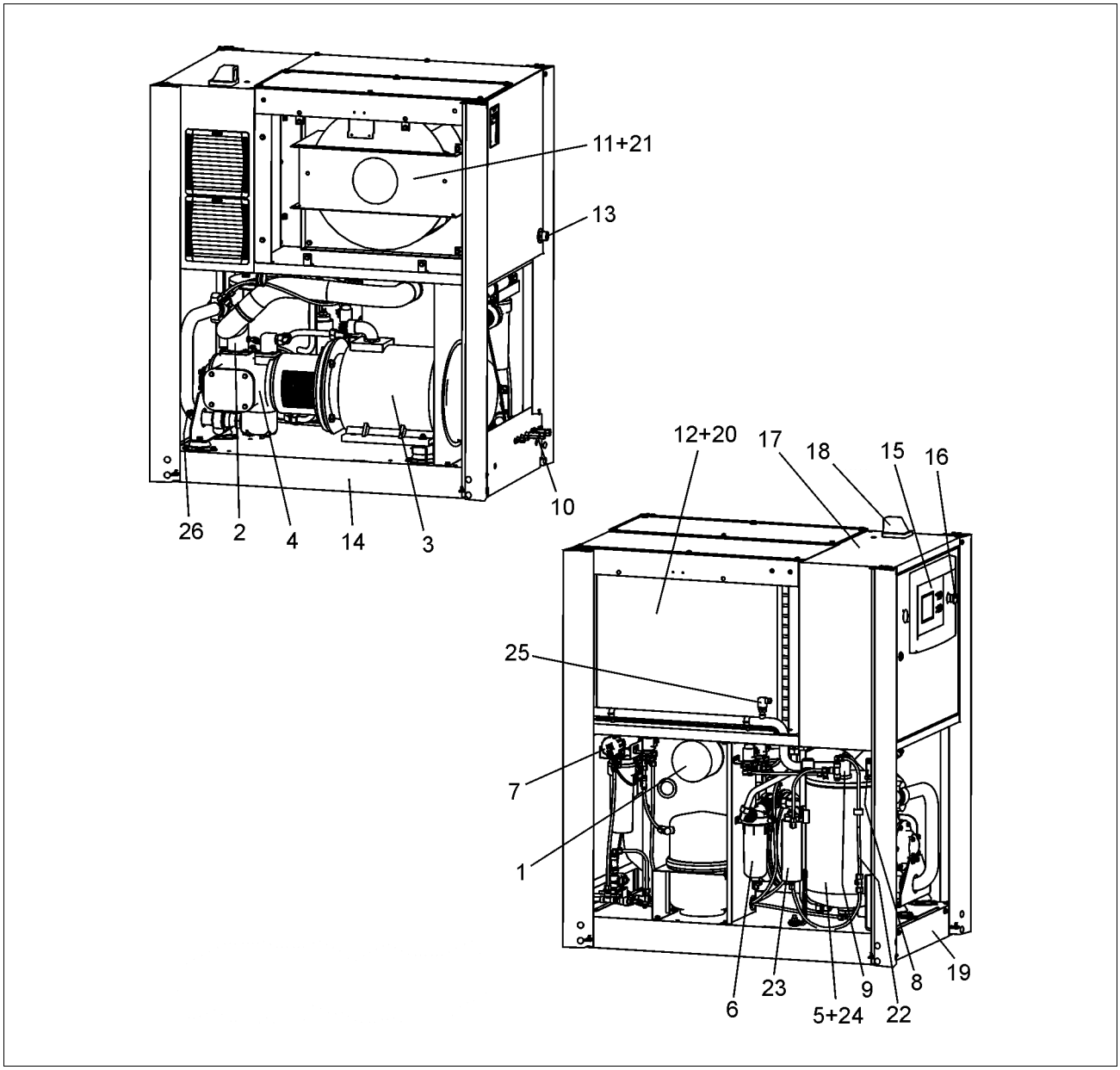


Fig. 2

1 Intake filter
2 Suction inlet
3 Electric motor
4 Screw compressor
5 Pressure reservoir
6 Water filter
7 RO-Unit
8 Pressure relief valve
9 Pressure holding valve
10 Water connection
11 Cooling air ventilator
12 Cooling air inlet filter mat
13 Compressed air outlet
14 Base frame
15 Control keypad
16 EMERGENCY OFF push-button
17 Control cabinet
18 Supply cable gland
19 Opening for lifting gear
20 Water cooler
22 Water level indicator
23 Water level sensor
24 Network pressure sensor
25 Final compression pressure sensor
26 Final compression temperature sensor

5.2 Schematic diagram

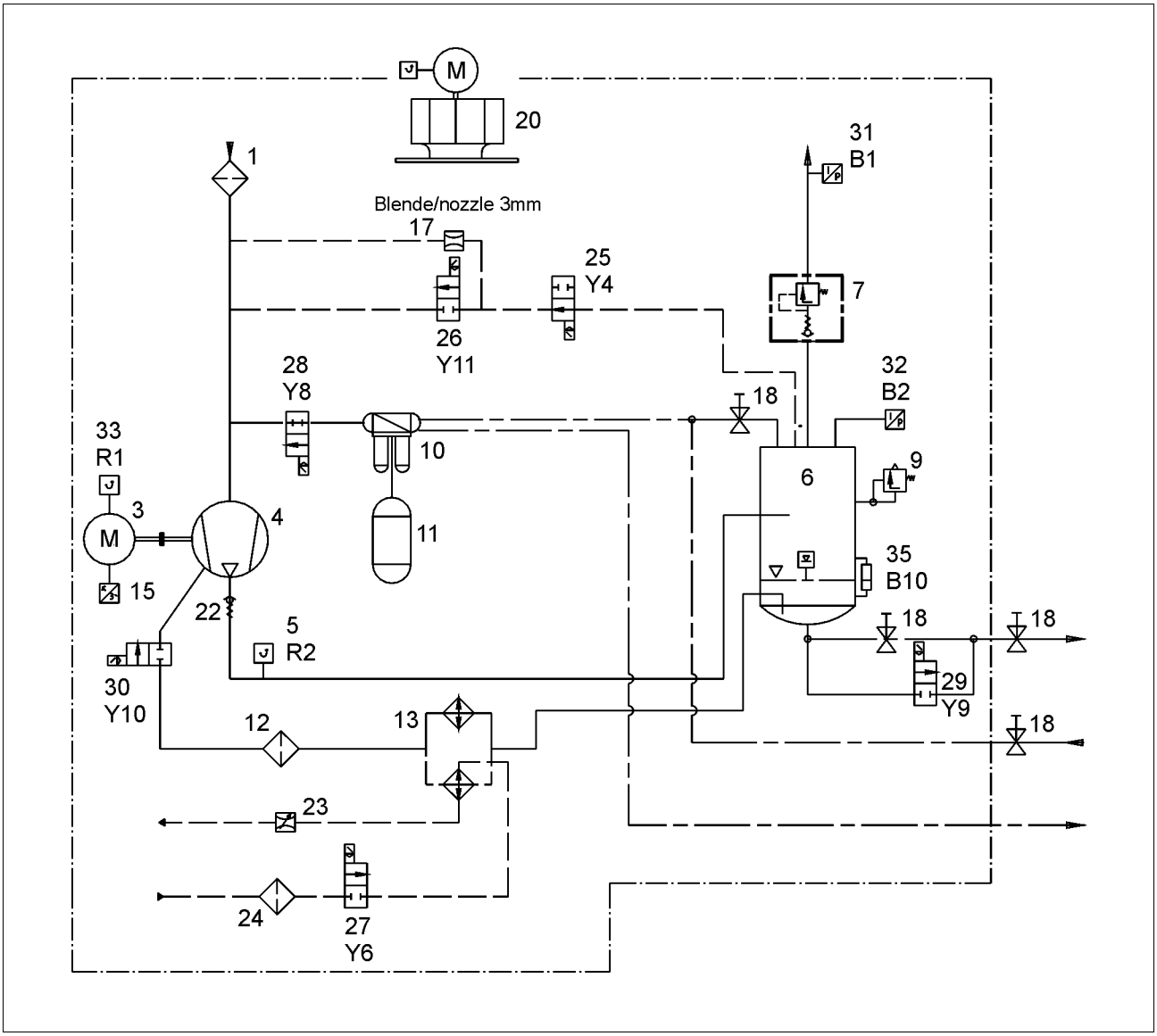


Fig. 3

1. Intake filter
2. Intake controller
3. Electric motor
4. Compressor block
5. Temperature sensor (R2)
6. Pressure reservoir
7. Pressure holding valve
9. Pressure relief valve
10. Osmosis unit
11. Water reservoir
12. Water filter
13. Water cooler
15. Inverter
15. Blow-off valve
16. Pressure holding valve (residual pressure)
17. Throttle
18. Manual valve
20. Ventilator
22. Non-return valve
23. Throttle
24. Mud flap
25. 2/2-directional solenoid valve (discharge Y4)
26. 2/2-directional solenoid valve (by-pass Y11)
27. 2/2-directional solenoid valve (water stop Y6)
28. 2/2-directional solenoid valve (water in Y8)
29. 2/2-directional solenoid valve (water out Y9)
30. 2/2-directional solenoid valve (water stop Y10)
31. Network pressure sensor (B1)
32. Final compression pressure sensor (B2)
33. Motor temperature (R1)
35. Water level sensor (B10)

5.3 Water circuit

The water flows from the pressure tank (-6- Fig. 3) through the water cooler (-13- Fig. 3) and water filter (-12- Fig. 3) and is then injected into the screw compressor (-4- Fig. 3).

The entire water circuit is based on a differential pressure in the system. At a vessel pressure of, for example, 145 PSI, the water is injected into the screw compressor at around 116 PSI.

The intake controller is closed when the screw compressor is idling. An idling pressure (residual pressure) of approx. 50 PSI is maintained in the vessel by means of a bypass bore in the intake controller. There is thus always sufficient pressure at the injection point to assure supply of the necessary quantity of water for injection.

5.4 Air circulation

The air drawn in passes via intake filter (-1- Fig. 3) into the screw compressor (-4- Fig. 3). The air is cooled by the injected water during the compression process and the compressed-air/water mixture flows into the vessel (-6- Fig. 3). The water is largely separated from the compressed air in this process and passes via the pressure maintenance and non-return valve (-7- Fig. 3) into the supply system.

5.5 Control

(Please also see the operating instructions for the compressor control GD Pilot TS)

(see Fig. 3)

System downtime

- Solenoid valve (- 25 -(Y4)) is de-energized (open) when the system is shut down, solenoid valve (-26- (Y11)) is also de-energized (closed).
- The pressure reservoir (- 6 -) is depressurized to atmospheric pressure via the solenoid valve (-25-(Y4)) and the orifice (-17-).

Starting up the system

- The drive motor (- 3 -) starts up.
- The compressor draws air in via the air filter; a certain quantity is blown off again into the intake zone via the solenoid valves (-25-(Y4)) and (-26-(Y11)).
- This way, constant pressure of approx. 58 to 65 PSI is maintained in the pressure tank (- 6 -), as the pressure holding non-return valve (-7-) still remains closed at this pressure level.
- The water supply of the screw compressor (- 4 -) is provided by the drop in pressure between the pressure tank (-6-) and the injection site in the screw compressor.
- If pressure in the load system falls below the minimum pressure programmed on the control system, the solenoid valve (-25-(Y4)) is energized (closed). Pressure then continues to build up in the pressure reservoir (-6-).
- At a tank pressure of ca. 65 PSI, the pressure holding non-return valve (-7-) opens.
- The compressed air transportation into the mains has begun.

Stopping the system:

- After pressing the OFF button on the control panel of the compressor control system GD Pilot TS, the magnet valve (- 25 - (Y4) is de-energized (opened) and the solenoid valve (-26-(Y11)) is energized (opened) when the drive motor is running.
- The pressure reservoir (-6-) is depressurized to a constant pressure of 58 to 65 PSI.
- The drive motor (-3-) reduces its number of revs to the set minimum value and comes to a standstill after 30 seconds have passed.
- Once the drive motor has stopped, solenoid valve (-26-(Y11)) is de-energized (closed) and the remaining pressure in the reservoir is discharged via the orifice (-17-).

Speed control operation

Speed is controlled using a software-implemented PI regulator that adapts the RPMs according to the need for compressed air.

The controller attempts to maintain the mains pressure between the values set in the control for max. and min. mains pressure (target pressure).

Automatic operation

- If the mains pressure achieves the preset maximum value, then the electric motor (-3-) will have its speed lowered in order to allow for the delivery amount to adapt to the actual need for compressed air.
- If the motor has reached minimum speed and the load-system pressure continues to rise, solenoid valve (-25-(Y4)) is de-energized (opened) and solenoid valve (-26-(Y11)) continues energized (open). Reservoir pressure is reduced to approx. 58 to 65 PSI and the pressure-maintenance valve (-7-) closes.

- This way, no more compressed air will be supplied to the mains.
- If the mains pressure does not drop to the target value within the programmed follow-up time, then the system will shut down.
- If the target value is achieved before the expiration of the programmed motor follow-up time, then the magnet valve will again be energized (-25-(Y4)).
- The system will then go into load runs.

6.1 Transport

⚠ DANGER

The compressor or parts of it may fall if mistakes are made when lifting, and this will put your life at risk. Safety devices my be damaged if lifted incorrectliy.

- **Always observe the safety notes in Section 4.5 of the user manual.**
- **Never lift the compressor by or tie onto its enclosure.**
- **A suitable fork lift which complies with local safety regulations must be used when lifting the compressor.**
- **The fork length of the fork lift must correspond to the unit width (see Section 12.2).**
- **Keep the distance between the forks (see Fig. 4) and their length in mind when transporting the compressor.**
- **All loose parts or parts which can swing freely must be safely secured before the unit can be lifted.**
- **It is strictly prohibited to stand in the danger zone of a lifted load.**
- **Ensure that the transport load approach is performed properly (according to the user manual of the lifting device).**

NOTICE

The doors and the cover must be removed before lifting from the control side.

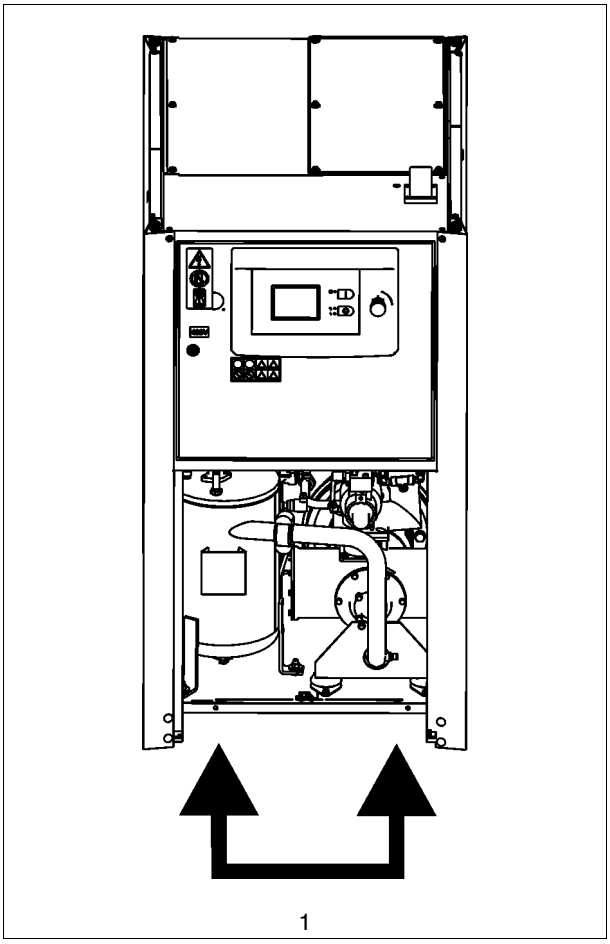


Fig. 4

Weights

The values listed below are approximate values, they refer to a screw compressor unit including water fill:

EnviroAire VS 15: 1515 lbs
EnviroAire VS 22: 1556 lbs

6.2 Installation

⚠ DANGER

Always observe the safety notes in Section 4 of the user manual.

Pay attention to the weight bearing capacity of the ground.

⚠ DANGER

Risk of explosion - The compressor intake should be set up such that hazardous mixtures (solvent vapors etc.) cannot be sucked in. The same applies to flying sparks.

⚠ CAUTION

Burn Hazard - Pipework or other parts with a surface temperature of over 70 °C/158 °F must be appropriately protected from being touched and labeled.

NOTICE

The operator must always provide sufficient ventilation and exhaust for the compressor station.

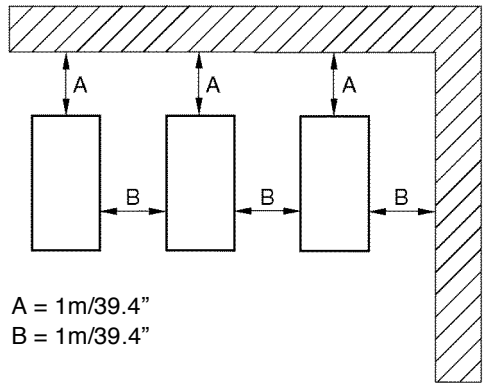


Fig. 5

The screw compressor unit has to be levelled. The system may not be run while on the transport pallet.

A minimum distance from walls, other machines, etc. should be maintained so that there is sufficient clearance for maintenance and repair work (Fig. 5).

During operation of the screw compressor unit, heat is generated by the electric motor and the compression process. The screw compressor radiates a part of this heat into the surroundings.

Proper ventilation has a considerable effect on the service life and the performance of a compressor.

7.1 Cooling air volume/minimum cross

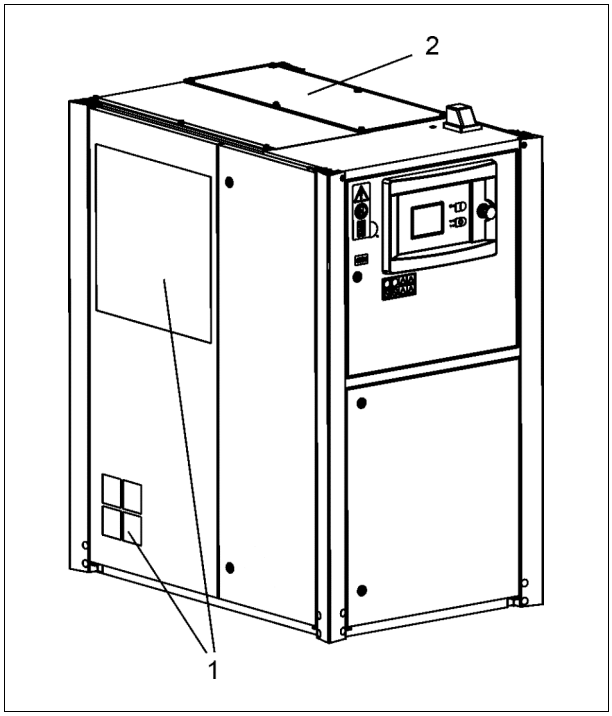


Fig. 6

1 Cooling air intake
2 Cooling air outlet

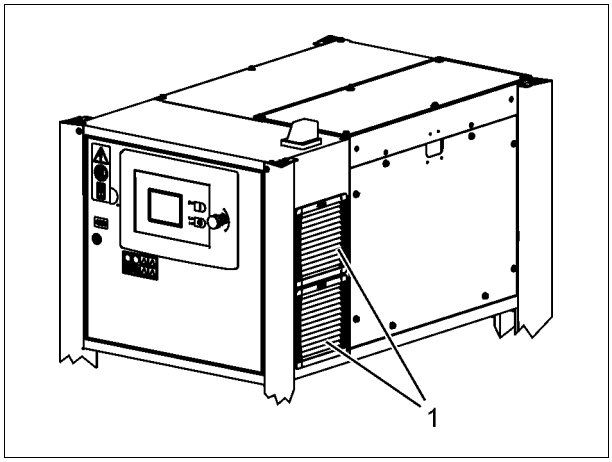


Fig. 7

1 Additional cooling air intake of control cabinet

The cooling air volume required by these screw compressors is as follows:

EnviroAire (VS) 15	approx. 3125 cfm
EnviroAire (VS) 22	approx. 3125 cfm

If conditions are not favorable, we recommend the installation of venting ducts. However, the velocity of the cooling air should not exceed 17ft/sec. We recommend a minimum duct cross-section of approx. 6 ft^2.

NOTICE

The stated minimum cross-section refers to a maximum duct length of 16.4 ft and a maximum of one bend. In the event of differing values (over 16.4 ft, more than one bend, filter cartridges, screens, etc.), please contact your technical adviser.

Gardner Denver screw compressors are rated for ambient temperatures and cooling temperatures of 35.6 °F to 104 °F.

In the case of temperatures other than the above limiting values, please consult your technical adviser.

In order to ensure a good heat dissipation, auxiliary fans should be rated to process approximately 15 to 20% more air volume than the total cooling air quantity required by the compressors installed in the compressed air station.

The figures below show the recommended ventilation sections arrangement:

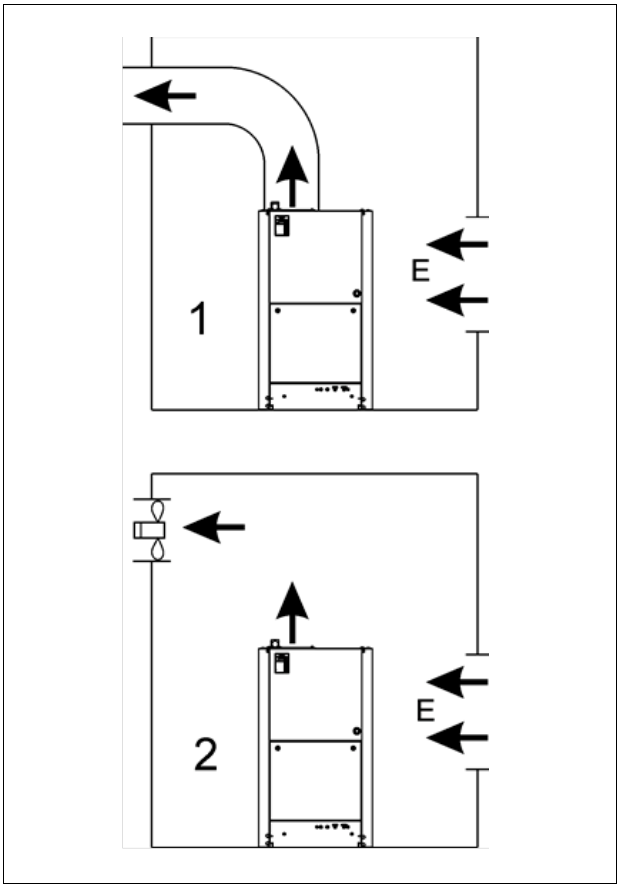


Fig. 8

7.2 Compressed-air connection

⚠ WARNING

A defective connection to the compressed-air system may jeopardize safe operation of the compressed-air system.

When connecting the compressor outlet to the customer's existing compressed-air system, check that the necessary operating temperatures, operating pressures as well as the necessary connecting flange or connecting thread are appropriate and in perfect working order.

For connections with hoses, take steps so that if an end breaks free it won't "whip" around dangerously.

NOTICE

After-coolers, separators, collecting reservoirs and the compressed-air lines must be equipped with drain facilities at their lowest points to drain collected liquids. These facilities have to be fitted to allow the observance of the draining of such liquids.

Hand-operated drain facilities have to be actuated in accordance with the operating instructions.

Automatic drain facilities have to be checked for proper function at regular intervals. When draining condensates into a collecting line, which also collects the condensate from other machines, make sure that the collecting line is free from back pressure at all lines.

When draining condensate, observe the corresponding regulations for waste water disposal.

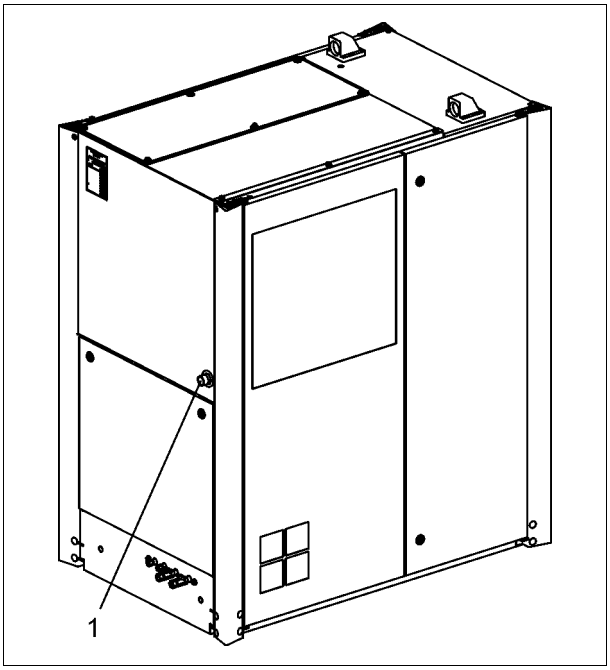


Fig. 9

1 Compressed-air connection

The compressed-air line system is connected at the compressed air supply of the screw compressor (-1- Fig. 9).

For this you should use a flexible connection (e.g., compressed air hose, compensator).

USA/CANADA-Version: 1 " NPT

7.3 Electrical connection (USA/CANADA Version only)

⚠ DANGER

Risk of strong damages and fire on the electric power components.

- **The power supply to the compressor side has to be fitted for industrial equipment and fulfilling the requirements of NFPA 79. Any kind of operation outside of the stated limits of NFPA 79 is inadmissible.**
- **The electrical connection should be made by a qualified electrician.**

⚠ WARNING

If local regulations are stricter than the values given below, observe the stricter regulations.

⚠ WARNING

If the electrical connection is made to a non-earthed three-phase system (IT network), please see the corresponding notes in the included frequency converter documentation.

If a residual current device (RCD) is used to monitor the earthing connection in the system for earth faults, to prevent interruptions only Type B devices (adjustable trip setting and delay) may be used.

To establish an electrical connection, proceed as follows:

Route the supply cable through the cable gland (-1- Fig. 10) on the control cabinet and tighten screws.

Connect the supply line to the connecting terminals as shown in the circuit diagram.

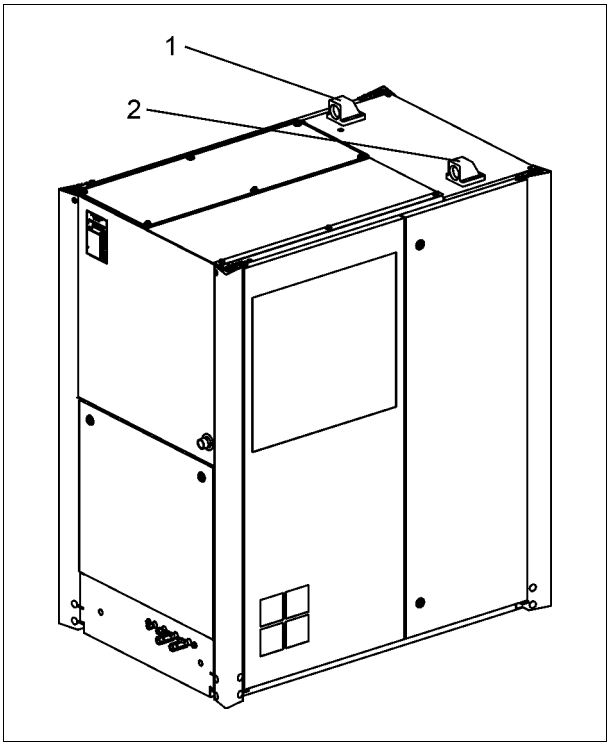


Fig. 10

1 Electrical connection RS-version
2 Electrical connection fix speed

Recommended supply cable cross-sections and fuses 60 Hz

Compressor type	Supply voltage **[V]**	Installed nominal motor power **[hp]**	Fuse protection (slow-blow fuse) **[AgL]**	Line cross section at 30 °C/86 °F
EnviroAire VS 15	460	20	40	AWG 6
EnviroAire VS 22	460	30	50	AWG 8

Notes on the table:

Ultimately the type of cable you use, its length and installation conditions (temperature, accumulation) are outside the scope of our knowledge. Therefore the above table only offers guidelines.

The gauges named in the table correspond to those in UL508A. (Rubber sheathed cable at 86 °F and max. 55 yd cable length)

* If conditions differ (cable length, temperature and accumulation) the gauge must be determined according to UL508A. The cable type must also be taken into consideration.

7.3.1 Check setting of the fan motor protection switch

Check the setting of the motor protection switch in accordance with the enclosed circuit diagram for the compressor.

Set the protection switch to the value stated in the table corresponding to the mains voltage and frequency (see circuit diagram).

7.3.2 Checking the setting of the control-power transformer

⚠ DANGER

High Voltage – Hazard of Shock, Burn, or Death.

- **The electrical connection should be made by a qualified electrician.**
- **Only perform checks and carry out work on the screw compressor when the unit is out of operation, depressurized, and secured from being switched on again!**

NOTICE

Incorrectly setting the control transformer poses a risk to the trouble-free operating of the system.

Checking the setting of the control transformer is part of commissioning and part of regular inspection/maintenance because the supply voltage can change.

The correct setting should be checked by measuring the control transformer's output voltage while the system is running with a load.

The control-power transformer is factory-preset to the rated voltage. However, practice has shown that the actual supply voltage often differs from this value.

Before first commissioning, set the measured supply voltage on the control transformer. Fig. 11 illustrates an example.

Following first commissioning, the setting of the control transformer must be inspected while operating under load and corrected where necessary. (see Chapter 10.9).

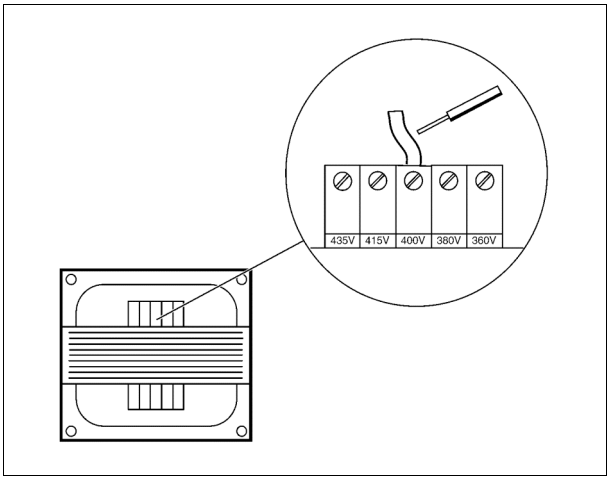


Fig. 11

7.4 Water supply

7.4.1 First-time water filling

NOTICE

For first-time filling, only water with the following threshold limits should be used:

Conductivity	5 - 150 μS / cm
pH value	6 - 8
Overall hardness (CaCO3)	< 3° dH
Iron (Fe)	< 0.3 mg / L
Chloride (Cl-)	< 50 mg / L
Sulphate (SO4-2)	< 50 mg / L
Nitrate (NO3-)	< 0.3 mg / L
Ammonium (NH4+)	< 0.3 mg / L

The Gardner Denver water analysis set can be used to determine the water quality.

If deviant values are present, we recommend use of the demineralisation unit from Gardner Denver for first-time filling.

For a more detailed description, see Section 7.5

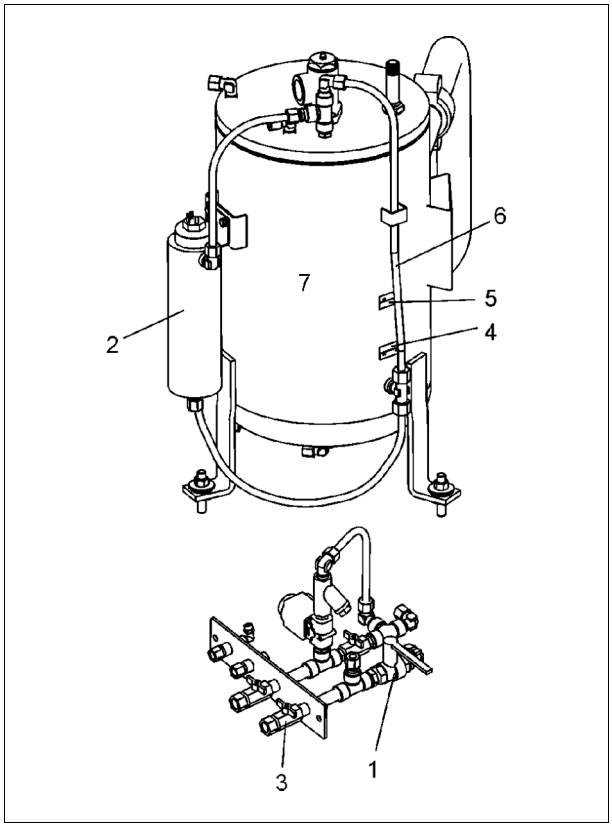


Fig. 12

1 Manual valve – water in
2 Water level sensor
3 Water supply
4 Fill level marking "Below"
5 Fill level marking "Above"
6 Water level indicator
7 Pressure tank

Perform first-time water filling as follows:

- Open manual valve – water in (-1- Fig. 12). Water flows through the inlet (-3- Fig. 12) into the pressure tank (-7- Fig. 12).
- Fill up to the fill level marking "Above" (-5- Fig. 12).
- Close manual valve – water in (-1- Fig. 12). Start system and monitor the water level.
- Once the fill level marking "Below" (-4- Fig. 12) has been reached, turn off system via the emergency off.
- Open manual valve – water in (-1- Fig. 12).
- Fill with water up to the fill level marking "Above" (-5- Fig. 12).
- Close manual valve – water in. Start system and monitor the water level.
- Once the fill level marking "Below" (-4- Fig. 12) has been reached, turn off system via the emergency off.
- Repeat this filling process until the water level has balanced out between the fill level markings.

7.4.2 Water supply during operation

NOTICE

The water-supply quality must not exceed the following limits for continuous operation:

Conductivity	< 2000 μS/cm
pH-Value	6,5 - 8
Overall hardness (CaCO3)	< 20 °dH
Iron (Fe)	< 0,3 mg / L
Chloride (Cl-)	< 250 mg / L
Sulphate (SO4-2)	< 240 mg / L
Nitrate (NO3-)	< 50 mg / L
Ammonium (NH4+)	< 0,5 mg / L

NOTICE

For long-term operation, the water quality of the internal circulation water (water injection) must not exceed the following limit values:

Conductivity	50 - 150 μS / cm
pH value	6 - 8
Overall hardness (CaCO3)	< 3° dH
Iron (Fe)	< 0.3 mg / L
Chloride (Cl-)	< 50 mg / L
Sulphate (SO4-2)	< 50 mg / L
Nitrate (NO3-)	< 0.3 mg / L
Ammonium (NH4+)	< 0.3 mg / L

7.5 Demineralisation unit

The following points are to be considered when using the demineralisation unit:

1) To be used only for the first filling of the compressor.
2) The quantity of water is reduced to approx. 0.26USgal/minute due to the integrated flow limiter.
3) Complete filling can take up to 90 minutes.
4) The cartridge is designed for a maximum water quantity of 11.9 USgal.
5) After initial filling the water supply to the compressor should be taken directly from the mains.

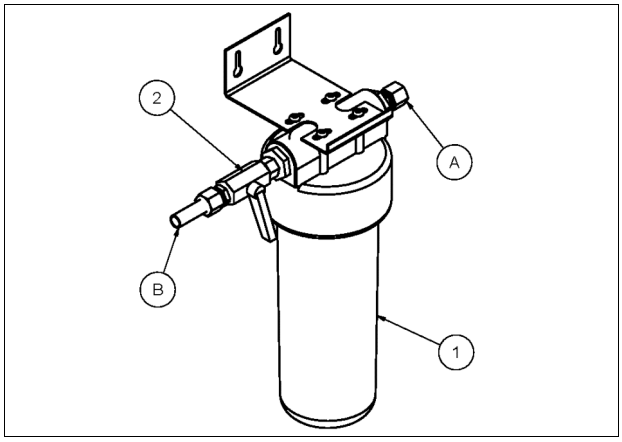


Fig. 13

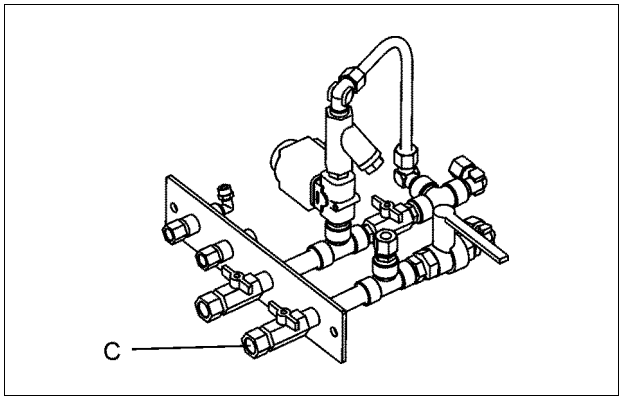


Fig. 14

Undertake the initial filling with the demineralisation unit as follows:

- Apply water connections for the inflow (-A - Fig. 13) and the connection between the outflow (-B- Fig. 13) with the water inflow from the compressor (-C- Fig. 14)
- Open stopcock for filling process (-2- Fig. 13). If necessary open the vent on the filter head of the demineralisation unit. The water level in the filter rises.
- Open manually operated valve – water on (-1- Fig. 12). The water flows via the inflow (-C- Fig. 14) into the pressure reservoir (-7- Fig. 12).
- Fill water up to the fill level marking "Above" (-5- Fig. 12). This process may take up to 90 minutes.
- Close manually operated valve – water on (-1- Fig. 12); start the system and observe the water level.
- When the fill level marking "Below" (-4- Fig. 12) is reached, switch system off via the emergency stop.
- Open manually operated valve – water on (-1- Fig. 12).
- Fill water up to the fill level marking "Above" (-5- Fig. 12) again.
- Close manually operated valve – water on. Start system and observe water level.
- When the fill level marking "Below" (-4- Fig. 12) is reached, switch system off via the emergency stop.
- Continue this filling procedure until the water level has balanced out between the fill level markings.
- After filling, remove the connection between outflow (-B- Fig. 13) and the water inflow (-C- Fig. 14) on the compressor.
- Connect water supply directly to the mains.

7.6 Extraction of water samples

⚠ WARNING

Air/water under pressure may cause severe personal injury.

- **Shut down compressor, relieve system of all pressure, disconnect, lockout and tagout power supply to the compressor package before extracting water samples.**

- Open the ball valve at the extraction site (-2- Fig. 17) and to flush the extraction site, allow around 0.026 USgal to drain into an appropriate reservoir.
- Fill the reservoir provided (water analysis set) with the sample quantity (approx. 0.08 USgal).
- After extracting the sample, close the ball valve.
- Check the water level on the water level indicator (-6- Fig. 12) and add water if necessary (see Chapter 7.4 Water supply).

7.7 Sound pressure level

Sound pressure levels are measured in dB(A) according to PN8NTC 2.2 under a 70% load at an 11-yard distance (tolerance: ± 3 dB(A)):

air-cooled unit: 70 dB(A)

Subject to technical revision.

8.1 First commissioning

⚠ DANGER

Rotating parts may lead to injuries, e.g., cutting of finger or hand.

- **Always operate system with the casing closed.**

⚠ CAUTION

Damages during transport may impair safety!

- **Before commissioning, every screw compressor should be checked again for damage and should be watched during the first hour of operation.**

NOTICE

The screw compressor is provided without cooling water and may only be started after it has properly been filled with water (also see Chapter 7.4).

When storing the screw compressor system or in the event of a longer period of downtime, if there is the risk of frost (t < 33.8°F) the cooling water should be completely discharged (compressor stage, coolers, system containers, water filters, storage containers, RO unit, lines, valves).

The screw compressor unit is completely factory-assembled. It can be directly connected to the compressed air mains by means of a flexible connection.

First commissioning is carried out as follows:

- Remove transport guards, if fitted.
- Check the water level in the pressure reservoir (see also chapter 7.4) (Fig. 12)
- Check settings of the fan motor protection switch (see Chapter 7.3.1)
- Check the setting of the control-power transformer (see also chapter 7.3.2).
- Check and re-tighten all connecting terminals of the electrical control.
- Open isolator valves between the screw compressor, reservoir and pipe.
- Turn on the main power supply switch.
- After the power supply was switched on, all LEDs on the compressor control GD Pilot TS light up for a display test. The fault shown on the display [power supply fault] must be acknowledged in the fault memory menu item prior to starting the unit. (The display language can be set in the start screen using the "globe icon".)
- After the acknowledgement, the message [READY TO START] appears on the display, unless another fault is present.
- The factory setting of the setpoint value for the network pressure (upper and lower switching point) is saved in the compressor control GD Pilot TS and depends on the relevant pressure variant of the compressor (see nameplate fig. 1, stage pressures = maximum operating pressure). These settings can be checked or changed in the compressor control GD Pilot TS menu [Settings; Pressure range, p1] (further information can be found in Section 5 of the compressor control GD Pilot TS operating manual).
- Next, check the control transformer output voltages while operating under load (see Chapter 10.9).

Temperature start-up protection

The screw compressor unit will not start up if the ambient temperature is lower than 35,6 °F.

8.2 Putting a decommissioned compressor back into operation

Before commissioning the compressor all the electrical and electronic components and units should be checked for the ingress of water or condensation.

If the electronic control system was removed during shut down, it must be re-installed.

Then proceed as described in chapter 8.1 'First commissioning'.

Display of the compressor control GD Pilot TS

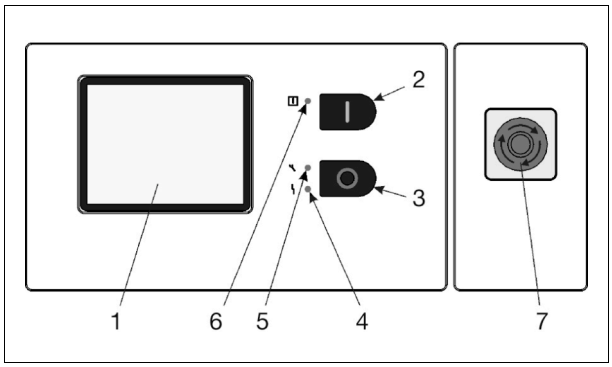


Fig. 15

1. Touchscreen Display
2. Start push-button [I]
3. Stop push-button [O]
4. red LED Flashing slowly = Warning
   Flashing rapidly = fault
5. yellow LED Flashing slowly = Maintenance required
6. green LED Lit up permanently = Unit in operation
   Flashing slowly = Unit in standby mode
7. Emergency stop

⚠ WARNING

The compressor can be automatically started at any time when it is in standby mode, i.e. the green LED is flashing.

8.3 Routine commissioning

⚠ WARNING

Rotating parts inside the unit may lead to injuries, e.g., cutting of finger or hand.

- **Before commissioning make sure that no one is located in the danger zone of the motor/screw compressor!**
- **After doing work: Check that all safety equipment is reinstalled and that all tools have been taken out!**
- **Only operate the screw compressor with the coverings closed!**

For routine commissioning, proceed as follows:

- Check the water level in the pressure reservoir (see also chapter 7.4)
- Open shut-off valves between the screw compressor, reservoir and pipe.
- Turn on the main power supply switch.
- After the power supply was switched on, all LEDs on the compressor control GD Pilot TS light up for a display test. The fault shown on the display [power supply fault] must be acknowledged in the fault memory menu item prior to starting the unit. (The display language can be set in the start screen using the "globe icon".)
- After the acknowledgement, the message [READY TO START] appears on the display, unless another fault is present.
- Press START button [I] (- 2 - Fig. 15).
- To switch off the compressor in the usual way use the STOP button (-3- Fig. 15) and not the emergency STOP button (-7- Fig. 15). After shutdown the compressor has a run on time of 30 - 50 seconds (soft-stop). The time remaining is counted down on the display.

Start-up protection of the electric motor

The screw compressor unit will not start up if the final compression pressure is more than 14.5 PSI.

Temperature start-up protection

The screw compressor unit will not start up if the ambient temperature is lower than 35,6 °F.

8.4 Commissioning after malfunction

NOTICE

Do not switch the screw compressor on repeatedly without having rectified the malfunction, since this may cause considerable damage to the machine.

Re-start after an automatic shutdown due to a malfunction as follows:

- Faults are shown as text in the compressor control GD Pilot TS "fault memory" display menu.

⚠ **Turn master switch off and secure it from being switched on again.**

- Eliminate fault.
- Turn master switch on.
- Acknowledge the fault in the fault memory menu. After the acknowledgement, the message [READY TO START] appears on the display, unless another fault is present.
- Press START button [I] (-2- Fig. 15).

8.5 Shutoff

To switch off the compressor use the O key (-3- Fig. 15) and not the EMERGENCY STOP button. After shutdown the compressor has a run on time of 30-50 seconds (soft-stop).

NOTICE

The unit may only be shut down using the emergency off button in real emergencies. When shutting down normally, please use the O key.

8.6 Emergency stop

The EMERGENCY STOP button is situated next to the GD Pilot TS. It is used to immediately shut down the unit. Only use the EMERGENCY STOP button (-7- Fig. 15) to shut down the unit in emergencies. When shutting down normally, always use the [O] key.

9. Storage of compressors

9.1 Decommissioning

All compressors are protected against corrosion at the factory for transport and for brief storage before commissioning.

If the compressors are to be stored for period exceeding six months, additional precautions must be taken.

Compressors which are to be shut down for a lengthy period must also be protected from corrosion.

Since corrosion occurs more quickly in damp atmospheres than in dry conditions, it is not possible to specify a maximum permissible standstill time which will apply in all cases.

NOTICE

The following aspects must be taken into account for storage of storing compressors.

The compressor should be stored in a dry building which should be heated if possible. This is particularly true during the months of winter.

The coolant is to be completely drained where there is a risk of frost (t < 33.8°F) (compressor stage, coolers, system containers, water filters, storage containers, RO unit, lines, valves).

If there is a risk that the temperature will fall or rise above the limits of 14 °F to 149 °F , the electrical controller must be removed and stored in ambient temperatures of 41 °F to 86 °F.

10.1 Maintenance recommendations

NOTICE

The screw compressor unit can only operate to your complete satisfaction when the maintenance work is carefully carried out at the specified intervals.

In order to facilitate this task, the scope of supply of the screw compressor unit comprises the “Maintenance and inspection manual for Gardner Denver compressors”, in which you can list your performed maintenance work at the specified intervals.

You can also have this maintenance work performed by our trained technicians. Please ask your Gardner Denver distributor for a maintenance contract.

10.2 Maintenance electric motor

The electric motor is permanently lubricated. The maintenance of the electric motor is to be performed in line with the motor operating instructions.

10.3 Maintenance and inspection schedule

⚠ DANGER

High voltage – Hazard of shock, burn, or death

- **Be careful with electricity: only work on screw compressors which are not powered.**
- **There is a risk of electric shock from charged capacitors! Disconnect the system from the mains and wait 10 minutes before touching electrical components. The power capacitors need this time to discharge.**

⚠ WARNING

Some parts of the system will still be pressurized after the system has been switched off. Small parts propelled at high speed by compressed air can penetrate the skin or destroy an eye.

Only perform checks and maintenance after observing the following:

- **Press the STOP button on the control panel and wait until the screw compressor comes to a stop and the screw compressor unit is depressurized.**
- **The pressure gauge shows no more than < 4.4 PSI.**
- **Shortly after shutting off the screw compressor unit a small residual pressure may remain.**
- **Set the on-site main switch to “0” (OFF) and secure it against being switched on.**

⚠ CAUTION

Burn hazard – Hot surfaces

- **Be careful of the hot surfaces of machine parts when carrying out checks, making settings and doing maintenance.**

Intervals are valid for normal industrial environments and operating conditions.

In the case of a very dirty atmosphere, the cleaning intervals have to be shortened as required.

For order numbers see the spare parts list.

10. Service and maintenance

Due at x service hours	Commissioning	2,000 h	4,000 h	6,000 h	8,000 h	10,000 h	12,000 h	14,000 h	16,000 h	18,000 h	20,000 h
At the latest after x months		3 m	6 m	9 m	12 m	15 m	18 m	21 m	24 m	27 m	30 m
Package A			☐		☐		☐		☐		☐
Package B					☐				☐		
Package C									☐		
Maintenance every 2000 h, although at least every 3 months:											
Cleaning/replacement of cooling air inlet filter		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Maintenance every 4000 h, although at least every 6 months:											
Replacement of air filter cartridge			☐		☐		☐		☐		☐
Replacement of water filter cartridge			☐		☐		☐		☐		☐
Replacement of prefilter RO unit			☐		☐		☐		☐		☐
Replace O-ring of intake controller *			☐		☐		☐		☐		☐
Inspection of the compressor stage *			☐		☐		☐		☐		☐
Maintenance every 8000 h, although at least each year:											
Checking/tightening of connecting terminals in the switch cabinet/ and checking of the “control transformer” setting	☐				☐				☐		
Checking/tightening screw connections	☐				☐				☐		
Checking/cleaning water level sensor					☐				☐		
Replace pressure holding non-return valve *					☐				☐		
General maintenance/cleaning					☐				☐		
Pressure relief valve / functional test minimum 1 per year					☐				☐		
Maintenance every 16000 h, although at least every 2nd year:											
Replace RO membrane									☐		
Rework/replace solenoid valves *									☐		
Inspection every 4 years:											
Inspection of the electrical installation by a qualified electrician											
Inspection every 5 years:											
Internal inspection of the pressure reservoir by a qualified person											
Inspection every 10 years:											
Pressure reservoir strength test at the named location											

☐ These maintenance intervals must be observed!

☒ For your own benefit, put a cross on the servicing schedule against maintenance work when performed.

* We recommend that you have the work on these parts be performed by a Gardner Denver company or by an authorised dealer.

	22,000 h	24,000 h	26,000 h	28,000 h	30,000 h	32,000 h	34,000 h	36,000 h	38,000 h	40,000 h	42,000 h	44,000 h	46,000 h	48,000 h	50,000 h	52,000 h	54,000 h	56,000 h	58,000 h	60,000 h	62,000 h	64,000 h	66,000 h	68,000 h	70,000 h	72,000 h	74,000 h	76,000 h	78,000 h	80,000 h
	33 m	36 m	39 m	42 m	45 m	48 m	51 m	54 m	57 m	60 m	63 m	66 m	69 m	72 m	75 m	78 m	81 m	84 m	87 m	90 m	93 m	96 m	99 m	102 m	105 m	108 m	111 m	114 m	117 m	120 m
		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐
		☐				☐				☐				☐				☐				☐				☐				☐
						☐								☐								☐								☐
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐
		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐
		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐
		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐
		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐		☐
		☐				☐				☐				☐				☐				☐				☐				☐
		☐				☐				☐				☐				☐				☐				☐				☐
		☐				☐				☐				☐				☐				☐				☐				☐
		☐				☐				☐				☐				☐				☐				☐				☐
		☐				☐				☐				☐				☐				☐				☐				☐
		☐				☐				☐				☐				☐				☐				☐				☐
						☐								☐								☐								☐
						☐								☐								☐								☐
						☐																☐								
										☐																				☐
																														☐

10.4 Change of air intake filter

⚠ DANGER

Only perform checks and carry out work on the screw compressor when the unit is out of operation, depressurized, and secured from being switched on again!

NOTICE

Never operate the screw compressor system without an air filter (even briefly removing it can cause considerable damage to the machine)!

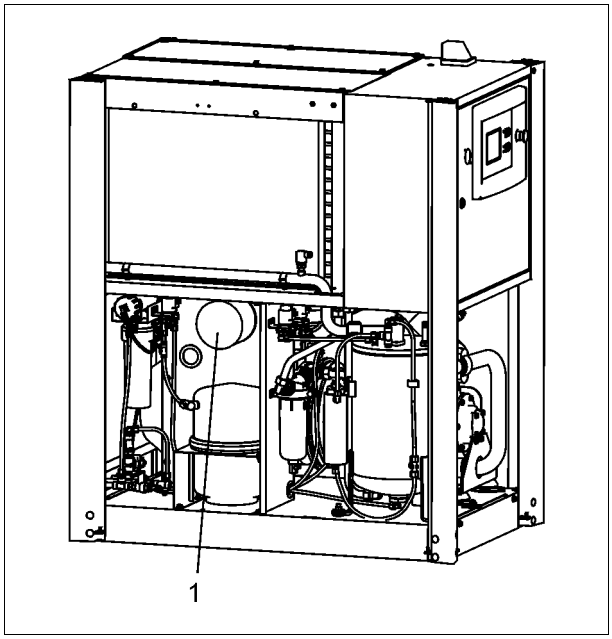


Fig. 16

1 Air intake filter

As a standard, the air filter is provided with a visual intake filter monitor, which indicates clogging of the air filter cartridge.

When the red service field of the intake filter monitor is visible and remains clicked into position while the screw compressor is out of operation, replace the air filter cartridge.

However, the air filter cartridge should be replaced at the latest as specified in chapter 10.3. Check air filter at least once a week or, if required, daily for the accumulator of dust. When carrying out maintenance work, make sure that no dirt gets to the clean air side of the air filter.

Changing intervals for air filter cartridge

The operating conditions (e.g., coolant temperatures), the operating modes and the quality of the intake air (e.g., content of dust, content of gaseous foreign substances such as SO_2 and solvent vapors, etc.) have a strong influence on the service life of the filters (air filters, water filters, fine separators).

Where such conditions exist the filter element may require changing more frequently.

10.5 Change water filter

⚠ WARNING

Air/water under pressure may cause severe personal injury.

- **Shut down compressor, relieve system of all pressure, disconnect, lockout and tagout power supply to the compressor package before removing valves, caps, plugs, fittings, bolts and filters.**
- **Make sure that system is leak tight!**

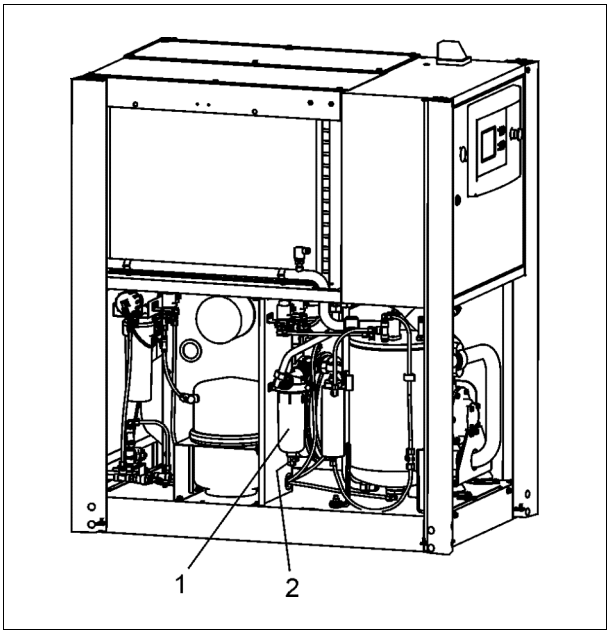


Fig. 17

1 Water filter
2 Extraction site for water sample

You will find the changing intervals listed in the maintenance schedule.

Perform the water filter change as follows:

- Turn off compressor, secure it from being switched on again, and make sure that it is depressurized and volt-free.

- Let cooling water drain off via the extraction site (-2- Fig. 17) and drain screw on the water filter housing (-1- Fig. 17).
- Open filter housing and remove filter elements.
- Clean the filter head and insert a new housing seal.
- Insert a new filter element and close filter housing again.
- Re-close drain valve and screw.

Changing times for the water filter

The operating conditions (e.g., cooling medium temperatures), the operating modes and the quality of the suctioned air (e.g., dust content, content of gaseous foreign matter such as SO_2, solvents, etc.) has a strong influence on the filter service life.

In these operational cases, shorter change intervals are possible.

10.6 Replace prefilter RO unit

⚠ WARNING

Air/water under pressure may cause severe personal injury.

- **Shut down compressor, relieve system of all pressure, disconnect, lockout and tagout power supply to the compressor package before removing valves, caps, plugs, fittings, bolts and filters.**
- **Make sure that system is leak tight!**

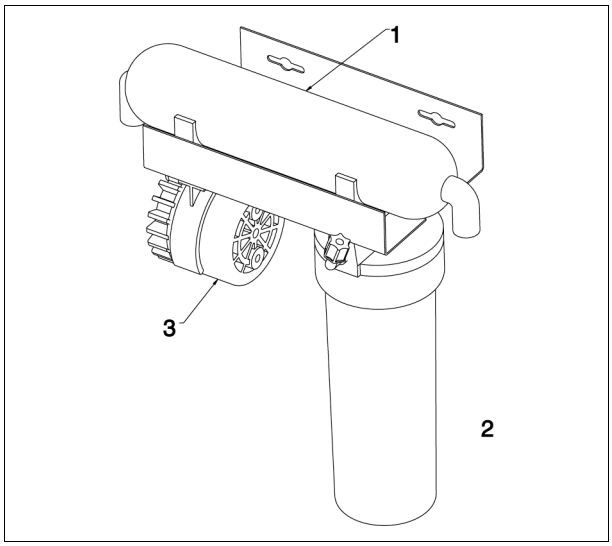


Fig. 18

1 RO membrane cartridge
2 Prefilter RO unit
3 Permeate pump

Perform the prefilter change as follows:

- Turn off compressor, secure it from being switched on again, and make sure that it is depressurized and volt-free.
- Close the main water supply connection and valve on the storage tank.
- Screw off the filter housing (-2- Fig. 18) and remove the filter element.
- Insert a new filter element and hand tighten the filter housing. Before the prefilter element can be installed, the element should be rinsed out with clean water so that all coaldust has been removed.
- Re-open the main water supply and the storage tank valve.

Changing times for prefilter RO unit

You will find the changing intervals listed in the maintenance schedule (see chapter 10.3).

The quality of the main water supply has a strong influence on the filter service life.

In the event of unfavorable conditions, shorter changing intervals are possible.

In order to determine the water quality, a water sample can be extracted as needed (see- Fig. 17).

10.7 Change the RO membrane cartridge

⚠ WARNING

Air/water under pressure may cause severe personal injury.

- **Shut down compressor, relieve system of all pressure, disconnect, lockout and tagout power supply to the compressor package before removing valves, caps, plugs, fittings, bolts and filters.**
- **Make sure that system is leak tight!**

Change the RO membrane cartridge as follows:

- Turn off compressor, secure it from being switched on again, and make sure that it is depressurized and volt-free.
- Close the main water supply connection and valve on the storage tank.
- Remove the lines to the membrane cartridge head (-1- Fig. 18).
- Remove the cartridge head and replace the old filter cartridge with a new one. Close the RO membrane cartridge.
- Refit lines to the RO membrane cartridge head.
- Re-open the main water supply and the storage tank valve.

10.8 Pressure relief valve

⚠ DANGER

When checking pressure relief valve there is an explosive release of pressure.

Failure to perform this operation in a safe manner or without safety equipment may result in personal injury or death.

- **Use the appropriate safety equipment, hearing and eye protection, and use safety precautions when performing this PRV check on an operating machine.**

⚠ DANGER

A defective pressure relief valve may result in pressure that is too high, breaking open parts of the system and causing serious or fatal injury.

Never operate a screw compressor system with a defective pressure relief valve or without pressure relief valve!

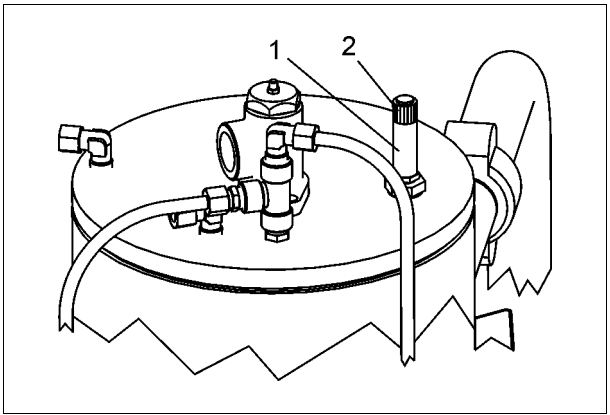


Fig. 19

1 Pressure relief valve
2 Valve cap

The pressure relief valve has no user serviceable or repairable components.

Testing the pressure relief valve

The valve can be tested:

1 On a separate compressed-air system. **or**
2 When raising the system operating pressure to its normal level.

Keep local legislation in mind when testing.

Pressure relief valve operation (-1- Fig. 19) depends on the valve type and can be carried out by:

- Lightly turning the valve cap (-2- Fig. 19) (1-2 turns), and subsequently closing it again.
- Operating the lifting lever/pull ring.

If the pressure relief valve doesn't close itself or is leaky, close the doors of the compressor and push the Stop Button. After the pressure in the pressure reservoir is reduced to ambient pressure, renew the pressure relief valve.

10.9 Connecting terminals in the switch cabinet/control transformer setting

⚠ DANGER

High voltage – Hazard of shock, burns, or death

- **Only qualified electricians may work on the control cabinet.**
- **Only perform checks and carry out work on the screw compressor when the unit is out of operation, depressurized, and secured from being switched on again!**
- **Push the STOP button on the control panel. After the soft-stop tiime (30 sec.), set the on-site main switch to “0”(OFF) and secure it against being switched on.**

⚠ DANGER

There is a risk of electric shock from charged capacitors!

- **Disconnect the system from the mains and wait 10 minutes before touching electrical components. The power capacitors need this time to discharge.**

NOTICE

Making incorrect settings to the control transformer poses a risk to the trouble-free operating of the system.

Checking the setting of the control transformer is part of commissioning and part of regular inspection/maintenance because the supply voltage can change.

The connecting terminals in the switch cabinet have to be checked and, if required, re-tightened during first commissioning and afterward according to the maintenance schedule.

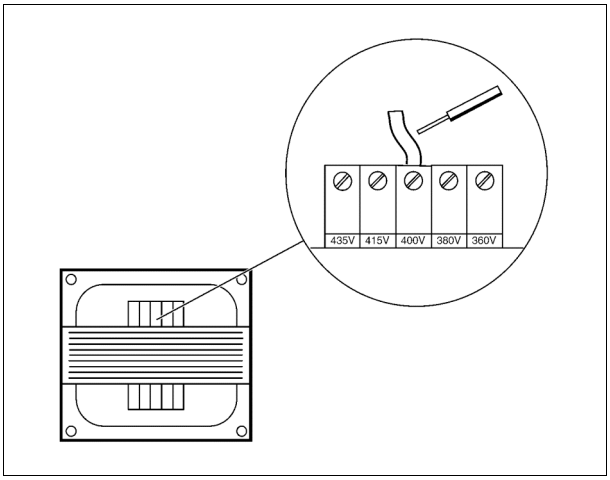


Fig. 20

Check the control transformer setting as follows:

- Switch the unit on as described in Chapter 8.3.
- Check the control transformer output voltages while operating under load. Several tapping points are provided for this purpose (see circuit diagram).
- Switch the unit off as described in Chapter 8.5.

Change the control transformer setting as follows, if the output voltage is not correct:

- Change the control transformer setting accordingly.
- Set the on-site main switch to “0”(OFF) and secure it against being switched on.
- Wait 10 minutes before touching electrical components. The power capacitors need this time to discharge.
- Change the control transformer setting. Fig. 20 illustrates an example.
- Then, check the setting again.

10.10 Screw connections

The screw connections of the air and water circuits have to be checked and, if required, re-tightened according to the maintenance schedule.

Check the hose and piping for unsealed areas.

10.11 General maintenance and cleaning

⚠ WARNING

Danger when cleaning system parts with compressed air: Small parts propelled at high speed by compressed air can penetrate the skin or destroy an eye.

- **Do not aim the compressed air at people**

The screw compressor should be blown off with compressed air at the given intervals (do not aim the compressed air at people), especially:

- Controller components
- Fittings
- Air end block
- Cooler
- Electric motor
- Dirt trap strainer

10.12 Clean / change filter with cooling air inlet and control cabinet inlet

⚠ DANGER

Only perform checks and carry out work on the screw compressor when the unit is out of operation, depressurized, and secured from being switched on again!

a) Filter mat cooling air inlet

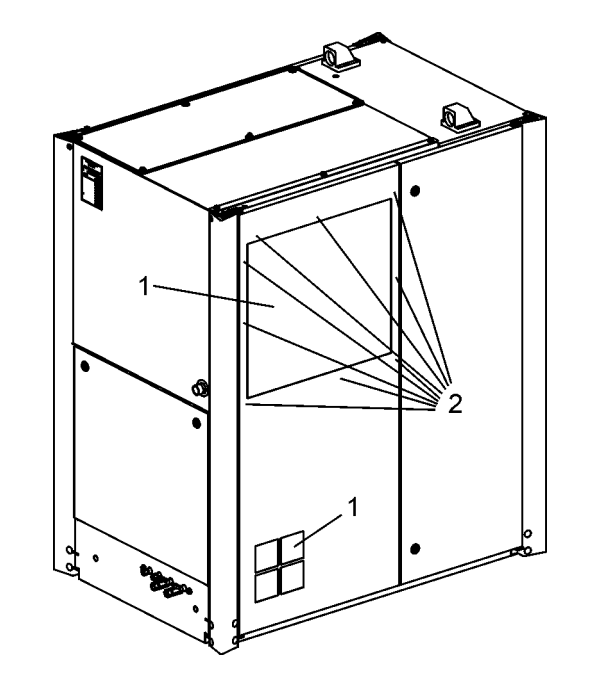


Fig. 21

1 Filter mat cooling air inlet
2 Mounting bolts

Perform filter mat change as follows:

- Remove the mounting screws (-2- Fig. 21).
- Take out the filter mat (-1- Fig. 21) and clean it, replace it if damaged.
- Return the filter mat to the silencer chamber (-3- Fig. 21).
- Secure the filter mat using the fixing bolts.

Cleaning:

Clean the filter mat by brushing or washing.

NOTICE

The filter pad may not be installed while wet or moist!

b) Control-cabinet inlet filter (-4- Fig. 21)

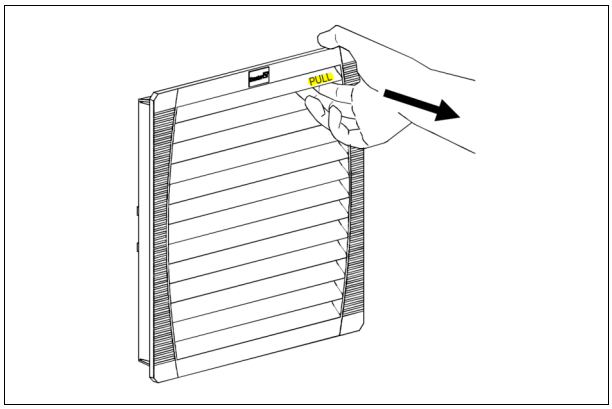


Fig. 22

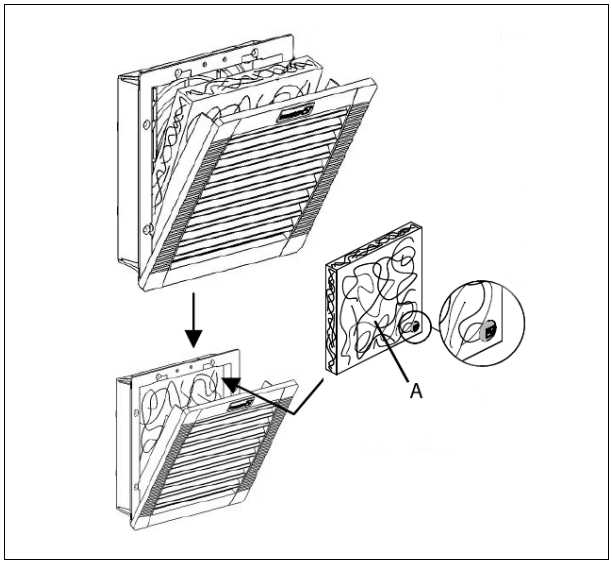


Fig. 23

Perform filter mat change as follows:

- Open the louver grilles of the inlet filter (Fig. 22).
- Remove the filter pad.
- Insert the new filter pad into the louver grille. Ensure that the smooth side (-A- Fig. 23) of the filter pad faces the air inlet side.
- Place the louver grille back onto the filter housing.

Changing times for the filter mat

The operating modes and the quality of the suctioned air (e.g., dust content) has a strong influence on the filter service life.

The filter should be checked on a weekly basis, eventually daily basis, for dust build-up.

In these cases the intervals between changes may be shorter.

10.13 Inspection of the compressor stage

⚠ DANGER

Only perform checks and carry out work on the screw compressor when the unit is out of operation, depressurized, and secured from being switched on again!

⚠ CAUTION

Caution when draining hot water: risk of scalding!

- **Allow the unit to cool down first.**

NOTICE

When removing the cover, water (3.17 USgal) may escape from the compressor. Please place an appropriate reservoir underneath it to collect the water.

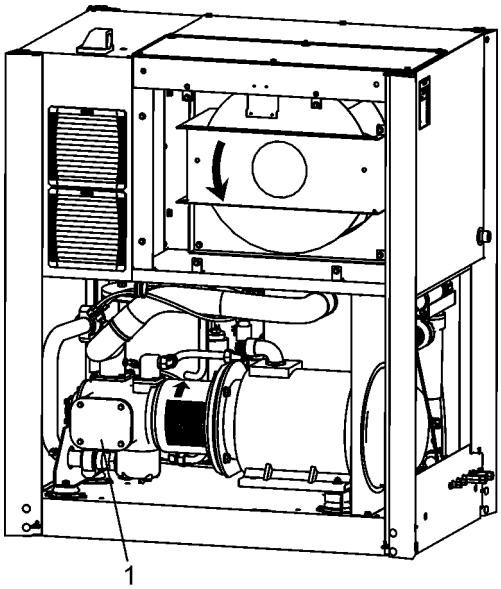


Fig. 24

Perform an inspection of the compressor stage as follows:

- Shut down the machine.
- Switch off the main switch or disconnect the machine from the power supply.
- Remove the retaining bolts from the side cover of the compressor and take off the cover (-1- Fig. 24).
- Assess the condition of the compressor. The inspection plan describes everything you need to consider.

- Attach the side cover with a new seal. Insert the screws to a torque of 18.5 lbf ft.
- Check the water level on the water level indicator (-6- Fig. 12) and add water if necessary (see Chapter 7.4 Water supply).

10.14 Inspection intervals for pressure reservoir and electrical installations

Pressure reservoir

As per the requirements of the 97/23/EC Pressure Equipment Directive, a qualified person must inspect the pressure reservoir from inside every five years.

As per the requirements of the 97/23/EC Pressure Equipment Directive, an appointed body must perform a strength test on the pressure reservoir after ten years.

Electrical installation

After four years, or after each intervention, the electric installation must be tested by an electrician.

Should stricter inspection intervals apply in your country, these must be observed.

10.15 Checking the water level sensor

⚠ DANGER

Only perform checks and carry out work on the screw compressor when the unit is out of operation, depressurized, and secured from being switched on again!

⚠ CAUTION

Caution when draining hot water: risk of scalding!

- **Allow the unit to cool down first.**

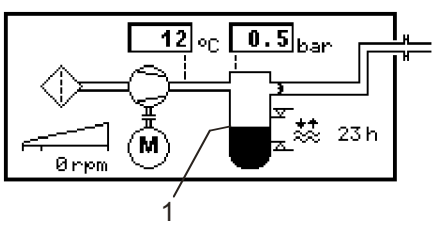


Fig. 25

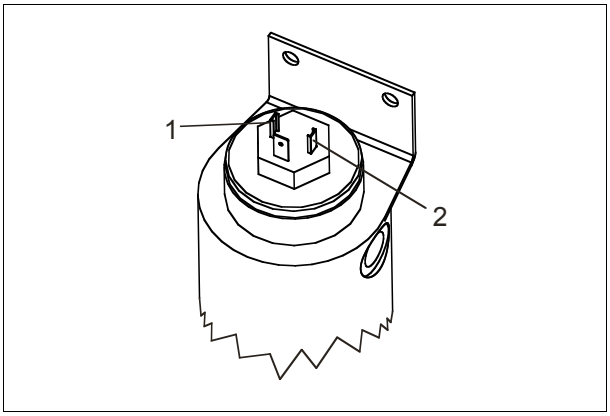


Fig. 26

Check if the water level indicator on the GD Pilot TS display deviates greatly from the water level indicator (-1- Fig. 25) on the pressure reservoir.

If this is the case, or the GD Pilot TS reports an error with the water level sensor, then this should be checked when the system is shut down as follows:

Raise the water level to approx. 2" above the 'upper' mark of the water display indicator (-5- Fig. 12) of the pressure reservoir. The resistance value of both the sensor connections (-1- and -2- Fig. 26) must lie between 1376Ω and 1394Ω.

To check the lower sensor value, release the connecting line from the lower screw connection of the water level sensor. Drain the water level sensor into a container provided. The drained water level sensor must have a resistance at both the connections (-1- and -2- Fig. 26) of between 990Ω and 1010Ω.

If one of these limit values is not reached, then the water level sensor will have to be replaced.

After the checking and possible replacement of the water level sensor, adjust the water level in the pressure reservoir again so that it is situated between both the fill level marks (-4- and -5- Fig. 12) once more.

11 Trouble-shooting

In the case of faults or warnings that are detected by the compressor control GD Pilot TS, please refer to the chapter "Fault/warning table" in the operating instructions of the GD Pilot TS.

Malfunction		Possible cause		Remedy
Unit cannot be started	1.	No operating or control voltage	1.	Check fuses, main switch and supply line
	2.	Malfunction not acknowledged	2.	Acknowledge fault message
	3.	Pressure reservoir not depressurized	3.	Wait until depressurized Screw compressor does not start up, when reservoir pressure is > 14.5 PSI
	4.	Electric motor defective	4.	Check connections, winding, etc.
	5.	Compressor defective	5.	Turn the compressor manually; if required, replace
	6.	Ambient temperature less than 35.6 °F	6.	Make sure that the ambient temperature is not less than 35.6 °F; install an auxiliary heater, if required
	7.	Remote control/timer has been activated	7.	Deactivate remote control/timer
	8.	Excessive mains pressure	8.	Wait until the mains pressure has fallen below the lower switching point
Unit stops during the start-up phase	1.	Intake regulator only closes partly, pressure builds up too quickly in the pressure reservoir	1.	Fix intake regulator or, if required, replace; check solenoid valves
	2.	Short-circuit in the unit	2.	Determine and eliminate cause; replace defective fuses
	3.	Connecting terminals in the switch cabinet are loose	3.	Check and re-tighten
	4.	Maximum motor switching cycles exceeded due to too frequent manual on and off-switching	4.	Avoid frequent manual on and off-switching, let electric motor cool down
Unit does not reach the set mains pressure	1.	Mains pressure sensor set too low	1.	Check, re-set
	2.	Intake regulator opens only partly	2.	Reduce consumption or cut in a further compressor
	3.	Excessive air consumption	3.	Fix intake regulator or, if required, replace; check solenoid valves
	4.	Air filter clogged	4.	Replace air filter cartridge
	5.	Heavy leakage in the compressor system	5.	Check unit

11. Trouble-shooting

Malfunction		Possible cause		Remedy
Unit switches off	1.	Ambient temperature too high	1.	Ventilate compressor room
	2.	Electric motor defective	2.	Check electric motor and thermistor
	3.	Fan defective	3.	Check/replace fan
	4.	Sensor, connections or lines defective	4.	Check sensors, connections and lines
	5.	Cross section of the electric supply lines too small	5.	Measure power requirement, if necessary, replace lines
	6.	Water level too low	6.	Manage the water level sensor and water intake
	7.	Excessive water temperature	7.	Check water cooler and fan/ Check water thermostat
	8.	Water injection pressure too low	8.	Clean/replace water filter cartridge and clean water circuit
Excessive idling pressure	1.	Intake regulator does not close correctly	1.	Check intake regulator Check solenoid valves
	2.	System not unloaded	2.	Check intake regulator Check solenoid valves
Water in the air filter	1.	Water stop valve not closing	1.	Check/ replace water stop valve
	2.	Frequent use of EM stop	2.	Only use the Emergency stop button in real emergencies
Pressure relief valve opens	1.	Pressure relief valve defective	1.	Replace
	2.	Pressure holding valve defective	2.	Check / Replace
	3.	Intake regulator closes too slowly	3.	Check intake regulator and solenoid valve
	4.	Mains pressure sensor defective	4.	Replace the mains pressure sensor
	5.	Electronics defective	5.	Replace electronics

12 Annex

12.1 Technical specifications

		EnviroAire VS 15		EnviroAire VS 22	
Maximum operating pressure	psig	115	145	115	145
Minimum operating pressure	psig	75			
Ambient temperature min./max.	°F	36 to 113		36 to 104	
FAD min.	cfm	11.1	15.4	24	27.2
FAD max.	cfm	77.9	64.5	117.9	103.6
Discharge temp. of air above ambient temp.	°F	22	22	29	29
Free field noise level	dB(A)	69/70		69/70	

Electrical data

Nominal electric motor power	hp	20	30
Max. total current consumption at 380V / 400V / 460V	Amps	31	43
Motor protection type		TEFC IP 55, EISA 2007 (IE-3)	
Nominal drive motor speed	rpm	3400	3350
Minimal motor speed	rpm	950	850
Nominal fan motor power	hp	1.2	
Suggested cable cross-section (400V)		AWG 8	AWG 6
Suggested fuse size (400V)	Amps	40	50

Cooling

Cooling air flow through ventilator	cfm	3125	3125
Heat rejected by ventilating fan	%	approx. 95% of terminal power	
Size of cooling air inlet aperture	in	23.4 x 21.6	
Size of cooling air outlet aperture	in	35.0 x 14.6	
Cooling air outlet temp. above ambient approx.	°F	20	27
Max. allowable pressure drop in duct at max. ambient	Pa	60	

Weights, dimensions and capacities data

Compressor water capacity	gal	7.4	
Approx. Water consumption in 24 hours	gal	2.7	
Water supply pressure -min / max	psig	32 to 87	
Compressed-air connection		R 1" NPT	
Water drain and supply connections		2 x G 3/8" NPT	
RO and regulation filter water drain connections		2 x G 1/4" NPT	
Weight	lbs	1515	1556
Dimensions L x W x H	in	53.0 x 34.6 x63.5	

12.2 Layout plan

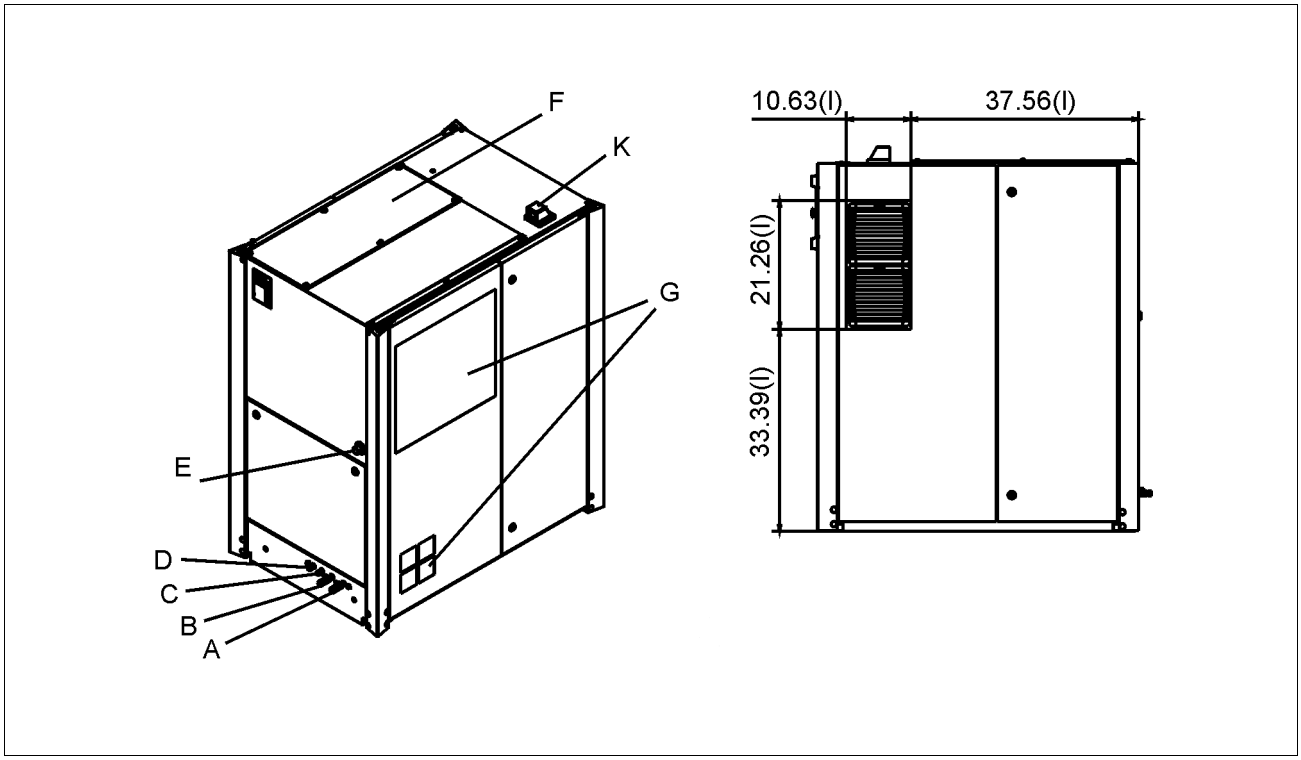


Fig. 27 (all dimensions in Inches)

A Water inlet inner thread G 3/8” (3/8” NPT)
B Water outlet inner thread G 3/8” (3/8” NPT)
C Drain water separator inner thread G 1/4” (1/4” NPT) (not available)
D Drain RO unit inner thread G 1/4” (1/4” NPT)
E Compressed air connection: external threaded connector R 1” (1” NPT)
F Cool air exhaust
G Cool air intake
I Switch cabinet cool air intake
K Electrical connection

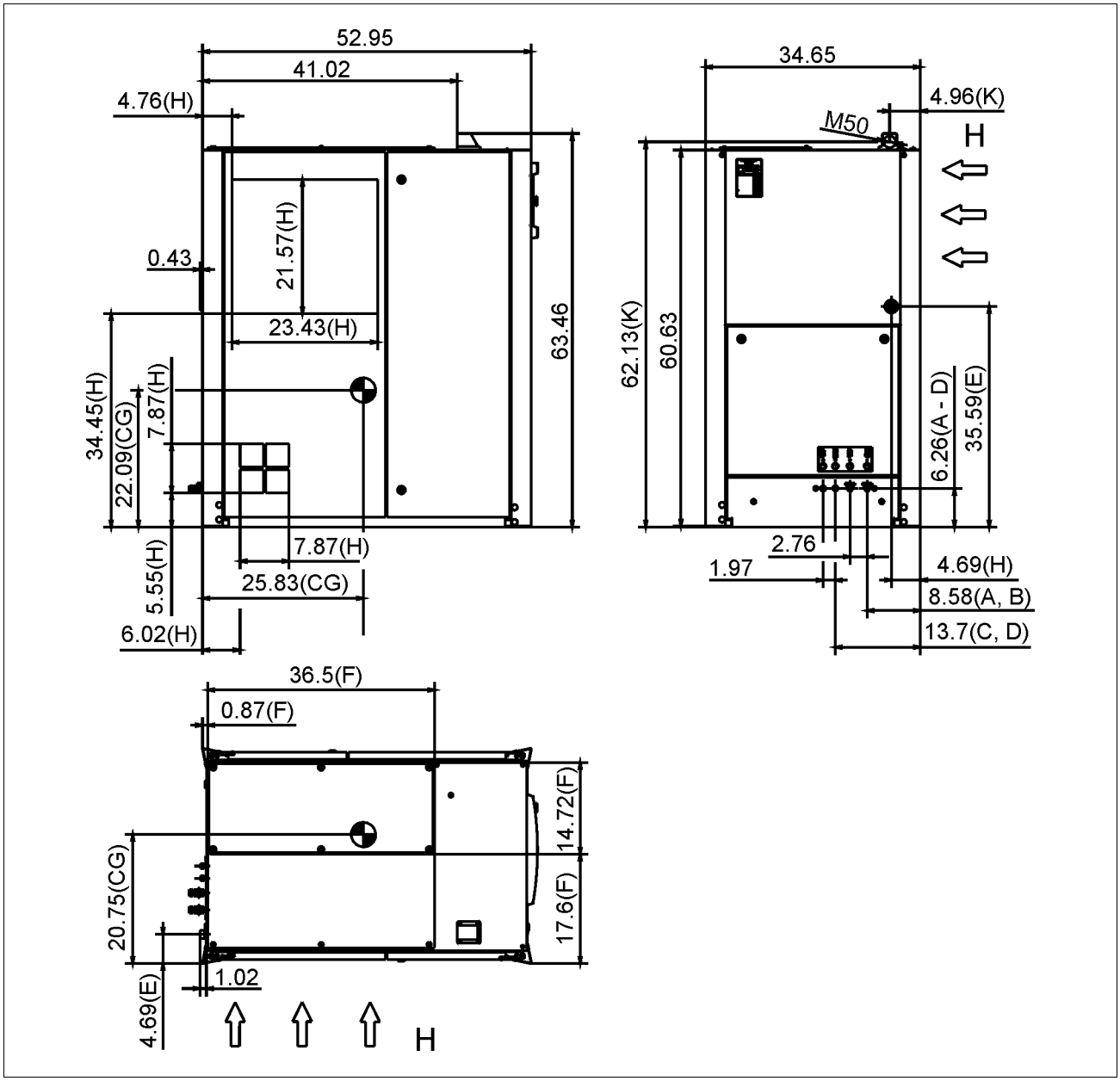


Fig. 28 (all dimensions in Inches)

A Water inlet inner thread G 3/8” (3/8” NPT)
B Water outlet inner thread G 3/8” (3/8” NPT)
C Drain water separator inner thread G 1/4” (1/4” NPT) (not available)
D Drain RO unit inner thread G 1/4” (1/4” NPT)
E Compressed air connection: external threaded connector R 1” (1” NPT)
F Cool air exhaust
H Cool air intake
I Switch cabinet cool air intake
K Electrical connection
CG Center of gravity

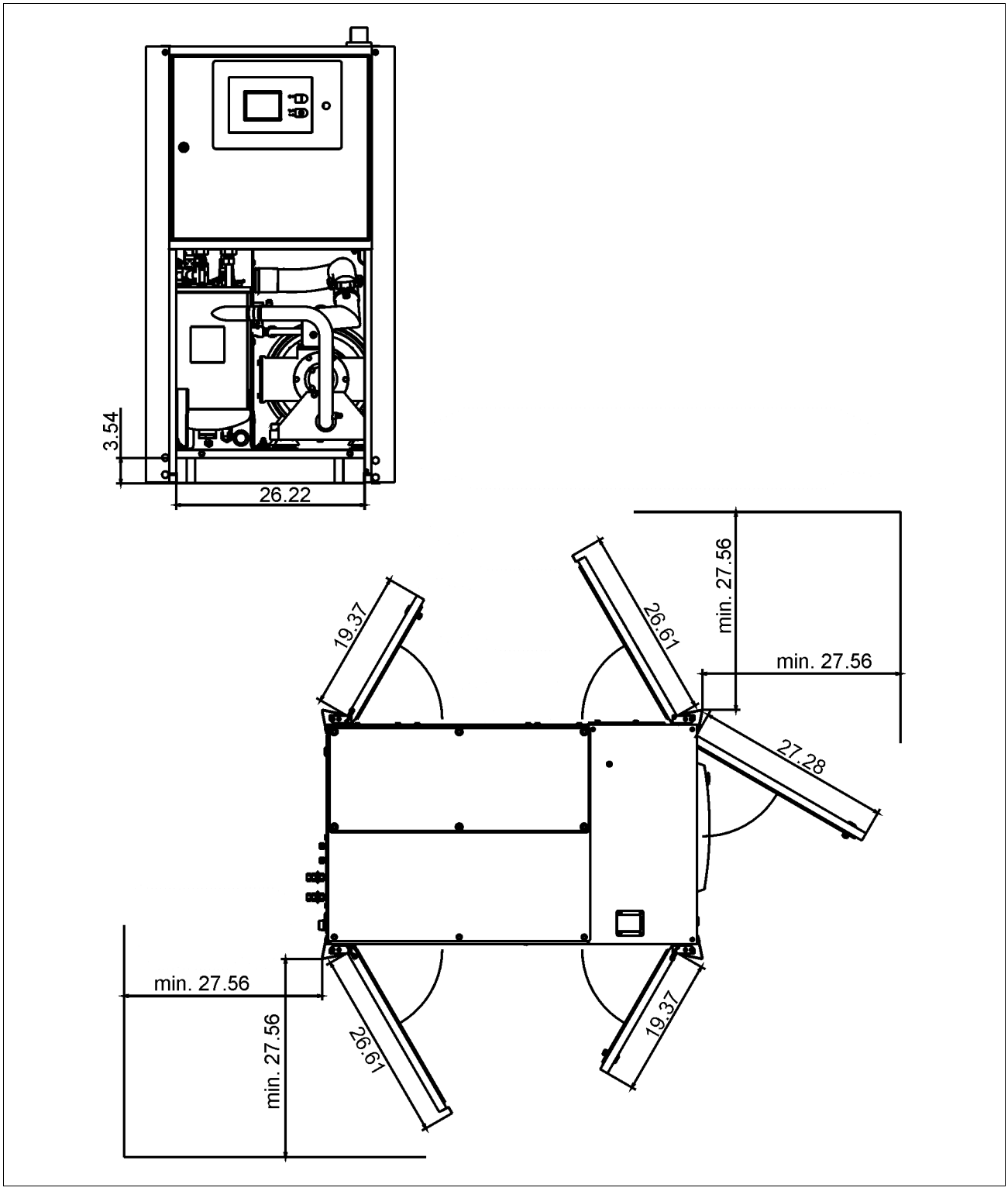


Fig. 29 (all dimensions in Inches)

Gardner Denver Compressor Division,
1800 Gardner Expressway, Quincy, Illinois 62305

Telephone: (800) 682-9868
Fax: (217) 224-7814

Gardner Denver Deutschland GmbH
Argenthaler Str. 11
55469 Simmern
Deutschland

Tel. ++49 (0)6761 832-0
Fax ++49 (0)6761 832-409