Oil-injected screw compressors


**CPI 75, CPI 100, CPI 101, CPI 120, CPV 60VS PM, CPV 75VS PM, CPV 100VS PM, CPV 101VS PM, CPV 120VS PM, CPM 75, CPM 100, CPM 120**

Instruction book

# CP Chicago Pneumatic

## Oil-injected screw compressors

CPI 75, CPI 100, CPI 101, CPI 120, CPV 60VS PM, CPV 75VS PM, CPV 100VS PM, CPV 101VS PM, CPV 120VS PM, CPM 75, CPM 100, CPM 120

## Instruction book

Original instructions

**WARNING**

**Read all safety warnings, instructions, illustrations and specifications provided with this product. Failure to follow all instructions listed in this instruction book may result in personal injury, death and/or property damage.**




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Chicago Pneumatic

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# 1 Safety precautions

## 1.1 Safety icons

**DANGER**

**Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.**

**WARNING**

**Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.**

**NOTICE**

**Indicates a potential situation which, if not avoided, might result in property damage or in an undesirable result or state.**

**NOTE**

**Indicates important information.**

## 1.2 General safety precautions

- The operator must employ safe working practices and observe all related work safety requirements and regulations.
- If any of the following statements does not comply with the applicable legislation, the stricter of the two shall apply.
- Installation, operation, maintenance and repair work must only be performed by authorized, trained, specialized personnel. The personnel should apply safe working practices by use of personal protection equipment, appropriate tools and defined procedures.
- The compressor is not considered capable of producing air of breathing quality. For air of breathing quality, the compressed air must be adequately purified according to the applicable legislation and standards.
- Before any maintenance, repair work, adjustment or any other non-routine checks, switch the controller in service mode (see section *Service mode*), stop the compressor, press the emergency stop button, switch off the voltage and depressurize the compressor. In addition, the power isolating switch must be opened and locked. The process of locking, tagging and trying to turn on the equipment to confirm it cannot operate is called Lock Out, Tag Out (LOTO).

  On units powered by a frequency converter, wait 10 minutes after switching off the voltage, before starting any electrical repair.

**DANGER**

**If the machine is equipped with an automatic restart after voltage failure function and if this function is active, be aware that the machine**

**will restart automatically when the power is restored if it was running when the power was interrupted!**

- Never play with compressed air. Do not apply the air to your skin or direct an air stream at people. Never use the air to clean dirt from your clothes. When using the air to clean equipment, do so with extreme caution and wear eye protection.
- The owner is responsible for maintaining the unit in safe operating condition. Parts and accessories shall be replaced if unsuitable for safe operation.
- It is not allowed to walk or stand on the unit or on its components.
- If compressed air is used in the food industry and more specifically for direct food contact, it is recommended, for optimal safety, to use certified Class 0 compressors in combination with appropriate filtration depending on the application. Please contact your customer center for advice on specific filtration.
- The service switch should only be operated by a trained service specialist from the manufacturer.

## 1.3 Safety precautions during installation

**WARNING**

**All responsibility for any damage or injury resulting from neglecting these precautions, or non-observance of the normal caution and care required for installation, operation, maintenance and repair, even if not expressly stated, will be disclaimed by the manufacturer.**

- The machine must only be lifted using suitable equipment in accordance with the applicable safety regulations. Loose or pivoting parts must be securely fastened before lifting. It is strictly forbidden to dwell or stay in the risk zone under a lifted load. Lifting acceleration and deceleration must be kept within safe limits. Wear a safety helmet when working in the area of overhead or lifting equipment.
- The unit is designed for indoor use. If the unit is installed outdoors, special precautions must be taken. Consult your supplier.
- Place the machine where the ambient air is as cool and clean as possible. If necessary, install a suction duct. Never obstruct the air inlet. Care must be taken to minimize the entry of moisture via the inlet air.
- Any blanking flanges, plugs, caps and desiccant bags must be removed before connecting the pipes.
- Air hoses must have the correct size and be suitable for the working pressure. Never use frayed, damaged or worn hoses. Distribution pipes and connections must have the correct size and be suitable for the working pressure.
- The aspirated air must be free of flammable fumes, vapors and particles, e.g. paint solvents, that can lead to internal fire or explosion.
- Arrange the air intake so that loose clothing worn by people cannot be drawn in.
- Ensure that the discharge pipe from the compressor to the air cooler or air net is free to expand under heat and that it is not in contact with or close to flammable materials.
- No external force may be exerted on the air outlet valve; the connected pipe must be free of strain.
- If remote control is installed, the machine must bear a clear sign stating: "DANGER: This machine is remotely controlled and may start without warning".

Before any maintenance or repair, the operator has to make sure that the machine is stopped and depressurized as well as that the electrical isolating switch is open, locked and labelled with a temporary warning. As a further safeguard, persons switching on or off remotely controlled machines shall take adequate precautions to ensure that there is no one checking or working on the machine. To this end, a suitable notice shall be affixed to the start equipment.

- Air-cooled machines must be installed in such a way that an adequate flow of cooling air is available and that the exhausted air does not recirculate to the compressor air inlet or cooling air inlet.
- The electrical connections must correspond to the applicable codes. The machines must be earthed and protected against short circuits by fuses in all phases. A lockable power isolating switch must be installed near the compressor.
- On machines with an automatic start/stop system or if the automatic restart after voltage failure (ARAVF) function is activated, a sign stating "This machine may start without warning" must be affixed near the instrument panel.
- In multiple compressor systems, manual valves must be installed to isolate each compressor. Non-return valves (check valves) must not be relied upon for isolating pressure systems.
- Never remove or tamper with the safety devices, guards or insulation fitted on the machine. Every pressure vessel or auxiliary installed outside the machine to contain air above atmospheric pressure must be protected by a pressure relieving device or devices as required.
- Piping or other parts with a temperature higher than 70 ˚C (158 ˚F) that can be touched accidentally by personnel in normal operation must be guarded or insulated. Other high temperature piping must be clearly marked.
- For water-cooled machines, the cooling water system installed outside the machine has to be protected by a safety device with a set pressure according to the maximum cooling water inlet pressure.
- If the ground is not level or can be subject to variable inclination, consult the manufacturer.
- In an installation with multiple compressors, the outlet piping must be installed in such a way that condensate cannot flow back into the compressor. See section *Installation proposal*.

**NOTE**

**Also consult the following safety precautions: *Safety precautions during operation* and *Safety precautions during maintenance or repair*.**

**These precautions apply to machinery processing or consuming air or inert gas. Processing of any other gas requires additional safety precautions typical to the application which are not included herein.**

**Some precautions are general and cover several machine types and equipment; hence some statements may not apply to your machine.**

## 1.4 Safety precautions during operation

**WARNING**

**All responsibility for any damage or injury resulting from neglecting these precautions, or non-observance of the normal caution and care required for installation, operation, maintenance and repair, even if not expressly stated, will be disclaimed by the manufacturer.**

- Never touch any piping or components of the machine during operation.

- Use only the correct type and size of hose end fittings and connections. When blowing through a hose or air line, ensure that the open end is held securely. A free end will whip and may cause injury. Make sure that a hose is fully depressurized before disconnecting it.
- Persons switching on remotely controlled machines shall take adequate precautions to ensure that there is no one checking or working on the machine. To this end, a suitable notice shall be affixed to the remote start equipment.
- Never operate the machine when there is a possibility of taking in flammable or toxic fumes, vapors or particles.
- Never operate the machine below or in excess of its limit ratings.
- Keep all bodywork doors shut during operation. The doors may be opened for short periods only, e.g. to carry out routine checks. Wear ear and eye protection when opening a door.

  On machines without bodywork, wear ear protection in the vicinity of the machine.
- People staying in environments or rooms where the sound pressure level reaches or exceeds 80 dB(A) shall wear ear protectors.
- Periodically check that:
  - All guards are in place and securely fastened
  - All hoses and/or pipes inside the machine are in good condition, secure and not rubbing
  - No leaks occur
  - All fasteners are tight
  - All electrical leads are secure and in good order
  - Safety valves and other pressure relief devices are not obstructed by dirt or paint
  - Air outlet valve and air net, i.e. pipes, couplings, manifolds, valves, hoses, etc. are in good repair, free of wear or abuse
  - All pre-filters are not clogged
- If warm cooling air from compressors is used in air heating systems, e.g. to warm up a workroom, take precautions against air pollution and possible contamination of the breathing air.
- On water-cooled compressors using open circuit cooling towers, protective measures must be taken to avoid the growth of harmful bacteria such as Legionella pneumophila bacteria.
- It is not allowed to directly use the hot water of the cooling water circuit of the compressor as process water in pollution sensitive applications such as the food -and pharmaceutical industry.
- Do not remove any of, or tamper with, the sound-damping material.
- Never remove or tamper with the safety devices, guards or insulations fitted on the machine. Every pressure vessel or auxiliary installed outside the machine to contain air above atmospheric pressure shall be protected by a pressure relieving device or devices as required.
- Yearly inspect the air receiver. Minimum wall thickness as specified in the instruction book must be respected. Local regulations remain applicable if they are more strict.

**NOTE**

**Also consult the following safety precautions: *Safety precautions during operation* and *Safety precautions during maintenance or repair*.**

**These precautions apply to machinery processing or consuming air or inert gas. Processing of any other gas requires additional safety precautions typical to the application which are not included herein.**

**Some precautions are general and cover several machine types and equipment; hence some statements may not apply to your machine.**

## 1.5 Safety precautions during maintenance or repair

**WARNING**

**All responsibility for any damage or injury resulting from neglecting these precautions, or non-observance of the normal caution and care required for installation, operation, maintenance and repair, even if not expressly stated, will be disclaimed by the manufacturer.**

- Always use the correct safety equipment (such as safety glasses, gloves, safety shoes, etc.).
- Use only the correct tools for maintenance and repair work.
- Use only genuine spare parts for maintenance or repair. The manufacturer will disclaim all damage or injuries caused by the use of non-genuine spare parts.
- All maintenance work shall only be undertaken when the machine has cooled down.
- A warning sign bearing a legend such as "Work in progress; do not start" shall be attached to the starting equipment.
- Persons switching on remotely controlled machines shall take adequate precautions to ensure that there is no one checking or working on the machine. To this end, a suitable notice shall be affixed to the remote start equipment.
- Close the compressor air outlet valve and depressurize the compressor before connecting or disconnecting a pipe.
- Before removing any pressurized component, effectively isolate the machine from all sources of pressure and relieve the entire system of pressure. See section *Maintenance*.
- Never use flammable solvents or carbon tetrachloride for cleaning parts. Take safety precautions against toxic vapors of cleaning liquids.
- Scrupulously observe cleanliness during maintenance and repair. Keep dirt away by covering the parts and exposed openings with a clean cloth, paper or tape.
- Never weld or perform any operation involving heat near the oil system. Oil tanks must be completely purged, e.g. by steam cleaning, before carrying out such operations. Never weld on, or in any way modify, pressure vessels.
- Whenever there is an indication or any suspicion that an internal part of a machine is overheated, the machine shall be stopped but no inspection covers shall be opened before sufficient cooling time has elapsed; this to avoid the risk of spontaneous ignition of the oil vapor when air is admitted.
- Never use a light source with open flame for inspecting the interior of a machine, pressure vessel, etc.
- Make sure that no tools, loose parts or rags are left in or on the machine.
- When replacing the air filter, make sure no dirt, dust, rags, tools or loose parts can fall in the air inlet.
- All regulating and safety devices shall be maintained with due care to ensure that they function properly. They may not be put out of action.
- Before clearing the machine for use after maintenance or overhaul, check that operating pressures, temperatures and time settings are correct. Check that all control and shut-down devices are fitted and that they function correctly. If removed, check that the coupling guard of the compressor drive shaft has been reinstalled.
- Every time the separator element is renewed, examine the discharge pipe and the inside of the oil separator vessel for carbon deposits; if excessive, the deposits should be removed.
- Protect the motor, air filter, electrical and regulating components, etc. to prevent moisture from entering them, e.g. when steam cleaning.

- Make sure that all sound-damping material and vibration dampers, e.g. damping material on the bodywork and in the air inlet and outlet systems of the compressor, is in good condition. If damaged, replace it by genuine material from the manufacturer to prevent the sound pressure level from increasing.
- Never use caustic solvents which can damage materials of the air net, e.g. polycarbonate bowls.
- **Only if applicable, the following safety precautions are stressed when handling refrigerant:**
  - Never inhale refrigerant vapors. Check that the working area is adequately ventilated; if required, use breathing protection.
  - Always wear special gloves. In case of refrigerant contact with the skin, rinse the skin with water. If liquid refrigerant contacts the skin through clothing, never tear off or remove the latter; flush abundantly with fresh water over the clothing until all refrigerant is flushed away; then seek medical first aid.
- Protect hands to avoid injury from hot machine parts, e.g. during draining of oil.
- Be aware of eventual sharp edges on certain parts of the machine.

**NOTE**

**Also consult the following safety precautions: *Safety precautions during operation* and *Safety precautions during maintenance or repair*.**

**These precautions apply to machinery processing or consuming air or inert gas. Processing of any other gas requires additional safety precautions typical to the application which are not included herein.**

**Some precautions are general and cover several machine types and equipment; hence some statements may not apply to your machine.**

## 1.6 Dismantling and disposal

The device must be disposed according to local regulations. The product is not designed for refurbishing after finished lifecycle.

### Dismantling

Once the end of life of the machine is reached, please follow next steps:

1. Stop the machine.
2. Check all safety precautions mentioned in the previous chapters to secure safe handling (e.g. LOTO, cool-down, depressurize, discharge, etc.).
3. Have trained personnel dismantle the installation.
4. Separate the harmful from the safe components (e.g. drain oil from parts containing oil).
5. Refer to the disposal topic below.

### Disposal of electrical and electronic appliances (WEEE)

This equipment falls under the provisions of the European Directive 2012/19/EU on waste electrical and electronic appliances (WEEE) as well as under the UKCA Waste Electrical and Electronic Equipment regulations 2013 and may not be disposed as unsorted waste.


The equipment is labelled in accordance with the European Directive 2012/19/EU and the UKCA Waste Electrical and Electronic Equipment regulations 2013 with the crossed-out wheelie bin symbol.

At the end of life-time of the electric and electronic equipment (EEE) it must be taken to separate collection.

For more information check with your local waste authority, customer center or distributor.

**Disposal of other used material**

Used filters or any other used material (e.g. filter bags, filter media, desiccant, lubricants, cleaning rags, machine parts, etc.) must be disposed of in an environmentally friendly and safe manner, and in line with the local recommendations and environmental legislation.

# 2 General description

## 2.1 Introduction

CPI 75-120, CPM 75-120 and CPV 60VS-120VS PM are single-stage, oil-injected screw compressors, driven by an electric motor.

The units are air-cooled or water-cooled.

The units are controlled by a controller. The controller and the emergency stop button are integrated in the door panel of the electrical cubicle. An electrical cabinet comprising the motor starter is located behind this panel.

The units are enclosed in a sound-insulated bodywork.

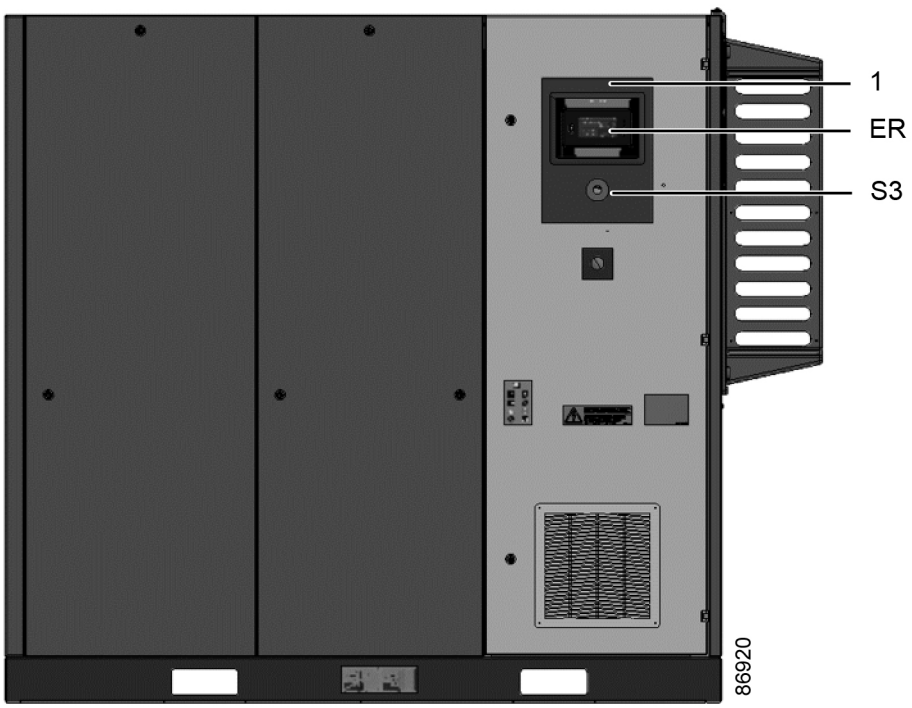



**Figure 1: Front view**

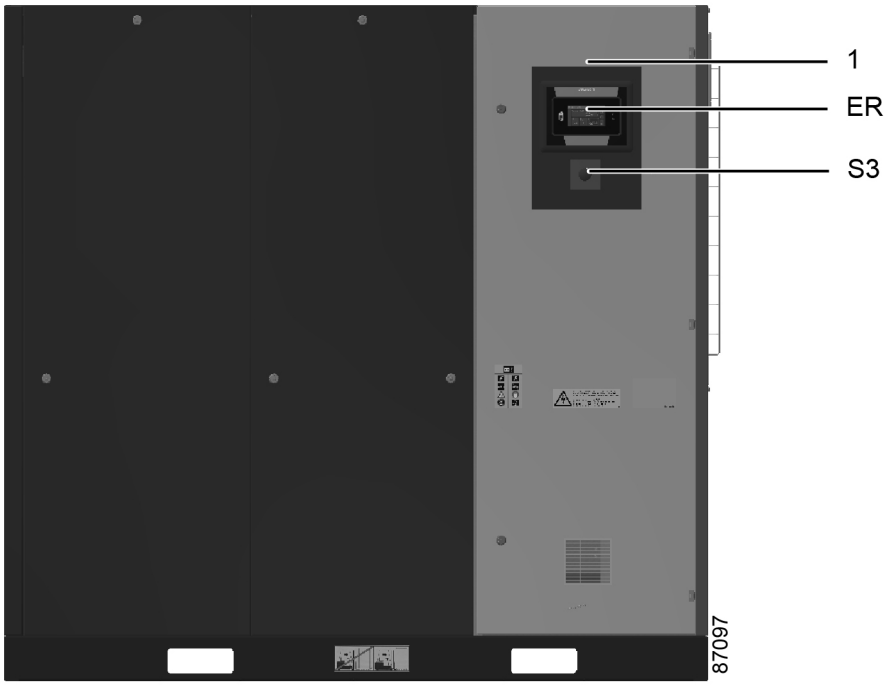



**Figure 2: Front view**

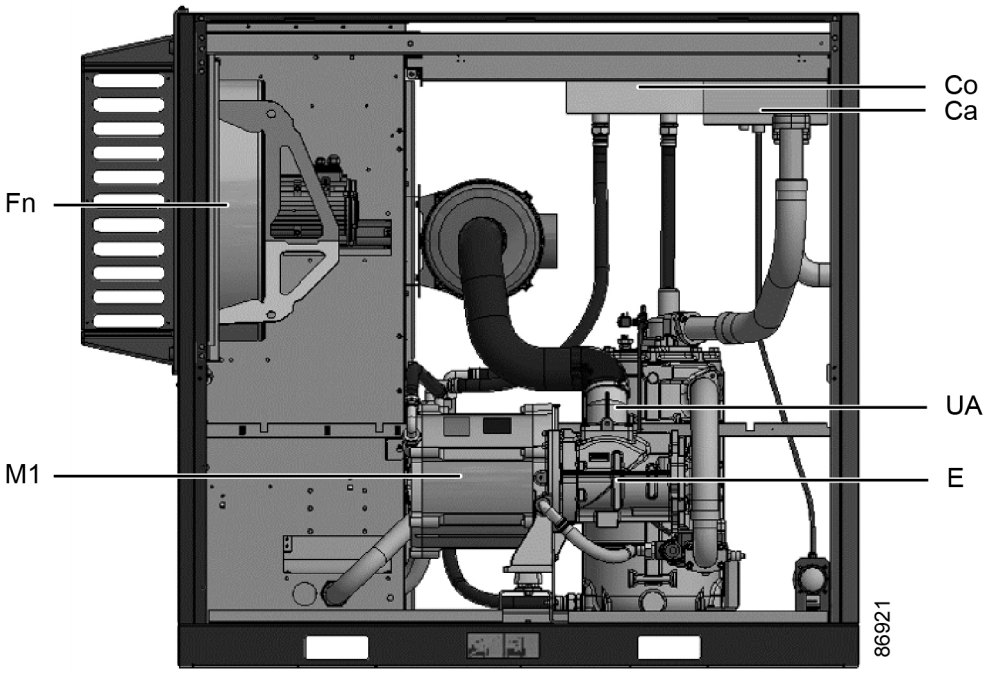



**Figure 3: Motor side view, Pack**

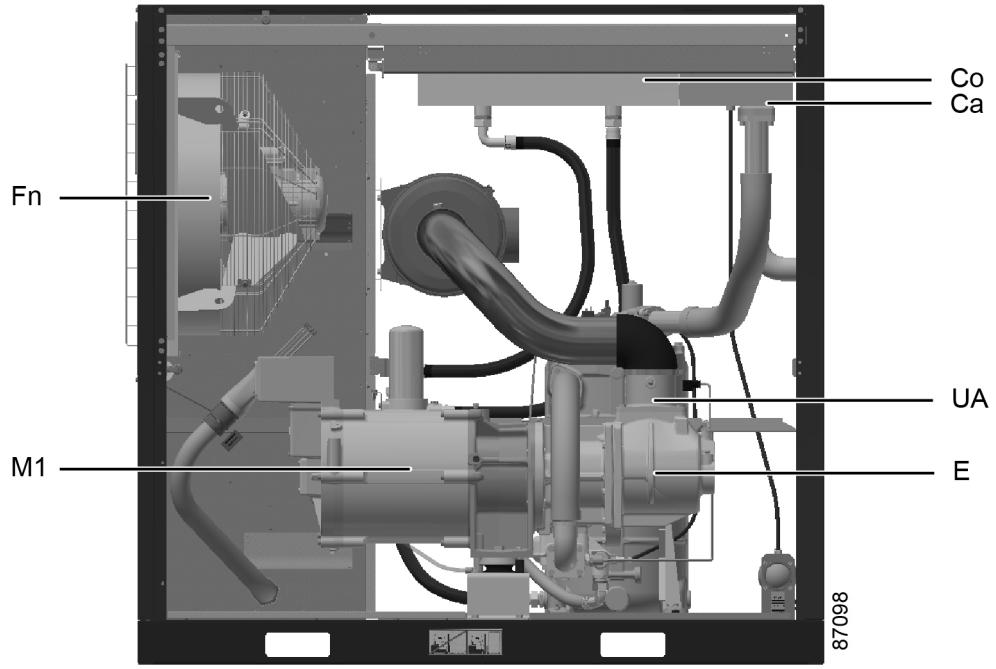



**Figure 4: Motor side view, Pack**

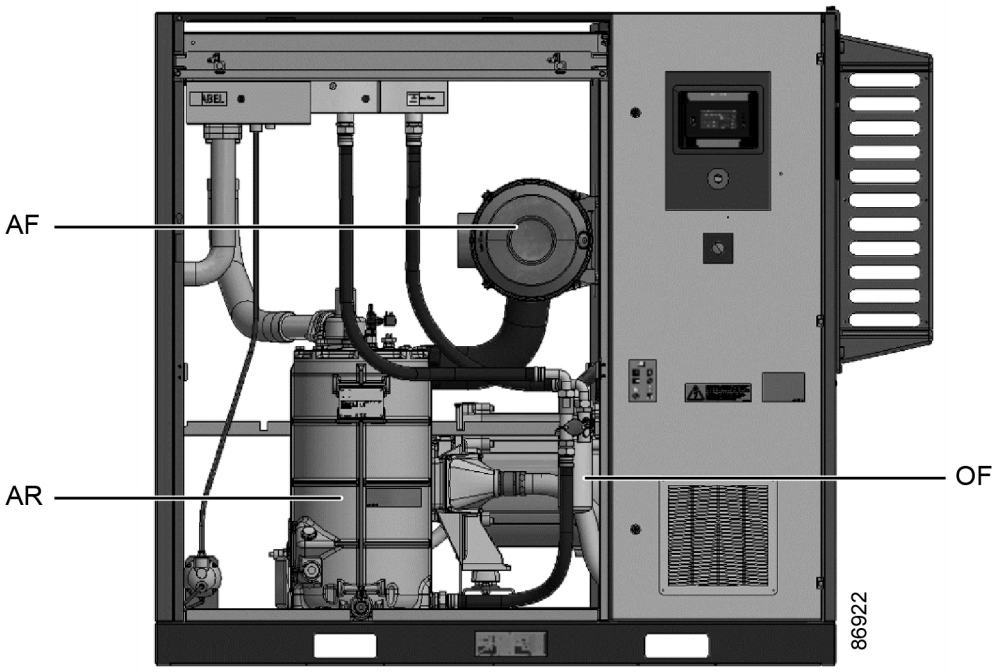



**Figure 5: Service side view, Pack**

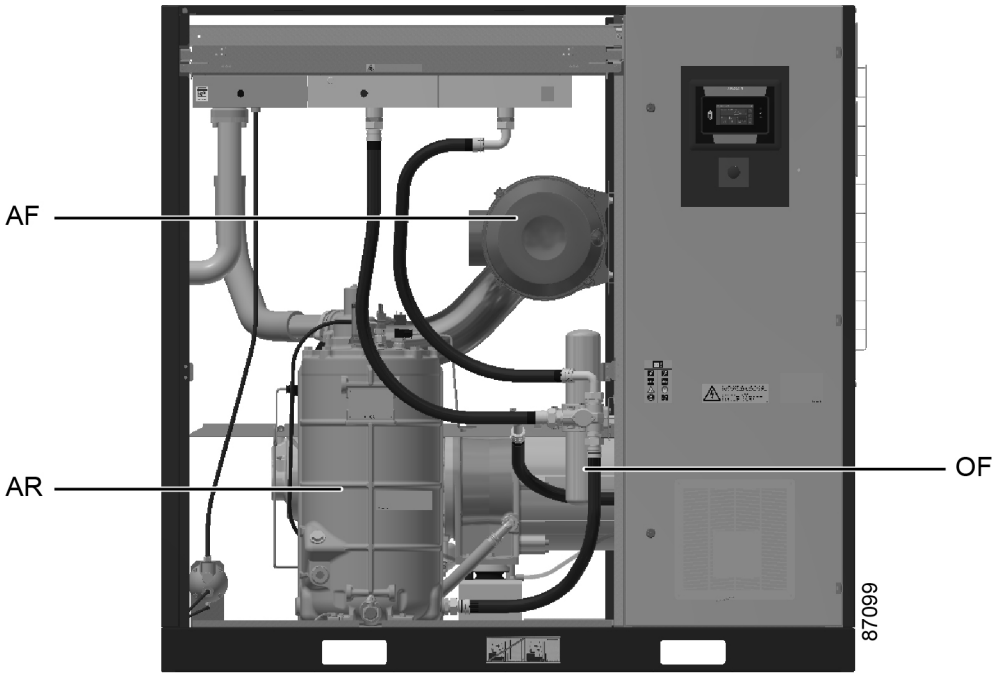



**Figure 6: Service side view, Pack**

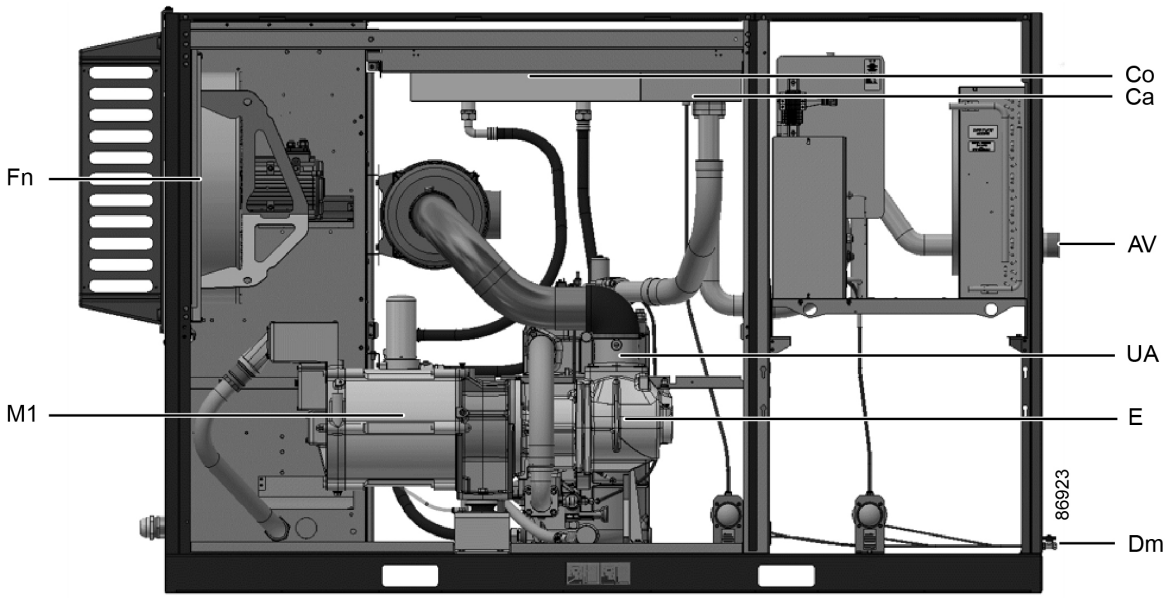



**Figure 7: Motor side view, Full-Feature**

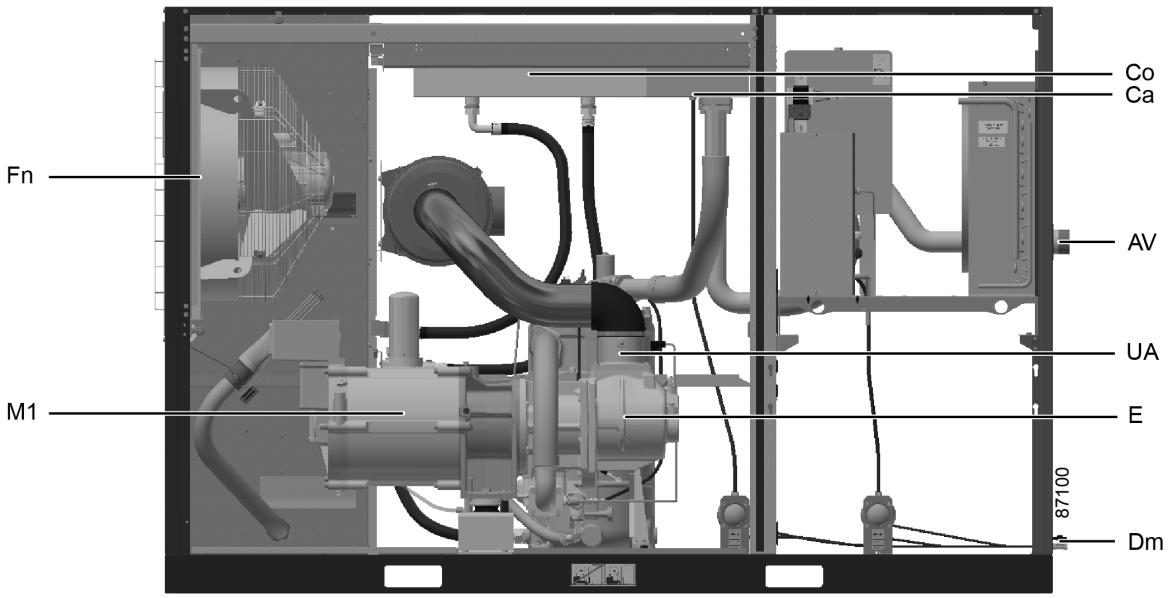



**Figure 8: Motor side view, Full-Feature**

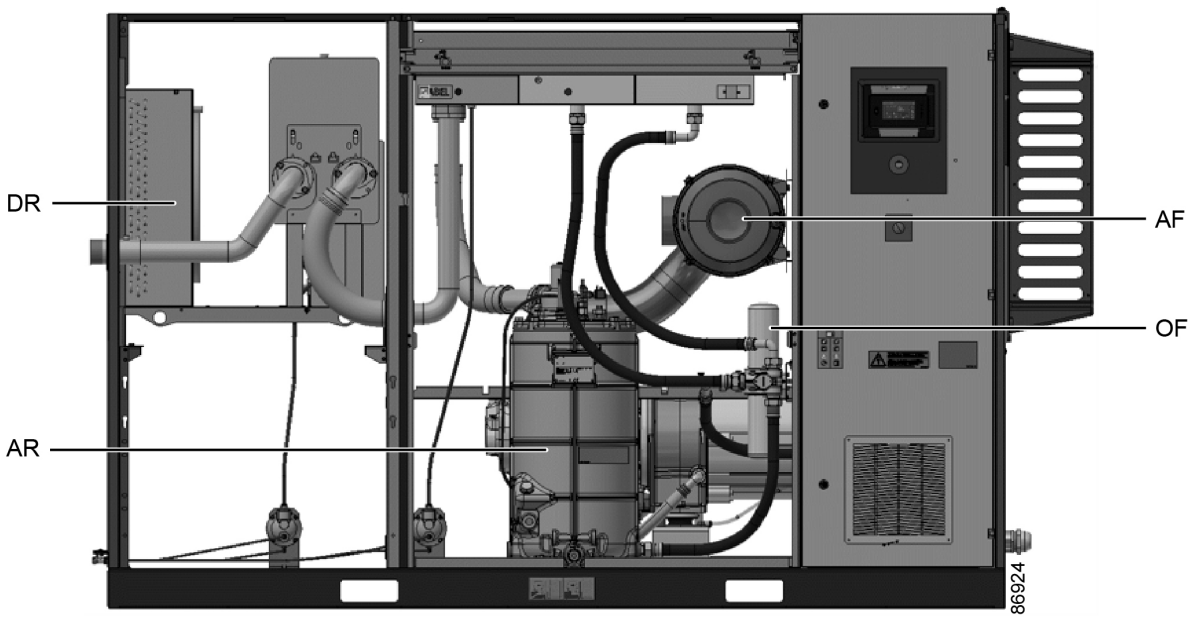



**Figure 9: Service side view, Full-Feature**

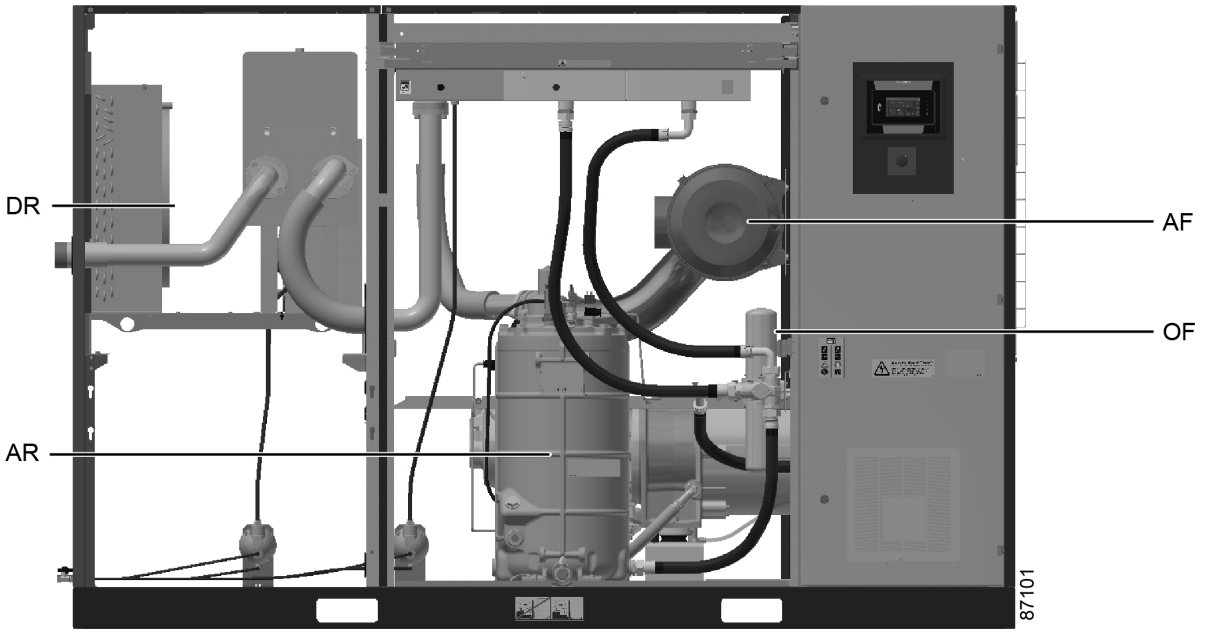



**Figure 10: Service side view, Full-Feature**

| Reference | Description |
|---|---|
| 1 | Electrical cabinet |
| AV | Outlet valve |
| Ca | Air cooler |
| Co | Oil cooler |
| E | Compressor element |
| ER | Controller |
| FN | Cooling fan |
| M1 | Motor of the compressor |
| S3 | Emergency stop button |
| Dm | Condensate outlets |
| UA | Unloader |
| AF | Air filter |
| AR | Air receiver (oil separator tank) |
| OF | Oil filter |
| DR | Dryer (only on units with integrated dryer) |

## 2.2 Air and oil circuit

### Air circuit

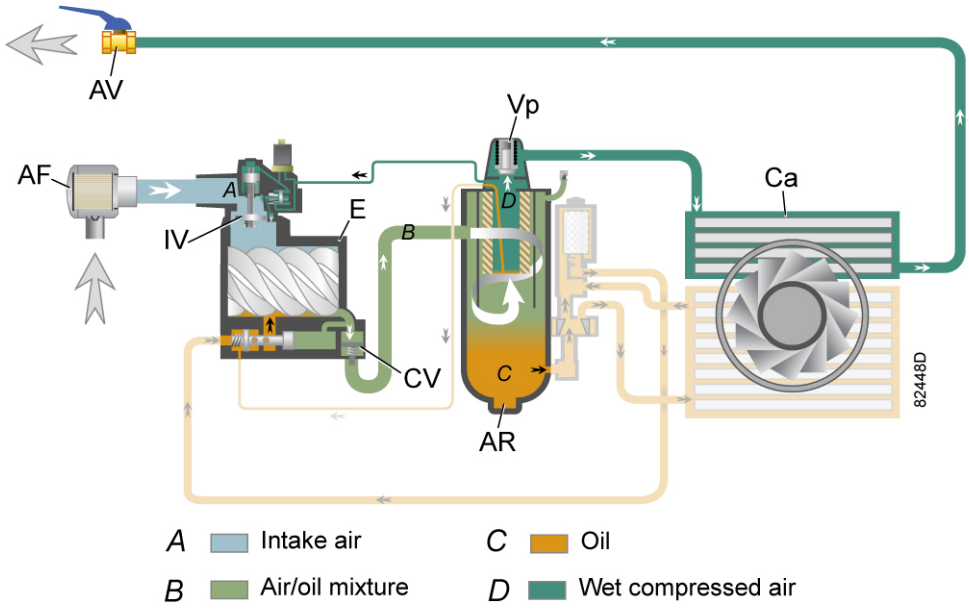



**Figure 11: Flow diagram, air circuit (units without integrated dryer)**

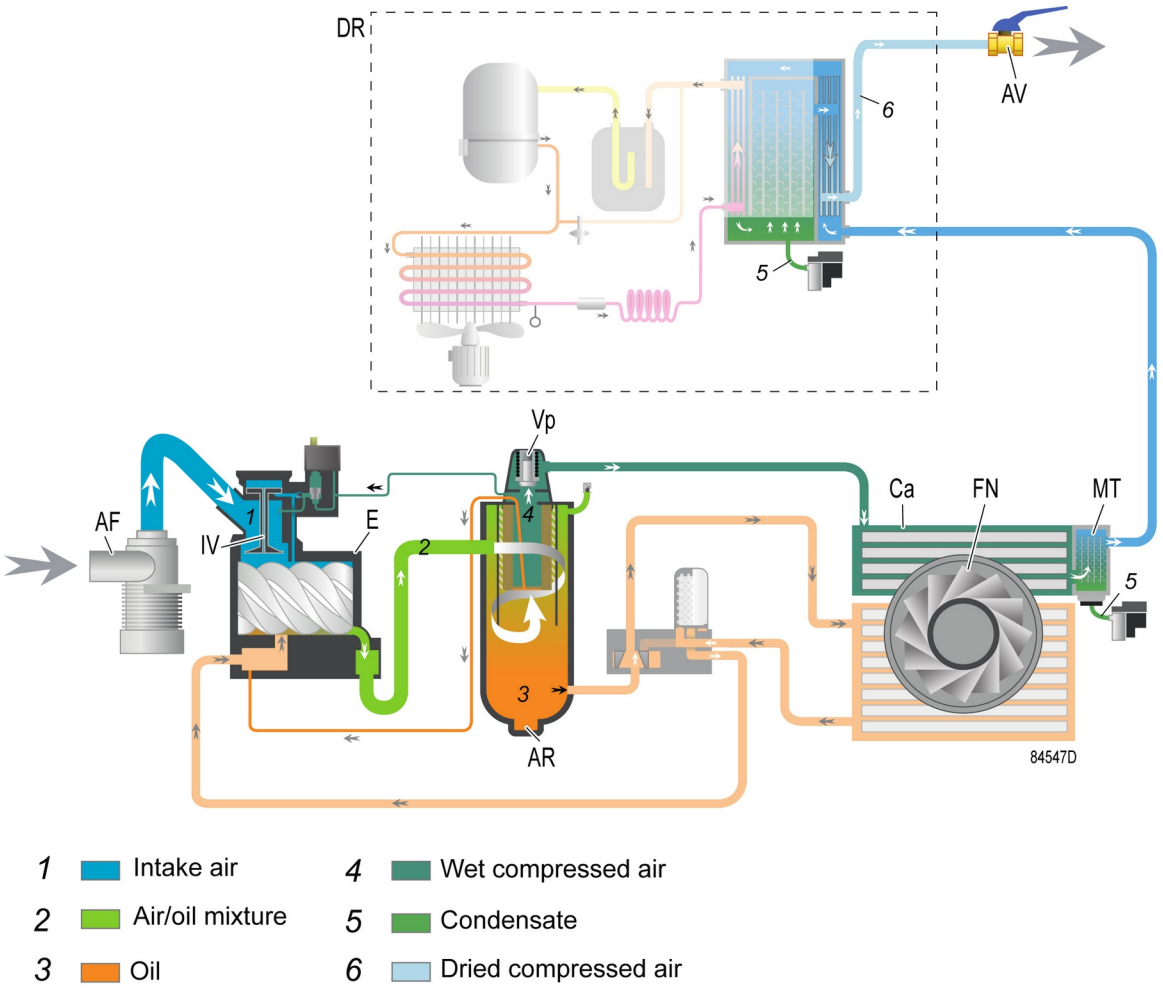



**Figure 12: Flow diagram, air circuit (units with integrated dryer)**

| Reference | Description |
|---|---|
| 1 | Intake air |
| 2 | Air/oil mixture |
| 3 | Oil |
| 4 | Wet compressed air |
| 5 | Condensate |
| 6 | Dried compressed air |

### Description

Air drawn through the inlet filter (AF) and the open inlet valve (IV) of the unloader is compressed in the compressor element (E). A mixture of compressed air and oil flows into the air receiver/oil separator tank (AR). The air is discharged through the outlet valve (AV) via the minimum pressure valve (Vp) and air cooler (Ca).

On units with an integrated dryer, the air cooler is provided with a moisture trap (MT).

On units with an integrated dryer, the air flows through the air dryer (DR) before it is discharged through the outlet valve (AV). Also see section *Air dryer*.

Under all circumstances, the minimum pressure valve (Vp) keeps the pressure in the separator tank (AR) above the minimum value that is required for lubrication of the compressor element. An

integrated check valve prevents the compressed air downstream of the minimum pressure valve from being vented to the atmosphere during unloaded operation. When the unit is stopped, the inlet valve (IV) closes, preventing compressed air (and oil) to be vented into the air filter.

## Oil circuit

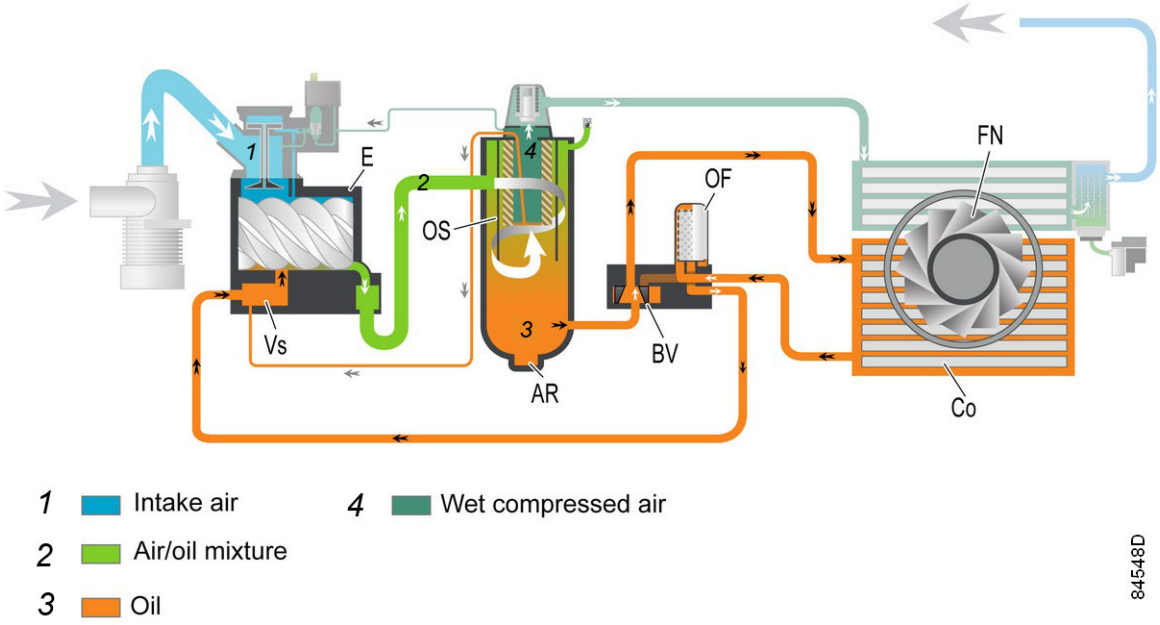



**Figure 13: Flow diagram, oil circuit**

| Reference | Description |
|---|---|
| 1 | Intake air |
| 2 | Air/oil mixture |
| 3 | Oil |
| 4 | Wet compressed air |

### Description

The air pressure in the separator tank forces the oil via the oil filter (OF) to the compressor element (E), where it acts as sealant, coolant, lubricant, and corrosion inhibitor (during stand still periods).

In the air receiver/oil separator tank (AR), most of the oil is separated from the air/oil mixture by gravity and inertia. The remaining oil is separated by the oil separator (OS). The oil collects in the lower part of the air receiver/oil separator tank (AR).

The oil circuit is provided with a thermostatic bypass valve (BV). When the oil temperature is below its setpoint, the oil cooler is bypassed. The bypass valve (BV) starts opening the supply to the cooler (Co) when the oil temperature has increased to the setpoint temperature. At approx. 15 ˚C (27 ˚F) above the setpoint temperature, all the oil flows through the oil cooler.

A tropical thermostatic valve (available as an option) offers a higher opening temperature, it helps to avoid condensate accumulation in the oil. This option is advised when the unit operates in high humidity conditions.

## 2.3 Cooling system

### Air-cooled

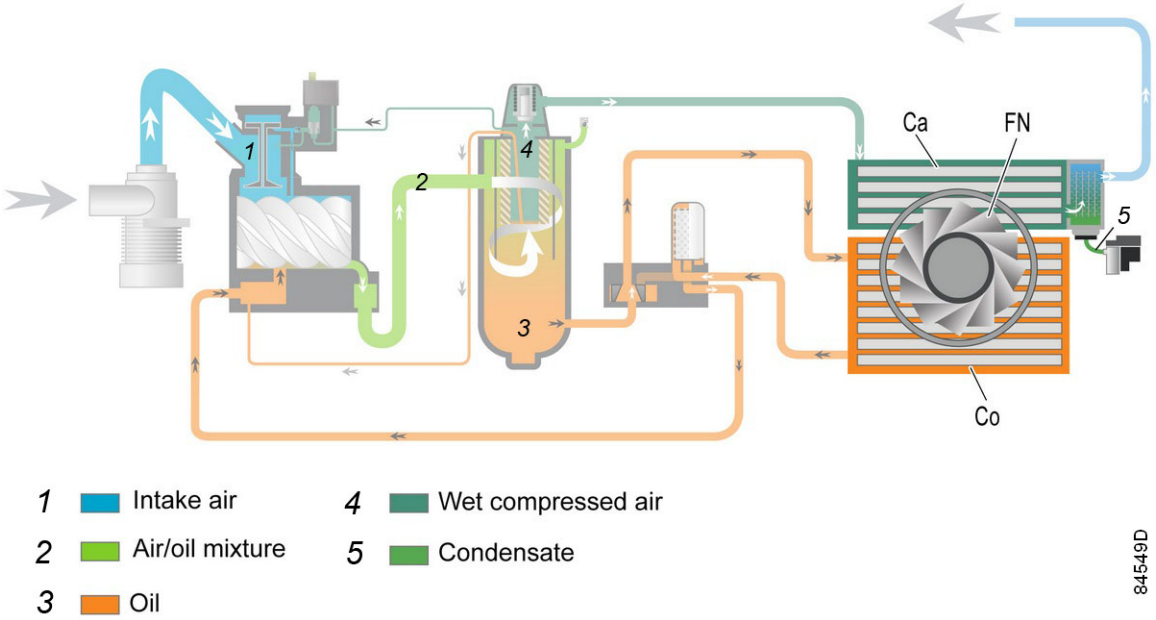



**Figure 14: Cooling system, air-cooled units**

| Reference | Description |
|---|---|
| 1 | Intake air |
| 2 | Air/oil mixture |
| 3 | Oil |
| 4 | Wet compressed air |
| 5 | Condensate |

### Description

The cooling system on air-cooled units comprises an air cooler (Ca) and oil cooler (Co).

The cooling air flow is generated by the fan (FN).

### Water-cooled

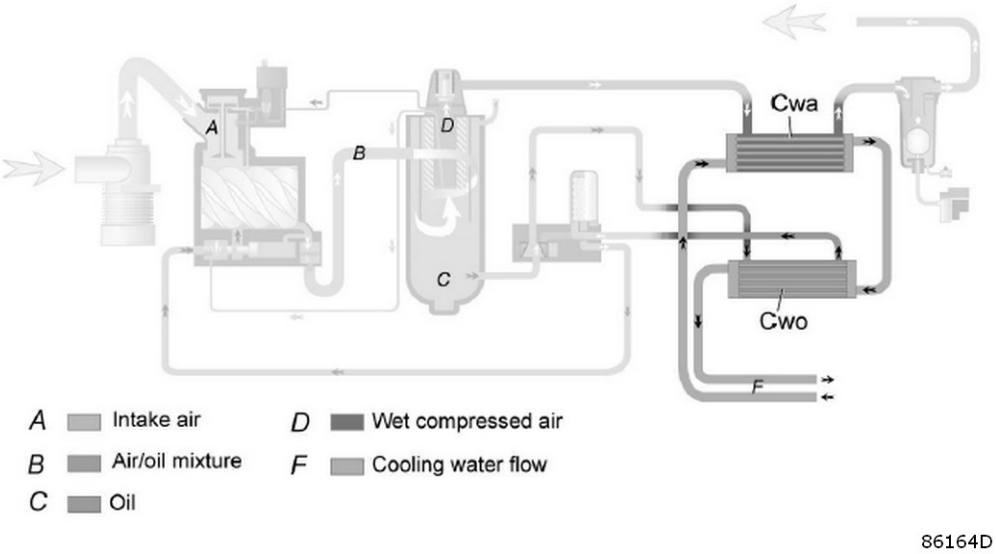



**Figure 15: Cooling system, water-cooled units**

| Reference | Description |
|---|---|
| A | Intake air |
| B | Air/oil mixture |
| C | Oil |
| D | Wet compressed air |
| F | Cooling water flow |

#### Description

The cooling system on water-cooled units comprises an air cooler (Cwa) and oil cooler (Cwo).

They are connected to a cooling water circuit. The water flows through the inlet pipe, the coolers and the outlet pipe.

## 2.4 Condensate system

On units with an integrated dryer, the condensate collected in the moisture trap of the air cooler is evacuated via a drain. There is an additional drain on the moisture trap of the dryer. Each drain is connected to its outlet connection (Da) and a manual drain valve (Dm).

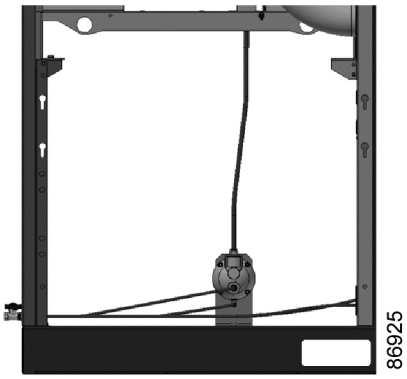



**Figure 16: Condensate drain**

## Drain connections

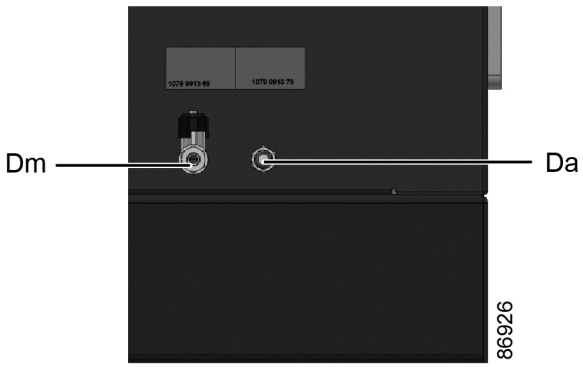



**Figure 17: Condensate drain connections**

| Reference | Description |
|---|---|
| Da | Automatic drain connection |
| Dm | Manual drain valve |

## 2.5 Regulating system

### 2.5.1 Unloader

Applicable to units with an unloader.

**Load/unload regulating system**

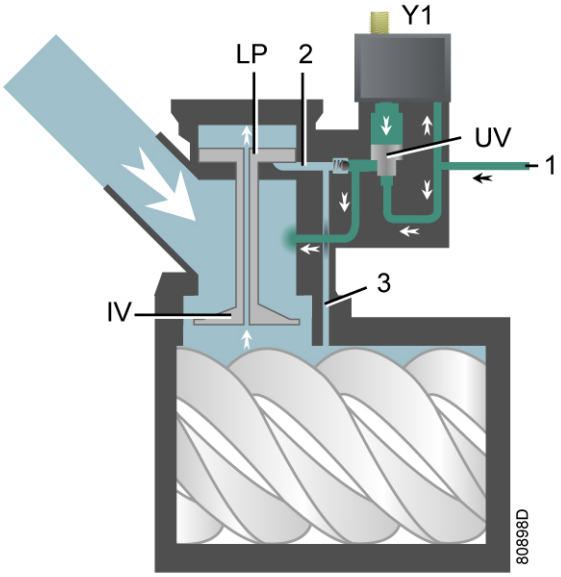



**Figure 18: Regulating system (loaded condition)**

**Loading**

When the net pressure is below the loading pressure, the solenoid valve (Y1) is energized. Results:

- The space above the unloading valve/blow-off valve (UV) is connected to the oil separator tank pressure (1) via the solenoid valve.
- The unloading valve/blow-off valve (UV) moves downwards, closing off the connection to channels (2) and (3).
- Underpressure from the compressor element causes the loading plunger (LP) to move downwards the and inlet valve (IV) to open fully.

Air delivery is 100%, the compressor runs loaded.

**Unloading**

If the air consumption is less than the air output of the compressor, the net pressure increases. When the net pressure reaches the unloading pressure, solenoid valve (Y1) is de-energised. Results:

- The pressure above the unloading valve/blow-off valve (UV) is released to the atmosphere and the space above the valve (UV) is no longer in connection with the oil separator tank pressure (1).
- The unloading valve/blow-off valve (UV) moves upwards, connecting the oil separator tank pressure (1) with channels (2) and (3).

- The pressure in channel (2) causes the loading plunger (LP) to move upwards, causing the inlet valve (IV) to close, while the pressure is gradually released to the atmosphere.
- The pressure in the separator tank stabilizes at low value. A small amount of air is kept drawn in to guarantee a minimal pressure, required for lubrication during unloaded operation.

Air output is stopped, the compressor runs unloaded.

### 2.5.2 Check valve

Applicable to units with a check valve.

When the unit is started and the net pressure is below the setpoint, the motor speed increases until the net pressure reaches the setpoint or until the maximum motor speed is reached.

If the air consumption is less than the air delivery of the unit, the net pressure increases further.

When the net pressure reaches the setpoint (the desired net pressure) and continues to rise, the controller decreases the motor speed.

When the pressure continues to increase, even though the motor already operates at minimum speed, the controller stops the motor as soon as the net pressure reaches a value equal to the setpoint plus the indirect stop level (typically 0.3 bar above the setpoint).

Should the net pressure rise very quickly to a value equal to the setpoint plus the direct stop level (typically 1 bar above the setpoint), the unit stops immediately without first decreasing the motor speed. See section *Machine settings*.

If the unit was stopped in automatic operation and the net pressure approaches the setpoint, the controller starts the motor again. The quicker the net pressure drops, the quicker the unit will restart.

## 2.6 Electrical system

### Electrical components, fixed speed units

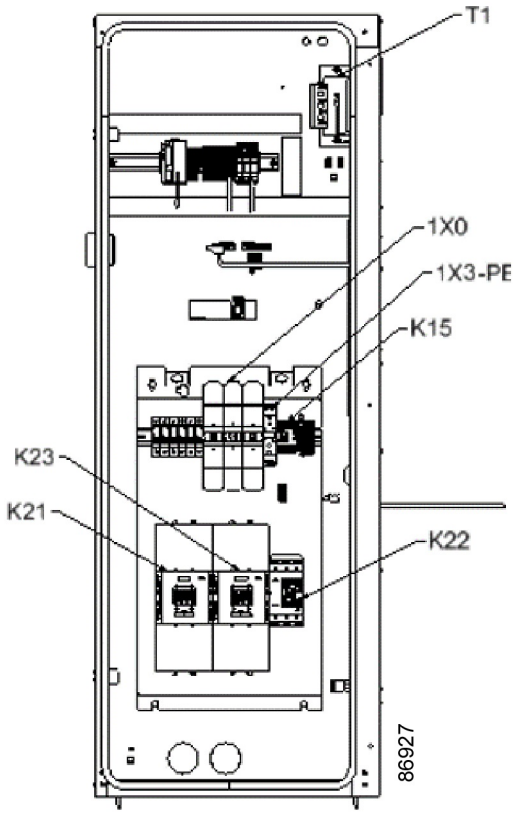



**Figure 19: Electrical cabinet, fixed speed units**

| Reference | Designation |
|---|---|
| T1 | Transformer |
| 1X0 | Customer supply connection |
| 1X3-PE | Earth terminal |
| K15 | Fan contactor |
| K21 | Line contactor |
| K22 | Star contactor |
| K23 | Delta contactor |

## Electrical components, variable speed units

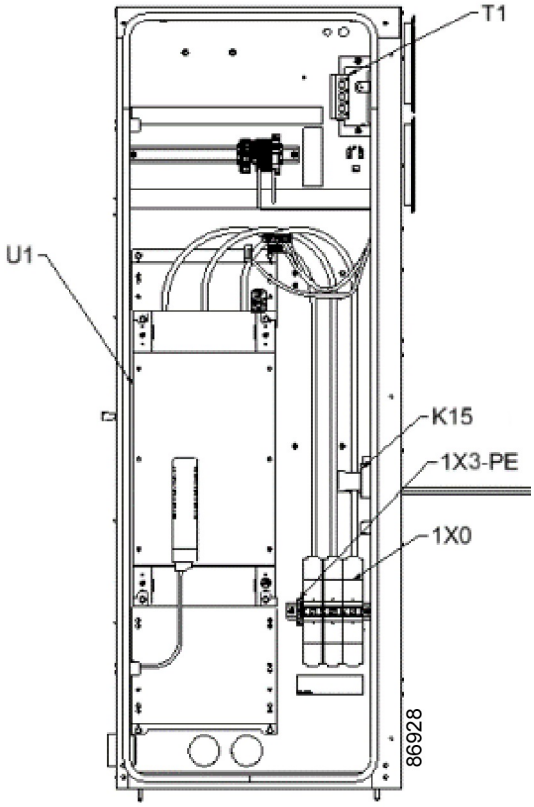



**Figure 20: Electrical cabinet, variable speed units**

| Reference | Designation |
|---|---|
| T1 | Transformer |
| 1X0 | Customer supply connection |
| 1X3-PE | Earth terminal |
| K15 | Fan contactor |
| U1 | Frequency converter |

## Electrical diagram

| | |
|---|---|
| 9820 7264 51 | Fixed speed, power module |
| 9820 7264 56 | Fixed speed, analog control module, Swipe controller |
| 9820 7264 69 | Fixed speed, analog control module, Touch controller |

**Table 1: Fixed speed units**

| | |
|---|---|
| 9820 7264 81 | Variable speed, power module |
| 9820 7264 83 | Analog control module, variable speed motor |
| 9820 7264 99 | Analog control module, permanent magnet variable speed motor |

**Table 2: Variable speed units**

The complete electrical diagram can be found in the technical documentation supplied with the machine.

## 2.7 Air dryer

On units with integrated dryer only.

### Flow diagram

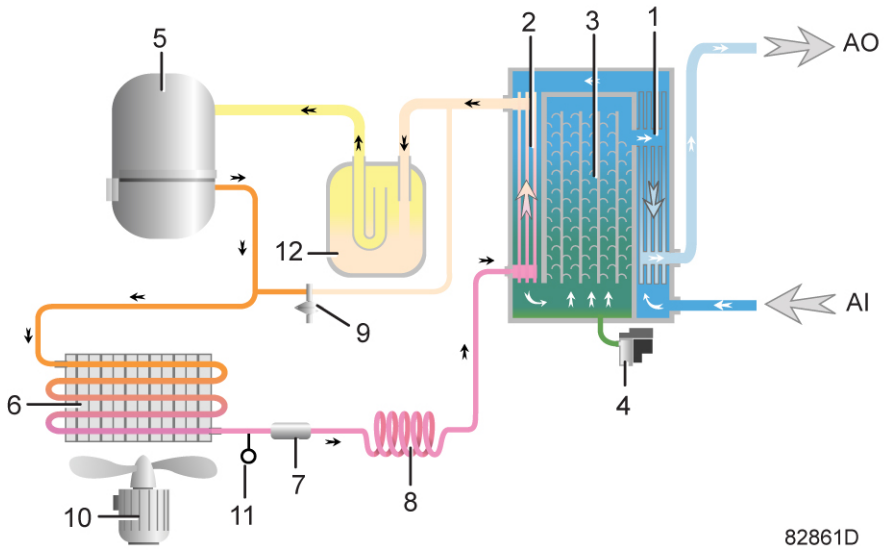



**Figure 21: Air dryer**

| Reference | Description |
|---|---|
| AI | Air inlet |
| AO | Air outlet |
| 1 | Air / air heat exchanger |
| 2 | Air / refrigerant heat exchanger / evaporator |
| 3 | Condensate separator |
| 4 | Automatic drain / condensate outlet |
| 5 | Refrigerant compressor |
| 6 | Refrigerant condenser |
| 7 | Liquid refrigerant dryer / filter |
| 8 | Capillary |
| 9 | Bypass valve |
| 10 | Condenser cooling fan |
| 11 | Pressure switch, fan control |
| 12 | Liquid separator |

### Compressed air circuit

Compressed air enters the heat exchanger (1) and is cooled by the outgoing, cold, dried air. Water in the incoming air starts to condense. The air then flows through the heat exchanger / evaporator (2), where the refrigerant evaporates, causing the air to be cooled further to close to the evaporating temperature of the refrigerant. More water in the air condenses. The cold air then flows through the separator (3) where all the condensate is separated from the air. The condensate is automatically drained through the condensate drain (4).

The cold, dried air flows through the heat exchanger (1) where it is warmed up by the incoming air.

## Refrigerant circuit

The compressor (5) delivers hot, high-pressure refrigerant gas which flows through the condenser (6) where most of the refrigerant condenses.

The liquid refrigerant flows through the liquid refrigerant dryer / filter (7) to the capillary tube (8). The refrigerant leaves the capillary tube at about evaporating pressure.

The refrigerant enters the evaporator (2) where it withdraws heat from the compressed air by further evaporation at a relatively constant pressure. The heated refrigerant leaves the evaporator and is sucked in by the compressor (5) through a liquid separator (12).

The bypass valve (9) regulates the refrigerant flow. The fan (10) is switched on or off by the switch (11) depending on the pressure degree of the condensate.

# 3 Swipe controller

## 3.1 Controller


**Figure 22: The ES4000S Swipe controller**

### Introduction

**The controller has following functions:**

- Controlling the unit
- Protecting the unit
- Monitoring components subject to service
- Automatic restart after voltage failure (ARAVF)

### Automatic control of the unit

The controller maintains the net pressure between programmable limits by automatically loading and unloading the unit.

A number of programmable settings, e.g. the unloading and loading pressures, the minimum stop time and the maximum number of motor starts are taken into account.

The controller stops the unit whenever possible to reduce the power consumption and restarts it automatically when the net pressure decreases. If the expected unloading period is too short, the unit is kept running to prevent too short standstill periods.

**WARNING**

**A number of time-based automatic start/stop commands may be programmed. Take into account that a start command will be executed (if programmed and activated), even after manually stopping the unit.**

## Protecting the unit

### Shutdown

If the element outlet temperature exceeds the programmed shutdown level, the unit will be stopped.

The unit will also be stopped in case of overload of the drive motor or fan motor.

**WARNING**

**Before remedying, consult the *Safety precautions*. Before resetting a warning or shutdown message, always solve the problem. Frequently resetting these messages without remedying may damage the unit.**

### Shutdown warning

A shutdown warning level is a programmable level below the shutdown level.

If one of the measurements exceeds the programmed shutdown warning level, a message will appear on the display and the general alarm LED will light up to warn the operator before the shutdown level is reached.

The message disappears as soon as the warning condition disappears or after a manual warning reset on the display.

A warning will also appear if the dew point temperature is too high in relation to the ambient temperature (on units with integrated dryer).

When the shutdown warning is shown, press stop button to stop the unit and wait until the unit has stopped. Switch off the voltage, inspect the unit and remedy if necessary. The warning message will disappear as soon as the warning condition disappears.

## Service warning

The service timer has a programmed time interval. If the service timer exceeds the programmed value, this will be indicated on the display to warn the operator to carry out the service actions.

When the service warning is shown, stop the unit, switch off the voltage and carry out the required service actions. See section *Preventive maintenance*.

## Automatic restart after voltage failure (ARAVF)

The controller has a built-in function to automatically restart the unit when the voltage is restored after voltage failure. For units leaving the factory, this function is made inactive.

To activate this function, you have to change the Access level to ‘Service user’. This profile is password protected. See section *Controller settings menu*.

Consult your supplier.

**WARNING**

**If the function is activated and provided the controller was in the automatic operation mode, the unit will automatically restart if the supply voltage to the module is restored. The Automatic Restart After Voltage Failure (ARAVF) label (see section *Pictographs*) shall be glued near to the controller.**

## 3.2 Control panel

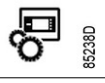

**Figure 23: Control panel**

### Parts and functions

| Reference | Designation | Function |
|---|---|---|
| 1 | Warning sign | Flashes in case of a shut-down, is lit in case of a warning condition. |
| 2 | Service sign | Is lit when service is needed. |
| 3 | Operation sign | Is lit when the unit is running. |
| 4 | Voltage sign | Indicates that the voltage is switched on. |
| 5 | Home button | Tap this button to return to the Main screen. |
| 6 | Display | The information is shown on the display. |
| 7 | Right vertical swipe bar | Swipe up or down to modify a setting.<br>After modifying, tap the cancel (12) or confirm (11) button. |
| 8 | Horizontal swipe bar | Swipe left or right to move horizontally through the menu. |
| 9 | Stop button | Tap this button to stop the unit. |
| 10 | Start button | Tap this button to start the unit.<br>The operation sign (3) lights up. The controller is operative. |
| 11 | Confirm button | After modifying a value, tap the confirm button to finalise. |
| 12 | Cancel button | Tap the cancel button to cancel a modification. |
| 13 | Left vertical swipe bar | Swipe up or down to move vertically through the menu. |

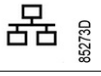
## 3.3 Icons used

### Menu icons

| Menu | Icon |
|---|---|
| Main screen |  |
| Machine Settings |  |
| Aux. Equipment Parameters |  |
| Data |  |
| Service |  |
| Controller Settings |  |
| Information |  |

### Status icons

| Icon | Description |
|---|---|
|  | Motor Stopped |
|  | Motor Stopped Wait |
|  | Running Unloaded |
|  | Manual Unload |
|  | Running Unloaded Wait |
|  | Running Loaded |
|  | Running Loaded Wait |
|  | Machine Control Mode, Local |
|  | Machine Control Mode, Remote |

| | |
|---|---|
|  | Machine Control Mode, LAN |
|  | Auto Restart After Voltage Failure (ARAVF) |

### System icons

| Icon | Description |
|---|---|
|  | Basic User |
|  | Advanced User |
|  | Service User |
|  | Change between screens (indication) |
|  | Reset |

**NOTE**

**This chapter gives a general survey of available icons. Not all icons mentioned in this chapter are applicable to every machine.**

## 3.4 Menu

### Procedure

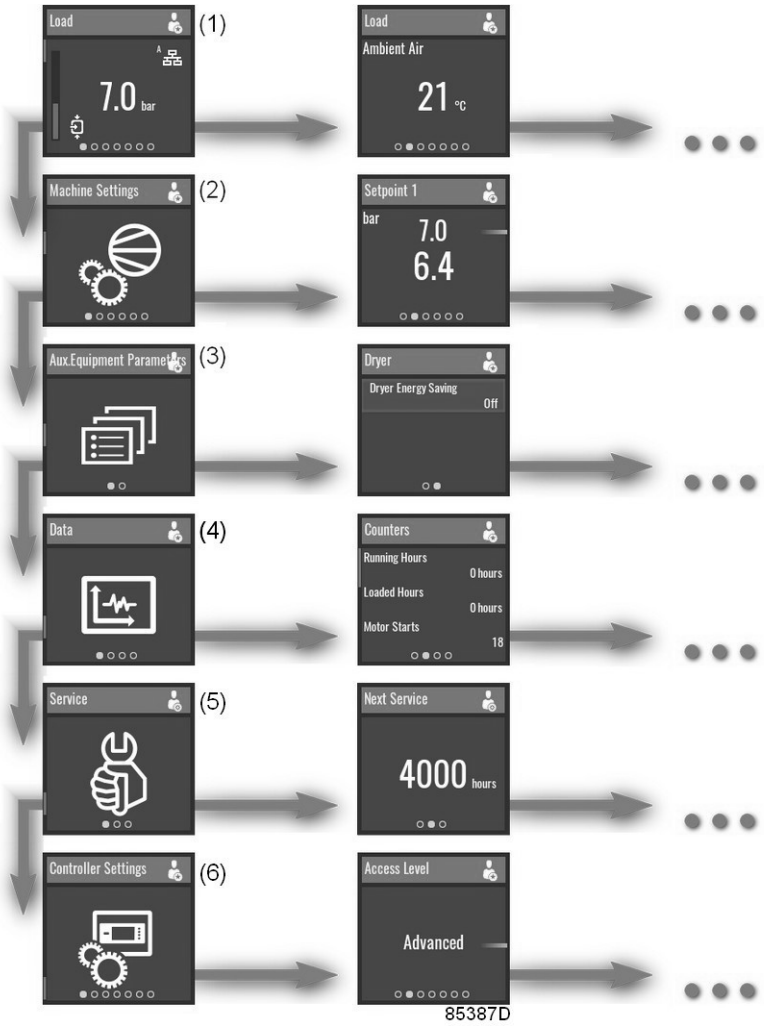
Starting from the main screen, use the left vertical swipe bar to navigate through the menu items.

Use the horizontal swipe bar to navigate through the different screens of a menu item.

The page indicator

shows how many screens there are available for the current menu item, depending on the user access level.

## Menu structure




| Reference | Designation | Function |
|---|---|---|
| (1) | Main screen | Next to the main screen, a maximum of 3 extra values can be shown. |
| (2) | Machine settings | Setpoints, Regulation settings and Control parameters can be viewed and modified through this menu. |
| (3) | Aux. Equipment parameters | Settings for auxiliary equipment can be viewed and modified through this menu.<br>This menu is only visible when the Access level is set to Advanced. See section *Controller settings*. |
| (4) | Data | The data menu contains information about the Counters, Inputs and Outputs. |
| (5) | Service | Information about the service interval can be found through this menu.<br>This menu is only visible when the Access level is set to Service. See section *Controller settings*. |
| (6) | Controller settings | Different controller settings, such as Access level or Ethernet settings can be viewed and modified through this menu. |

This is the main menu structure. The structure can be different depending on the configuration of the unit.

### Select or modify a setting

Several settings can be modified. The process of selecting or modifying a setting anywhere in the menu is basically the same.

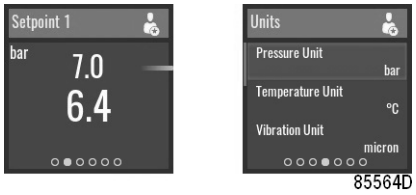



**Figure 24: Examples of modifiable settings**

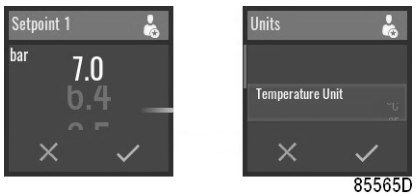
#### Select

In these examples, the upper value is selected.

To select the lower value, swipe down on the left vertical swipe bar.

#### Modify

To modify the selected value, tap the right vertical swipe bar.




Swipe up or down on the right vertical swipe bar to change the value.

On the horizontal swipe bar, tap ‘V’ to confirm or ‘X’ to decline.

## 3.5 Main screen

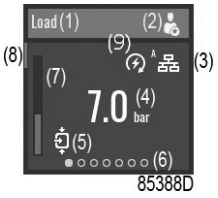
### Function

The Main screen is the screen that is shown automatically when the voltage is switched on. It is switched off automatically after a few minutes when there is no touch input.

Swipe left to navigate to the following screens:

- Predefined IO or counter data (optional)
- Setpoint used (optional)
- Manual unload (optional)
- Status

### Description



| Reference | Designation | Function |
|---|---|---|
| (1) | Screen information | On the main screen, the screen information bar shows the current status of the machine. When scrolling through menus, the name of the current menu item is shown. |
| (2) | Access level icon | The access level icon shows the current access level setting.<br>See section *Controller settings menu* to switch between User, Advanced or Service. |
| (3) | Control mode icon | The control mode icon shows the current control mode setting.<br>• Local control via start/stop buttons<br>• Remote control via digital input(s)<br>• LAN control via the network.<br>When in Remote or LAN control, the start/stop buttons on the controller will not work. |
| (4) | Input value | This field contains an input value, depending on the type of the machine. In this case, the current outlet pressure is shown. |
| (5) | Status | This icon shows the current status of the unit. |
| (6) | Page indicator (Breadcrumbs) | Indicates how many pages there are available for a given menu item.<br>The page which is currently active is indicated by a filled white circle.<br>Swipe left or right to go to another screen. |
| (7) | Value bar | This is an indicator for the input value, also shown on the main screen. When the regulation sensor is selected 2 extra load, unload lines are shown. |
| (8) | Scrollbar | This is an indication of the vertical position in the menu.<br>Swipe up or down to go to another menu item. |
| (9) | ARAVF icon | The ARAVF icon is shown when the Automatic Restart functionality is activated. |

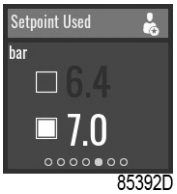
## Parameters

Starting from the main screen, swipe left to scroll through predefined IO or counter data. (optional)


**Figure 25: Example**

## Setpoint used

Starting from the main screen, swipe left until the Setpoint used screen is shown.

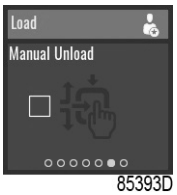


85392D

To switch to a different setpoint, swipe up or down on the left vertical swipe bar or tap next to the corresponding square.

### Manual unload

Starting from the main screen, swipe left until the Manual unload screen is shown.



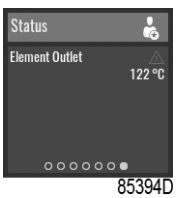
85393D

Manual unload can only be activated when the machine is in LOAD and Local control.

To manually unload the unit, tap on the left vertical swipe bar.

### Status

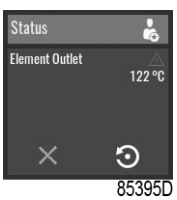
Starting from the main screen, swipe left until the Status screen is shown.



85394D

This screen shows the current status of the unit.

If an alarm is active, tap the right vertical swipe bar.



85395D

To reset the alarm, press the confirm button under the reset icon.

To cancel without resetting, press the cancel button under the red ‘X’ icon.

**WARNING**

**Before remedying, consult the *Safety precautions*. Before resetting a warning or shutdown message, always solve the problem. Frequently resetting these messages without remedying may damage the unit.**

## 3.6 Machine settings menu

### Function

The Machine Settings menu provides the ability to view and modify several machine settings.

Swipe left to navigate to the following screens:

- Setpoint 1 (optional)
- Setpoint 2 (optional)
- Regulation
- Control Mode
- Auto Restart

### Procedure

To view the Machine Settings menu:

1. Tap the Home button

   on top of the screen to go to the main screen.
2. Swipe up on the left vertical swipe bar until the Machine Settings menu is shown:

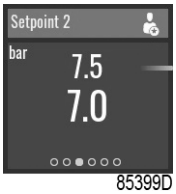

### Setpoint 1

Starting from the Machine Settings menu, swipe left until the Setpoint 1 screen is shown.


To select a load and unload setpoint, or to modify the values, see section *Select or modify a setting*.


### Setpoint 2

Starting from the Machine Settings menu, swipe left until the Setpoint 2 screen is shown.



85399D

To select a load and unload setpoint, or to modify the values, see section *Select or modify a setting*.

### Regulation

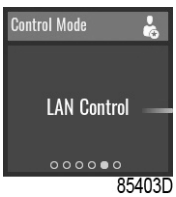
Starting from the Machine Settings menu, swipe left until the Regulation screen is shown.

85401D

To select a menu item, or to change the setting, see section *Select or modify a setting*.

### Control Mode

Starting from the Machine Settings menu, swipe left until the Control Mode screen is shown.



85403D

Following control modes are available:

- Local control through start/stop buttons
- Remote control through digital input(s)
- LAN control through UDP ethernet commands

When in Remote or LAN control, the start/stop buttons on the controller will not work.

To change the setting, see section *Select or modify a setting*.

### Auto Restart

Starting from the Machine Settings menu, swipe left until the Auto Restart screen is shown.

85405D

The controller has a built-in function to automatically restart the compressor when voltage is restored after voltage failure. This function is deactivated in compressors leaving the factory and can only be modified after entering a password, please consult your supplier to activate this function.

To select a menu item, or to change the setting, see section *Select or modify a setting*.

## 3.7 Auxiliary equipment parameters menu

### Function

The Aux. Equipment parameters menu provides the ability to view and modify several settings related to the auxiliary equipment of the unit.

Swipe left to navigate to the following screens:

- Dryer (optional)
- Fan (optional)
- Phase sequence detection (optional)
- Internal or External SmartBox

### Procedure

To view the Aux. Equipment parameters menu:

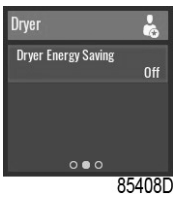
1. Tap the Home button

   on top of the screen to go to the main screen.
2. Swipe up on the left vertical swipe bar until the Aux. Equipment parameters menu is shown:


### Dryer

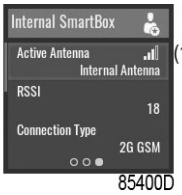
Starting from the Aux. Equipment parameters menu, swipe left until the Dryer screen is shown.




To select a menu item, or to change the setting, see section *Select or modify a setting*.


### SmartBox

Starting from the Aux. Equipment parameters menu, swipe left until the Internal SmartBox screen is shown.




| | |
|---|---|
| (1) | The reception quality of the internal antenna can be monitored.<br>  <br>85256D |

To select a menu item, or to change the setting, see section *Select or modify a setting*.

## 3.8 Data menu

### Function

The Data menu provides the ability to view several important values.

Swipe left to navigate to the following screens:

- Counters
- Inputs
- Outputs

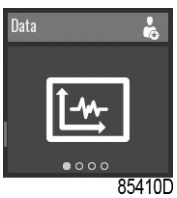
### Procedure

To view the Data menu:

1. Tap the Home button

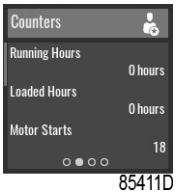
   
   

   on top of the screen to go to the main screen.
2. Swipe up on the left vertical swipe bar until the Data menu is shown:




### Counters

Starting from the Data menu, swipe left until the Counters screen is shown.

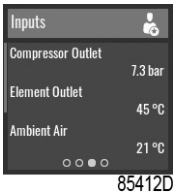



### Select

To select a different item, swipe up or down on the left vertical swipe bar.

### Inputs

Starting from the Data menu, swipe left until the Inputs screen is shown.



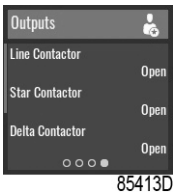
85412D

#### Select

To select a different item, swipe up or down on the left vertical swipe bar.

### Outputs

Starting from the Data menu, swipe left until the Outputs screen is shown.



85413D

#### Select

To select a different item, swipe up or down on the left vertical swipe bar.

**DANGER**

**Voltage-free outputs may only be used to control or monitor functional systems. They should NOT be used to control, switch or interrupt safety related circuits. Check the maximum allowed load on the label.**

**WARNING**

**Stop the unit and switch off the supply before connecting external equipment. Check the *Safety precautions*.**

## 3.9 Service menu

### Function

The Service menu provides the ability to reset the service timer. This menu is only available as Service user.

Swipe left to navigate to the following screens:

- Next service
- Safety valve test

### Procedure

To view the Service menu:

1. Use the controller as a Service user

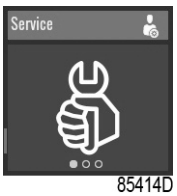

.

See *Controller settings menu* to change the user profile.

2. Tap the Home button


on top of the screen to go to the main screen.

3. Swipe up on the left vertical swipe bar until the Machine Settings menu is shown:



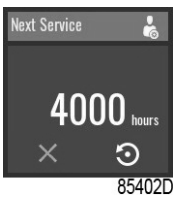

**Next Service**

Starting from the Service menu, swipe left until the Next Service screen is shown.


The Next Service will be triggered after the Running Hours value exceeds the Next Service value.

**Reset**

Tap the right vertical swipe bar, the following screen is now shown:




To cancel without resetting, press the cancel button under the red ‘X’ icon.

To reset the alarm, press the confirm button under the reset icon. The following screen is now shown:


On the horizontal swipe bar, tap ‘V’ to confirm or ‘X’ to decline.

## 3.10 Controller settings menu

### Function

The Controller Settings menu provides the ability to view and modify several settings of the controller.

Swipe left to navigate to the following screens:

- Access Level
- Language
- Units
- CAN Settings
- Ethernet Settings
- Display Timeout

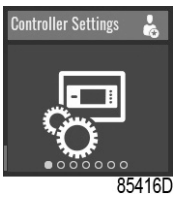
### Procedure

To view the Controller Settings menu:

1. Tap the Home button


on top of the screen to go to the main screen.

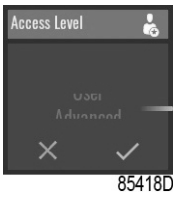
2. Swipe up on the left vertical swipe bar until the Controller Settings menu is shown:




### Access Level

Starting from the Controller Settings menu, swipe left until the Access Level screen is shown.


To modify the setting, see section *Select or modify a setting*.




#### Enter a password

The Service user profile is protected by a password. After selecting the Service user profile, the following screen pops up:


The user can enter the password by swiping up or down on the right vertical swipe bar to select the first digit.

Tap '→' to be able to enter the second digit.

Once the 4 digits are entered, the user can confirm by tapping 'V' or decline by tapping 'X'.

### Language

Starting from the Controller Settings menu, swipe left until the Language screen is shown.


To modify the setting, see section *Select or modify a setting*.

**WARNING**

**The controller will reboot after changing this setting.**

### Units

The units displayed can be modified through this menu.

### CAN Settings

The list of CAN Settings is shown. When CAN is turned off, the settings can be modified.

### Ethernet Settings

The list of Ethernet Settings is shown. When ethernet is turned off, IP address, Subnet mask and Gateway can be modified.

**WARNING**

**Do not forget to turn on Ethernet settings after changing these settings. Otherwise the controller can't connect anymore!**

### Display Timeout

Starting from the Controller Settings menu, swipe left until the Display Timeout screen is shown.

Display timeout is used to save energy and save the lifetime of the display. Timer starts after last operator actions on the push buttons or swipe bars.

85427D

To modify the setting, see section *Select or modify a setting*.

## 3.11 Information menu

### Function

The Information menu provides the ability to view important information.

Swipe left to navigate to the following screens:

- Help
- Information

### Procedure

To view the Information menu:

1. Tap the Home button


85386D

on top of the screen to go to the main screen.
2. Swipe up on the left vertical swipe bar until the Information menu is shown:

### Help

Starting from the Information menu, swipe left until the Help screen is shown.

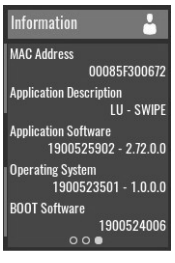
The manufacturer’s website is shown.

### Info

Starting from the Information menu, swipe left until the Info screen is shown.

Following items are displayed:

- Mac Address
- Application Description
- Application Software: nr + version
- Operation: nr + version
- BOOT Software: nr



## 3.12 Technical data Swipe controller

### General

| | |
|---|---|
| Supply voltage | 24 V AC / 16 A, 50 / 60 Hz (+40% / -30%)<br>24 V DC / 0.7 A |
| Type of protection | IP54 (front)<br>IP21 (back) |
| Ambient and temperature conditions | IEC60068-2 |
| Operating temperature range | -10 °C - 60 °C (14 °F - 140 °F) |
| Storage temperature range | -30 °C - 70 °C (-22 °F - 158 °F) |
| Permissible humidity | Relative humidity 90%.<br>No condensation. |
| Noise emission | IEC61000-6-3 |
| Noise immunity | IEC61000-6-2 |
| Mounting | Cabinet door |

### Digital outputs

| | |
|---|---|
| Number of outputs | 6 |
| Type | Relay (voltage free contacts) |
| Rated voltage AC | 250 V AC / 10 A max. |
| Rated voltage DC | 30 V DC / 10 A max. |
| Minimum amperage | 10 mA on potential free contact |

### Digital inputs

| | |
|---|---|
| Number of inputs | 4 |
| Supply by controller | 24 V DC |
| Supply protection | Short circuit protected to ground |
| Input protection | Not isolated |

### Analog inputs

| | |
|---|---|
| Number of pressure inputs | 1 |
| Number of temperature inputs | 3 |

# 4 Touch controller

## 4.1 Controller functions


**Figure 26: The ES4000$^{T}$Touch controller**

### Introduction

The controller has the following functions:

- Controlling the unit.
- Protecting the unit.
- Monitoring components subject to service.
- Automatic restart after voltage failure (ARAVF).

  This function can only be activated by a service technician.

### Automatic control of the unit

The controller maintains the net pressure between programmable limits by automatically loading and unloading the unit (fixed speed units) or by adapting the motor speed (units with frequency converter).

A number of programmable settings, e.g. the unloading and loading pressures (for fixed speed units), the setpoint (for units with frequency converter), the minimum stop time, the maximum number of motor starts and several other parameters are taken into account.

The controller stops the unit whenever possible to reduce the power consumption and restarts it automatically when the net pressure decreases. If the expected unloading period is too short, the unit is kept running to prevent too short standstill periods.

**WARNING**

**A number of time-based automatic start/stop commands may be programmed. Take into account that a start command will be executed (if programmed and activated), even after manually stopping the unit.**

### Shutdown

Several sensors are provided on the unit. If one of the measured signals exceeds the programmed shutdown level, the unit will be stopped.

Example: If the outlet pressure exceeds the programmed shutdown level, the unit will be stopped. This will be indicated on the display of the controller.

The unit will also be stopped in case of overload of the drive motor or fan motor.

**WARNING**

**Before remedying, consult the safety precautions.**

**Before resetting a warning or shutdown message, an authorized technician should solve the problem. If a warning or alarm persists to occur, consult your supplier. Frequently resetting these messages without remedying may damage the unit.**

### Shutdown warning

A shutdown warning level is a programmable level below the shutdown level.

If one of the measurements exceeds the programmed shutdown warning level, a message will appear on the display and the general alarm LED will light up to warn the operator before the shutdown level is reached.

The message disappears as soon as the warning condition disappears.

When the shutdown warning is shown, press the stop button to stop the unit and wait until the unit has stopped. Consult an authorized technician to solve the problem.

### Service warning

A number of service operations are grouped as a Service Plan. Each Service Plan has a programmed time interval. If the service timer exceeds a programmed value, this will be indicated on the display to warn the operator to carry out the service actions belonging to that Service Plan.

When the service warning is shown, stop the unit, switch off the voltage and carry out the required service actions.

**WARNING**

**Ignoring this service warning could severely damage your machine in the long term. The supplier is not liable for failures caused by neglecting service interval timings.**

### Automatic restart after voltage failure (ARAVF)

The controller has a built-in function to automatically restart the unit when the voltage is restored after voltage failure.

**WARNING**

**If the function is activated and the controller was in the automatic operation mode before the supply voltage was interrupted, the unit will automatically restart once the supply voltage to the unit is restored. The ARAVF label shall be attached near to the controller.**

## 4.2 Control panel

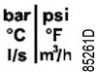

**Figure 27: Control panel**

| Reference | Designation | Function |
|---|---|---|
| 1 | Touch screen | Shows the unit operating condition and several icons to navigate through the menu.<br>The screen can be operated by touch. |
| 2 | Warning sign | Flashes in case of a shut-down, is lit in case of a warning condition. |
| 3 | Service sign | Is lit when service is needed. |
| 4 | Operation sign | Is lit when the unit is running in automatic operation. |
| 5 | Voltage sign | Indicates that the voltage is switched on. |
| 6 | Stop button | Stops the unit. |
| 7 | Start button | Starts the unit. The operation sign lights up. The controller is operative. |

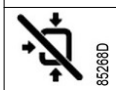
## 4.3 Icons used

### Menu icons

| Menu | Icon | Menu | Icon | Menu | Icon |
|---|---|---|---|---|---|
| Data |  85233D | Status |  85239D | | |
| | | Inputs |  85240D | | |
| | | Outputs |  85241D | | |
| | | Counters |  85242D | | |
| | | Auxiliary Equipment Parameters |  85243D | Converters |  85251D |
| Service |  85234D | Service | | Overview |  85252D |
| | | | | Service Plan |  85253D |
| | | | | Service History |  85254D |
| | | Service Functions |  85244D | | |
| | | Clean Screen |  85302D | | |
| Week Timer |  85235D | | | Week |  85303D |
| | | | | Remaining Running Time |  85304D |
| Event History |  85236D | Saved Data |  85245D | | |
| Machine Settings |  85237D | Alarms |  85239D | | |
| | | Regulation |  85346D | | |
| | | Control Parameters |  85347D | | |
| | | Auxiliary Equipment Parameters |  85243D | Converters |  85251D |
| | | | | Fan |  85255D |

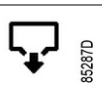
| Menu | Icon | Menu | Icon | Menu | Icon |
|---|---|---|---|---|---|
| | | | | Internal SmartBox |  |
| | | Auto Restart |  | | |
| Controller Settings |  | Network Settings |  | Ethernet Settings |  |
| | | | | CAN Settings |  |
| | | Localisation |  | Language |  |
| | | | | Date/Time |  |
| | | | | Units |  |
| | | User Password |  | | |
| | | Help |  | | |
| | | Information |  | | |

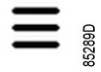
## Status icons

| Icon | Description |
|---|---|
|  | Motor Stopped |
|  | Motor Stopped Wait |
|  | Running Unloaded |
|  | Manual Unload |
|  | Running Unloaded Wait |
|  | Running Loaded |
|  | Failed to Load |
|  | Running Loaded Wait |

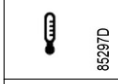
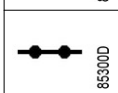
| Icon | Description |
|---|---|
|  | Manual Stop |
|  | Machine Control Mode, Local |
|  | Machine Control Mode, Remote |
|  | Machine Control Mode, LAN |
|  | Automatic Restart After Voltage Failure |
|  | Week Timer Active |

## System icons

| Icon | Description |
|---|---|
|  | Basic User |
|  | Advanced User |
|  | Service User |
|  | Antenna 25% |
|  | Antenna 50% |
|  | Antenna 75% |
|  | Antenna 100% |
|  | Change between screens (indication) |
|  | Energy recovery |
|  | Dryer |
|  | Element |
|  | Drain(s) |

| Icon | Description |
|---|---|
|   | Analogue Output |
|   | Menu |
|   | Reset |
|   | Auto Restart |
|   | Filter(s) |
|   | Cooler |
|   | Valve(s) |
|   | Power Meter |

### Input icons

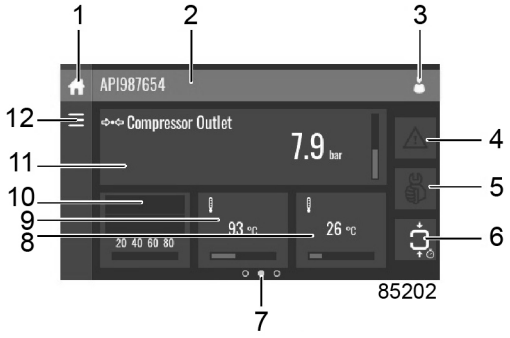
| Icon | Description |
|---|---|
|   | Pressure |
|   | Temperature |
|   | Special Protection |
|   | Open |
|   | Closed |

## 4.4 Main screen

### Function

The main screen is the screen that is shown automatically when the voltage is switched on. It is switched off automatically after a few minutes when there is no touch input.

### Description




| Reference | Designation | Function |
|---|---|---|
| 1 | Home button | The home button is always shown and can be tapped to return to the main screen. |
| 2 | Screen information | On the main screen, the screen information bar shows the serial number of the machine. When scrolling through menus, the name of the current menu is shown. |
| 3 | Access level button | The access level button is always shown and can be tapped to change the current user access level. |
| 4 | Alarm button | The alarm button can be tapped to show the current alarms. If an alarm occurs, the icon on the button will be red. |
| 5 | Service button | The service button can be tapped to show the service information. |
| 6 | Status | This icon shows the current status of the unit. |
| 7 | Page indicator | This indicates which page you are currently seeing. The middle indication is the main screen, left is the menu screen and the right the quick access screen. Swipe left or right to go to another screen. |
| 12 | Menu button | The menu button is always shown and can be tapped to go to the menu. |

## 4.5 Quick access screen

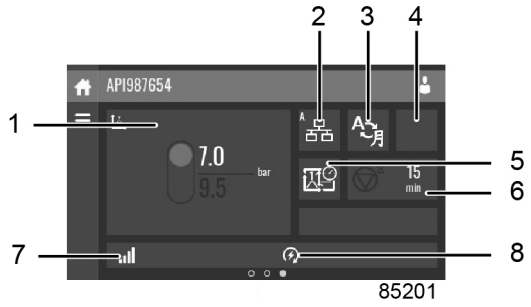
### Function

The screen is used to directly access some frequently used functions.

### Procedure

The quick access screen can be viewed by swiping left, starting from the main screen.

### Description




Through this screen, several important settings can be viewed and modified.

| Reference | Function | Description |
|---|---|---|
| 1 | Setpoints | Several setpoints can be modified by tapping this icon. |
| 2 | Control mode | The control mode can be changed by tapping this icon.<br>• Local control via start/stop buttons<br>• Remote control via digital input(s)<br>• LAN control via the network.<br>When in remote or LAN control, the start/stop buttons on the controller will not work. |
| 3 | Display language | The display language of the controller can be changed by tapping this icon. |
| 4 | Operation mode | When tapped, the operation mode can be chosen between manual and automatic. When manual mode is selected, the controller will switch to automatic mode automatically after 24 hours. |
| 5 | Week timer | Week timers can be set by tapping this icon. |
| 6 | Remaining running time | The remaining running time can be set and modified by tapping this icon. |
| 7 | Internal SmartBox | The reception quality of the internal antenna can be monitored.<br>Each bar represents 25% reception strength. If the four bars are filled, the reception strength is 100%. If only one bar is filled, the reception strength is just 25%. |
| 8 | Auto Restart | Auto restart can be activated by tapping this icon. |

## 4.6 Menu screen

### Function

This screen is used to display the different menus where settings can be viewed or changed.

### Procedure

The menu screen can be viewed by tapping the menu button or by swiping right, starting from the main screen.

## Description

85204

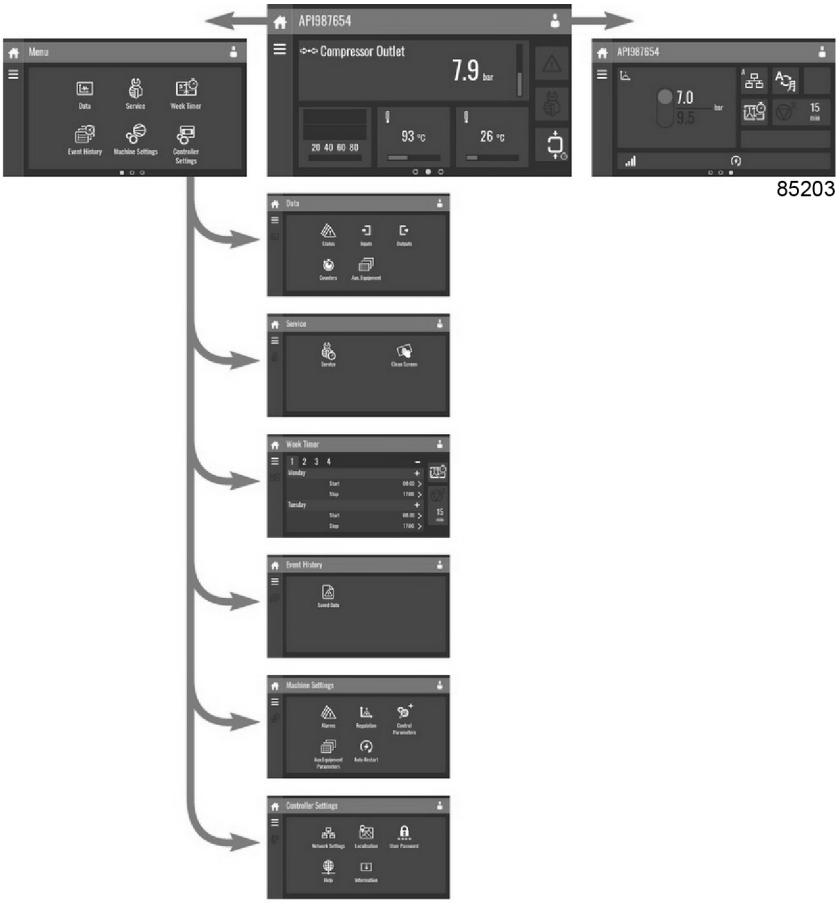
| Reference | Designation | Function |
|---|---|---|
| (1) | Data | The data menu contains the status of the unit, information about the inputs, outputs and counters. The auxiliary equipment can also be viewed through this menu. |
| (2) | Service | The service menu contains the service information. The "clean screen" function can be used to clean the touchscreen. |
| (3) | Week timer | Multiple week timers and a remaining running time can be set through this menu. |
| (4) | Event history | In case of an alarm, the status information of the unit is saved and can be viewed through this menu. |
| (5) | Machine settings | Alarms settings, regulation settings and control parameters can be changed through this menu. Auxiliary equipment parameters can also be changed.<br>The automatic restart function can be set through this menu. This function is password-protected. |
| (6) | Controller settings | Network settings, localisation settings and a user password can be set through this menu. There is also a help page available and the controller information can be shown. |

## Menu structure

**NOTICE**

**This is the main structure. It can differ depending on the configuration of the unit.**

Operating the controller can be done by swiping through screens and tapping icons or menu items.



85203

## 4.7 Data menu

### Function

This screen is used to display the following submenus:

- **Status**
- **Inputs**
- **Outputs**
- **Counters**
- **Auxiliary Equipment**

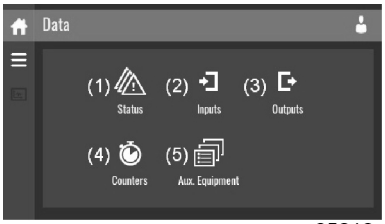
These submenus can be entered by tapping the icons.

### Procedure

To enter the **Data** menu screen:

1. Tap the Menu button.
2. Tap the **Data** icon.

## Description




85210

| Reference | Description |
|---|---|
| (1) | **Status** menu |
| (2) | **Inputs** menu |
| (3) | **Outputs** menu |
| (4) | **Counters** |
| (5) | **Auxiliary equipment** menu |

### Status menu

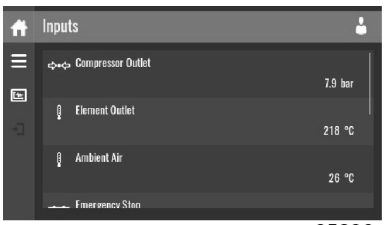
Tap the **Status** icon to enter the **Status** menu.

This menu shows the current status of the unit.

If an alarm is active, it can be viewed by tapping the alarm message. To reset an alarm, tap the reset button.

### Inputs menu

Tap the **Inputs** icon to enter the **Inputs** menu.




85206

This menu shows information about all the inputs.

### Outputs menu

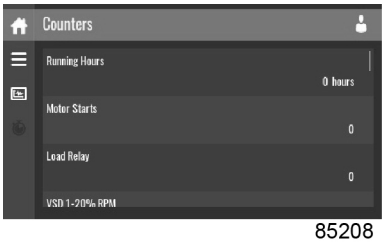
Tap the **Outputs** icon to enter the **Outputs** menu.


85207

This menu shows information about all the outputs.

### Counters menu

Tap the **Counters** icon to enter the **Counters** menu.

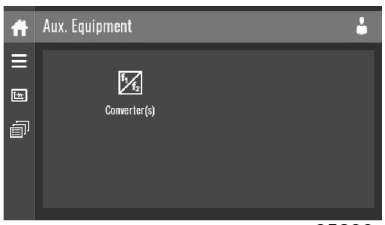


85208

This menu shows an overview of all actual hours and counters of the unit and controller.

### Auxiliary Equipment menu

Tap the **Auxiliary Equipment** icon to enter the **Auxiliary Equipment** menu.



85209

This menu shows an overview of all auxiliary equipment fitted.

## 4.8 Service menu

### Function

This screen is used to display the following submenus:

- **Service**
- **Service Functions** (visible as advanced user)
- **Clean Screen**

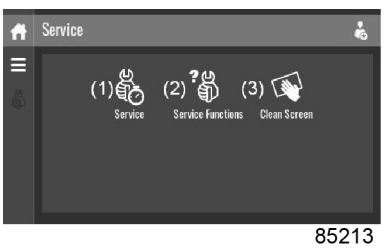
These submenus can be entered by tapping the icons.

### Procedure

To enter the **Service** menu screen:

1. Tap the Menu button.
2. Tap the **Service** icon.

### Description



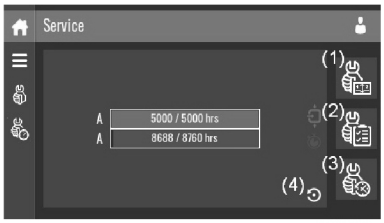
85213

| Reference | Description |
|---|---|
| (1) | **Service** |

| Reference | Description |
|---|---|
| (2) | **Service Functions** (only visible as advanced user) |
| (3) | **Clean Screen** |

### Service menu

Tap the **Service** icon to enter the **Service** menu.




85211

This menu shows the remaining **Running Hours** and the remaining **Real Time Hours** until the next service. The first row (A) shows the **Running Hours** when the first service is needed (green), the second row shows the **Real Time Hours** (blue)

A service overview can be viewed by tapping icon (1).

The service plan can be viewed by tapping icon (2). Through this menu, the service plan can be modified:

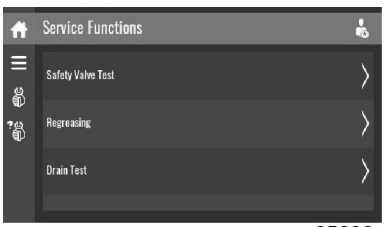
1. Tap the desired service plan. A selection screen will pop up.
2. Change the Running Hours by tapping '–' or '+'.
3. Confirm by tapping 'V' or decline by tapping 'X'.

The service history can be viewed by tapping icon (3).

When a service plan interval is reached, a message will appear on the screen. When service has been performed, the service timer can be reset by tapping the reset button (4).

### Service functions (visible for advanced user)

Tap the **Service Functions** icon to enter the **Service Functions** menu.

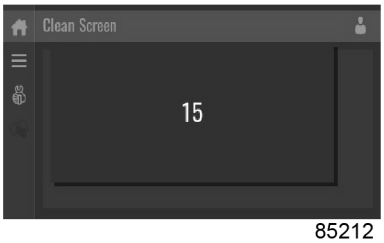



85232

Depending on the machine, this menu can have a different set of functions. Many of them are password protected, as they are only accessible for authorized personnel.

### Clean screen

Tap the **Clean Screen** icon to start the 15 seconds countdown to perform cleaning of the touch screen.



85212

The touch screen and the start and stop button become inactive for 15 seconds.

## 4.9 Week timer menu

### Function

This screen is used to set up to 4 different timers with each up to 8 settings per day.

The week timers can be activated through this screen.

A **Remaining Running Time** can be set from 5 up to 240 minutes.

### Procedure

To enter the **Week Timer** menu screen:

1. Tap the Menu button.
2. Tap the **Week Timer** icon.

### Description

85214

| Reference | Designation | Function |
|---|---|---|
| (1) | Add or select week | If less than 4 weeks are programmed, tap the '+' button to add a week. |
| (2) | Remove week | Tap to remove a programmed week timer. |
| (3) | Activate week timer | A selection screen pops up. The user can choose the correct week by tapping '–' or '+' and can confirm by tapping 'V' or decline by tapping 'X'. |
| (4) | Remaining running time | A selection screen pops up. The user can change the remaining time by tapping '–' or '+' and can confirm by tapping 'V' or decline by tapping 'X'. |
| (5) | Add setting | A selection screen pops up. The user can change the setting by swiping up or down and confirm by tapping 'V' or decline by tapping 'X'. |

## 4.10 Event history menu

### Function

This screen is used to display the saved data in case of an alarm.

These submenus can be entered by tapping the icons.

### Procedure

To enter the **Event History** menu screen:

1. Tap the Menu button.
2. Tap the **Event History** icon.

### Description


85216

| Reference | Description |
|---|---|
| (1) | **Saved Data** |

### Saved data

Tap the **Saved Data** icon to enter the **Saved Data** menu.

Scroll through the items swiping up and down in this list. The event date and time is shown at the right side of the screen.

Press on one of the items in the list for more information reflecting the status of the unit when the shutdown occurred.

## 4.11 Machine settings menu

### Function

This screen is used to display the following submenus:

- **Alarms**
- **Regulation**
- **Control Parameters**

  (Only visible if the machine has adaptable parameters.)
- **Aux. Equipment Parameters**
- **Auto Restart**

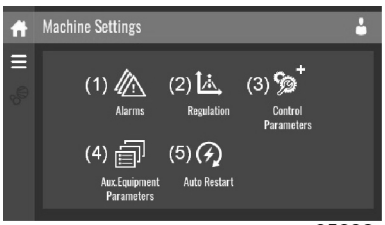
These submenus can be entered by tapping the icons.

### Procedure

To enter the **Machine Settings** menu screen:

1. Tap the Menu button.
2. Tap the **Machine Settings** icon.

### Description

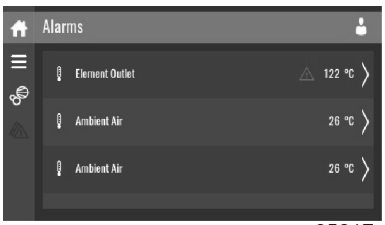


85222

| Reference | Description |
|---|---|
| (1) | **Alarms** menu |
| (2) | **Regulation** menu |
| (3) | **Control Parameters** menu |
| (4) | **Aux. Equipment Parameters** menu |
| (5) | **Auto Restart** menu |

### Alarms menu

Tap the **Alarms** icon to enter the **Alarms** menu.



85217

A list of all alarms is shown.

When pressing on one of the items in the underlying list, the warning and/or shutdown levels are shown for this alarm.

### Regulation menu

Tap the **Regulation** icon to enter the **Regulation** menu.

85218

Setpoints can be modified and capacity control can be consulted through this menu.

#### Modify a setting

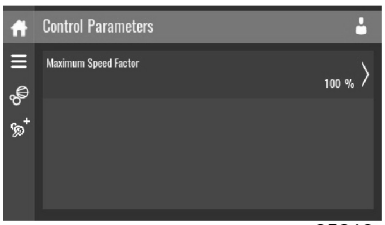
When tapping a list item, a selection screen pops up. The user can modify the setting by tapping '–' or '+' and can confirm by tapping 'V' or decline by tapping 'X'.

**Change a selection**

When tapping a list item, a selection screen pops up. The user can change the selection by swiping up or down and confirm by tapping 'V' or decline by tapping 'X'.

## Control parameters menu

Tap the **Control Parameters** icon to enter the **Control Parameters** menu.




85219

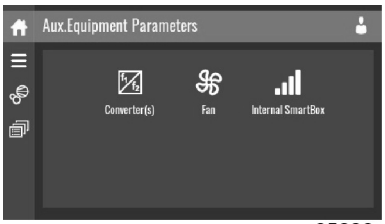
This menu shows information about the **Control Parameters**.

**Modify a setting**

When tapping a list item, a selection screen pops up. The user can modify the setting by tapping '–' or '+' and can confirm by tapping 'V' or decline by tapping 'X'.

## Auxiliary equipment parameters menu

Tap the **Aux. Equipment Parameters** icon to enter the **Aux. Equipment Parameters** menu.




85220

This menu shows an overview of all the auxiliary equipment fitted.

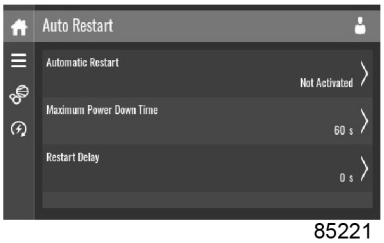
Through this menu, the parameters of the auxiliary equipment can be changed.

**Modify a setting**

When tapping a list item, a selection screen pops up. The user can modify the setting by tapping '–' or '+' and can confirm by tapping 'V' or decline by tapping 'X'.

## Auto restart menu

Tap the **Auto Restart** icon to enter the **Auto Restart** menu.




85221

Through this menu, the automatic restart can be activated. The activation is password protected.

The automatic restart settings can also be changed.

**Enter a password**

When tapping a password protected item, a selection screen pops up. The user can enter the password by swiping up or down to select the desired number. Once the 4 digits are entered, the user can confirm by tapping ‘V’ or decline by tapping ‘X’.

**Modify a setting**

When tapping a list item, a selection screen pops up. The user can modify the setting by tapping ‘–’ or ‘+’ and can confirm by tapping ‘V’ or decline by tapping ‘X’.

## 4.12 Controller settings menu

### Function

This screen is used to display the following submenus:

- **Network Settings**
- **Localisation**
- **User Password**
- **Help**
- **Information**

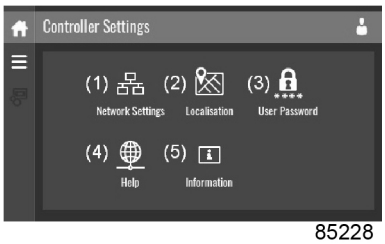
These submenus can be entered by tapping the icons.

### Procedure

To enter the **Controller Settings** menu screen:

1. Tap the Menu button.
2. Tap the **Controller Settings** icon.

### Description

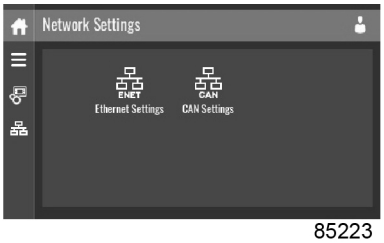


85228

| Reference | Description |
|---|---|
| (1) | **Network Settings** menu |
| (2) | **Localisation** menu |
| (3) | **User Password** menu |
| (4) | **Help** menu |
| (5) | **Information** menu |

### Network settings menu

Tap the **Network Settings** icon to enter the **Network Settings** menu.




85223

### Ethernet Settings

The list of **Ethernet Settings** is shown. When ethernet is turned off, the settings can be modified.

### CAN Settings

The list of **CAN Settings** is shown. When CAN is turned off, the settings can be modified.

### Modify a setting

When tapping a list item, a selection screen pops up. The user can modify the setting by tapping '–' or '+' and can confirm by tapping 'V' or decline by tapping 'X'.

### Change a selection

When tapping a list item, a selection screen pops up. The user can change the selection by swiping up or down and confirm by tapping 'V' or decline by tapping 'X'.

## Localisation menu

Tap the **Localisation** icon to enter the **Localisation** menu.


85224

### Language

The language setting of the controller can be modified through this menu.

### Date/Time

The date and time settings of the controller can be modified through this menu.

### Units

The units displayed can be modified through this menu.

### Modify a setting

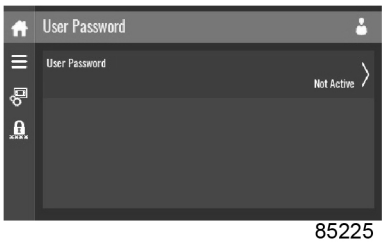
When tapping a list item, a selection screen pops up. The user can modify the setting by tapping '–' or '+' and can confirm by tapping 'V' or decline by tapping 'X'.

### Change a selection

When tapping a list item, a selection screen pops up. The user can change the selection by swiping up or down and confirm by tapping 'V' or decline by tapping 'X'.

### User password menu

Tap the **User Password** icon to enter the **User Password** menu.




85225

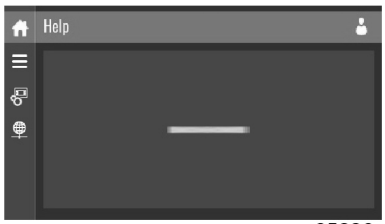
The user password can be activated or deactivated through this menu. Enter and confirm a user password to activate, repeat to deactivate.

#### Enter a password

When tapping a password protected item, a selection screen pops up. The user can enter the password by swiping up or down to select the desired number. Once the 4 digits are entered, the user can confirm by tapping ‘V’ or decline by tapping ‘X’.

### Help menu

Tap the **Help** icon to enter the **Help** menu.

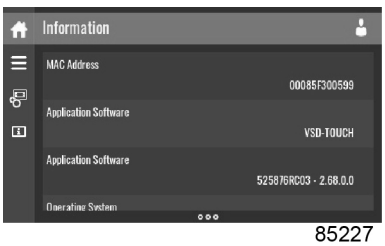



85226

This menu can show a link to the web page of your supplier, a helpdesk phone number or other helpful information.

### Information menu

Tap the **Information** icon to enter the **Information** menu.




85227

This menu shows information about the controller.

## 4.13 Access level

### Function

Through this pop-up screen, the access level settings can be viewed or changed.

### Procedure

The **Access Level** screen can be viewed or changed by tapping the **Access Level** button at the upper right corner of the screen.

### Description

85229

| Reference | Designation | Function |
|---|---|---|
| (1) | User | A basic set of parameters is visualized, no password required. |
| (2) | Service | A basic set of parameters can be modified, no password required. |
| (3) | Full | This access level is not accessible to end users. |
| (4) | Decline | Tap to decline the selected user level. |
| (5) | Confirm | Tap to confirm the selected user level. |

### Service access level

85230

Tap the **Service** access level icon (1) and confirm (2).

85231

The screen information bar (1) now shows the current status of the unit instead of the machine serial number.

The Received Signal Strength Indicator (RSSI) value is now shown in the Internal SmartBox menu. See section *Quick access screen*.

In the service menu, an extra menu item is now available. See section *Service menu*.

## 4.14 Technical data Touch controller

### General

| | |
|---|---|
| Supply voltage | 24 V AC / 16 A, 50 / 60Hz (+40% / -30%)<br>24 V DC / 0.7 A |
| Type of protection | IP54 (front)<br>IP21 (back) |
| Ambient and temperature conditions | IEC60068-2 |
| Operating temperature range | -10 °C - 60 °C (14 °F - 140 °F) |
| Storage temperature range | -30 °C - 70 °C (-22 °F - 158 °F) |
| Permissible humidity | Relative humidity 90%.<br>No condensation. |
| Noise emission | IEC61000-6-3 |
| Noise immunity | IEC61000-6-2 |
| Mounting | Cabinet door |

### Digital outputs

| | |
|---|---|
| Number of outputs | 9 |
| Type | Relay (voltage free contacts) |
| Rated voltage AC | 250 V AC / 10 A max. |
| Rated voltage DC | 30 V DC / 10 A max. |
| Minimum amperage | 10 mA on potential free contact |

### Digital inputs

| | |
|---|---|
| Number of inputs | 10 |
| Supply by controller | 24 V DC |
| Supply protection | Short circuit protected to ground |
| Input protection | Not isolated |

### Analog inputs

| | |
|---|---|
| Number of pressure inputs | 2 |
| Number of temperature inputs | 5 |

## 4.15 Web server

All controllers have a built-in web server that allows direct connection to the company network or to a dedicated PC via a local area network (LAN). This allows to consult certain data and settings via a PC instead of the display of the controller.

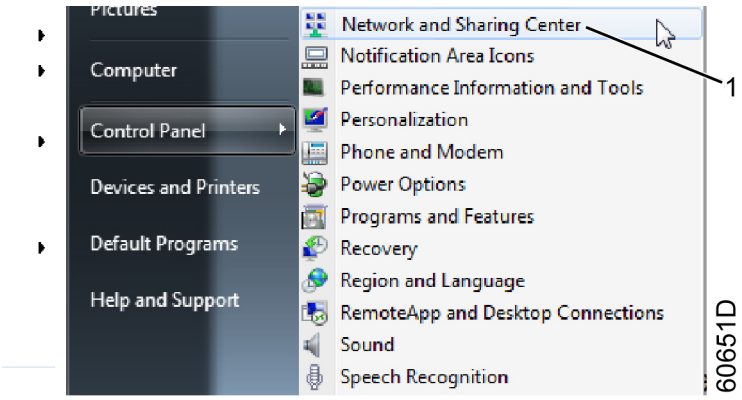
### Getting started

Make sure you are logged in as administrator.

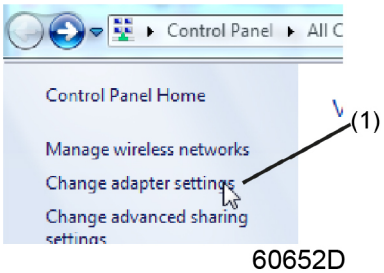
- Use the internal network card from your computer or a USB to LAN adapter.
- Use a UTP cable (CAT 5e) to connect to the controller (see picture below).


### Configuration of the network card

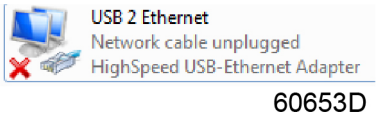
- Go to Network and Sharing Center (1).



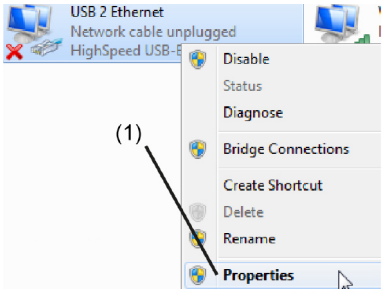

- Click on Change adapter settings (1).




- Select the Local Area Connection, which is connected to the controller.

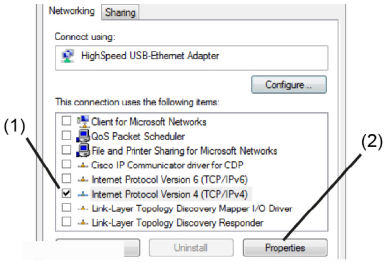



- Click with the right button and select Properties (1).



60654D

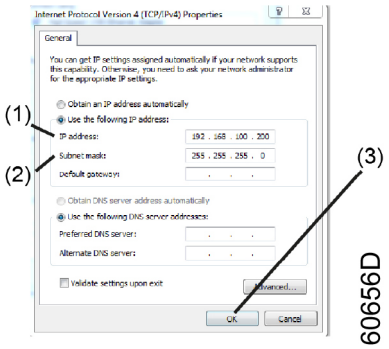
- Use the check box Internet Protocol version +4 (TCP/IPv4) (1) (see picture). To avoid conflicts, uncheck other properties if they are checked. After selecting TCP/IPv4, click on the Properties button (2) to change the settings.



60655D

- Use the following settings
  - IP Address 192.168.100.200(1)
  - Subnetmask 255.255.255.0(2)

  Click OK (3) and close network connections.



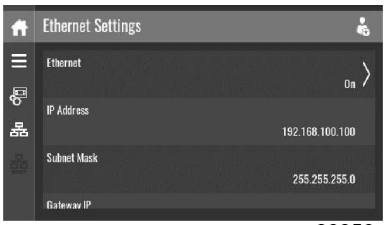
60656D

**Configure a company network (LAN) connection**

- Ask your IT department to generate a fixed IP address in your company's network. That IP address will be excluded from the DNS server, so it will be reserved for the controller. Also get the correct Gateway and Subnet mask settings. For example:
  - IP = 10.25.43.200
  - Gateway = 10.25.42.250
  - Subnet mask = 255.255.254.0
- Connect the controller to the company's network (LAN) by using a UTP cable (min. CAT 5e).

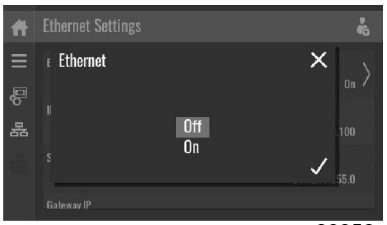

81508D

- Adapt the network settings in the controller.
  - Put the controller in advanced mode by navigating to **Menu** > **Controller settings** > **Network settings** > **Ethernet settings**.



86359

  - Switch off the ethernet communication to allow the editing of the settings.



86358

  - Adapt IP adress
  - Adapt Gateway IP
  - Adapt Subnetmask
  - Switch on the Ethernet communication
  - Wait a few minutes so the controller can be connected to the LAN network.

### Configuration of the web server

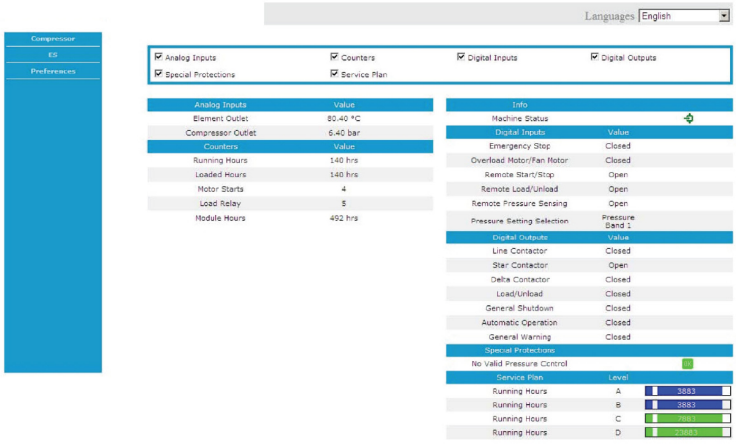
The internal web server is designed and tested for Microsoft® Internet Explorer. Opera, Mozilla Firefox, Safari and Chrome should work as well.

#### Viewing the controller data

**NOTE**

**All screen shots are indicative. The number of displayed fields depends on the selected options.**

- Open your browser and type the IP address of the controller you want to view in your browser (in this example http://192.168.100.100). The interface opens.



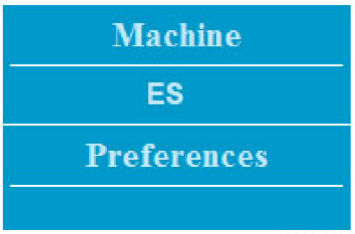

81520D

**Navigation and options**

- • The banner shows the unit type and the language selector. In this example, three languages are available on the controller.


81521D

- • On the left side of the interface, you can find the navigation menu. If a license for ESi is foreseen, the menu contains 3 buttons:




83810D

  - Machine: shows all generator settings.
  - ES: shows the ESi status (if a license is provided).
  - Preferences: allows to change temperature and pressure unit.

# 5 Installation

## 5.1 Dimension drawings

The dimension drawing can be found in the technical documentation supplied with the unit.

| Dimension drawing | Model |
|---|---|
| 9828 5225 40 | Pack, PM units |
| 9828 5225 41 | Full-Feature, PM units |
| 9828 5225 42 | Pack, fixed speed units with inlet basket |
| 9828 5225 43 | Full-Feature, fixed speed units with inlet basket |
| 9828 5225 44 | Pack, fixed speed units with inlet grill |
| 9828 5225 45 | Full-Feature, fixed speed units with inlet grill |

## 5.2 Installation proposal

**Safety**

**WARNING**

**The operator must apply all relevant safety precautions, including those mentioned in this manual.**

- **Read the manual before installing the compressor. The instruction book contains the necessary information regarding the detailed values.**
- **Check the situation.**
- **Use the correct tooling.**

**Outdoor/altitude operation**

**NOTE**

**The compressor is not designed for outdoor installation. Additionally, if the ambient temperature can fall below 0 ˚C (32 ˚F) and when operating above 1000 m (3300 ft), precautions must be taken. In this case, consult your supplier.**

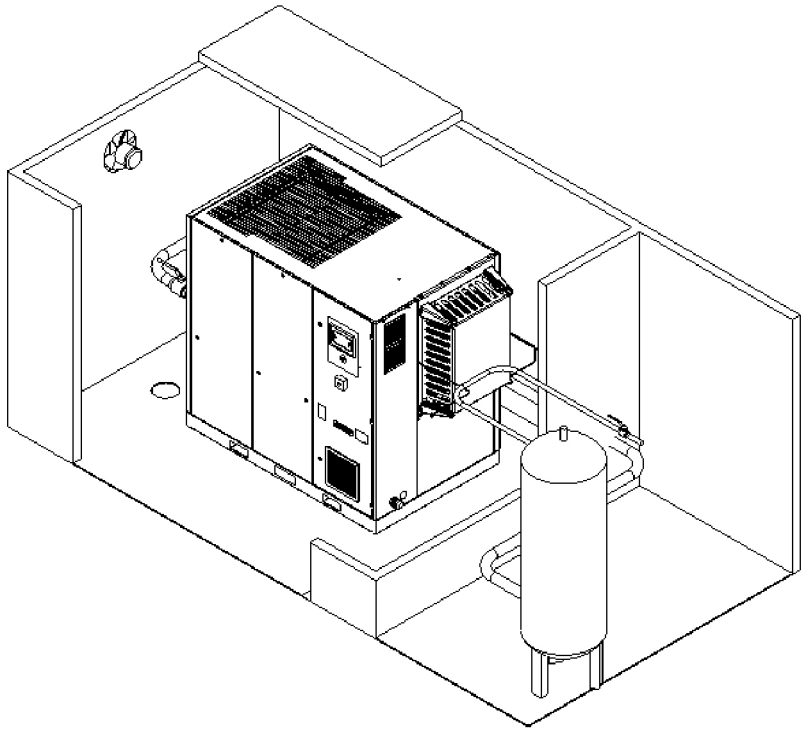
**Moving/lifting**

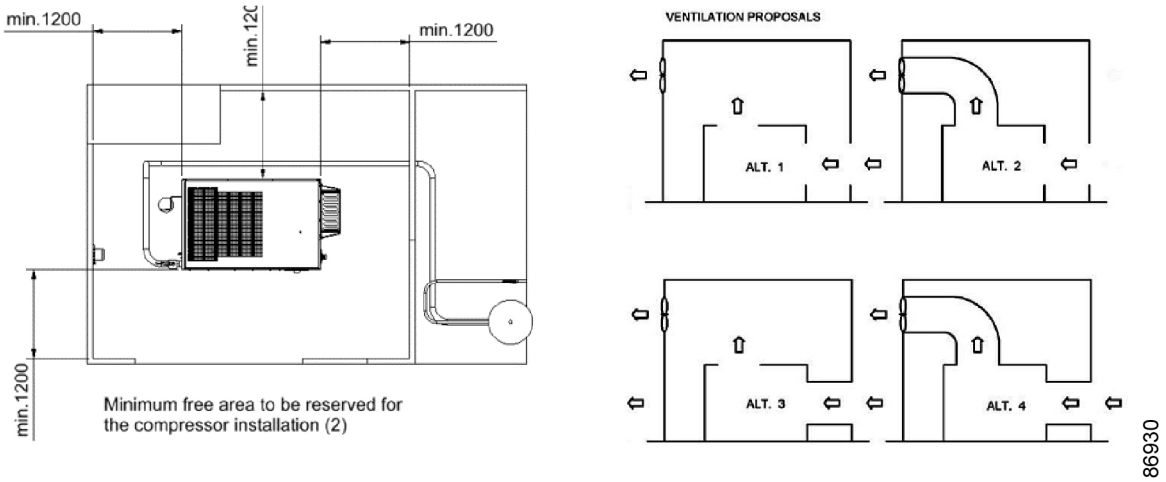
**NOTE**

**The compressor can be moved by a lift truck using the slots in the frame. Take care not to damage the bodywork during lifting or transport. Make sure that the forks protrude from the other side of the frame. The compressor can also be lifted after inserting beams in the slots. Make sure that the beams cannot slide and that they protrude from the frame equally. The chains must be held parallel to the bodywork by chain spreaders in**

**order to not damage the compressor. The lifting equipment must be placed in such a way that the compressor is lifted perpendicularly. Lift gently and avoid twisting.**

## Compressor room example






| Reference | Description |
|---|---|
| (1) | Ventilation proposals |
| (2) | Minimum free area to be reserved for the compressor installation |

**NOTE**

**All piping to be connected stress-free to the compressor.**

## Installation guidelines

1. Install the compressor unit on a solid, level floor suitable for taking its weight.
2. Position of the compressed air outlet valve.
3. The pressure drop over the air delivery pipe can be calculated from:

   $\Delta p = (L \times 450 \times Q_c^{1.85}) / (d^5 \times P)$

   - $\Delta p$ = pressure drop in bar (recommended maximum: 0.1 bar (1.5 psi))
   - L = length of the pipe in m
   - $Q_c$ = Free air delivery (FAD) of the compressor in l/s
   - d = inner diameter of the pipe in mm
   - P = absolute pressure at the compressor outlet in bar(a)

   It is recommended that the connection of the compressor air outlet pipe is made on top of the main air net pipe in order to minimise carry-over of possible condensate residue.
4. Ventilation: the inlet grids and ventilation fan should be installed in such a way that any re-circulation of cooling air is avoided.

   The maximum air velocity through the grids is 5 m/s (16.5 ft/s).

   The maximum allowed pressure drop in ventilation ducts before or after the compressor is 30 Pa.

   The maximum air temperature at the compressor intake is 46 °C (115 °F), the minimum air temperature is 0 °C (32 °F).

   **The required ventilation capacity to limit the compressor room temperature can be calculated as follows:**

   $Q_v = 1.06\ N / \Delta T$ for versions without dryer.

   $Q_v = (1.06\ N + 1.3) / \Delta T$ for versions with dryer.

   - Qv = Required ventilation capacity in $m^3/s$
   - N = Shaft input of compressor in kW
   - $\Delta T$ = Temperature increase in the compressor room in °C
5. The drain pipes to the drain collector must not dip into the water of the drain collector. Any flow back must be avoided. Drain pipes of different compressors may not be interconnected before the (atmospheric) collector. Interconnecting drain pipes of different compressors can damage the electronic drains of the compressor. Oil / water separators are available to separate a major part of the oil from the condensate to ensure that the condensate meets the requirements of the environmental codes.
6. Control module with monitoring panel.
7. Position of the main cable entry. Power supply cable to be sized and installed by a qualified electrician.

   **NOTE**

   **To preserve the protection degree of the electric cubicle and to protect its components from dust, it is mandatory to use a proper cable gland when connecting the supply cable to the compressor.**
8. Provision for inlet and outlet of the energy recovery system (system is optional).
9. The air receiver (optional) should be installed in a frost-free room on a solid, level floor. For normal air consumption, the volume of the air net (receiver and piping) can be calculated as follows:

V = (0.25 x Qc x P1 x To) / (fmax x ΔP x T1)

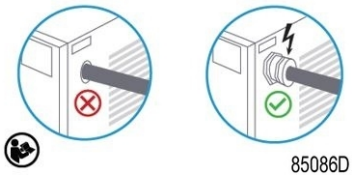
- V = Volume of the air net in l
- Qc = Free air delivery (FAD) of the compressor in l/s
- P1 = Compressor air inlet pressure in bar absolute
- fmax = Cycle frequency =1 cycle / 30s
- ΔP = P unload - P load in bar
- T1 = Compressor air inlet temperature in K
- To = Air receiver temperature K

**10.** To prevent feedback of exhaust air to the cooling inlet, sufficient space should be provided above the unit to evacuate the exhaust air.

**Electrical connections**

- The supply voltage on the compressor terminals must not deviate more than 10% of the nominal voltage. It is highly recommended to keep the voltage drop over the supply cable at nominal current below 5% of the nominal voltage.
- Power supply cable must be sized and installed by a qualified electrician. Cable sizing examples according to IEC and UL can be found in the *Technical Data* section. If cables are grouped together with other power cables, it may be necessary to use cables of a larger size than those calculated for the standard operating conditions. Local regulations remain applicable if they are stricter than the values proposed.
- A main switch and fuses are not included in the compressor unit and should be provided externally by a qualified electrician. For selecting the correct fuse type and size, refer to the service diagram or the *Technical Data* section. Note that different sizes exist for compressors with or without integrated dryer.


- Always double-check the fuse size versus the calculated cable size. If required, reduce fuse size or enlarge cable size.
- To preserve the protection degree and to protect the components from dust from the environment, it is mandatory to use a well sealing cable gland when connecting the supply cable to the compressor.




- For variable speed units, fast reacting fuses should be installed as mentioned in the instruction book. The use of circuit breakers is not allowed.
- Electric screw connections need to be checked and torqued before initial start-up. Torque values can be found on the service diagram.

## Rotation check

**WARNING**

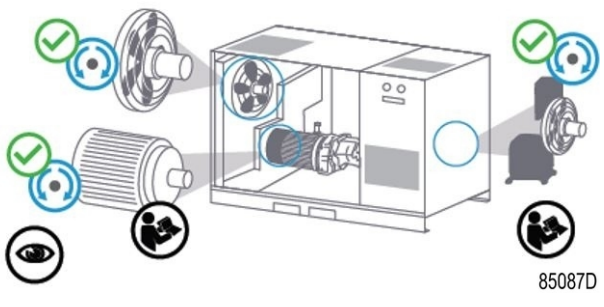
**Incorrect phase direction on the incoming power lines may cause irreversible damage to the compressor element.**

### Fixed speed compressors

- Main Motor: Switch on the voltage. Start the compressor and stop it immediately. Check the rotation direction of the drive motor while the motor is coasting to a stop. The correct rotation direction of the drive is indicated by an arrow shown on the motor fan cowl. If the rotation direction of the drive motor is incorrect, open the isolating switch and reverse two incoming main power lines.
- Cooling Fan Motor: Check the rotation of the main fan. The cooling fan contactor (mostly denoted as Q15 or K15, see service diagram) must be switched on manually for a short moment of time. If the rotation direction of the fan motor is incorrect, open the isolating switch and reverse two incoming main power lines.
- Dryer: Check the rotation of the dryer (only needed for Full-Feature versions, Pack versions will rotate correctly). The dryer contactor must be switched on manually for a short moment of time. Rotation arrows are provided to indicate the correct rotation direction of the dryer condenser fan. If the rotation direction of the dryer condenser fan is incorrect, open the isolating switch and reverse two incoming main power lines.

### Variable speed compressors

- Cooling Fan Motor: Check the rotation of the main fan. The cooling fan contactor (mostly denoted as Q15 or K15, see service diagram) must be switched on manually for a short moment of time. Rotation arrows, visible through the grating in the roof, are provided on the plate below the fan to indicate the correct rotation direction on the fan motor. If the rotation direction of the fan motor is incorrect, open the isolating switch and reverse two incoming main power lines.
- Dryer: Check the rotation of the dryer (only needed for Full-Feature versions, Pack versions will rotate correctly). The dryer contactor must be switched on manually for a short moment of time. Rotation arrows are provided to indicate the correct rotation direction of the dryer condenser fan. If the rotation direction of the dryer condenser fan is incorrect, open the isolating switch and reverse two incoming main power lines.



## 5.3 Electrical connections

**DANGER**

**Working with machinery controlled by a frequency converter requires special safety precautions.**

**These safety precautions depend on the kind of network used (TN, TT, IT system). Consult your supplier.**

**NOTE**

**Most compressors are designed for use in TT/TN networks and are intended for industrial environments where the electrical supply is separated from the residential/commercial supply network.**

**To use the machine in light industrial, commercial or residential environments with a shared supply network or in an IT network, additional measures may be required. Contact your supplier.**

The complete electrical diagram can be found in the technical documentation supplied with the unit.

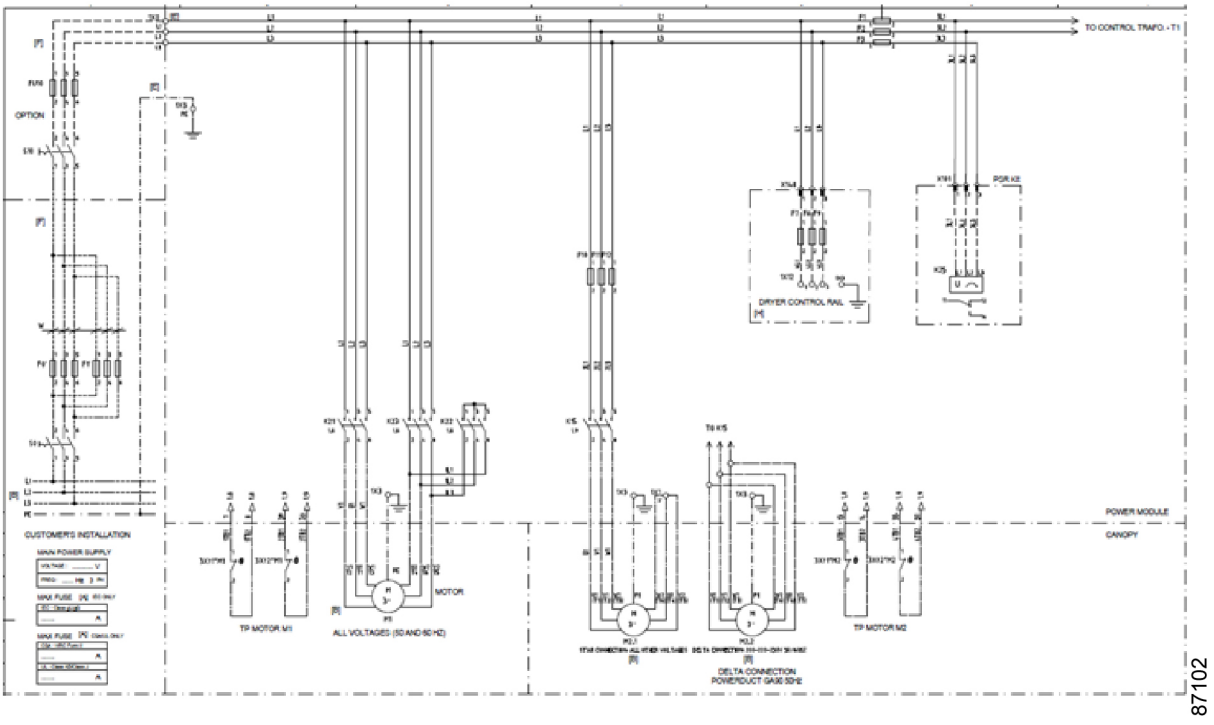



**Figure 28: Electrical connections, fixed speed units**

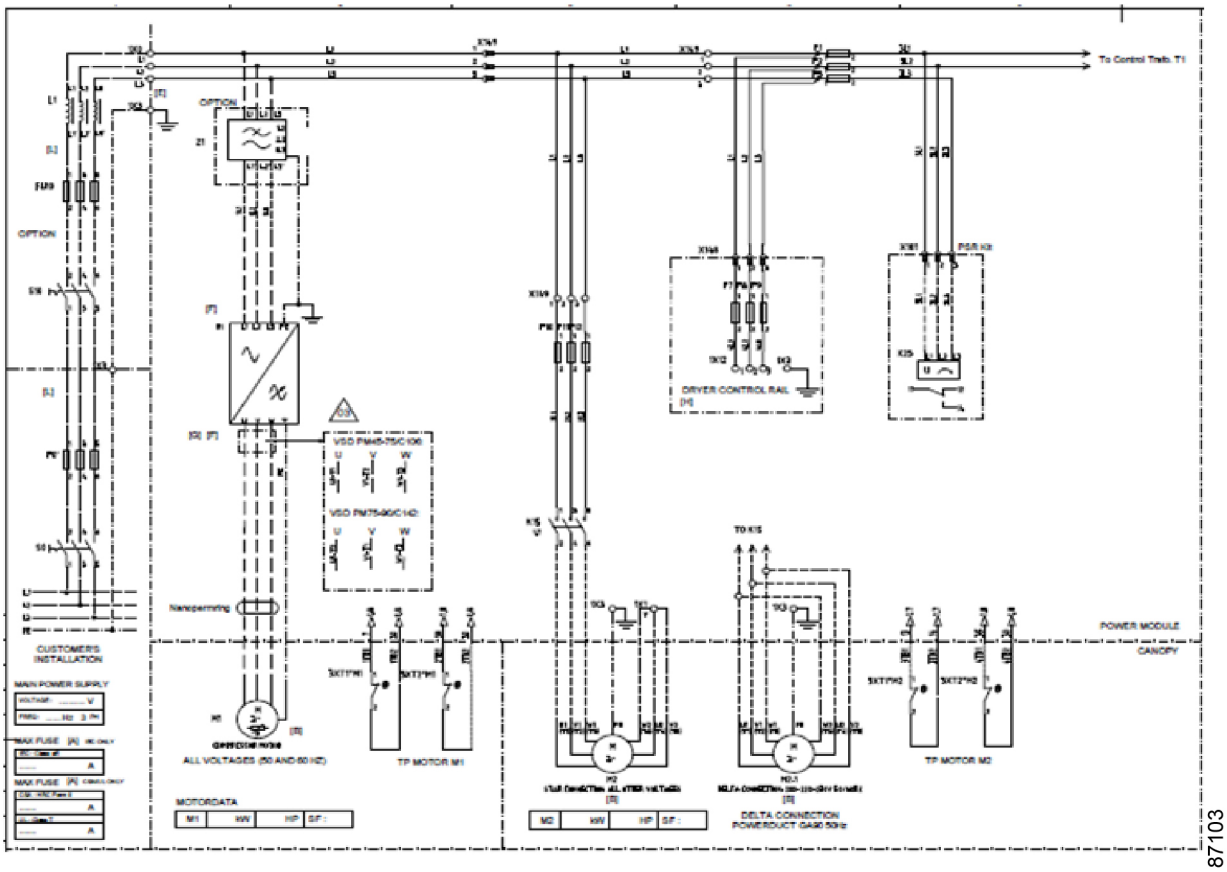



**Figure 29: Electrical connections, variable speed units**

| Reference | Description |
|---|---|
| (1) | Customer's installation |
| (2) | Power circuit |
| (3) | Motor |

## Description

**NOTE**

**You can find the correct position for the electrical connections in the section *Dimension drawings*.**

1. Provide an isolating switch.
2. Check that the motor cables and wires inside the electrical cabinet are clamped tight to their terminals.
3. Check the fuses and the setting of the overload relay. See section *Electrical cable size*.
4. Connect the power supply cables to the power terminals (1X0).
5. Connect the earth conductor to the earth terminals (1X3-PE).

**NOTE**

**To preserve the protection degree of the electric cubicle and to protect its components from dust, it is mandatory to use a proper cable gland when connecting the supply cable to the compressor.**

### Compressor control mode

**The following control modes can be selected:**

- **Local control**: The compressor will react to commands entered by means of the buttons on the control panel. Compressor start/stop commands via Clock function are active, if programmed.
- **Remote control**: The compressor will react to commands from external switches. Emergency stop remains active. Compressor start/stop commands via Clock function are still possible.

**NOTE**

**Have the modifications checked by your supplier.**

**Stop the compressor and switch off the voltage before connecting external equipment.**

**Only potential free contacts are allowed.**

- **LAN control**: The compressor is controlled via a local network. Consult your supplier.

### Compressor status indication

The controller is provided with potential free auxiliary NO contacts (NO = normally open) (K07, K08 and K09) for remote indication of:

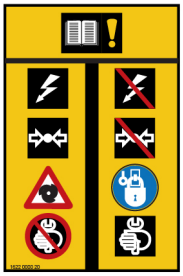
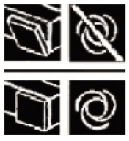
- Manual/automatic operation (K07)
- Warning condition (K08)
- Shut-down condition (K09)

Maximum contact load: 10 A / 250 V AC.

Stop the compressor and switch off the voltage before connecting external equipment. Consult your supplier.

## 5.4 Pictographs

### Description

| | | | |
|---|---|---|---|
| 1 |  84224D | 2 |  84231D |

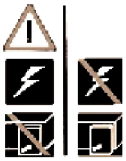
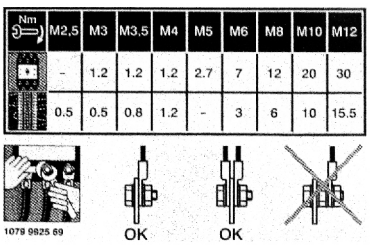
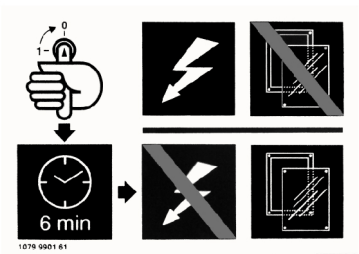
| | | | |
|---|---|---|---|
| 3 |  84230D | 4 |  84234D |
| 5 |  84221D | 6 |  84219D |
| 7 |  84226D | 8 |  84228D |
| 9 |  84227D | 10 |  84229D |
| 11 |  84225D | 12 |  84232D |
| 13 |  84222D | 14 |  84223D |
| 15 |  84145D | | |

**Table 3: Pictographs**

| Reference | Description |
|---|---|
| 1 | Warning: always read the manual, switch off the voltage, depressurize compressor and lock out / tag out (LOTO) before repairing. |

| Reference | Description |
|---|---|
| 2 | Keep the doors closed during operation. |
| 3 | Switch off the voltage before removing protecting cover inside electrical cubicle. |
| 4 | Warning: voltage. |
| 5 | Automatic condensate drain. |
| 6 | Stop the compressor before cleaning the coolers. |
| 7 | Lightly oil the gasket of the oil filter, screw it on and tighten by hand (approximately half a turn). |
| 8 | Before connecting the compressor electrically, consult the Instruction book for the motor rotation direction. |
| 9 | Compressor remains pressurized for 180 seconds after switching off the voltage. |
| 10 | Torques for steel (Fe) or brass (CuZn) bolts. |
| 11 | Switch off the voltage and wait at least 6 minutes before removing the screen. |
| 12 | Oil outlet. |
| 13 | Cooling water inlet. |
| 14 | Cooling water outlet. |
| 15 | Automatic Restart After Voltage Failure (ARAVF). |

# 6 Energy recovery

## 6.1 Energy recovery (ER) unit

### Description

A large part of the energy required for any compression process is transformed into heat. The major part of the compression heat is dissipated through the oil system. Energy recovery (ER) systems are designed to recover most of this heat by transforming it into warm or hot water without any adverse effects on compressor performance. The water can be used for diverse applications.

### Components

**The energy recovery (ER) system is completely integrated and comprises the following:**

- Stainless steel oil/water heat exchanger (HE).
- Thermostatic bypass valve for the energy recovery heat exchanger (BV2).
- The necessary bolts, pipes, etc.
- Oil drain valve.

### Energy recovery (ER) unit

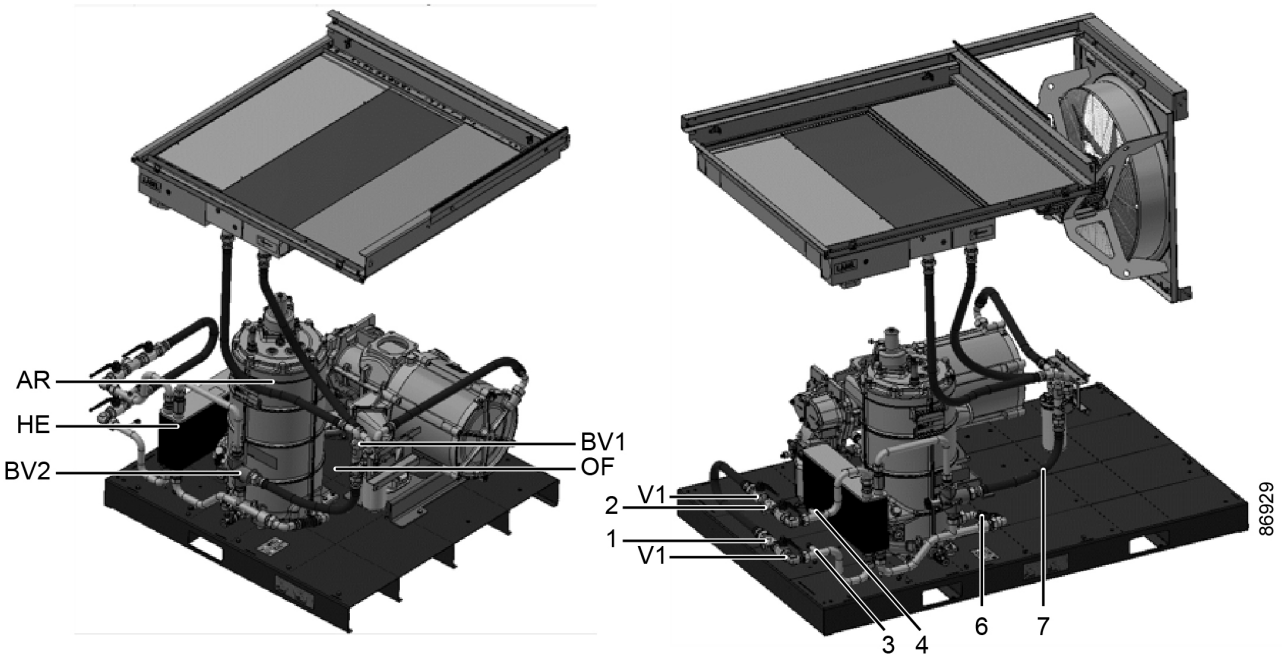



**Figure 30: Main components**

| Reference | Description |
|---|---|
| 1 | Water inlet pipe |
| 2 | Water outlet pipe |
| 3 | Temperature sensor, water inlet pipe |
| 4 | Temperature sensor, water outlet pipe |
| 5 | Oil drain plug |

| Reference | Description |
|---|---|
| 6 | Oil flexible hose from the compressor oil separator vessel to the energy recovery (ER) unit |
| 7 | Oil flexible hose from the energy recovery (ER) unit to the oil filter housing |
| PRV | Pressure relief valve |
| BV2 | Heat exchanger bypass valve |
| HE | Heat exchanger |
| V1 | Selector valve |
| AR | Oil separator tank |
| OF | Oil filter housing |
| BV1 | Oil cooler bypass valve |

### Field installation

The main components are assembled ex-factory as a compact unit which fits inside the bodywork of the compressor. Consult your supplier for installing and connecting the energy recovery (ER) unit.

## 6.2 Energy recovery (ER) systems

### General

The energy recovery (ER) systems can be applied as low temperature rise/high water flow systems or as high temperature rise/low water flow systems.

### Low temperature rise/high water flow systems

For this type of application, the temperature difference between the water in the energy recovery (ER) system and the compressor oil is low. As a consequence, a high water flow is needed for maximum energy recovery.

Example: The heated water is used to keep another medium at a moderately high temperature, in a closed circuit, e.g. central heating.

### High temperature rise/low water flow systems

For this type of application, a high water temperature rise in the energy recovery (ER) system is obtained, which consequently brings on a low flow rate.

Example: An open circuit where cold water from a main supply is heated by the energy recovery (ER) system for use in a factory, e.g. pre-heating of boiler feed water.

### Recovery water flow

The recovery water enters the unit at the inlet connection (1). The compression heat is transferred from the compressor oil to the water in the heat exchanger (HE). The water leaves the heat exchanger (HE) via the outlet connection (2).

### Water requirements for closed water circuits

The use of a closed water circuit minimizes the need for additional water. Therefore, the use of soft or even demineralized water is economically feasible and eliminates the problem of scale deposits. Although the heat exchanger is made of stainless steel, the water circuit connected to the compressor may require corrosion inhibitors.

Add an anti-freeze product such as ethylene-glycol to the water in proportion to the expected temperature to avoid freezing.

### Water requirements for open water circuits

In open, non-recirculating water circuits, major problems that are usually encountered are related to deposit control, corrosion control, and microbiological growth control. To minimize these problems, the water that is being used should meet a number of requirements.

## 6.3 Energy recovery (ER) operation

### Description

The compressor oil flow is controlled by two thermostatic valves (BV1 and BV2), ensuring reliable compressor operation and optimum energy recovery.

The bypass valve (BV1) is integrated in the oil filter housing of the compressor and controls the oil flow through the main oil cooler (Co) of the compressor. The energy recovery bypass valve (BV2) controls the oil flow through the energy recovery heat exchanger (HE). Both valves consist of an insert (thermostat) mounted in a housing.

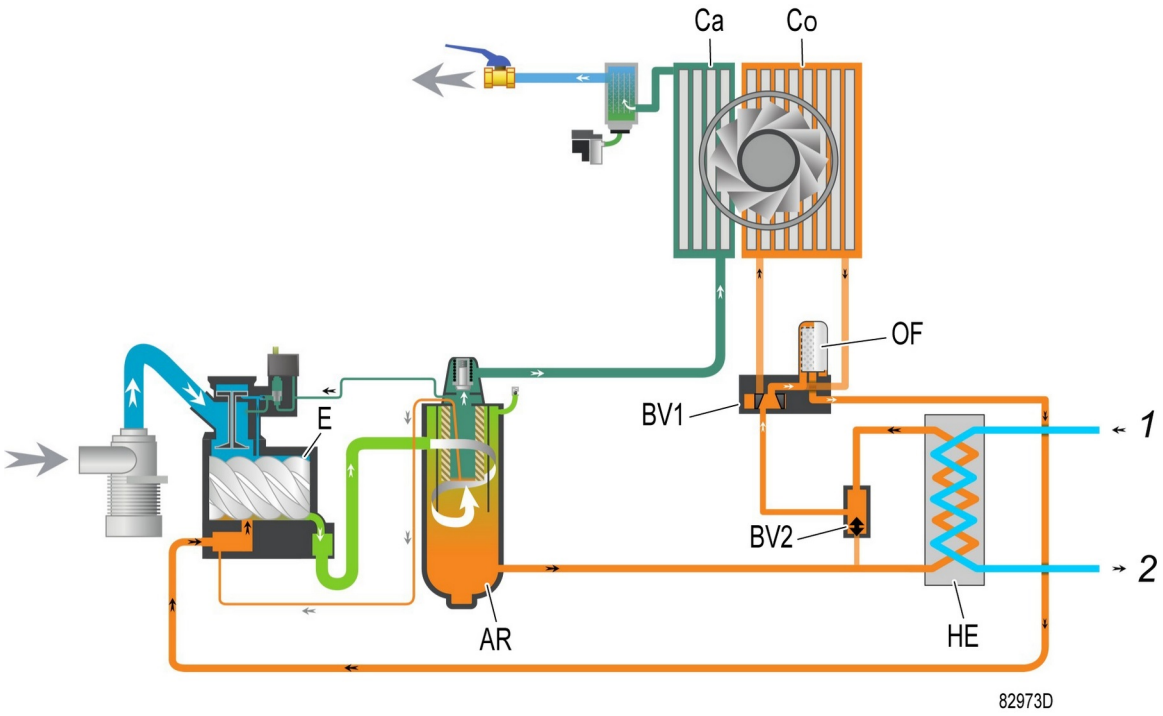



**Figure 31: Flow diagram of compressor with energy recovery (ER) system**

| Reference | Description |
|---|---|
| 1 | Water inlet |
| 2 | Water outlet |
| AR | Oil separator vessel |
| BV1 | Thermostatic bypass valve in the oil filter housing |
| BV2 | Thermostatic bypass valve of the energy recovery (ER) unit |
| Co | Oil cooler |
| Ca | Air cooler |

| Reference | Description |
|---|---|
| E | Compressor element |
| HE | Oil/water heat exchanger of the energy recovery (ER) unit |
| OF | Oil filter |

The energy recovery bypass valve (BV2) starts closing the bypass line over the energy recovery heat exchanger (HE) at the lower limit of its temperature range. At the upper limit of its temperature range, the bypass line is completely closed and all the oil flows through the energy recovery heat exchanger (HE).

The energy recovery bypass valve (BV2) can have an opening temperature of 40°C or 60°C, based on product configuration. If the energy recovery bypass valve (BV2) has an opening temperature of 40°C (104 ˚F), it will completely open at 55 ˚C (131 ˚F). If the energy recovery bypass valve (BV2) has an opening temperature of 60 ˚C (140 ˚F), it will completely open at 75 ˚C (167 ˚F).

The oil cooler bypass valve (BV1) starts closing the bypass over the oil cooler (Co) at the lower limit of its temperature range. At the upper limit of its temperature range, the bypass is completely closed and all the oil flows through the oil cooler (Co).

The oil cooler bypass valve (BV1) must have a higher opening temperature (setpoint) than the energy recovery bypass valve (BV2). This is necessary to ensure that the heat is not dissipated in the compressor oil cooler (Co), but preferably in the energy recovery heat exchanger (HE) when using the compression heat as source for energy recovery (ER).

**Energy recovery (ER) system in use (see drawing)**

The wheel (V1) of the energy recovery bypass valve (BV2) is totally **turned in clockwise**.

- **Compressor start-up**

  When the compressor is started up from cold, the oil temperature will be low. The energy recovery bypass valve (BV2) shuts off the oil supply through the energy recovery heat exchanger (HE) and the bypass valve of the oil cooler (BV1) shuts off the oil supply through the oil cooler (Co) to prevent the compressor oil from being cooled. The oil flows from the oil separator vessel (AR) through the oil filter(s) (OF) back to the compressor element (E).

  All energy input is used to rapidly warm up the compressor oil. No energy is recovered.
- **Maximum energy recovery**

  As soon as the oil temperature reaches the setpoint (opening temperature) of the energy recovery bypass valve (BV2), the valve starts closing off the bypass over the energy recovery heat exchanger (HE) oil line, gradually allowing the oil to flow through the energy recovery heat exchanger (HE). As the oil temperature rises to approx. 15 ˚C (27 ˚F) above the setpoint, all the oil passes through the energy recovery heat exchanger (HE). The exchange of heat between the compressor oil and the heat recovery water is at its maximum. The oil from the energy recovery heat exchanger (HE) outlet flows via the oil filter (OF), the oil stop valve (Vs - if present), the compressor element (E) and the separator (AR) back to the inlet of the energy recovery heat exchanger (HE). The bypass valve of the oil cooler (BV1) bypasses the oil cooler (Co) as long as the oil temperature remains below its setpoint.

  Operation principle at different loads:

  - **Low consumption of recovered energy**

    The temperature of the oil leaving the energy recovery heat exchanger (HE) rises. When the temperature rises above its setpoint, the oil cooler bypass valve (BV1) will gradually allow the oil to be cooled in the oil cooler (Co).

- **Recovery water flow too high/temperature too low**

  In this case, the energy recovery bypass valve (BV2) will open the bypass line allowing oil from the energy recovery heat exchanger (HE) to be mixed with oil from the separator (AR). Energy is transferred from the compressor oil to the water, but at a relatively low temperature level.

**Energy recovery (ER) system not in use**

The wheel (V1) of the thermostatic bypass valve of the energy recovery unit (BV2) is **completely turned out anti-clockwise**.

The oil circuit is the same as without installation of the energy recovery (ER) system.

No energy is recovered.

This situation should be considered as exceptional, e.g. in case of maintenance of the energy recovery (ER) system or when no energy is required for a long period.

Run the unit unloaded for a few minutes before isolating the energy recovery (ER) system from the compressor.

**Stopping the unit for a long period**

In case of an open water system and/or if freezing temperatures can be expected, isolate the compressor water system and blow it through with compressed air.

## 6.4 Energy recovery (ER) maintenance

**Compressor oil**

For references used consult section *Energy recovery (ER) unit*.

**Oil change:**

1. Run the unit until warm. Stop the unit, switch off the isolating switch and close the air outlet valve of the compressor.
2. Depressurize the compressor and drain the oil by opening the drain valve. Also drain the oil from the heat exchanger by opening the drain valve on the energy recovery heat exchanger (HE). Close the valve after draining.
3. Resume oil change as described in section *Oil, oil filter and oil separator change* in this book.

**Thermostatic bypass valves**

Change the thermostat of the energy recovery system (BV2) at the same time interval as the thermostat of the unit (BV1).

**Energy recovery heat exchanger (HE)**

If the temperature rise over the energy recovery (ER) system declines over a period of time with the same basic working conditions, the heat exchanger should be inspected. To clean the oil side, soak the heat exchanger in a degreasing solution. To remove scale formation in the water compartment, a proper descaling process should be applied. Consult your supplier.

## 6.5 Energy recovery (ER) data

### Reference conditions

See section *Reference conditions and limitations*.

### Effective working pressure

See section *Compressor data* for the normal working pressure.

### Maximum allowed pressure of the heat exchanger

| | |
|---|---|
| Oil side | 15 bar (217 psi) |
| Water side | 10 bar (145 psi) |

### Reading settings

In addition to other data, the following temperatures can be read on the controller display:

**For air-cooled units:**

- The water inlet temperature of the energy recovery (ER) system
- The water outlet temperature of the energy recovery (ER) system

### Modifying settings

If the programmed warning settings for the water temperatures are exceeded, a warning indication is shown on the controller:

| Temperature input | | Minimum setting | Nominal setting | Maximum setting |
|---|---|---|---|---|
| Water inlet temperature of energy recovery (ER) | ˚C | 0 | 70 | 99 |
| Water inlet temperature of energy recovery (ER) | ˚F | 32 | 158 | 210 |
| Water outlet temperature of energy recovery (ER) | ˚C | 0 | 90 | 99 |
| Water outlet temperature of energy recovery (ER) | ˚F | 32 | 194 | 210 |

To modify a setting, consult the relevant section in the description of the controller.

### Recoverable energy

The recoverable energy can be calculated by using the following formula:

RECOVERED ENERGY (kW) = 4.2 x water flow (l/s) x water temperature rise (˚C)

### Data for low temperature rise/high water flow systems

In the tables below, typical values are given for the above mentioned type of water flow system.

| Parameter | Unit | 45 kW | 55 kW | 75 kW | 76 kW | 90 kW |
|---|---|---|---|---|---|---|
| Recoverable energy | kW | 39.4 | 48.1 | 65.6 | 66.5 | 78.8 |
| Recoverable energy | hp | 52.8 | 64.5 | 88.0 | 89.2 | 105.6 |
| Water flow | l/min | 28.1 | 34.4 | 46.9 | 47.5 | 56.3 |
| Water flow | cfm | 0.99 | 1.22 | 1.66 | 1.68 | 1.99 |

| Parameter | Unit | 45 kW | 55 kW | 75 kW | 76 kW | 90 kW |
|---|---|---|---|---|---|---|
| Temperature at inlet | ˚C | 50 | 50 | 50 | 50 | 50 |
| Temperature at inlet | ˚F | 122 | 122 | 122 | 122 | 122 |
| Temperature at outlet | ˚C | 70 | 70 | 70 | 70 | 70 |
| Temperature at outlet | ˚F | 158 | 158 | 158 | 158 | 158 |

### Data for high temperature rise/low water flow systems

In the tables below, typical values are given for the above mentioned type of water flow system.

| Parameter | Unit | 45 kW | 55 kW | 75 kW | 76 kW | 90 kW |
|---|---|---|---|---|---|---|
| Recoverable energy | kW | 39.4 | 48.1 | 65.6 | 66.5 | 78.8 |
| Recoverable energy | hp | 52.8 | 64.5 | 88.0 | 89.2 | 105.6 |
| Water flow | l/min | 8.0 | 9.8 | 13.4 | 13.6 | 16.1 |
| Water flow | cfm | 0.28 | 0.35 | 0.47 | 0.48 | 0.57 |
| Temperature at inlet | ˚C | 20 | 20 | 20 | 20 | 20 |
| Temperature at inlet | ˚F | 68 | 68 | 68 | 68 | 68 |
| Temperature at outlet | ˚C | 90 | 90 | 90 | 90 | 90 |
| Temperature at outlet | ˚F | 194 | 194 | 194 | 194 | 194 |

## 6.6 Energy recovery (ER) cooling water requirements

### General

**NOTE**

**Cooling water needs to fulfill certain requirements in order to avoid problems of scaling, fouling, corrosion or bacterial growth.**

**In open circuit cooling towers, protective measures must be taken to avoid the growth of harmful bacteria such as legionella pneumophila when there is a risk of inhalation of the water droplets.**

No general recommendation can encompass the effects of all combinations of the various compounds, solids and gases typically found in cooling water in interaction with different materials. Therefore the recommendations formulated in our cooling water specifications are a general guideline for acceptable coolant quality. However, where strict limits apply, a statement is made in the specification.

The water requirements refer to untreated water. When water is treated, some parameters will change. Water treatments should be carried out by a specialized water treatment company, taking the responsibility for the performance of the treated cooling water and the compatibility with the materials in the cooling circuit. This includes not only the selection of the appropriate additives, but also the correct application, monitoring of concentrations and properties, prevention of sludge formation and maintenance of the system. This applies also to treatment with antifreeze products. They must be provided with suitable stabilizers and inhibitors. Specifications are also depending on the type of cooling circuit (open, once through / recirculating with tower / closed) and on the application (standard – max 65 °C cooling water temperature at the outlet) or energy recovery (water temperature up to 95 °C).

In case water is not in line with recommended values or if any doubt, consult the manufacturer.

## Cooling water parameters

### 1. pH

The effect of pH is already included in the Ryznar Stability Index (RSI - see item 4 below), but also the pH itself is subject to limitations:

| | | pH | |
|---|---|---|---|
| **Type of cooling system** | **Materials** | **Standard** | **Energy recovery (ER)** |
| Single pass | Containing copper | **6.8 - 9.3** | **6.8 - 9.3** |
| | Stainless steel with carbon steel and / or cast iron | **6.8** - 9.3 | **6.8** - 9.3 |
| | Stainless steel only | **6** - 9.3 | **6** - 9.3 |
| Recirculating (with tower) | Containing copper | **6.8 - 9.3** | not applicable |
| | Stainless steel with carbon steel and / or cast iron | **6.8** - 9.3 | |
| | Stainless steel only | **6** - 9.3 | |
| Closed loop | Containing copper | **7.5 - 9.3** | **7.5 - 9.3** |
| | Stainless steel with carbon steel and / or cast iron | **7.5** - 9.3 | **7.5** - 9.3 |
| | Stainless steel only | **6** - 9.3 | **6** - 9.3 |

The values in **bold** are rejection limits.

When the system contains Zn or Al, the pH must be < 8.5.

### 2. Total dissolved solids (TDS) and conductivity

The conductivity is expressed in µS/cm, the TDS in ppm.

Both parameters are related with each other. The conductivity is convenient for quick monitoring of general water quality, but the TDS is required for calculating the RSI. If only one of both parameters is measured, an estimation can be obtained by using a theoretical conversion factor (0.67):

TDS = conductivity x 0.67

### 3. Hardness

Different types of hardness together with the pH and the alkalinity of the water determine the equilibrium situation of the water, specified by the RSI.

In addition, the calcium hardness must be limited to:

| | Ca (ppm Ca $CO_3$) | |
|---|---|---|
| **Type of cooling system** | **Standard** | **Energy recovery (ER)** |
| Single pass | < 500 | < 2 |
| Recirculating (with tower) | < 500 | not applicable |
| Closed loop | < 1000 | < 50 |

### 4. The Ryznar Stability Index (RSI)

The Ryznar Stability Index is a parameter for predicting whether water will tend to dissolve or precipitate calcium carbonate. The adhesion of scaling depositions and their effect are different on different materials, but the equilibrium of the water (scaling or corrosive) is only determined

by its actual pH value and by the saturation pH value ($pH_s$). The saturation pH value is determined by the relationship between the calcium hardness, the total alkalinity, the total solids concentration and the temperature.

The Ryznar Stability Index is calculated as follows:

$RSI = 2*pH_s - pH$,

in which

- pH = measured pH (at room temp) of the water sample
- $pH_s$= pH at saturation

$pH_s$ is calculated from:

$pH_s = (9.3 + A + B) - (C + D)$,

in which

- A: depends on the total solids concentration
- B: depends on the water temperature at the outlet of the heat exchanger
- C: depends on the calcium hardness ($CaCO_3$)
- D: depends on the $HCO_3^-$ concentration or M-alkalinity

The values of A, B, C and D can be found in below table:

| **Total dissolved solids (mg/l)** | **A** | **Temperature (°C)** | **B** | **Ca hardness (ppm $CaCO_3$)** | **C** | **M-Alkalinity (ppm $CaCO_3$)** | **D** |
|---|---|---|---|---|---|---|---|
| < 30 | 0.1 | 0 - 1 | 2.3 | 9 - 11 | 0.6 | 10 - 11 | 1.0 |
| 30 - 320 | 0.2 | 2 - 6 | 2.2 | 12 - 14 | 0.7 | 12 - 14 | 1.1 |
| > 320 | 0.3 | 7 - 11 | 2.1 | 15 - 17 | 0.8 | 15 - 17 | 1.2 |
| | | 12 - 16 | 2.0 | 18 - 22 | 0.9 | 18 - 22 | 1.3 |
| | | 17 - 22 | 1.9 | 23 - 28 | 1.0 | 23 - 28 | 1.4 |
| | | 23 - 27 | 1.8 | 29 - 35 | 1.1 | 29 - 35 | 1.5 |
| | | 28 - 32 | 1.7 | 36 - 44 | 1.2 | 36 - 44 | 1.6 |
| | | 33 - 38 | 1.6 | 45 - 56 | 1.3 | 45 - 56 | 1.7 |
| | | 39 - 43 | 1.5 | 57 - 70 | 1.4 | 57 - 70 | 1.8 |
| | | 44 - 49 | 1.4 | 71 - 89 | 1.5 | 71 - 89 | 1.9 |
| | | 50 - 55 | 1.3 | 90 - 112 | 1.6 | 90 - 112 | 2.0 |
| | | 56 - 61 | 1.2 | 113 - 141 | 1.7 | 113 - 141 | 2.1 |
| | | 62 - 67 | 1.1 | 142 - 177 | 1.8 | 142 - 177 | 2.2 |
| | | 68 - 73 | 1.0 | 178 - 223 | 1.9 | 178 - 223 | 2.3 |
| | | 74 - 79 | 0.9 | 224 - 281 | 2.0 | 224 - 281 | 2.4 |
| | | 80 - 85 | 0.8 | 282 - 355 | 2.1 | 282 - 355 | 2.5 |
| | | 86 - 91 | 0.7 | 356 - 446 | 2.2 | 356 - 446 | 2.6 |
| | | 92 - 95 | 0.6 | 447 - 563 | 2.3 | 447 - 563 | 2.7 |
| | | | | 564 - 707 | 2.4 | 564 - 707 | 2.8 |
| | | | | 708 - 892 | 2.5 | 708 - 892 | 2.9 |
| | | | | 893 - 1000 | 2.6 | 893 - 1000 | 3.0 |

**Interpretation of the values obtained:**

- RSI < 6: boiler scale formation
- 6 < RSI < 7: neutral water
- RSI > 7: corrosive water

**NOTE**

**As a general rule, the RSI index should be between 5.6 and 7.5. If that is not the case, contact a specialist.**

5. **Free chlorine ($Cl_2$)**

   Disinfecting with chlorine is **not done in closed systems, neither in energy recovery (ER) systems**.

   A continuous level of 0.5 ppm should not be exceeded. For shock treatments, a maximum limit of 2 ppm for maximum 30 minutes/day applies.

6. **Chlorides ($Cl^-$)**

   Chloride ions will create pitting corrosion on stainless steel. Their concentration should be limited, depending from the RSI value.

| | RSI < 5.5 | 5.6 < RSI < 6.2 | 6.3 < RSI < 6.8 | 6.9 < RSI < 7.5 | 7.6 < RSI |
|---|---|---|---|---|---|
| $Cl^-$ (ppm) | 200 | 350 | 500 | 350 | 200 |

   **For energy recovery (ER) systems, the limit is 100 ppm.**

7. **Sulphates ($SO_4^{2-}$)**

| | Sulphate (ppm) | |
|---|---|---|
| **Type of cooling system** | **Standard** | **Energy recovery (ER)** |
| Single pass | < 1000 | < 200 |
| Recirculating (with tower) | < 1000 | not applicable |
| Closed loop | < 400 | < 200 |

8. **Iron and Manganese**

| | Dissolved iron (ppm) | | Dissolved manganese (ppm) | |
|---|---|---|---|---|
| **Type of cooling system** | **Standard** | **Energy recovery (ER)** | **Standard** | **Energy recovery (ER)** |
| Single pass | < 1 | < 0.2 | < 0.2 | < 0.05 |
| Recirculating (with tower) | < **1** | not applicable | < **0.2** | not applicable |
| Closed loop | < 1 | < 0.2 | < 0.2 | < 0.05 |

   The values in **bold** are rejection limits.

9. **Copper**

| | Copper (ppm) | |
|---|---|---|
| **Type of cooling system** | **Standard** | **Energy recovery (ER)** |
| Single pass | < 1 | < 0.2 |
| Recirculating (with tower) | < 1 | not applicable |
| Closed loop | < 1 | < 0.2 |

10. **Ammonium**

    The limit of **0.5 ppm** is a rejection limit.

    The limitation only applies for copper containing systems.

11. **Suspended solids**

    Large particles (size > 10 µm) should not be present as they can be filtered out.

Small particles (< 0.5 µm) are not taken into account.

For particles between 0.5 µm and 10 µm, the following limits apply:

| | Suspended solids (ppm) | |
|---|---|---|
| **Type of cooling system** | **Standard** | **Energy recovery (ER)** |
| Single pass | < 10 | < 1 |
| Recirculating (with tower) | < 10 | not applicable |
| Closed loop | < 10 | < 1 |

**12. Oil or grease**

< **1 ppm** (rejection value)

**13. Bacteria**

If bacteria are present, they must be aerobic. Anaerobic bacteria (in closed systems) must be avoided.

| | Biology (CFU/ml) | |
|---|---|---|
| **Type of cooling system** | **Standard** | **Energy recovery (ER)** |
| Single pass | < $10^5$ / **< $10^7$** | < $10^3$ / **< $10^5$** |
| Recirculating (with tower) | < $10^5$ / **< $10^7$** | not applicable |
| Closed loop | < $10^3$ / **< $10^5$** | < $10^3$ / **< $10^5$** |

The table shows the recommended values. The values in **bold** are rejection limits.

**NOTE**

**If additives are used in the cooling water, take into account that the cooling capacity will change.**

$$\Delta m = ((C_{pw} - C_{pa}) * X) / (C_{pw} *(1-X) + X*C_{pa}) * 100\ \%$$

**with**

**Δm: change of mass flow of the coolant**

**$C_{pw}$: specific heat capacity of water**

**$C_{pa}$: specific heat capacity of the additives**

**X: the percentage of additives**

# 7 Operating instructions

## 7.1 Initial start-up

**WARNING**

**The operator must apply all relevant safety precautions.**

**NOTE**

**For the location of the air outlet valve and the drain connections, see sections *Introduction* and *Condensate system*.**

**Preparations**

1. Consult the sections *Electrical cable size*, *Installation proposal* and *Dimension drawings*.
2. **The following transport fixtures, painted red, must be removed:**
   - Bolt and bushings or support under the motor (1)
   - Bolts and bushings under the gear casing (2)
   - Bolts or bolts and bushings under the oil separator vessel (3)
3. Check that the electrical connections correspond to the applicable codes and that all wires are clamped tight to their terminals.

   The installation must be earthed and protected against short circuits by fuses of the inert type in all phases. An isolating switch must be installed near the compressor.
4. Check transformer (T1) for correct connection.

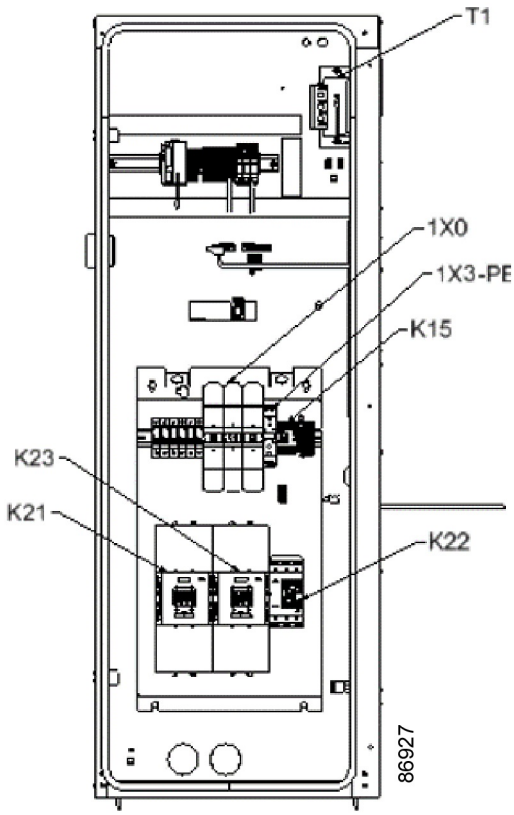



**Figure 32: Electrical cubicle, fixed speed**

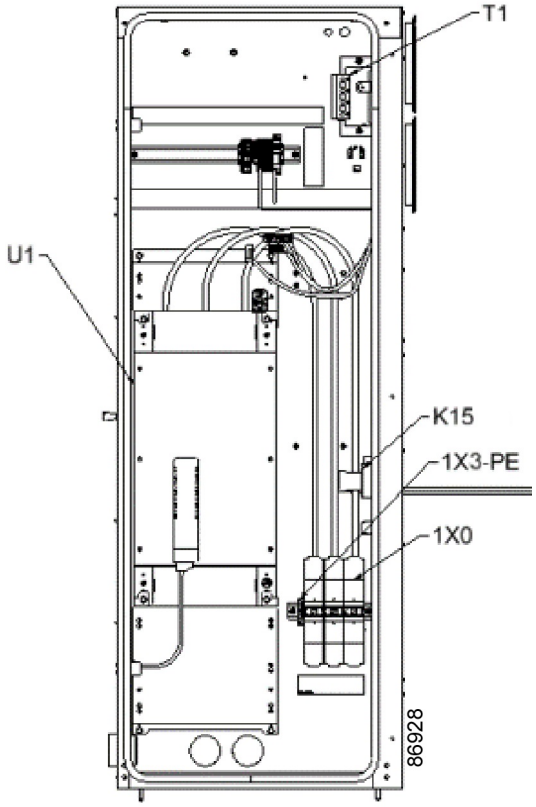



**Figure 33: Electrical cubicle, variable speed**

5. Fit air outlet valve (AV). See section *Introduction* for the location of the valve.
6. Close the valve.
7. Connect the air net to the valve.
8. Connect the condensate drain outlet(s) to a drain collector. See section *Condensate system*.

   The drain pipes to the drain collector must not dip into the water. If there is a risk for freezing, the pipes must be insulated.

   For draining of pure condensate water, install an oil/water separator which is available as an option.
9. On water-cooled compressors, drain valves, shut-off valves and a regulating valve should be fitted by the customer in the cooling water piping.
10. **Provide labels, warning the operator that:**

    - The compressor may automatically restart after voltage failure (if activated, consult your supplier).
    - The compressor is automatically controlled and may be restarted automatically (if activated, consult your supplier).

### Initial start after a standstill

If the compressor has not run for the past 6 months, it is strongly recommended to improve the lubrication of the compressor element before starting. To do so:

1. Disconnect the inlet hose.
2. Remove the unloader (UA) or inlet valve.

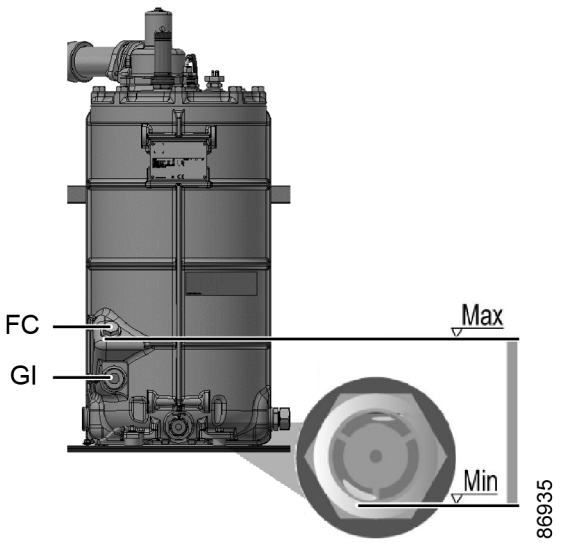
3. Pour approximately 0.75 l (0.20 US gal, 0.17 Imp gal) of compressor oil into the compressor element inlet. For oil specifications, see section *Oil specifications*.
4. Reinstall the unloader (UA) or inlet valve and reconnect the inlet hose.
5. Make sure that all connections are tight.

**Figure 34: Location of the unloader / inlet valve**

## Initial start procedure

1. Check the oil level before starting.

   The oil level should be between the oil filler neck (FC) and the bottom of the sight glass (GI).




2. Switch on the voltage. Start the compressor and stop it immediately. Check the rotation direction of drive motor (M1) while the motor is coasting to a stop. The correct rotation direction of the drive motor is indicated by an arrow shown on the motor fan cowl.

   If the rotation direction of the drive motor is incorrect, open the isolating switch and reverse two incoming main power lines.

   **Incorrect rotation direction of the drive motor may cause damage to the compressor.**
3. Also check the rotation direction of the fan motor. Rotation arrows, visible through the grating in the roof, are provided on the plate below the fan to indicate the correct rotation direction of the fan motor.

   Check the rotation of the main fan. The cooling fan contactor (mostly denoted as Q15 or K15, see service diagram) must be switched on manually for a short moment of time. Rotation arrows, visible through the grating in the roof, are provided on the plate below the fan to indicate the correct rotation direction on the fan motor. If the rotation direction of the fan motor is incorrect, open the isolating switch and reverse two incoming main power lines.
4. Start and run the compressor for a few minutes. Check that the compressor operates normally.
5. Check that the outlet temperature doesn't rise too much after start-up. The unit will shutdown when the outlet temperature is 65°C (149°F) above the inlet temperature.

## 7.2 Before starting

**Procedure**

1. If the compressor has not run for the past 6 months, it is strongly recommended to improve the lubrication of the compressor element before starting. See section *Initial start*.
2. Check oil level. Top up if necessary.

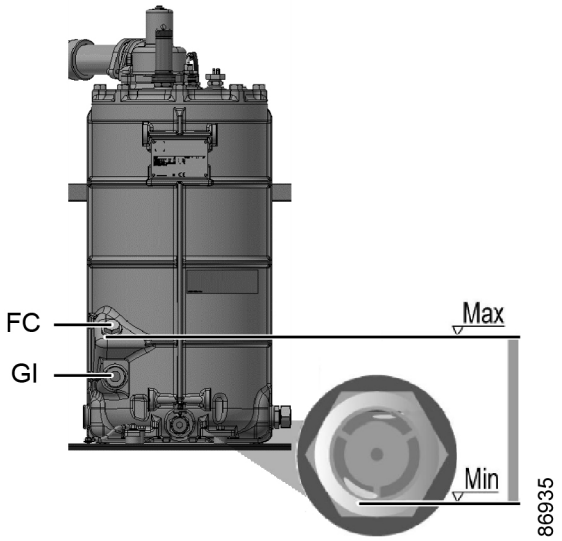



**Figure 35: Position of oil level sight glass**

## 7.3 Starting

**Procedure**

**NOTE**

**For the position of the air outlet valve and the drain connections, see section *Introduction*.**


**Figure 36: Swipe controller**


**Figure 37: Touch controller**

1. Open the air outlet valve.
2. Switch on the voltage. Check that voltage on LED lights up.
3. Press start button on the control panel. The compressor starts running and the automatic operation LED lights up. After the start-up cycle, the compressor starts running loaded.
4. On water-cooled compressors, the cooling water is used to cool the compressor oil and compressed air. Regulate the cooling water flow during loaded operation to obtain the most suitable temperature at the outlet of the compressor element. This temperature is determined by the condensation point of water at operating conditions (lower temperature limit) and the maximum desirable oil temperature (100 °C / 212 °F) as upper limit. For good practice, regulate the cooling flow to obtain an element outlet temperature approximately 5 °C above the relevant (lower limit) temperature obtained from the figure below. If the calculated temperature is higher

than 100 °C, this will lead to more rapid oil deterioration, which will have an impact on oil service intervals. Consult your supplier for best practices in this case. Also consult your supplier in case condensate should form in the oil.

For optimal operation, the cooling water outlet temperature must never exceed the value specified in section *Reference conditions and limitations*.

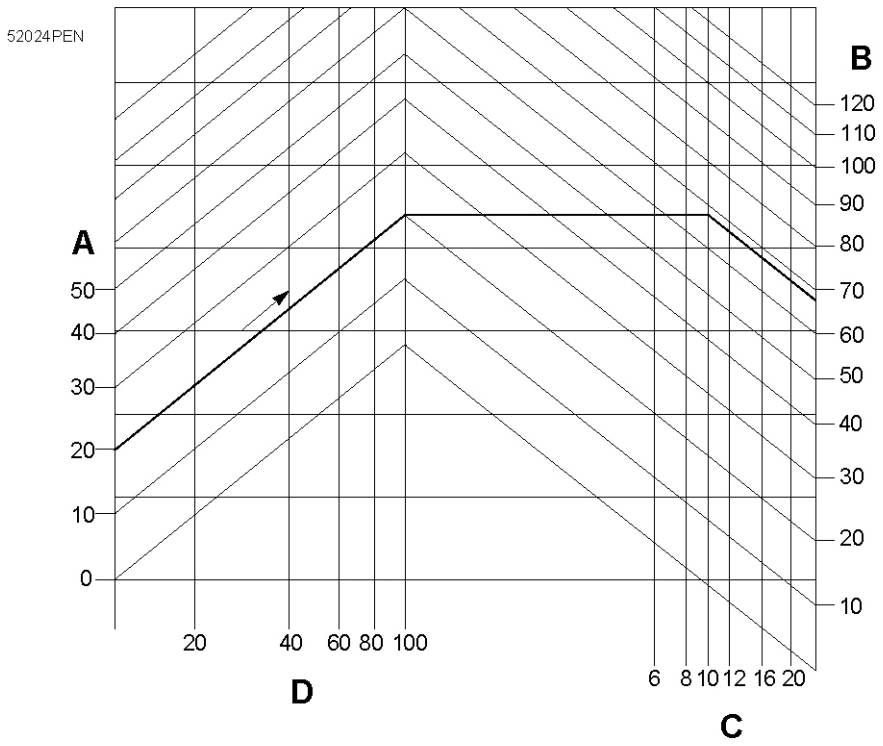



**Figure 38: Minimum compressor element outlet temperature for water-cooled units**

| | |
|---|---|
| A | Air inlet temperature (°C) |
| B | Condensation temperature (°C) |
| C | Working pressure (bar(e)) |
| D | Relative air humidity (%) |

**Example:** If operating at a pressure of 10 bar(e) (145 psig) in an ambient temperature of 20 ˚C (68 ˚F) and at a relative air humidity of 100 %, the minimum temperature to prevent condensation formation in the oil is 68 ˚C (154 ˚F). Regulate the cooling water flow during loaded operation to obtain a temperature between 70 °C (158 °F) and 75 ˚C (167 ˚F) at the outlet of the compressor element.

## 7.4 During operation

**DANGER**

**When the motors are stopped and the automatic operation LED is alight, the motors may start automatically.**

**WARNING**

**The operator must apply all relevant safety precautions. Also consult section *Problem solving*.**

**NOTE**

**Removing the service panel during operation will lead to an automatic shutdown of the unit after a certain time, depending on the version of the unit.**

**NOTE**

**Keep the doors closed during operation.**


**Figure 39: Swipe controller**


**Figure 40: Touch controller**

## Checking the oil level

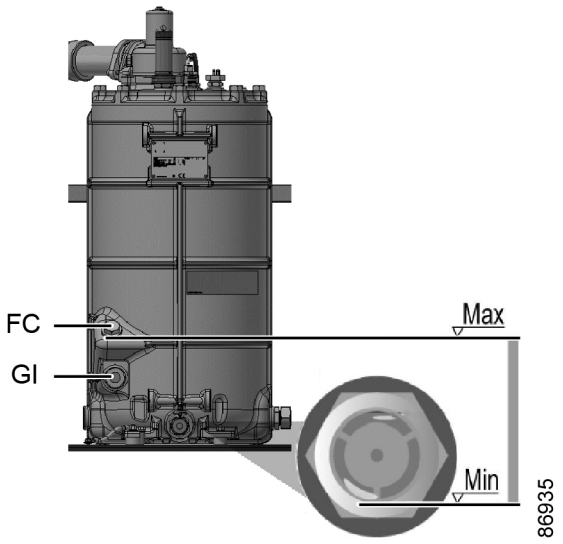



**Figure 41: Position of the oil level sight-glass**

Regularly check the oil level. To do so:

1. Press the stop button.
2. A few minutes after stopping, the oil level should be between the oil filler neck (FC) and the top of the sight glass (GI).
3. If the oil level is too low, push the emergency stop button to avoid the compressor to start unexpectedly.
4. Next, close the air outlet valve and open the manual drain valve (Dm) until the air system between oil separator/air receiver vessel and outlet valve is fully depressurized. See section *Condensate system* for location of the outlet valve and water drain.

5. Unscrew oil filler plug (FC) one turn to permit any pressure left in the system to escape. Wait a few minutes.
6. Remove the plug and add oil until the level reaches the filler opening.
7. Fit and tighten the plug (FC).
8. Unlock the emergency stop button and select the STOP icon on the display and press reset before restarting.

## 7.5 Checking the display


**Figure 42: Swipe controller**


**Figure 43: Touch controller**

Check the main screen regularly for readings and messages. The display normally shows the compressor outlet pressure, while the status of the compressor is indicated by pictographs.

Remedy the trouble if the alarm LED is lit or flashes, see section *Shutdown warning*, *Shutdown* and *Problem solving*.

The panel will show a service indication if a service plan interval has been exceeded or if a service level for a monitored component has been exceeded.

Carry out the service actions of the indicated plans or replace the component and reset the relevant timer, see section *Service warning*.

## 7.6 Stopping


**Figure 44: Swipe controller**


**Figure 45: Touch controller**

**Procedure**

1. Press the stop button. The automatic operation LED goes out and the compressor stops after 30 seconds of unloaded operation.
2. To stop the compressor in the event of an emergency, press the emergency stop button. The alarm LED flashes.
   a. Remedy the problem cause and unlock the button by pulling it out.
   b. Press the alarm icon.
   c. Press the reset icon.

   Do not use emergency stop button for normal stopping!
3. Close the air outlet valve (AV).
4. Open the condensate drain valve of the compressor (Dm) to drain the water trap completely.
5. On water-cooled compressors:
   - Close the cooling water inlet valve.
   - If freezing temperatures are expected, drain the cooling system completely.

## 7.7 Taking out of operation

**WARNING**

**The operator must apply all relevant safety precautions.**

**Procedure**

1. Stop the compressor and close the air outlet valve.
2. Switch off the voltage and disconnect the compressor from the mains.
3. Open the condensate drain valve(s) (Dm).

4. Unscrew the oil filler plug only one turn to permit any pressure in the system to escape. See section *Oil and oil filter change* to locate the filler plug.
5. Shut off and depressurize the part of the air net which is connected to the outlet valve. Disconnect the compressor air outlet pipe from the air net.
6. On water-cooled compressors:
   - Isolate and disconnect the water system from the cooling water net.
   - Drain the water circuit.
7. Drain the oil.
8. Drain the condensate circuit and disconnect the condensate piping from the condensate net.

# 8 Maintenance

## 8.1 Preventive maintenance schedule

**WARNING**

**Before carrying out any maintenance, repair work or adjustments, proceed as follows:**

- **Stop the compressor.**
- **Close the air outlet valve.**
- **Open the condensate drain valve to depressurize the air system between air receiver and outlet valve.**
- **Press the emergency stop button.**
- **Switch off the voltage. Lock Out and Tag Out (LOTO).**
- **Wait 5 minutes for the vessel to depressurize.**
- **Wait 10 minutes for the converter capacitors to discharge before starting any electrical checks, work and/or repair.**

**For detailed instructions, see section *Problem solving*.**

**The operator must apply all relevant safety precautions.**

**WARNING**

**Before lifting the electric motor, all built-on parts shall be removed.**

**WARNING**

**Consult your supplier before modifying a timer setting.**

**WARNING**

**For the change interval of oil and oil filter in extreme conditions, consult your customer center.**

**WARNING**

**Any leakage should be attended to immediately. Damaged hoses or flexible joints must be replaced.**

**Warranty - Product Liability**

Use only authorized parts. Any damage or malfunction caused by the use of unauthorized parts is not covered by Warranty or Product Liability.

**Service kits**

For overhauling or carrying out preventive maintenance, service kits are available. Consult the Spare Parts list for part numbers.

### Service contracts

Your supplier offers several types of service contracts, relieving you of all preventive maintenance work. Consult your customer center.

### General

When servicing, replace all removed O-rings and washers.

### Intervals

The local customer center may overrule the maintenance schedule, especially the service intervals, depending on the environmental and working conditions of the compressor.

The longer interval checks must also include the shorter interval checks.

### Regular maintenance

Following actions have to be done on a regular basis:

| Period | Operation |
|---|---|
| Daily | Check the oil level.<br>Check the readings on the controller display.<br>Check that condensate is discharged during operation of the compressor.<br>Drain the condensate.<br>Check the pressure dew point temperature (on compressors with integrated dryer). |
| 3-monthly(1) | Check the coolers. Clean if necessary.<br>Check the cooling fins of the electric motor(s). Clean if necessary.<br>Remove the air filter element and inspect. If necessary, clean using an air jet. Replace damaged or heavily contaminated elements.<br>Check the filter element of the electric cabinet. Replace if necessary.<br>On compressors with integrated dryer:<br>• Stop the compressor, close the air outlet valve and switch off the voltage.<br>• Remove any dirt from the condenser inlet with a vacuum cleaner.<br>• Next, clean with an air jet in the reverse direction of the normal flow. Use low pressure air. Keep the compressed air nozzle more than 30 cm away from the condenser to avoid damaging the condenser fins.<br>• Remove dust from inside the dryer, e.g. with a vacuum cleaner.<br>Do not use water or solvents to clean the condenser. |
| Yearly | Check the condition of all hoses. Replace if necessary. |

**Table 4: Maintenance checklist**

(1)More frequently when operating in a dusty atmosphere

### Programmed service interventions

Apart from the above mentioned actions, a number of service interventions (see the table below) are programmed in the controller. Each plan has a programmed time interval at which all service actions belonging to that plan are to be carried out. When reaching the interval, a message will appear on the screen indicating which service plans are to be carried out.

See section *Service menu*.

After servicing, the intervals must be reset.

The following table is valid for CPI 75-120 and CPV 60VS-120VS PM.

| Operations to be carried out | Interval | | | |
|---|---|---|---|---|
| | A-service Every 4000 running hours | B-service Every 8000 running hours | C-Service Every 16000 running hours | D-Service Every 24000 running hours |
| Check measured parameters | x | x | x | x |
| Clean the filter mats | x | x | x | x |
| Change the oil filter | x | x | x | x |
| Change the lubricant(1) | x | x | x | x |
| Change the air filter | x | x | x | x |
| Change the inverter filter(2) and the cubicle filter | | x | x | x |
| Change the oil separator element | | x | x | x |
| Overhaul the drain valve | | x | x | x |
| Overhaul the unloader valve | | x | x | x |
| Oil stop valve (check valve) kit | | x | x | x |
| Minimum pressure valve kit | | x | x | x |
| Thermostatic valve kit | | x | x | x |
| Overhaul the compressor element (use an exchange element) | | | | x |
| Replace the shaft seal | | | | x |
| Overhaul the main drive motor | | | | x |
| Replace internal fans inverter | | | | x |
| Overhaul the fan motor | | | | x |

**Table 5: Preventive Maintenance schedule programmed in the controller**

(1)The indicated oil exchange intervals are valid for standard operating conditions (see section *Reference conditions and limitations*) and nominal operating pressure (see section *Compressor data*). Exposure of the compressor to external pollutants, operation at high humidity combined with low duty cycles or operation at higher temperatures may require a shorter oil exchange interval. Contact your supplier if in doubt.

(2)If available.

When Rotair Xtra compressor oil is used, the standard oil change interval can be extended to 8000 hours.

The following table is valid for CPM 75-120.

| Operations to be carried out | Interval | | | |
|---|---|---|---|---|
| | A-service Every 2000 running hours | B-service Every 4000 running hours | C-Service Every 8000 running hours | D-Service Every 20000 running hours |
| Check measured parameters | x | x | x | x |
| Clean the filter mats | x | x | x | x |
| Change the oil filter | x | x | x | x |
| Change the lubricant(1) | x | x | x | x |
| Change the air filter | x | x | x | x |
| Change the inverter filter(2) and the cubicle filter | | x | x | x |
| Change the oil separator element | | x | x | x |
| Overhaul the drain valve | | x | x | x |
| Replace the unloader valve | | | | x |
| Oil stop valve (check valve) kit | | | x | |

| Operations to be carried out | Interval | | | |
|---|---|---|---|---|
| | A-service Every 2000 running hours | B-service Every 4000 running hours | C-Service Every 8000 running hours | D-Service Every 20000 running hours |
| Minimum pressure valve kit | | | x | |
| Thermostatic valve kit | | | x | |
| Replace the compressor element | | | | x |
| Replace the shaft seal | | | | x |
| Overhaul the main drive motor | | | | x |
| Replace the internal/external fans inverter | | | | x |
| Overhaul the fan motor | | | | x |

**Table 6: Preventive Maintenance schedule programmed in the controller**

(1)The indicated oil exchange intervals are valid for standard operating conditions (see section *Reference conditions and limitations*) and nominal operating pressure (see section *Compressor data*). Exposure of the compressor to external pollutants, operation at high humidity combined with low duty cycles or operation at higher temperatures may require a shorter oil exchange interval. Contact your supplier if in doubt.

(2)If available.

When Rotair Xtra compressor oil is used, the standard oil change interval can be extended to 4000 hours.

## 8.2 Oil specifications

It is strongly recommended to use genuine lubricants. They are the result of years of field experience and research. See section *Preventive maintenance schedule* for the advised replacement intervals and consult your Spare Parts list for part number information.

**WARNING**

**Avoid mixing lubricants of different brands or types as they may not be compatible and the oil mix may have inferior properties. A label, indicating the type of oil filled ex factory, is stuck on the air receiver/oil tank.**

**WARNING**

**Only genuine oils to be used.**

**Oil level to be checked on a regular basis.**

**Timely service of consumables needed.**

**Use correct personal protection equipment (gloves and safety goggles).**

### Rotair Plus

Rotair Plus is a high-quality lubricant for oil-injected screw compressors which keeps the compressor in excellent condition.

See the table below for oil exchange intervals:

| Ambient temperature | Element outlet temperature | Exchange interval | Maximum time interval |
|---|---|---|---|
| up to 30°C (95°F) | up to 95°C (203°F) | 4000 | 1 year |
| from 30°C (86°F) up to 35°C (95°F) | from 95°C (203°F) up to 100°C (212°F) | 3000 | 1 year |
| from 35°C (95°F) up to 40°C (104°F) | from 100°C (212°F) up to 105°C (221°F) | 2000 | 1 year |
| above 40°C (104°F) | above 105°C (221°F) | use Rotair Xtra | use Rotair Xtra |

### Rotair Xtra

Rotair Xtra is a high-quality synthetic lubricant for oil-injected screw compressors which keeps the compressor in excellent condition.

See the table below for oil exchange intervals:

| Ambient temperature | Element outlet temperature | Exchange interval | Maximum time interval |
|---|---|---|---|
| up to 35°C (95°F) | up to 100°C (212°F) | 8000 | 2 years |
| from 35°C (95°F) up to 40°C (104°F) | from 100°C (212°F) up to 105°C (221°F) | 6000 | 2 years |
| above 40°C (104°F) | above 105°C (221°F) | 5000 | 2 years |

## 8.3 Drive motor

### General

Keep the outside of the electric motor clean for efficient cooling. If necessary, remove dust with a brush and/or compressed air jet.

### Bearing maintenance

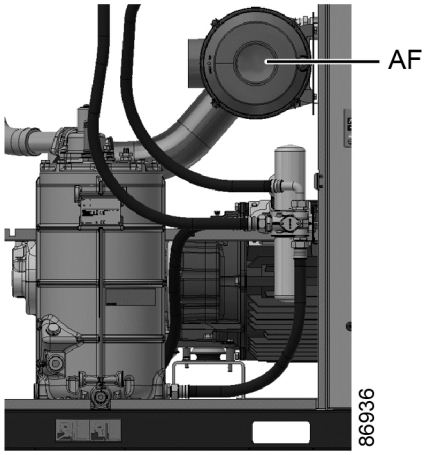
The bearing at the drive end side is lubricated by the oil system and requires no periodic maintenance.

The non-drive end side bearing of motors without grease nipples requires no periodic maintenance.

Motors with a grease nipple at the non-drive end side must follow the maintenance interval as mentioned on the motor data plate.

## 8.4 Air filter

### Location of air filter




### Recommendations

1. Never remove the element while the compressor is running.
2. For minimum downtime, replace the dirty element by a new one.
3. Discard the element when damaged.

### Procedure

1. Stop the compressor. Switch off the voltage. Lock Out and Tag Out.
2. Release the snap clips of the air filter (AF) and remove the cover and the air filter element. Discard the filter element.
3. Fit the new element and the cover.
4. Reset the air filter service warning.

   See section *Service menu*.

## 8.5 Oil and oil filter change

### Warning

**WARNING**

**The operator must apply all relevant safety precautions.**

**Always drain the compressor oil at all drain points. Used oil left in the compressor can contaminate the oil system and can shorten the lifetime of the new oil.**

**Never mix lubricants of different brands or types as they may not be compatible and the oil mix will have inferior properties. A label, indicating the type of oil filled ex factory, is stuck on the air receiver/oil tank.**

**If the compressor is equipped with an Energy Recovery unit, also consult section *Maintenance for energy recovery systems*.**

## Procedure

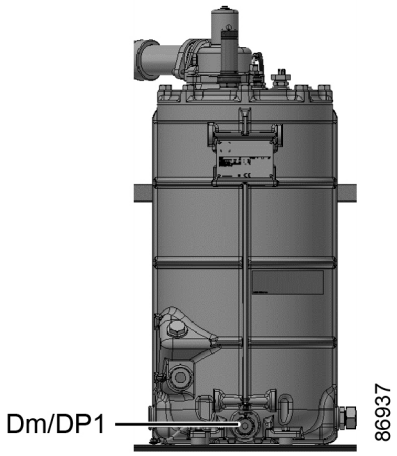



**Figure 46: Oil drain and filler plug on the oil separator vessel**

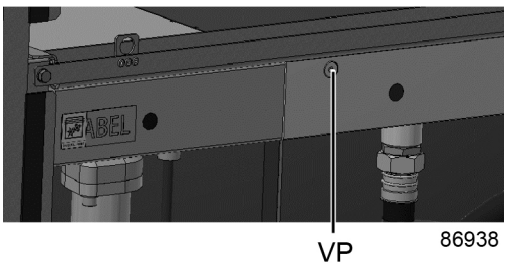



**Figure 47: Vent plug, oil cooler**

1. Run the compressor until warm.
2. Stop the compressor after 3 minutes of unloaded operation.
3. Close the air outlet valve and switch off the voltage.
4. Wait a few minutes and depressurize by unscrewing the oil filler plug (FC) just one turn to permit any pressure in the system to escape.
5. Air-cooled units: loosen the vent plug (VP) of the oil cooler and wait for 5 minutes.
6. Remove the drain plug (DP1) and open the drain valve (Dm).
7. Collect the oil in a collector and deliver it to the local collection service.
8. Refit and tighten the drain and vent plugs (VP) after draining.
9. Close the drain valve (Dm).
10. Remove the oil filter (OF). **Be aware that this filter has a bayonet connection.** Rotate the filter across the vertical axis and push slightly upwards. Make sure the connection interface is clean before mounting.
11. Remove the filler plug (FC).
12. Fill the air receiver (AR) with oil until the level reaches the filler neck. Make sure that no dirt drops into the system.
13. Refit and tighten the filler plug (FC).
14. Run the compressor loaded for a few minutes.
15. Stop the compressor and wait a few minutes to allow the oil to settle.
16. Depressurize the system by unscrewing the filler plug (FC) just one turn to permit any pressure in the system to escape.
17. Remove the filler plug (FC).

18. Fill the air receiver with oil until the level reaches the filler neck.
19. Tighten the filler plug (FC).
20. Reset the service warning after carrying out all service actions in the relevant Service Plan. See section *Service menu*.

## 8.6 Coolers

### General

Keep the coolers clean to maintain their efficiency.

### Instructions for air-cooled compressors

- Stop the compressor, close the air outlet valve and switch off the voltage.
- Cover all parts under the coolers.
- Remove any dirt from the coolers with a fiber brush. Brush in the direction of the cooling fins.

  Also remove any dirt from the fan with a fiber brush.
- Next, clean with an air jet in the reverse direction to normal flow. Use low pressure air. If necessary, the pressure may be increased up to 6 bar(e) (87 psig).
- If it is necessary to wash the coolers with a cleaning agent, consult your supplier.
- Remove the cover used during cleaning.

### Instructions for water-cooled compressors

Consult your supplier.

## 8.7 Filtering panel

**DANGER**

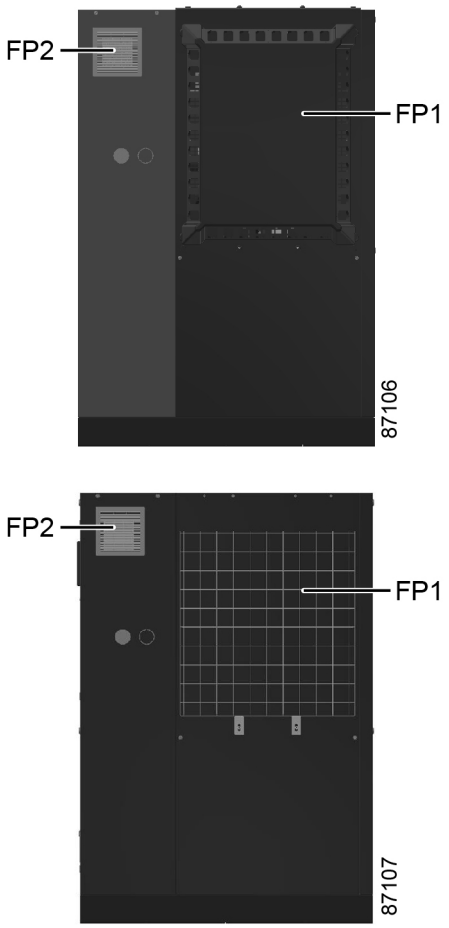
**Before starting any maintenance or repair work, switch off the voltage and close the air outlet valve.**

**DANGER**

**Always disconnect the power supply before working on the electrical circuit!**

### Cleaning the filtering panel

1. Stop the compressor.
2. Close the air outlet valve and switch off the voltage.
3. Remove the air inlet filter panel(s) (FP1) and the cubicle filter (FP2).




4. Clean the inlet filtering panel with a jet of air or wash it with water, but do not use solvents.
5. Replace the cubicle filter.
6. Once the operation has been completed, reassemble the filter panel.

## 8.8 Safety valves

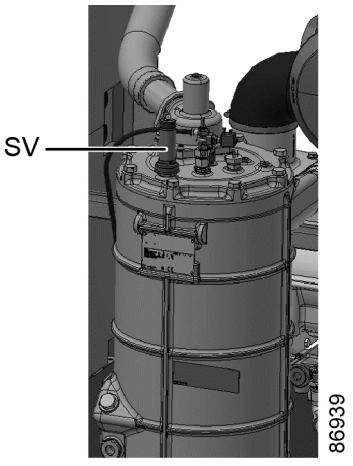



**Figure 48: Position of safety valve**

### Operating

Operate the safety valve from time to time by unscrewing the cap one or two turns. Retighten it afterwards.

### Testing

Before removing the valve, depressurize the compressor. See also section *Problem solving*.

The safety valve (SV) can be tested on a separate air line. If the valve does not open at the set pressure stamped on the valve, it needs to be replaced.

### Warning

No adjustments are allowed. Never run the compressor without safety valve.

## 8.9 Dryer maintenance instructions

### Safety precautions

**DANGER**

**Refrigeration dryers of ID type contain refrigerant HFC.**

**When handling refrigerant, all applicable safety precautions must be observed. Please be specifically aware of the following points:**

- **Contact of refrigerant with the skin will cause freezing. Special gloves must be worn. If contacted with the skin, the skin should be rinsed with water. On no account may clothing be removed.**
- **Fluid refrigerant will also cause freezing of the eyes; always wear safety glasses.**
- **Refrigerant is harmful. Do not inhale refrigerant vapors. Check that the working area is adequately ventilated.**

Be aware that certain components such as the refrigerant compressor and the discharge pipe can become quite hot, up to 110 °C (230 °F). Therefore, wait until the dryer has cooled down before removing the panels.

Before starting any maintenance or repair work, switch off the voltage and close the air inlet and outlet valves.

### Local legislation

**WARNING**

**Local legislation may stipulate that:**

- **Work on the refrigerant circuit of the cooling dryer or on any equipment which influences its function must be undertaken by an authorised control body.**
- **The installation should be checked once a year by an authorised control body.**

### General

For all references see section *Introduction*.

The following remarks should be kept in mind:

- Keep the dryer clean.
- Brush or blow off the finned surface of condenser monthly.
- Stop the compressor, close the air outlet valve and switch off the voltage.
- Remove any dirt on the condenser inlet with a vacuum cleaner.
- Next, clean with an air jet in the reverse direction to normal flow. Use low pressure air. If necessary, the pressure may be increased up to 6 bar(e) (87 psig).
- Clean the condenser area with a vacuum cleaner.
- Inspect and clean the condensate drain monthly.

## 8.10 Service kits

For overhauling and for preventive maintenance, a wide range of service kits is available. Service kits comprise all parts required for servicing the component and offer the benefits of genuine parts while keeping the maintenance budget low.

Also a full range of extensively tested lubricants, suitable for your specific needs is available to keep the compressor in excellent condition.

Consult the Spare Parts List for part numbers.

## 8.11 Storage after installation

### Procedure

Run the compressor regularly until warm, e.g., twice a week. Load and unload the compressor a few times.

**NOTE**

**If the compressor is going to be stored without running from time to time, protective measures must be taken. Consult your supplier.**

# 9 Problem solving

**DANGER**

**Before starting any maintenance or repair work, switch off the voltage and close the air outlet valve.**

**DANGER**

**Only pressing the emergency stop button is not sufficient to make the compressor voltage free.**

**DANGER**

**If the machine is equipped with an automatic restart after voltage failure function and if this function is active, be aware that the machine will restart automatically when the power is restored if it was running when the power was interrupted!**

**WARNING**

**The operator must apply all relevant safety precautions.**

**WARNING**

**Before carrying out any maintenance, repair work or adjustment:**

- **Press the stop button**
- **Wait until the compressor has stopped and close the air outlet valve.**
- **Open the manual drain valve(s).**
- **Press the emergency stop button and switch off the voltage.**
- **Open and lock the isolating switch.**
- **Depressurize the oil separator vessel by opening the oil filler plug one turn.**

**For location of components: see sections *Introduction*, *Condensate system* and *Initial start-up*.**

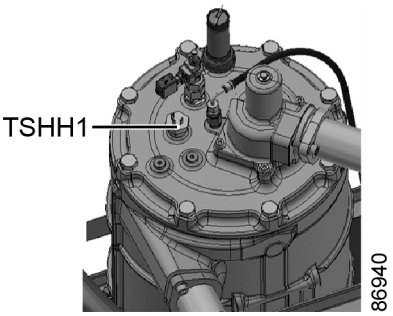
**WARNING**

**The air outlet valve can be locked during maintenance or repair as follows:**

- **Close the valve.**
- **Remove the screw fixing the handle with the wrench delivered with the compressor.**
- **Lift the handle and turn it until the slot of the handle fits over the blocking edge on the valve body.**
- **Fit the screw.**

## Faults and remedies, compressor

See section *Service menu*.

| Condition | Fault | Remedy |
|---|---|---|
| Compressor does not start or stops during operation. | Too high temperature in oil separator vessel or temperature switch (TSHH1) defective.   | Find cause and remedy. Replace if necessary. |
| | Wiring interrupted. | Find cause and remedy. Replace if necessary. |
| Compressor starts running, but does not load after a delay time. | Solenoid valve out of order. | Replace valve. |
| | Inlet valve stuck in closed position. | Have valve checked. |
| | Leak in control air tubes. | Replace leaking tubes. |
| | Minimum pressure valve leaking (when air net is depressurized). | Have valve checked. |
| Compressor does not unload, safety valve blows. | Solenoid valve out of order. | Replace valve. |
| | Inlet valve does not close. | Have valve checked. |
| Condensate is not discharged from condensate separator during loading. | Discharge tube clogged. | Check and correct as necessary. |
| Compressor air output or pressure below normal. | Air consumption exceeds air delivery of compressor. | Check the connected equipment. |
| | Choked air filter element. | Replace filter element. |
| | Solenoid valve malfunctioning. | Replace valve. |
| | Leak in control air tubes. | Replace leaking tubes. |
| | Oil separator element clogged. | Have element replaced. |
| | Air leakage. | Have leaks repaired. |
| | Safety valve leaking. | Replace valve. |
| | Inlet valve does not fully open. | Have valve checked. |
| | Compressor element out of order. | Consult your supplier. |
| Excessive oil consumption; oil carry-over through discharge line. | Incorrect oil causing foam. | Change to correct oil. |
| | Oil level too high. | Check for overfilling. Release pressure and drain oil to correct level. |
| | Oil separator defective. | Replace oil separator element. |
| Safety valve blows after loading. | Inlet valve malfunctioning. | Have valve checked. |
| | Minimum pressure valve malfunctioning. | Have valve checked. |
| | Safety valve out of order. | Have valve replaced. |
| | Oil separator element clogged. | Have oil separator element replaced. |
| | Compressor element out of order. | Consult your supplier. |

| Condition | Fault | Remedy |
|---|---|---|
| Compressor element outlet temperature or delivery air temperature above normal. | Oil level too low. | Check and correct. |
| | Insufficient cooling air or cooling air temperature too high. | Check for cooling air restriction or improve ventilation of the compressor room. Avoid recirculation of cooling air. If installed, check capacity of compressor room fan. |
| | Oil cooler clogged. | Clean cooler. |
| | Bypass valve malfunctioning. | Have valve tested. |
| | Air cooler clogged. | Clean cooler. |
| | Compressor element out of order. | Consult your supplier. |
| Cooling air fan does not deliver enough air. | Unit shuts down due to overtemperature, fan overload, too high oil consumption or less free air delivery (FAD). | Fan rotates in the wrong direction due to wrong electrical connection. |

## Faults and remedies, dryer

For all references hereafter, consult section *Air dryer*.

| Condition | Fault | Remedy |
|---|---|---|
| Pressure dew point too high. | Air inlet temperature too high. | Check and correct; if necessary, clean the aftercooler of the compressor. |
| | Ambient temperature too high. | Check and correct; if necessary, draw cooling air via a duct from a cooler place or relocate the compressor. |
| | Shortage of refrigerant. | Have circuit checked for leaks and recharged. |
| | Refrigerant compressor does not run. | See below. |
| | Evaporator pressure too high. | See below. |
| | Condenser pressure too high. | See below. |
| Condenser pressure too high or too low. | Fan control switch out of order. | Replace. |
| | Fan blades or fan motor out of order. | Have checked fan/fan motor, if necessary replace. |
| | Ambient temperature too high. | Check and correct; if necessary, draw cooling air via a duct from a cooler place or relocate the compressor. |
| | Condenser externally clogged. | Clean condenser. |
| Compressor stops or does not start. | Electric power supply to compressor is interrupted. | Check and correct as necessary. |
| | Thermal protection of refrigerant compressor motor has tripped. | Motor will restart when motor windings have cooled down. |
| Condensate drain remains inoperative. | Drain system clogged. | Have system inspected.<br>Clean the filter of the drain by opening the manual drain valve.<br>On units with an electronic drain, check functioning of the drain by pushing the test button. |

| Condition | Fault | Remedy |
|---|---|---|
| Condensate trap continuously discharges air and water. | Drain out of order. | Have system checked. If necessary, replace the drain. |
| Evaporator pressure is too high or too low at unload. | Hot gas bypass valve incorrectly set or out of order. | Have hot gas bypass valve adjusted. |
| | Condenser pressure too high or too low. | See above. |
| | Shortage of refrigerant. | Have circuit checked for leaks and recharged if necessary. |

# 10 Technical data

## 10.1 Readings on display


**Figure 49: Swipe controller**


**Figure 50: Touch controller**

**Important**

**NOTE**

**The data is valid under the reference conditions. See section *Reference conditions and limitations*.**

| Reference | Reading |
|---|---|
| Air outlet pressure | Modulates between programmed unloading and loading pressures. |
| Compressor element outlet temperature | Approx. 60 ˚C (140 ˚F) above cooling air inlet temperature. |

## 10.2 Electric cable size and fuses

**Important**

**WARNING**

**The voltage on the compressor terminals must not deviate more than 10% of the nominal voltage. It is however highly recommended to keep the voltage drop over the supply cables at nominal current below 5% of the nominal voltage (IEC 60204-1).**

**If cables are grouped together with other power cables, it may be necessary to use cables of a larger size than those calculated for the standard operating conditions.**

**Use the original cable entry. See section *Dimension drawings*. To preserve the protection degree of the electrical cubicle and to protect its components from dust from the environment, it is mandatory to use a fitting cable gland when connecting the supply cable to the compressor.**

**Local regulations remain applicable if they are stricter than the values proposed below.**

**Currents are calculated with the full service factor and 10% undervoltage. Fuses are maximum allowed values calculated for full service factor and 10% overvoltage and undervoltage.**

**DANGER**

**Always double-check the fuse size versus the calculated cable size. If required, reduce fuse size or enlarge cable size.**

**Cable length should not exceed the maximum length according to IEC60204 table 10.**

**Currents and fuses, air-cooled, IEC approved units**

| Compressor (kW) | | | Imax(1) | Max. fuse(1) | Imax(2) | Max. fuse(2) |
|---|---|---|---|---|---|---|
| | | | | gL/gG | | gL/gG |
| | V | Hz | A | A | A | A |
| 55 | 230 | 50 | 248 | 250 | 255 | 300 |

| Compressor (kW) | | | Imax(1) | Max. fuse(1) | Imax(2) | Max. fuse(2) |
|---|---|---|---|---|---|---|
| | | | | gL/gG | | gL/gG |
| | V | Hz | A | A | A | A |
| 55 | 230 | 60 | 251 | 250 | 254 | 300 |
| 55 | 380 | 60 | 150 | 160 | 154 | 160 |
| 55 | 400 | 50 | 143 | 160 | 147 | 160 |
| 55 | 460 | 60 | 125 | 125 | 129 | 160 |
| 75 | 230 | 50 | 334 | 355 | 344 | 355 |
| 75 | 230 | 60 | 329 | 355 | 334 | 355 |
| 75 | 380 | 60 | 199 | 200 | 208 | 224 |
| 75 | 400 | 50 | 194 | 200 | 200 | 200 |
| 75 | 460 | 60 | 166 | 200 | 171 | 200 |
| 76 | 230 | 50 | 334 | 355 | 344 | 355 |
| 76 | 230 | 60 | 329 | 355 | 334 | 355 |
| 76 | 380 | 60 | 199 | 200 | 208 | 224 |
| 76 | 400 | 50 | 194 | 200 | 200 | 200 |
| 76 | 460 | 60 | 166 | 200 | 171 | 200 |
| 90 | 230 | 50 | 368 | 400 | 378 | 400 |
| 90 | 230 | 60 | 370 | 400 | 377 | 400 |
| 90 | 380 | 60 | 229 | 250 | 235 | 250 |
| 90 | 400 | 50 | 217 | 224 | 223 | 250 |
| 90 | 460 | 60 | 185 | 200 | 191 | 200 |

**Table 7: Fixed speed units**

| Compressor (kW) | | | Imax(1) | Max. fuse(1) | Imax(2) | Max. fuse(2) |
|---|---|---|---|---|---|---|
| | | | | aR | | aR |
| | V | Hz | A | A | A | A |
| 45 | 380 | 60 | 137 | 160 | 141 | 160 |
| 45 | 400 | 50 | 137 | 160 | 141 | 160 |
| 45 | 460 | 60 | 136 | 160 | 140 | 160 |
| 55 | 380 | 60 | 161 | 160 | 165 | 200 |
| 55 | 400 | 50 | 161 | 160 | 164 | 200 |
| 55 | 460 | 60 | 160 | 160 | 163 | 200 |
| 75 | 380 | 60 | 188 | 200 | 196 | 200 |
| 75 | 400 | 50 | 187 | 200 | 193 | 200 |
| 75 | 460 | 60 | 187 | 200 | 191 | 200 |
| 76 | 380 | 60 | 193 | 200 | 202 | 200 |
| 76 | 400 | 50 | 193 | 200 | 198 | 200 |
| 76 | 460 | 60 | 192 | 200 | 196 | 200 |
| 90 | 380 | 60 | 244 | 250 | 250 | 250 |
| 90 | 400 | 50 | 243 | 250 | 249 | 250 |
| 90 | 460 | 60 | 243 | 250 | 249 | 250 |

**Table 8: Variable speed units**

## Currents and fuses, water-cooled, IEC approved units

| Compressor (kW) | | | Imax(1) | Max. fuse(1) | Imax(2) | Max. fuse(2) |
|---|---|---|---|---|---|---|
| | | | | gL/gG | | gL/gG |
| | V | Hz | A | A | A | A |
| 55 | 230 | 50 | 239 | 250 | 246 | 250 |
| 55 | 230 | 60 | 241 | 250 | 245 | 250 |

| Compressor (kW) | | | Imax(1) | Max. fuse(1) | Imax(2) | Max. fuse(2) |
|---|---|---|---|---|---|---|
| | | | | gL/gG | | gL/gG |
| | V | Hz | A | A | A | A |
| 55 | 380 | 60 | 144 | 160 | 148 | 160 |
| 55 | 400 | 50 | 138 | 160 | 141 | 160 |
| 55 | 460 | 60 | 121 | 125 | 124 | 125 |
| 75 | 230 | 50 | 325 | 355 | 335 | 355 |
| 75 | 230 | 60 | 320 | 355 | 324 | 355 |
| 75 | 380 | 60 | 194 | 200 | 203 | 224 |
| 75 | 400 | 50 | 189 | 200 | 194 | 200 |
| 75 | 460 | 60 | 162 | 160 | 166 | 200 |
| 76 | 230 | 50 | 325 | 355 | 335 | 355 |
| 76 | 230 | 60 | 320 | 355 | 324 | 355 |
| 76 | 380 | 60 | 194 | 200 | 203 | 224 |
| 76 | 400 | 50 | 189 | 200 | 194 | 200 |
| 76 | 460 | 60 | 162 | 160 | 166 | 200 |
| 90 | 230 | 50 | 356 | 355 | 366 | 400 |
| 90 | 230 | 60 | 357 | 355 | 363 | 400 |
| 90 | 380 | 60 | 222 | 224 | 228 | 250 |
| 90 | 400 | 50 | 210 | 224 | 215 | 224 |
| 90 | 460 | 60 | 179 | 200 | 185 | 200 |

**Table 9: Fixed speed units**

| Compressor (kW) | | | Imax(1) | Max. fuse(1) | Imax(2) | Max. fuse(2) |
|---|---|---|---|---|---|---|
| | | | | aR | | aR |
| | V | Hz | A | A | A | A |
| 45 | 380 | 60 | 132 | 160 | 136 | 160 |
| 45 | 400 | 50 | 132 | 160 | 136 | 160 |
| 45 | 460 | 60 | 132 | 160 | 136 | 160 |
| 55 | 380 | 60 | 155 | 160 | 159 | 160 |
| 55 | 400 | 50 | 155 | 160 | 159 | 160 |
| 55 | 460 | 60 | 155 | 160 | 159 | 160 |
| 75 | 380 | 60 | 182 | 200 | 191 | 200 |
| 75 | 400 | 50 | 182 | 200 | 188 | 200 |
| 75 | 460 | 60 | 182 | 200 | 186 | 200 |
| 76 | 380 | 60 | 187 | 200 | 196 | 200 |
| 76 | 400 | 50 | 187 | 200 | 193 | 200 |
| 76 | 460 | 60 | 187 | 200 | 192 | 200 |
| 90 | 380 | 60 | 236 | 250 | 243 | 250 |
| 90 | 400 | 50 | 236 | 250 | 242 | 250 |
| 90 | 460 | 60 | 236 | 250 | 242 | 250 |

**Table 10: Variable speed units**

## Currents and fuses, air-cooled, UL approved units

| Compressor (kW) | | | Imax(1) | Max. fuse(1) | Imax(2) | Max. fuse(2) |
|---|---|---|---|---|---|---|
| | | | | Class J | | Class J |
| | V | Hz | A | A | A | A |
| 55 | 230 | 60 | 251 | 250 | 254 | 300 |
| 55 | 460 | 60 | 125 | 125 | 129 | 150 |
| 75 | 230 | 60 | 329 | 350 | 338 | 350 |

| Compressor (kW) | | | Imax(1) | Max. fuse(1) | Imax(2) | Max. fuse(2) |
|---|---|---|---|---|---|---|
| | | | | Class J | | Class J |
| | V | Hz | A | A | A | A |
| 75 | 460 | 60 | 166 | 175 | 171 | 175 |
| 76 | 230 | 60 | 329 | 350 | 338 | 350 |
| 76 | 460 | 60 | 166 | 175 | 171 | 175 |
| 90 | 230 | 60 | 370 | 400 | 377 | 400 |
| 90 | 460 | 60 | 185 | 200 | 191 | 200 |

**Table 11: Fixed speed units**

| Compressor (kW) | | | Imax(1) | Max. fuse(1) | Imax(2) | Max. fuse(2) |
|---|---|---|---|---|---|---|
| | | | | Class T | | Class T |
| | V | Hz | A | A | A | A |
| 45 | 460 | 60 | 136 | 150 | 140 | 150 |
| 55 | 460 | 60 | 160 | 175 | 163 | 175 |
| 75 | 460 | 60 | 187 | 200 | 191 | 200 |
| 76 | 460 | 60 | 192 | 200 | 196 | 200 |
| 90 | 460 | 60 | 243 | 250 | 249 | 250 |

**Table 12: Variable speed units**

## Currents and fuses, water-cooled, UL approved units

| Compressor (kW) | | | Imax(1) | Max. fuse(1) | Imax(2) | Max. fuse(2) |
|---|---|---|---|---|---|---|
| | | | | Class J | | Class J |
| | V | Hz | A | A | A | A |
| 55 | 230 | 60 | 241 | 250 | 245 | 250 |
| 55 | 460 | 60 | 121 | 125 | 124 | 125 |
| 75 | 230 | 60 | 320 | 350 | 329 | 350 |
| 75 | 460 | 60 | 162 | 175 | 166 | 175 |
| 76 | 230 | 60 | 320 | 350 | 329 | 350 |
| 76 | 460 | 60 | 162 | 175 | 166 | 175 |
| 90 | 230 | 60 | 357 | 400 | 363 | 400 |
| 90 | 460 | 60 | 179 | 200 | 185 | 200 |

**Table 13: Fixed speed units**

| Compressor (kW) | | | Imax(1) | Max. fuse(1) | Imax(2) | Max. fuse(2) |
|---|---|---|---|---|---|---|
| | | | | Class T | | Class T |
| | V | Hz | A | A | A | A |
| 45 | 460 | 60 | 132 | 150 | 136 | 150 |
| 55 | 460 | 60 | 155 | 175 | 159 | 175 |
| 75 | 460 | 60 | 182 | 200 | 186 | 200 |
| 76 | 460 | 60 | 187 | 200 | 192 | 200 |
| 90 | 460 | 60 | 236 | 250 | 242 | 250 |

**Table 14: Variable speed units**

## Currents and fuses, air-cooled, CSA approved units

| Compressor (kW) | | | Imax(1) | Max. fuse(1) HRC form II | Imax(2) | Max. fuse(2) HRC form II |
|---|---|---|---|---|---|---|
| | V | Hz | A | A | A | A |
| 55 | 230 | 60 | 251 | 250 | 258 | 300 |
| 55 | 460 | 60 | 125 | 125 | 132 | 150 |
| 55 | 575 | 60 | 100 | 100 | 107 | 110 |
| 75 | 230 | 60 | 329 | 350 | 337 | 350 |
| 75 | 460 | 60 | 166 | 175 | 174 | 175 |
| 75 | 575 | 60 | 141 | 150 | 148 | 150 |
| 76 | 230 | 60 | 329 | 350 | 337 | 350 |
| 76 | 460 | 60 | 166 | 175 | 174 | 175 |
| 76 | 575 | 60 | 141 | 150 | 148 | 150 |
| 90 | 230 | 60 | 370 | 400 | 378 | 400 |
| 90 | 460 | 60 | 185 | 200 | 193 | 200 |
| 90 | 575 | 60 | 163 | 175 | 171 | 175 |

**Table 15: Fixed speed units**

| Compressor (kW) | | | Imax(1) | Max. fuse(1) Class T | Imax(2) | Max. fuse(2) Class T |
|---|---|---|---|---|---|---|
| | V | Hz | A | A | A | A |
| 45 | 460 | 60 | 136 | 150 | 144 | 150 |
| 55 | 460 | 60 | 160 | 175 | 167 | 175 |
| 75 | 460 | 60 | 187 | 200 | 194 | 200 |
| 76 | 460 | 60 | 192 | 200 | 199 | 200 |
| 90 | 460 | 60 | 243 | 250 | 250 | 250 |

**Table 16: Variable speed units**

## Currents and fuses, water-cooled, CSA approved units

| Compressor (kW) | | | Imax(1) | Max. fuse(1) HRC form II | Imax(2) | Max. fuse(2) HRC form II |
|---|---|---|---|---|---|---|
| | V | Hz | A | A | A | A |
| 55 | 230 | 60 | 241 | 250 | 248 | 250 |
| 55 | 460 | 60 | 121 | 125 | 128 | 150 |
| 55 | 575 | 60 | 96 | 100 | 104 | 110 |
| 75 | 230 | 60 | 320 | 350 | 327 | 350 |
| 75 | 460 | 60 | 162 | 175 | 169 | 175 |
| 75 | 575 | 60 | 137 | 150 | 144 | 150 |
| 76 | 230 | 60 | 320 | 350 | 327 | 350 |
| 76 | 460 | 60 | 162 | 175 | 169 | 175 |
| 76 | 575 | 60 | 137 | 150 | 144 | 150 |
| 90 | 230 | 60 | 357 | 400 | 364 | 400 |
| 90 | 460 | 60 | 179 | 200 | 186 | 200 |
| 90 | 575 | 60 | 158 | 175 | 166 | 175 |

**Table 17: Fixed speed units**

| Compressor (kW) | | | Imax(1) | Max. fuse(1) Class T | Imax(2) | Max. fuse(2) Class T |
|---|---|---|---|---|---|---|
| | V | Hz | A | A | A | A |
| 45 | 460 | 60 | 132 | 150 | 139 | 150 |
| 55 | 460 | 60 | 155 | 175 | 163 | 175 |
| 75 | 460 | 60 | 182 | 200 | 190 | 200 |
| 76 | 460 | 60 | 187 | 200 | 195 | 200 |
| 90 | 460 | 60 | 236 | 250 | 244 | 250 |

**Table 18: Variable speed units**

Imax: current in the supply lines at maximum load and 10% under voltage.

(1)Compressors without integrated dryer.

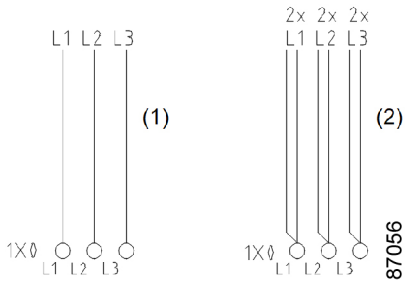
(2)Compressors with integrated dryer.

**Fuse calculations for IEC** are done according to 60364-4-43 *Low-voltage electrical installations* - part 4-43 *Protection against overcurrent*. Fuse sizes are calculated to protect the cable against short circuit.

**Fuse calculations for CSA and UL**: the indicated fuse size is the maximum fuse size in order to protect the motor against short circuit.

## Possible configurations

There are 2 possible cabling layouts:




- (1): Single supply cables.
- (2): Parallel supply cables

## Supply cable

Minimum and maximum connection possibilities.

| 1X0 L1, L2, L3 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Compressor (kW) | | | | Finely Stranded 1 cable/phase | | Finely Stranded 2 equal cables/phase | |
| | Voltage (V) | Frequency (Hz) | Approval | Min. | Max. | Min. | Max. |
| 55 | 230 | 50 | IEC | 70 mm² | 240 mm² | 35 mm² | 50 mm² |
| 55 | 230 | 60 | IEC | 70 mm² | 240 mm² | 35 mm² | 50 mm² |
| 55 | 380 | 60 | IEC | 35 mm² | 95 mm² | 16 mm² | 35 mm² |
| 55 | 400 | 50 | IEC | 16 mm² | 70 mm² | 16 mm² | 25 mm² |
| 55 | 460 | 60 | IEC | 16 mm² | 70 mm² | 16 mm² | 25 mm² |
| 55 | 500 | 50 | IEC | 16 mm² | 70 mm² | 16 mm² | 25 mm² |

| 1X0 L1, L2, L3 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Compressor (kW) | | | | Finely Stranded 1 cable/phase | | Finely Stranded 2 equal cables/phase | |
| | Voltage (V) | Frequency (Hz) | Approval | Min. | Max. | Min. | Max. |
| 55 | 230 | 60 | UL/cUL | 2/0 AWG | MCM500 | 2 AWG | 1/0 AWG |
| 55 | 460 | 60 | UL/cUL | 3 AWG | 2/0 AWG | 3 AWG | 4 AWG |
| 55 | 575 | 60 | UL/cUL | 3 AWG | 2/0 AWG | 3 AWG | 4 AWG |
| 75 | 230 | 50 | IEC | 25 mm² | 300 mm² | - | - |
| 75 | 230 | 60 | IEC | 25 mm² | 300 mm² | - | - |
| 75 | 380 | 60 | IEC | 50 mm² | 150 mm² | 25 mm² | 50 mm² |
| 75 | 400 | 50 | IEC | 50 mm² | 150 mm² | 25 mm² | 50 mm² |
| 75 | 460 | 60 | IEC | 35 mm² | 95 mm² | 16 mm² | 35 mm² |
| 75 | 500 | 50 | IEC | 35 mm² | 95 mm² | 16 mm² | 35 mm² |
| 75 | 230 | 60 | UL/cUL | 4 AWG | MCM600 | - | - |
| 75 | 460 | 60 | UL/cUL | 1/0 AWG | MCM300 | 4 AWG | 1/0 AWG |
| 75 | 575 | 60 | UL/cUL | 1/0 AWG | MCM300 | 4 AWG | 1/0 AWG |
| 76 | 230 | 50 | IEC | 25 mm² | 300 mm² | - | - |
| 76 | 230 | 60 | IEC | 25 mm² | 300 mm² | - | - |
| 76 | 380 | 60 | IEC | 50 mm² | 150 mm² | 25 mm² | 50 mm² |
| 76 | 400 | 50 | IEC | 50 mm² | 150 mm² | 25 mm² | 50 mm² |
| 76 | 460 | 60 | IEC | 35 mm² | 95 mm² | 16 mm² | 35 mm² |
| 76 | 500 | 50 | IEC | 35 mm² | 95 mm² | 16 mm² | 35 mm² |
| 76 | 230 | 60 | UL/cUL | 4 AWG | MCM600 | - | - |
| 76 | 460 | 60 | UL/cUL | 1/0 AWG | MCM300 | 4 AWG | 1/0 AWG |
| 76 | 575 | 60 | UL/cUL | 1/0 AWG | MCM300 | 4 AWG | 1/0 AWG |
| 90 | 230 | 50 | IEC | 25 mm² | 300 mm² | - | - |
| 90 | 230 | 60 | IEC | 25 mm² | 300 mm² | - | - |
| 90 | 380 | 60 | IEC | 50 mm² | 150 mm² | 25 mm² | 50 mm² |
| 90 | 400 | 50 | IEC | 50 mm² | 150 mm² | 25 mm² | 50 mm² |
| 90 | 460 | 60 | IEC | 50 mm² | 150 mm² | 25 mm² | 50 mm² |
| 90 | 500 | 50 | IEC | 50 mm² | 150 mm² | 25 mm² | 50 mm² |
| 90 | 230 | 60 | UL/cUL | 4 AWG | MCM600 | - | - |
| 90 | 460 | 60 | UL/cUL | 1/0 AWG | MCM300 | 4 AWG | 1/0 AWG |
| 90 | 575 | 60 | UL/cUL | 1/0 AWG | MCM300 | 4 AWG | 1/0 AWG |

**Table 19: Fixed speed units**

| 1X0 L1, L2, L3 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Compressor (kW) | | | | Finely Stranded 1 cable/phase | | Finely Stranded 2 equal cables/phase | |
| | Voltage (V) | Frequency (Hz) | Approval | Min. | Max. | Min. | Max. |
| 45 | 380 | 60 | IEC | 2.5 mm² | 70 mm² | 2.5 mm² | 70 mm² |
| 45 | 400 | 50 | IEC | 2.5 mm² | 70 mm² | 2.5 mm² | 70 mm² |
| 45 | 460 | 60 | IEC | 2.5 mm² | 70 mm² | 2.5 mm² | 70 mm² |
| 45 | 460 | 60 | UL/cUL | 14 AWG | 00 AWG | 14 AWG | 00 AWG |
| 55 | 380 | 60 | IEC | 6 mm² | 120 mm² | 6 mm² | 120 mm² |
| 55 | 400 | 50 | IEC | 6 mm² | 120 mm² | 6 mm² | 120 mm² |
| 55 | 460 | 60 | IEC | 6 mm² | 120 mm² | 6 mm² | 120 mm² |
| 55 | 460 | 60 | UL/cUL | 10 AWG | KCMIL 250 | 10 AWG | KCMIL 250 |
| 75 | 380 | 60 | IEC | 6 mm² | 120 mm² | 6 mm² | 120 mm² |
| 75 | 400 | 50 | IEC | 6 mm² | 120 mm² | 6 mm² | 120 mm² |
| 75 | 460 | 60 | IEC | 6 mm² | 120 mm² | 6 mm² | 120 mm² |

| 1X0 L1, L2, L3 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Compressor (kW) | | | | Finely Stranded 1 cable/phase | | Finely Stranded 2 equal cables/phase | |
| | Voltage (V) | Frequency (Hz) | Approval | Min. | Max. | Min. | Max. |
| 75 | 460 | 60 | UL/cUL | 10 AWG | KCMIL 250 | 10 AWG | KCMIL 250 |
| 76 | 380 | 60 | IEC | 6 mm² | 120 mm² | 6 mm² | 120 mm² |
| 76 | 400 | 50 | IEC | 6 mm² | 120 mm² | 6 mm² | 120 mm² |
| 76 | 460 | 60 | IEC | 6 mm² | 120 mm² | 6 mm² | 120 mm² |
| 76 | 460 | 60 | UL/cUL | 10 AWG | KCMIL 250 | 10 AWG | KCMIL 250 |
| 90 | 380 | 60 | IEC | 6 mm² | 120 mm² | 6 mm² | 120 mm² |
| 90 | 400 | 50 | IEC | 6 mm² | 120 mm² | 6 mm² | 120 mm² |
| 90 | 460 | 60 | IEC | 6 mm² | 120 mm² | 6 mm² | 120 mm² |
| 90 | 460 | 60 | UL/cUL | 10 AWG | KCMIL 250 | 10 AWG | KCMIL 250 |

**Table 20: Variable speed units**

| 1X3-PE | | | | | |
|---|---|---|---|---|---|
| Compressor (kW) | | | | Finely Stranded 1 cable/phase | |
| | Voltage (V) | Frequency (Hz) | Approval | Min. | Max. |
| 55 | 230 | 50 | IEC | 35 mm² | 95 mm² |
| 55 | 230 | 60 | IEC | 35 mm² | 95 mm² |
| 55 | 380 | 60 | IEC | 25 mm² | 50 mm² |
| 55 | 400 | 50 | IEC | 4 mm² | 35 mm² |
| 55 | 460 | 60 | IEC | 4 mm² | 35 mm² |
| 55 | 500 | 50 | IEC | 4 mm² | 35 mm² |
| 55 | 230 | 60 | UL/cUL | 2 AWG | 3/0 AWG |
| 55 | 460 | 60 | UL/cUL | 12 AWG | 2 AWG |
| 55 | 575 | 60 | UL/cUL | 12 AWG | 2 AWG |
| 75 | 230 | 50 | IEC | 35 mm² | 150 mm² |
| 75 | 230 | 60 | IEC | 35 mm² | 150 mm² |
| 75 | 380 | 60 | IEC | 35 mm² | 95 mm² |
| 75 | 400 | 50 | IEC | 35 mm² | 95 mm² |
| 75 | 460 | 60 | IEC | 25 mm² | 50 mm² |
| 75 | 500 | 50 | IEC | 25 mm² | 50 mm² |
| 75 | 230 | 60 | UL/cUL | 2 AWG | MCM250 |
| 75 | 460 | 60 | UL/cUL | 2 AWG | 3/0 AWG |
| 75 | 575 | 60 | UL/cUL | 2 AWG | 3/0 AWG |
| 76 | 230 | 50 | IEC | 35 mm² | 150 mm² |
| 76 | 230 | 60 | IEC | 35 mm² | 150 mm² |
| 76 | 380 | 60 | IEC | 35 mm² | 95 mm² |
| 76 | 400 | 50 | IEC | 35 mm² | 95 mm² |
| 76 | 460 | 60 | IEC | 25 mm² | 50 mm² |
| 76 | 500 | 50 | IEC | 25 mm² | 50 mm² |
| 76 | 230 | 60 | UL/cUL | 2 AWG | MCM250 |
| 76 | 460 | 60 | UL/cUL | 2 AWG | 3/0 AWG |
| 76 | 575 | 60 | UL/cUL | 2 AWG | 3/0 AWG |
| 90 | 230 | 50 | IEC | 35 mm² | 150 mm² |
| 90 | 230 | 60 | IEC | 35 mm² | 150 mm² |
| 90 | 380 | 60 | IEC | 35 mm² | 95 mm² |
| 90 | 400 | 50 | IEC | 35 mm² | 95 mm² |
| 90 | 460 | 60 | IEC | 35 mm² | 95 mm² |
| 90 | 500 | 50 | IEC | 35 mm² | 95 mm² |
| 90 | 230 | 60 | UL/cUL | 2 AWG | MCM250 |

| 1X3-PE | | | | | |
|---|---|---|---|---|---|
| Compressor (kW) | | | | Finely Stranded 1 cable/phase | |
| | Voltage (V) | Frequency (Hz) | Approval | Min. | Max. |
| 90 | 460 | 60 | UL/cUL | 2 AWG | 3/0 AWG |
| 90 | 575 | 60 | UL/cUL | 2 AWG | 3/0 AWG |

**Table 21: Fixed speed units**

| 1X3-PE | | | | | |
|---|---|---|---|---|---|
| Compressor (kW) | | | | Finely Stranded 1 cable/phase | |
| | Voltage (V) | Frequency (Hz) | Approval | Min. | Max. |
| 45 | 380 | 60 | IEC | 2.5 mm² | 35 mm² |
| 45 | 400 | 50 | IEC | 2.5 mm² | 35 mm² |
| 45 | 460 | 60 | IEC | 2.5 mm² | 35 mm² |
| 45 | 460 | 60 | UL/cUL | 12 AWG | 2 AWG |
| 55 | 380 | 60 | IEC | 10 mm² | 50 mm² |
| 55 | 400 | 50 | IEC | 10 mm² | 50 mm² |
| 55 | 460 | 60 | IEC | 10 mm² | 50 mm² |
| 55 | 460 | 60 | UL/cUL | 10 AWG | 00 AWG |
| 75 | 380 | 60 | IEC | 10 mm² | 50 mm² |
| 75 | 400 | 50 | IEC | 10 mm² | 50 mm² |
| 75 | 460 | 60 | IEC | 10 mm² | 50 mm² |
| 75 | 460 | 60 | UL/cUL | 10 AWG | 00 AWG |
| 76 | 380 | 60 | IEC | 10 mm² | 50 mm² |
| 76 | 400 | 50 | IEC | 10 mm² | 50 mm² |
| 76 | 460 | 60 | IEC | 16 mm² | 70 mm² |
| 76 | 460 | 60 | UL/cUL | 6 AWG | 00 AWG |
| 90 | 380 | 60 | IEC | 16 mm² | 70 mm² |
| 90 | 400 | 50 | IEC | 16 mm² | 70 mm² |
| 90 | 460 | 60 | IEC | 16 mm² | 70 mm² |
| 90 | 460 | 60 | UL/cUL | 6 AWG | 00 AWG |

**Table 22: Variable speed units**

## 10.3 Dryer switches

### General

The regulating and safety devices are factory-adjusted to ensure optimum performance of the dryer.

Do not alter the setting of any of the devices.

## 10.4 Reference conditions and limitations

### Reference conditions

| | | |
|---|---|---|
| Air inlet pressure (absolute) | bar | 1 |
| Air inlet pressure (absolute) | psi | 14.5 |
| Air inlet temperature | ˚C | 20 |
| Air inlet temperature | ˚F | 68 |
| Relative humidity | % | 0 |

| On water-cooled units also: | | |
|---|---|---|
| Cooling water inlet temperature | ˚C | 20 |
| Cooling water inlet temperature | ˚F | 68 |

### Limits

| Maximum working pressure | | See section *Compressor data* |
|---|---|---|
| Minimum working pressure | bar(e) | 4 |
| Minimum working pressure | psig | 58 |
| Maximum air inlet temperature | ˚C | 46 |
| Maximum air inlet temperature | ˚F | 115 |
| Minimum ambient temperature | ˚C | 0 |
| Minimum ambient temperature | ˚F | 32 |

| On water-cooled units also: | | |
|---|---|---|
| Maximum cooling water outlet temperature | ˚C | 50 |
| Maximum cooling water outlet temperature | ˚F | 122 |
| Maximum cooling water inlet temperature | ˚C | 35 |
| Maximum cooling water inlet temperature | ˚F | 95 |
| Maximum cooling water inlet pressure | bar(e) | 5 |
| Maximum cooling water inlet pressure | psig | 72.5 |

## 10.5 Compressor data

### Reference conditions

**NOTE**

**The data is valid under the reference conditions. See section *Reference conditions and limitations*.**

### Fixed speed

The following table is valid for CPI 75-120 and CPV 60VS-120VS PM.

| | Units | 7 Bar | 8 Bar | 10 Bar | 13 Bar |
|---|---|---|---|---|---|
| Frequency | Hz | 50 | 50 | 50 | 50 |
| Nominal \Reference working pressure | bar(e) | 7 | 8 | 9.5 | 12.5 |
| Nominal \Reference working pressure | psig | 101.5 | 116 | 137.75 | 181.25 |
| Maximum working pressure | bar(e) | 7.5 | 8.5 | 10 | 13 |

| | Units | 7 Bar | 8 Bar | 10 Bar | 13 Bar |
|---|---|---|---|---|---|
| Maximum working pressure | psig | 108.75 | 123.25 | 145 | 189 |
| Set point of thermostatic valve | ˚C | 38 | 38 | 38 | 60 |
| Set point of thermostatic valve | ˚F | 100.4 | 100.4 | 100.4 | 140 |
| Motor Shaft Speed | r/min | 2975 | 2975 | 2975 | 2975 |
| Nominal motor power | kW | 55 | 55 | 55 | 55 |
| Nominal motor power | hp | 73.7 | 73.7 | 73.7 | 73.7 |
| Oil Capacity | l | 23 | 23 | 23 | 23 |
| Oil Capacity | US gal | 6.1 | 6.1 | 6.1 | 6.1 |
| Sound pressure level (according to ISO 2151:2004) | db(A) | 71 | 71 | 70 | 70 |

| | Units | 100 psi | 125 psi | 150 psi | 175 psi |
|---|---|---|---|---|---|
| Frequency | Hz | 60 | 60 | 60 | 60 |
| Nominal \Reference working pressure | bar(e) | 6.9 | 8.6 | 10.3 | 12 |
| Nominal \Reference working pressure | psig | 100 | 125 | 150 | 175 |
| Maximum working pressure | bar(e) | 7.4 | 9.1 | 10.8 | 12.5 |
| Maximum working pressure | psig | 107.3 | 131.95 | 156.6 | 181 |
| Set point of thermostatic valve | ˚C | 38 | 38 | 38 | 60 |
| Set point of thermostatic valve | ˚F | 100.4 | 100.4 | 100.4 | 140 |
| Motor Shaft Speed | r/min | 3575 | 3575 | 3575 | 3575 |
| Nominal motor power | kW | 55 | 55 | 55 | 55 |
| Nominal motor power | hp | 73.7 | 73.7 | 73.7 | 73.7 |
| Oil Capacity | l | 23 | 23 | 23 | 23 |
| Oil Capacity | US gal | 6.1 | 6.1 | 6.1 | 6.1 |

| | Units | 100 psi | 125 psi | 150 psi | 175 psi |
|---|---|---|---|---|---|
| Sound pressure level (according to ISO 2151:2004) | db(A) | 71 | 71 | 73 | 70 |

**Table 23: 55kW**

| | Units | 7 Bar | 8 Bar | 10 Bar | 13 Bar |
|---|---|---|---|---|---|
| Frequency | Hz | 50 | 50 | 50 | 50 |
| Nominal \Reference working pressure | bar(e) | 7 | 8 | 9.5 | 12.5 |
| Nominal \Reference working pressure | psig | 101.5 | 116 | 137.75 | 181.25 |
| Maximum working pressure | bar(e) | 7.5 | 8.5 | 10 | 13 |
| Maximum working pressure | psig | 108.75 | 123.25 | 145 | 189 |
| Set point of thermostatic valve | ˚C | 38 | 38 | 38 | 60 |
| Set point of thermostatic valve | ˚F | 100.4 | 100.4 | 100.4 | 140 |
| Motor Shaft Speed | r/min | 2980 | 2980 | 2980 | 2980 |
| Nominal motor power | kW | 75 | 75 | 75 | 75 |
| Nominal motor power | hp | 100.5 | 100.5 | 100.5 | 100.5 |
| Oil Capacity | l | 37 | 37 | 37 | 37 |
| Oil Capacity | US gal | 9.7 | 9.7 | 9.7 | 9.7 |
| Sound pressure level (according to ISO 2151:2004) | db(A) | 73 | 72 | 73 | 73 |

| | Units | 100 psi | 125 psi | 150 psi | 175 psi |
|---|---|---|---|---|---|
| Frequency | Hz | 60 | 60 | 60 | 60 |
| Nominal \Reference working pressure | bar(e) | 6.9 | 8.6 | 10.3 | 12 |
| Nominal \Reference working pressure | psig | 100 | 125 | 150 | 175 |

| | Units | 100 psi | 125 psi | 150 psi | 175 psi |
|---|---|---|---|---|---|
| Maximum working pressure | bar(e) | 7.4 | 9.1 | 10.8 | 12.5 |
| Maximum working pressure | psig | 107.3 | 131.95 | 156.6 | 181 |
| Set point of thermostatic valve | ˚C | 38 | 38 | 38 | 60 |
| Set point of thermostatic valve | ˚F | 100.4 | 100.4 | 100.4 | 140 |
| Motor Shaft Speed | r/min | 3575 | 3575 | 3575 | 3575 |
| Nominal motor power | kW | 75 | 75 | 75 | 75 |
| Nominal motor power | hp | 100.5 | 100.5 | 100.5 | 100.5 |
| Oil Capacity | l | 37 | 37 | 37 | 37 |
| Oil Capacity | US gal | 9.7 | 9.7 | 9.7 | 9.7 |
| Sound pressure level (according to ISO 2151:2004) | db(A) | 73 | 73 | 73 | 73 |

**Table 24: 75kW**

| | Units | 7 Bar | 8 Bar | 10 Bar | 13 Bar |
|---|---|---|---|---|---|
| Frequency | Hz | 50 | 50 | 50 | 50 |
| Nominal \Reference working pressure | bar(e) | 7 | 8 | 9.5 | 12.5 |
| Nominal \Reference working pressure | psig | 101.5 | 116 | 137.75 | 181.25 |
| Maximum working pressure | bar(e) | 7.5 | 8.5 | 10 | 13 |
| Maximum working pressure | psig | 108.75 | 123.25 | 145 | 189 |
| Set point of thermostatic valve | ˚C | 38 | 38 | 38 | 60 |
| Set point of thermostatic valve | ˚F | 100.4 | 100.4 | 100.4 | 140 |
| Motor Shaft Speed | r/min | 2980 | 2980 | 2980 | 2980 |
| Nominal motor power | kW | 76 | 76 | 76 | 76 |

| | Units | 7 Bar | 8 Bar | 10 Bar | 13 Bar |
|---|---|---|---|---|---|
| Nominal motor power | hp | 101.8 | 101.8 | 101.8 | 101.8 |
| Oil Capacity | l | 33 | 33 | 33 | 33 |
| Oil Capacity | US gal | 8.7 | 8.7 | 8.7 | 8.7 |
| Sound pressure level (according to ISO 2151:2004) | db(A) | 71 | 71 | 71 | 72 |

| | Units | 100 psi | 125 psi | 150 psi | 175 psi |
|---|---|---|---|---|---|
| Frequency | Hz | 60 | 60 | 60 | 60 |
| Nominal \Reference working pressure | bar(e) | 6.9 | 8.6 | 10.3 | 12 |
| Nominal \Reference working pressure | psig | 100 | 125 | 150 | 175 |
| Maximum working pressure | bar(e) | 7.4 | 9.1 | 10.8 | 12.5 |
| Maximum working pressure | psig | 107.3 | 131.95 | 156.6 | 181 |
| Set point of thermostatic valve | ˚C | 38 | 38 | 38 | 60 |
| Set point of thermostatic valve | ˚F | 100.4 | 100.4 | 100.4 | 140 |
| Motor Shaft Speed | r/min | 3575 | 3575 | 3575 | 3575 |
| Nominal motor power | kW | 76 | 76 | 76 | 76 |
| Nominal motor power | hp | 101.8 | 101.8 | 101.8 | 101.8 |
| Oil Capacity | l | 33 | 33 | 33 | 33 |
| Oil Capacity | US gal | 8.7 | 8.7 | 8.7 | 8.7 |
| Sound pressure level (according to ISO 2151:2004) | db(A) | 71 | 71 | 71 | 72 |

**Table 25: 76kW**

| | Units | 7 Bar | 8 Bar | 10 Bar | 13 Bar |
|---|---|---|---|---|---|
| Frequency | Hz | 50 | 50 | 50 | 50 |
| Nominal \Reference working pressure | bar(e) | 7 | 8 | 9.5 | 12.5 |

| | Units | 7 Bar | 8 Bar | 10 Bar | 13 Bar |
|---|---|---|---|---|---|
| Nominal \Reference working pressure | psig | 101.5 | 116 | 137.75 | 181.25 |
| Maximum working pressure | bar(e) | 7.5 | 8.5 | 10 | 13 |
| Maximum working pressure | psig | 108.75 | 123.25 | 145 | 189 |
| Set point of thermostatic valve | ˚C | 38 | 38 | 38 | 60 |
| Set point of thermostatic valve | ˚F | 100.4 | 100.4 | 100.4 | 140 |
| Motor Shaft Speed | r/min | 2980 | 2980 | 2980 | 2980 |
| Nominal motor power | kW | 90 | 90 | 90 | 90 |
| Nominal motor power | hp | 120.6 | 120.6 | 120.6 | 120.6 |
| Oil Capacity | l | 38 | 38 | 38 | 38 |
| Oil Capacity | US gal | 10.0 | 10.0 | 10.0 | 10.0 |
| Sound pressure level (according to ISO 2151:2004) | db(A) | 72 | 71 | 73 | 71 |

| | Units | 100 psi | 125 psi | 150 psi | 175 psi |
|---|---|---|---|---|---|
| Frequency | Hz | 60 | 60 | 60 | 60 |
| Nominal \Reference working pressure | bar(e) | 6.9 | 8.6 | 10.3 | 12 |
| Nominal \Reference working pressure | psig | 100 | 125 | 150 | 175 |
| Maximum working pressure | bar(e) | 7.4 | 9.1 | 10.8 | 12.5 |
| Maximum working pressure | psig | 107.3 | 131.95 | 156.6 | 181 |
| Set point of thermostatic valve | ˚C | 38 | 38 | 38 | 60 |
| Set point of thermostatic valve | ˚F | 100.4 | 100.4 | 100.4 | 140 |
| Motor Shaft Speed | r/min | 3575 | 3575 | 3575 | 3575 |

| | Units | 100 psi | 125 psi | 150 psi | 175 psi |
|---|---|---|---|---|---|
| Nominal motor power | kW | 90 | 90 | 90 | 90 |
| Nominal motor power | hp | 120.6 | 120.6 | 120.6 | 120.6 |
| Oil Capacity | l | 38 | 38 | 38 | 38 |
| Oil Capacity | US gal | 10.0 | 10.0 | 10.0 | 10.0 |
| Sound pressure level (according to ISO 2151:2004) | db(A) | 72 | 72 | 71 | 71 |

**Table 26: 90kW**

The following table is valid for CPM 75-120.

| | Units | 7 Bar | 8 Bar | 10 Bar |
|---|---|---|---|---|
| Frequency | Hz | 50 | 50 | 50 |
| Nominal\Reference working pressure | bar(e) | 7 | 8 | 9.5 |
| Nominal\Reference working pressure | psig | 101.5 | 116 | 137.75 |
| Maximum working pressure | bar(e) | 7.5 | 8.5 | 10 |
| Maximum working pressure | psig | 108.75 | 123.25 | 145 |
| Set point of thermostatic valve | ˚C | 38 | 38 | 38 |
| Set point of thermostatic valve | ˚F | 100.4 | 100.4 | 100.4 |
| Motor Shaft Speed | r/min | 2975 | 2975 | 2975 |
| Nominal motor power | kW | 55 | 55 | 55 |
| Nominal motor power | hp | 73.7 | 73.7 | 73.7 |
| Oil Capacity | l | 22 | 22 | 22 |
| Oil Capacity | US gal | 5.8 | 5.8 | 5.8 |
| Sound pressure level (according to ISO 2151:2004) | db(A) | 71 | 71 | 70 |

| | Units | 100 psi | 125 psi | 150 psi |
|---|---|---|---|---|
| Frequency | Hz | 60 | 60 | 60 |
| Nominal\Reference working pressure | bar(e) | 6.9 | 8.6 | 10.3 |
| Nominal\Reference working pressure | psig | 100 | 125 | 150 |
| Maximum working pressure | bar(e) | 7.4 | 9.1 | 10.8 |
| Maximum working pressure | psig | 107.3 | 131.95 | 156.6 |
| Set point of thermostatic valve | ˚C | 38 | 38 | 38 |

| | Units | 100 psi | 125 psi | 150 psi |
|---|---|---|---|---|
| Set point of thermostatic valve | ˚F | 100.4 | 100.4 | 100.4 |
| Motor Shaft Speed | r/min | 3575 | 3575 | 3575 |
| Nominal motor power | kW | 55 | 55 | 55 |
| Nominal motor power | hp | 73.7 | 73.7 | 73.7 |
| Oil Capacity | l | 22 | 22 | 22 |
| Oil Capacity | US gal | 5.8 | 5.8 | 5.8 |
| Sound pressure level (according to ISO 2151:2004) | db(A) | 71 | 70 | 70 |

**Table 27: 55kW**

| | Units | 7 Bar | 8 Bar | 10 Bar |
|---|---|---|---|---|
| Frequency | Hz | 50 | 50 | 50 |
| Nominal\Reference working pressure | bar(e) | 7 | 8 | 9.5 |
| Nominal\Reference working pressure | psig | 101.5 | 116 | 137.75 |
| Maximum working pressure | bar(e) | 7.5 | 8.5 | 10 |
| Maximum working pressure | psig | 108.75 | 123.25 | 145 |
| Set point of thermostatic valve | ˚C | 38 | 38 | 38 |
| Set point of thermostatic valve | ˚F | 100.4 | 100.4 | 100.4 |
| Motor Shaft Speed | r/min | 2980 | 2980 | 2980 |
| Nominal motor power | kW | 75 | 75 | 75 |
| Nominal motor power | hp | 100.5 | 100.5 | 100.5 |
| Oil Capacity | l | 29 | 29 | 29 |
| Oil Capacity | US gal | 7.7 | 7.7 | 7.7 |
| Sound pressure level (according to ISO 2151:2004) | db(A) | 73 | 72 | 73 |

| | Units | 100 psi | 125 psi | 150 psi |
|---|---|---|---|---|
| Frequency | Hz | 60 | 60 | 60 |
| Nominal\Reference working pressure | bar(e) | 6.9 | 8.6 | 10.3 |
| Nominal\Reference working pressure | psig | 100 | 125 | 150 |
| Maximum working pressure | bar(e) | 7.4 | 9.1 | 10.8 |
| Maximum working pressure | psig | 107.3 | 131.95 | 156.6 |
| Set point of thermostatic valve | ˚C | 38 | 38 | 38 |
| Set point of thermostatic valve | ˚F | 100.4 | 100.4 | 100.4 |

| | Units | 100 psi | 125 psi | 150 psi |
|---|---|---|---|---|
| Motor Shaft Speed | r/min | 3575 | 3575 | 3575 |
| Nominal motor power | kW | 75 | 75 | 75 |
| Nominal motor power | hp | 100.5 | 100.5 | 100.5 |
| Oil Capacity | l | 29 | 29 | 29 |
| Oil Capacity | US gal | 7.7 | 7.7 | 7.7 |
| Sound pressure level (according to ISO 2151:2004) | db(A) | 73 | 73 | 73 |

**Table 28: 75kW**

| | Units | 7 Bar | 8 Bar | 10 Bar |
|---|---|---|---|---|
| Frequency | Hz | 50 | 50 | 50 |
| Nominal\Reference working pressure | bar(e) | 7 | 8 | 9.5 |
| Nominal\Reference working pressure | psig | 101.5 | 116 | 137.75 |
| Maximum working pressure | bar(e) | 7.5 | 8.5 | 10 |
| Maximum working pressure | psig | 108.75 | 123.25 | 145 |
| Set point of thermostatic valve | ˚C | 38 | 38 | 38 |
| Set point of thermostatic valve | ˚F | 100.4 | 100.4 | 100.4 |
| Motor Shaft Speed | r/min | 2980 | 2980 | 2980 |
| Nominal motor power | kW | 90 | 90 | 90 |
| Nominal motor power | hp | 120.6 | 120.6 | 120.6 |
| Oil Capacity | l | 34 | 34 | 34 |
| Oil Capacity | US gal | 9.0 | 9.0 | 9.0 |
| Sound pressure level (according to ISO 2151:2004) | db(A) | 72 | 71 | 73 |

| | Units | 100 psi | 125 psi | 150 psi |
|---|---|---|---|---|
| Frequency | Hz | 60 | 60 | 60 |
| Nominal\Reference working pressure | bar(e) | 6.9 | 8.6 | 10.3 |
| Nominal\Reference working pressure | psig | 100 | 125 | 150 |
| Maximum working pressure | bar(e) | 7.4 | 9.1 | 10.8 |
| Maximum working pressure | psig | 107.3 | 131.95 | 156.6 |
| Set point of thermostatic valve | ˚C | 38 | 38 | 38 |
| Set point of thermostatic valve | ˚F | 100.4 | 100.4 | 100.4 |
| Motor Shaft Speed | r/min | 3575 | 3575 | 3575 |

| | Units | 100 psi | 125 psi | 150 psi |
|---|---|---|---|---|
| Nominal motor power | kW | 90 | 90 | 90 |
| Nominal motor power | hp | 120.6 | 120.6 | 120.6 |
| Oil Capacity | l | 34 | 34 | 34 |
| Oil Capacity | US gal | 9.0 | 9.0 | 9.0 |
| Sound pressure level (according to ISO 2151:2004) | db(A) | 71 | 72 | 72 |

**Table 29: 90kW**

## Variable speed

| | Units | 13 Bar | 175 psi |
|---|---|---|---|
| Frequency | Hz | 50 | 60 |
| Nominal\Reference working pressure | bar(e) | 12.5 | 12 |
| Nominal\Reference working pressure | psig | 181.25 | 175 |
| Maximum working pressure | bar(e) | 13 | 12.5 |
| Maximum working pressure | psig | 189 | 181 |
| Set point of thermostatic valve | ˚C | 38 | 38 |
| Set point of thermostatic valve | ˚F | 100.4 | 100.4 |
| Motor Shaft Speed | r/min | 4200 | 4200 |
| Nominal motor power | kW | 45 | 45 |
| Nominal motor power | hp | 60.3 | 60.3 |
| Oil Capacity | l | 22 | 22 |
| Oil Capacity | US gal | 5.8 | 5.8 |
| Sound pressure level (according to ISO 2151:2004) | db(A) | 70 | 70 |

**Table 30: 45kW**

| | Units | 13 Bar | 175 psi |
|---|---|---|---|
| Frequency | Hz | 50 | 60 |
| Nominal\Reference working pressure | bar(e) | 12.5 | 12 |
| Nominal\Reference working pressure | psig | 181.25 | 175 |
| Maximum working pressure | bar(e) | 13 | 12.5 |
| Maximum working pressure | psig | 189 | 181 |
| Set point of thermostatic valve | ˚C | 38 | 38 |

| | Units | 13 Bar | 175 psi |
|---|---|---|---|
| Set point of thermostatic valve | ˚F | 100.4 | 100.4 |
| Motor Shaft Speed | r/min | 5100 | 5100 |
| Nominal motor power | kW | 55 | 55 |
| Nominal motor power | hp | 73.7 | 73.7 |
| Oil Capacity | l | 25 | 25 |
| Oil Capacity | US gal | 6.6 | 6.6 |
| Sound pressure level (according to ISO 2151:2004) | db(A) | 70 | 70 |

**Table 31: 55kW**

| | Units | 13 Bar | 175 psi |
|---|---|---|---|
| Frequency | Hz | 50 | 60 |
| Nominal\Reference working pressure | bar(e) | 12.5 | 12 |
| Nominal\Reference working pressure | psig | 181.25 | 175 |
| Maximum working pressure | bar(e) | 13 | 12.5 |
| Maximum working pressure | psig | 189 | 181 |
| Set point of thermostatic valve | ˚C | 38 | 38 |
| Set point of thermostatic valve | ˚F | 100.4 | 100.4 |
| Motor Shaft Speed | r/min | 6200 | 6200 |
| Nominal motor power | kW | 75 | 75 |
| Nominal motor power | hp | 100.5 | 100.5 |
| Oil Capacity | l | 37 | 37 |
| Oil Capacity | US gal | 9.8 | 9.8 |
| Sound pressure level (according to ISO 2151:2004) | db(A) | 72 | 72 |

**Table 32: 75kW**

| | Units | 13 Bar | 175 psi |
|---|---|---|---|
| Frequency | Hz | 50 | 60 |
| Nominal\Reference working pressure | bar(e) | 12.5 | 12 |
| Nominal\Reference working pressure | psig | 181.25 | 175 |
| Maximum working pressure | bar(e) | 13 | 12.5 |
| Maximum working pressure | psig | 189 | 181 |
| Set point of thermostatic valve | ˚C | 38 | 38 |
| Set point of thermostatic valve | ˚F | 100.4 | 100.4 |

| | Units | 13 Bar | 175 psi |
|---|---|---|---|
| Motor Shaft Speed | r/min | 6154 | 6154 |
| Nominal motor power | kW | 76 | 76 |
| Nominal motor power | hp | 101.84 | 101.84 |
| Oil Capacity | l | 34 | 34 |
| Oil Capacity | US gal | 9.0 | 9.0 |
| Sound pressure level (according to ISO 2151:2004) | db(A) | 71 | 71 |

**Table 33: 76kW**

| | Units | 13 Bar | 175 psi |
|---|---|---|---|
| Frequency | Hz | 50 | 60 |
| Nominal\Reference working pressure | bar(e) | 12.5 | 12 |
| Nominal\Reference working pressure | psig | 181.25 | 175 |
| Maximum working pressure | bar(e) | 13 | 12.5 |
| Maximum working pressure | psig | 189 | 181 |
| Set point of thermostatic valve | ˚C | 38 | 38 |
| Set point of thermostatic valve | ˚F | 100.4 | 100.4 |
| Motor Shaft Speed | r/min | 6653 | 6653 |
| Nominal motor power | kW | 90 | 90 |
| Nominal motor power | hp | 120.6 | 120.6 |
| Oil Capacity | l | 40 | 40 |
| Oil Capacity | US gal | 10.6 | 10.6 |
| Sound pressure level (according to ISO 2151:2004) | db(A) | 72 | 72 |

**Table 34: 90kW**

# 11 Instructions for use

### Oil separator vessel

This vessel can contain pressurized air. This can be potentially dangerous if the equipment is misused.

This vessel must only be used as a compressed air/oil separator tank and must be operated within the limits specified on the data plate.

No alterations must be made to this vessel by welding, drilling or other mechanical methods without the written permission of the manufacturer.

The pressure and temperature of this vessel must be clearly indicated.

The safety valve must correspond with pressure surges of 1.1 times the maximum allowable operating pressure. It should guarantee that the pressure will not permanently exceed the maximum allowable operating pressure of the vessel.

Use only oil as specified by the manufacturer.

Original bolts have to be used after opening for inspection. The maximum torque has to be taken into consideration: for M12 bolts 73 Nm (53.8 lbf.ft), for M16 bolts 185 Nm (136.4 lbf.ft).

# 12 Guidelines for inspection

## Guidelines

On the Declaration of Conformity / Declaration by the Manufacturer, the harmonised and/or other standards that have been used for the design are shown and/or referred to.

The Declaration of Conformity / Declaration by the Manufacturer is part of the documentation that is supplied with this compressor.

Local legal requirements and/or use outside the limits and/or conditions as specified by the manufacturer may require other inspection periods.

# 13 Pressure equipment directives (PED)

### Components subject to 2014/68/EU Pressure Equipment Directive

The following table contains the necessary information for the inspection of all pressure equipment of category II and higher according to the Pressure Equipment Directive 2014/68/EU and all pressure equipment according to the Simple Pressure Vessels Directive 2014/29/EU.

| Component | Description | Volume | Design pressure | Minimum and maximum design temperature | PED Class |
|---|---|---|---|---|---|
| 1629 0342 30 | Vessel CW LR / MOM BP 4000 | 62 L | 15(bar) | -10 ˚C / 120 ˚C | II |
| 1629 0342 31 | Vessel CW CE / ASME BP 4000 | 62 L | 15(bar) | -10 ˚C / 120 ˚C | II |
| 1629 0342 34 | Vessel CW AS1210 BP 4000 | 62 L | 15(bar) | -10 ˚C / 120 ˚C | II |
| 1629 0342 37 | Vessel CW ASME / CRN BP 4000 | 62 L | 15(bar) | -10 ˚C / 120 ˚C | II |
| 1629 0342 40 | Vessel CW LR / MOM BP 8000 | 62 L | 15(bar) | -10 ˚C / 120 ˚C | II |
| 1629 0342 44 | Vessel CW AS1210 BP 8000 | 62 L | 15(bar) | -10 ˚C / 120 ˚C | II |
| 1629 0342 47 | Vessel CW ASME / CRN BP 8000 | 62 L | 15(bar) | -10 ˚C / 120 ˚C | II |
| 1629 0343 30 | Vessel CCW LR / MOM BP 4000 | 62 L | 15(bar) | -10 ˚C / 120 ˚C | II |
| 1629 0343 31 | Vessel CCW CE / ASME BP 4000 | 62 L | 15(bar) | -10 ˚C / 120 ˚C | II |
| 1629 0343 34 | Vessel CCW AS1210 BP 4000 | 62 L | 15(bar) | -10 ˚C / 120 ˚C | II |
| 1629 0343 37 | Vessel CCW ASME / CRN BP 4000 | 62 L | 15(bar) | -10 ˚C / 120 ˚C | II |
| 1629 0343 40 | Vessel CCW LR / MOM BP 8000 | 62 L | 15(bar) | -10 ˚C / 120 ˚C | II |
| 1629 0343 41 | Vessel CCW CE / ASME BP 8000 | 62 L | 15(bar) | -10 ˚C / 120 ˚C | II |
| 1629 0343 47 | Vessel CCW ASME / CRN BP 8000 | 62 L | 15(bar) | -10 ˚C / 120 ˚C | II |
| 1649 8120 01 | Safety valve 12 bar ND 15.2 | - | - | - | IV |

| Component | Description | Volume | Design pressure | Minimum and maximum design temperature | PED Class |
|---|---|---|---|---|---|
| 1649 8120 02 | Safety valve 14.5 bar ND 15.2 | - | - | - | IV |
| 1649 8120 03 | Safety valve 14 bar ND 13 | - | - | - | IV |

| Component | Description | Number of cycles(1) | Minimum wall thickness | Visual inspection frequency(2) | Hydrostatic inspection frequency(2) |
|---|---|---|---|---|---|
| 1629 0342 30 | Vessel CW LR / MOM BP 4000 | $2 \times 10^6$ | 8 mm | 1 year | 10 years |
| 1629 0342 31 | Vessel CW CE/ ASME BP 4000 | $2 \times 10^6$ | 8 mm | 1 year | 10 years |
| 1629 0342 34 | Vessel CW AS1210 BP 4000 | $2 \times 10^6$ | 8 mm | 1 year | 10 years |
| 1629 0342 37 | Vessel CW ASME / CRN BP 4000 | $2 \times 10^6$ | 8 mm | 1 year | 10 years |
| 1629 0342 40 | Vessel CW LR / MOM BP 8000 | $2 \times 10^6$ | 8 mm | 1 year | 10 years |
| 1629 0342 44 | Vessel CW AS1210 BP 8000 | $2 \times 10^6$ | 8 mm | 1 year | 10 years |
| 1629 0342 47 | Vessel CW ASME / CRN BP 8000 | $2 \times 10^6$ | 8 mm | 1 year | 10 years |
| 1629 0343 30 | Vessel CCW LR / MOM BP 4000 | $2 \times 10^6$ | 8 mm | 1 year | 10 years |
| 1629 0343 31 | Vessel CCW CE / ASME BP 4000 | $2 \times 10^6$ | 8 mm | 1 year | 10 years |
| 1629 0343 34 | Vessel CCW AS1210 BP 4000 | $2 \times 10^6$ | 8 mm | 1 year | 10 years |
| 1629 0343 37 | Vessel CCW ASME / CRN BP 4000 | $2 \times 10^6$ | 8 mm | 1 year | 10 years |
| 1629 0343 40 | Vessel CCW LR / MOM BP 8000 | $2 \times 10^6$ | 8 mm | 1 year | 10 years |
| 1629 0343 41 | Vessel CCW CE / ASME BP 8000 | $2 \times 10^6$ | 8 mm | 1 year | 10 years |
| 1629 0343 47 | Vessel CCW ASME / CRN BP 8000 | $2 \times 10^6$ | 8 mm | 1 year | 10 years |
| 1649 8120 01 | Safety valve 12 bar ND 15.2 | - | - | - | - |

| Component | Description | Number of cycles(1) | Minimum wall thickness | Visual inspection frequency(2) | Hydrostatic inspection frequency(2) |
|---|---|---|---|---|---|
| 1649 8120 02 | Safety valve 14.5 bar ND 15.2 | - | - | - | - |
| 1649 8120 03 | Safety valve 14 bar ND 13 | - | - | - | - |

The compressors conform to PED smaller than category II.

(1)The number of cycles refers to the number of cycles from 0 bar(e) to maximum pressure.

(2)The minimum wall thickness must be respected at all times. Inspection techniques such as ultrasonic or X-ray are equivalent to hydrostatic testing for this equipment.

# 14 Declaration of conformity

Insert logo here

**EU DECLARATION OF CONFORMITY**

We, (1) declare under our sole responsibility, that the product
Machine name :
Machine type :
Serial number :

Which falls under the provisions of article 12.2 of the EC Directive 2006/42/EC on the approximation of the laws of the Member States relating to machinery, is in conformity with the relevant Essential Health and Safety Requirements of this directive.

The machinery complies also with the requirements of the following directives and their amendments as indicated.

| Directive on the approximation of laws of the Member States relating to | | Harmonized and/or Technical Standards used | | Att' mnt |
|---|---|---|---|---|
| (2) | | (3) | | |
| | | | | X |
| | | | | |
| | | | | X |
| | | | | |
| | | | | |
| | | | | X |

The harmonized and the technical standards used are identified in the attachments hereafter

<1> is authorized to compile the technical file.

| | Conformity of the specification to the directives | Conformity of the product to the specification and by implication to the directives |
|---|---|---|
| Issued by | Engineering | Manufacturing |

Name
Signature
Date
*Place*

84360D

**Figure 51: Typical example of a Declaration of Conformity document**

**(1)** Contact address:
C. Aria C. S.R.L.
Via Selva Maiolo, 5/7
Montecchio, Maggiore, Vicenza
Italy

**(2)** Applicable directives

**(3)** Standards used

On the Declaration of Conformity / Declaration by the Manufacturer, the harmonized and/or other standards that have been used for the design are shown and/or referred to.

The Declaration of Conformity / Declaration by the Manufacturer is part of the documentation that is supplied with this device.

People.

Passion.

Performance.

No. 2920 7217 03 / 2025 FebruaryC. Aria C. S.R.L.

Chicago Pneumatic

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