



GA 110 VSD+, GA 132 VSD+, GA 160 VSD+

Instruction book

Sustainable Productivity

Atlas Copco

Atlas Copco

GA 110 VSD+, GA 132 VSD+, GA 160 VSD+

Instruction book

Original instructions

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Atlas Copco

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1 Safety precautions


1.1 Safety icons

Explanation

	Danger to life
	Warning
	Important note

1.2 General safety precautions

1. The operator must employ safe working practices and observe all related work safety requirements and regulations.
2. If any of the following statements does not comply with the applicable legislation, the stricter of the two shall apply.
3. 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.
4. 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.
5. Before any maintenance, repair work, adjustment or any other non-routine checks:
 - Stop the machine
 - Press the emergency stop button
 - Switch off the voltage
 - Depressurize the machine
 - Lock Out - Tag Out (LOTO):
 - Open the power isolating switch and lock it with a personal lock
 - Tag the power isolating switch with the name of the service technician.
 - Never rely on indicator lamps or electrical door locks before maintenance work, always disconnect and check with measuring device.

	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!
---	---

6. 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.
7. The owner is responsible for maintaining the unit in safe operating condition. Parts and accessories shall be replaced if unsuitable for safe operation.
8. It is prohibited to walk or stand on the unit or on its components.
9. The Variable Speed Drive is equipped with a Safe Torque Off function, triggered by the emergency stop button. The Safe Torque Off function has the immediate effect that the drive

can not supply any torque-generating energy. The drive is reliably torque-free. This state is monitored internally in the drive.



The Safe Torque Off function does not disconnect the voltage of the main and auxiliary circuits from the drive. Maintenance work on electrical parts of the drive or the motor can only be carried out after isolating the drive system from the main supply!

10. 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.
11. The Variable Speed Driven compressor is equipped with an interior permanent magnet (English: Interior Permanent Magnet (IPM)) motor. In case of malfunction of the inlet valve and/or check valve at stop, the accumulated compressed air in the oil separation vessel or air net can drive the compressor element in generator mode, resulting in the build-up of dangerous tension in the motor supply cables.
12. Before commencing repair work on the variable speed drive:
 - a. Disconnect the adjustable frequency drive from line power.
 - b. Wait for the discharge of the DC link. See period of time on the warning label.
 - c. Measure that there is no voltage on the drive input and output terminals.
 - d. Disconnect the motor cables from the drive.
 - e. Ground the motor cables by temporarily connecting them together as well as to the PE.

1.3 Safety precautions during installation



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.

Precautions during installation

1. 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.
2. The unit is designed for indoor use. If the unit is installed outdoors, special precautions must be taken; consult your supplier.
3. In case the device is a compressor, 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 at the inlet air.
4. Any blanking flanges, plugs, caps and desiccant bags must be removed before connecting the pipes.
5. Air hoses must be of correct size and suitable for the working pressure. Never use frayed, damaged or worn hoses. Distribution pipes and connections must be of the correct size and suitable for the working pressure.
6. In case the device is a compressor, the aspirated air must be free of flammable fumes, vapors and particles, e.g. paint solvents, that can lead to internal fire or explosion.
7. In case the device is a compressor, arrange the air intake so that loose clothing worn by people cannot be drawn in.

8. Ensure that the discharge pipe from the compressor to the aftercooler or air net is free to expand under heat and that it is not in contact with or close to flammable materials.
9. No external force may be exerted on the air outlet valve; the connected pipe must be free of strain.
10. If remote control is installed, the machine must bear a clear sign stating: DANGER: This machine is remotely controlled and may start without warning.
The operator has to make sure that the machine is stopped and depressurized and that the electrical isolating switch is open, locked and labelled with a temporary warning before any maintenance or repair. 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.
11. 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.
12. 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.
13. On machines with automatic start/stop system or if the automatic restart function after voltage failure is activated, a sign stating "This machine may start without warning" must be affixed near the instrument panel.
14. 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.
15. 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.
16. Piping or other parts with a temperature in excess of 70°C (158°F) and which may be accidentally touched by personnel in normal operation must be guarded or insulated. Other high temperature piping must be clearly marked.
17. For water-cooled machines, the cooling water system installed outside the machine has to be protected by a safety device with set pressure according to the maximum cooling water inlet pressure.
18. If the ground is not level or can be subject to variable inclination, consult the manufacturer.
19. If the device is a dryer and no free extinguishing system is present in the air net close to the dryer, safety valves must be installed in the vessels of the dryer.



Also consult following safety precautions: [Safety precautions during operation](#) and [Safety precautions during maintenance](#).
 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



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.

Precautions during operation

1. Never touch any piping or components of the machine during operation.
2. 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.
3. 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.
4. Never operate the machine when there is a possibility of taking in flammable or toxic fumes, vapors or particles.
5. Never operate the machine below or in excess of its limit ratings.
6. 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 protectors when opening a door. On machines without bodywork, wear ear protection in the vicinity of the machine.
7. People staying in environments or rooms where the sound pressure level reaches or exceeds 80 dB(A) shall wear ear protectors.
8. 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
 - Air cooling filters of the electrical cabinet are not clogged
9. 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.
10. 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.
11. Do not remove any of, or tamper with, the sound-damping material.
12. 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.
13. 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.



Also consult following safety precautions: [Safety precautions during installation](#) and [Safety precautions during maintenance](#).
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



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.

Precautions during maintenance or repair

1. Always use the correct safety equipment (such as safety glasses, gloves, safety shoes, etc.).
2. Use only the correct tools for maintenance and repair work.
3. 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.
4. All maintenance work shall only be undertaken when the machine has cooled down.
5. A warning sign bearing a legend such as "Work in progress; do not start" shall be attached to the starting equipment.
6. 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.
7. Close the compressor air outlet valve and depressurize the compressor before connecting or disconnecting a pipe.
8. Before removing any pressurized component, effectively isolate the machine from all sources of pressure and relieve the entire system of pressure.
9. Never use flammable solvents or carbon tetrachloride for cleaning parts. Take safety precautions against toxic vapors of cleaning liquids.
10. Scrupulously observe cleanliness during maintenance and repair. Keep dirt away by covering the parts and exposed openings with a clean cloth, paper or tape.
11. 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.
12. 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.
13. Never use a light source with open flame for inspecting the interior of a machine, pressure vessel, etc.
14. Make sure that no tools, loose parts or rags are left in or on the machine.
15. 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.
16. 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.

17. 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.
18. Protect the motor, air filter, electrical and regulating components, etc. to prevent moisture from entering them, e.g. when steam cleaning.
19. 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.
20. Never use caustic solvents which can damage materials of the air net, e.g. polycarbonate bowls.
21. **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.



Also consult following safety precautions: [Safety precautions during installation](#) and [Safety precautions during operation](#).

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

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, ...).
3. Separate the harmful from the safe components (e.g. drain oil from oil containing parts).
4. Refer to the disposal topic mentioned 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) and may not be disposed as unsorted waste.



The equipment is labelled in accordance with the European Directive 2012/19/EU with the crossed-out wheellie 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. 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

General



General view

Description of GA VSD+ compressors

GA VSD+ (Variable Speed Drive) compressors are single-stage, oil-injected screw compressors driven by an interior permanent magnet (English: Interior Permanent Magnet (IPM)) motor. The compressors deliver pulsation-free air. By continuously matching the speed of the drive motor to the air net pressure, the compressor optimizes energy consumption and reduces the operating pressure band.

GA VSD+ AC compressors are air-cooled.

GA VSD+ WC compressors are water-cooled.

The following options are available:

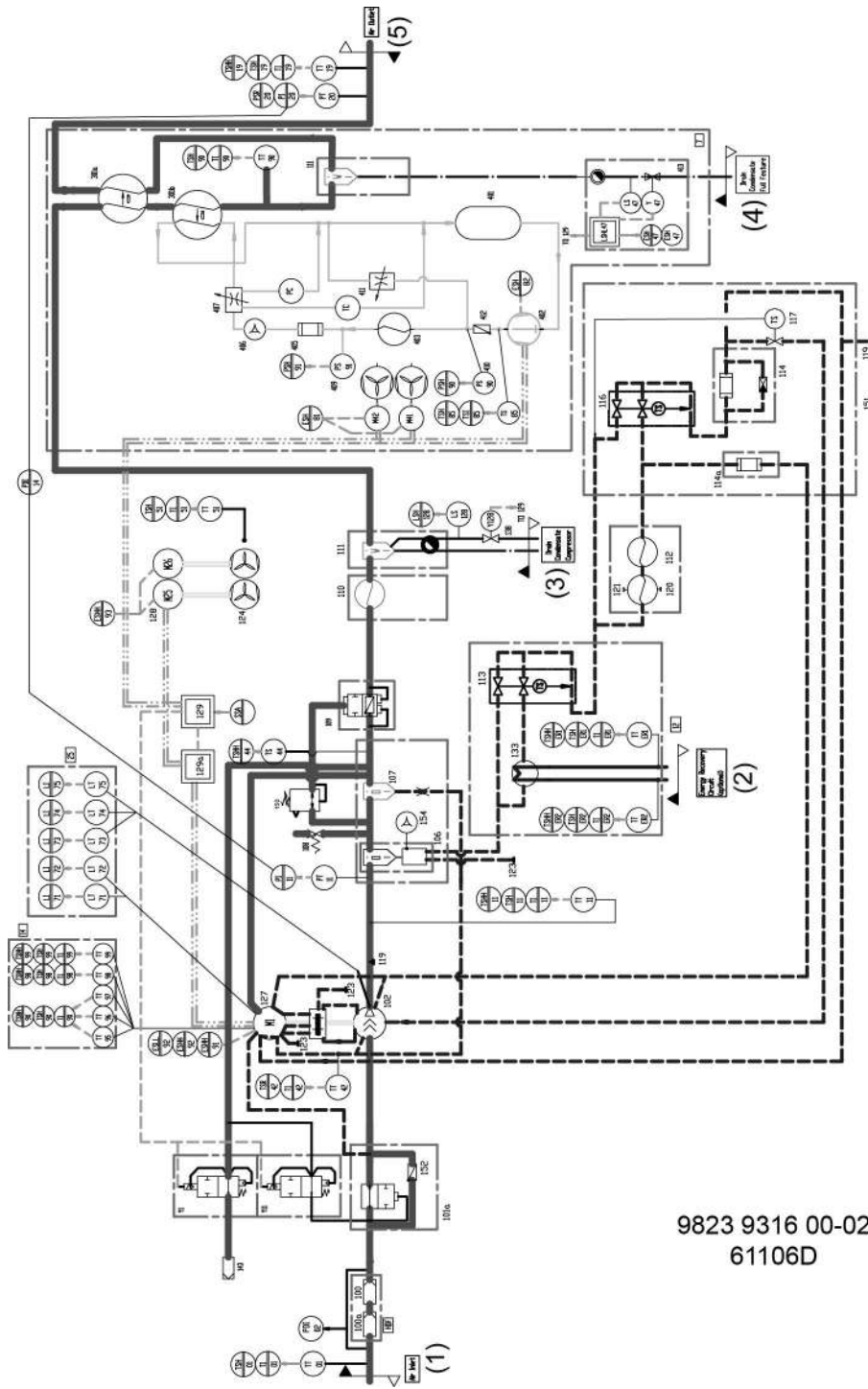
SPM monitoring

A number of vibration sensors are provided on the drive motor and compressor element. The readings can be called up on the display of the Elektronikon regulator.

Energy recovery

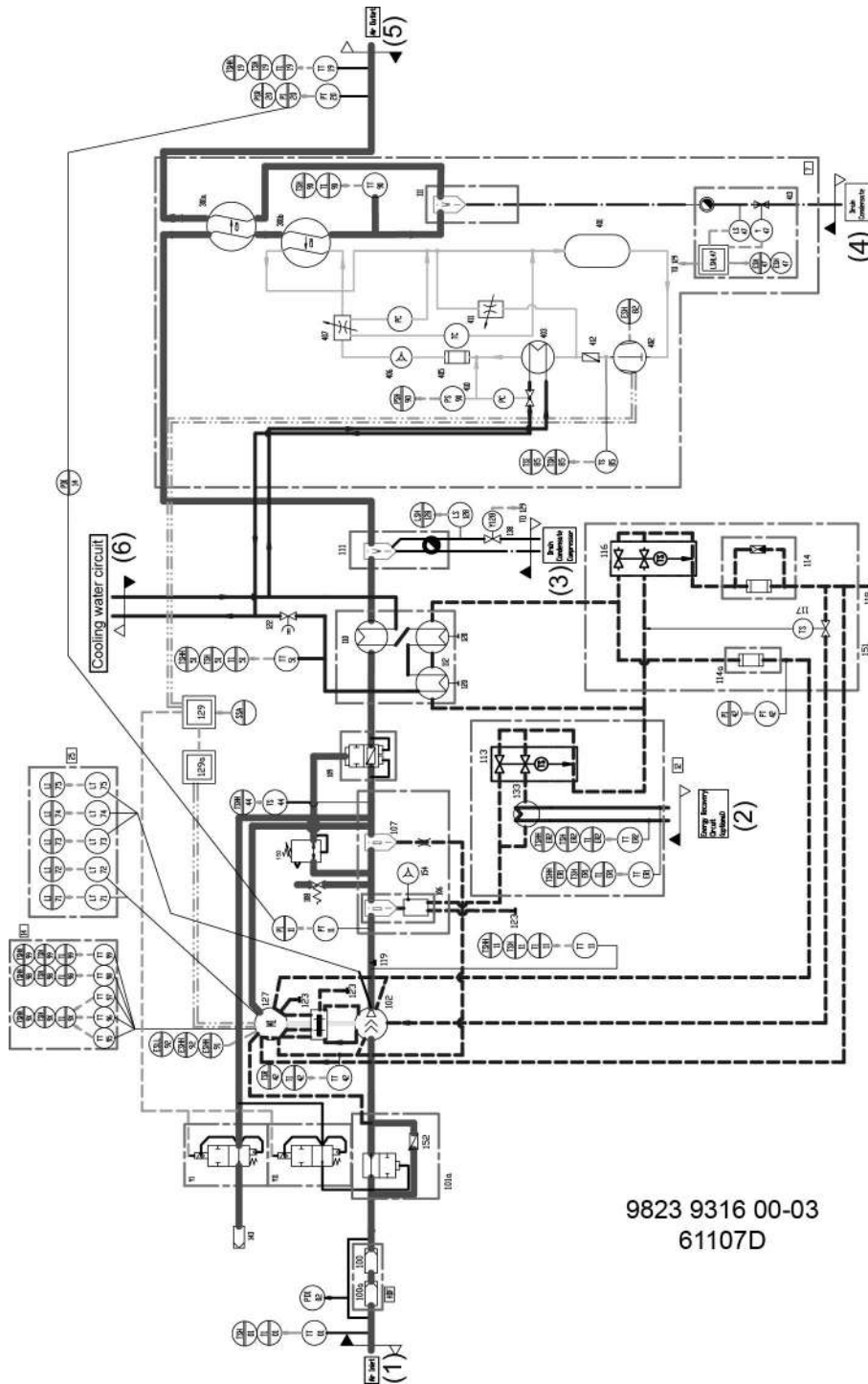
The compressor is provided with an Atlas Copco energy recovery system to recover the major part of the compression heat and heat losses of the drive motor gathered in hot water without any influence on the compressor performance.

2.2 Flow diagram



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Air-cooled version



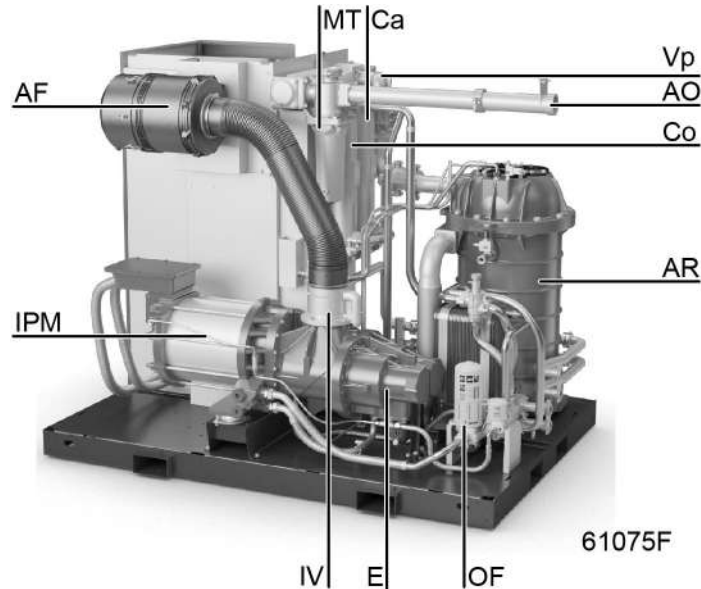
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Water-cooled version

Reference	Description
1	Air inlet
2	Energy recovery circuit (optional)
3	Condensate drain, compressor
4	Condensate drain, compressor Full-Feature
5	Air outlet

Reference	Description
6	Cooling water circuit

Position of components



Air flow

Air comes in through filter (AF) and inlet valve (IV) and is compressed in the compressor element (E).

A mixture of compressed air and oil flows into the air receiver/oil separator (AR), where oil and air are separated.

The air flows through the minimum pressure valve (Vp), the air cooler (Ca) and the condensate trap (MT) to the air outlet (AO).

Minimum pressure valve (Vp) prevents the receiver pressure from dropping below a minimum pressure and includes a check valve which prevents blow-back of compressed air from the net.

Full-Feature compressors have a dryer after the air cooler.

Oil circuit

The air receiver (AR) removes most of the oil from the air/oil mixture by centrifugal action. The oil collects in the lower part of the air receiver (AR) which serves as oil tank.

The oil separator removes the remaining oil.

The oil circuit has a thermostatic bypass valve that prevents that the oil flows through the oil cooler (Co) when the oil temperature is low.

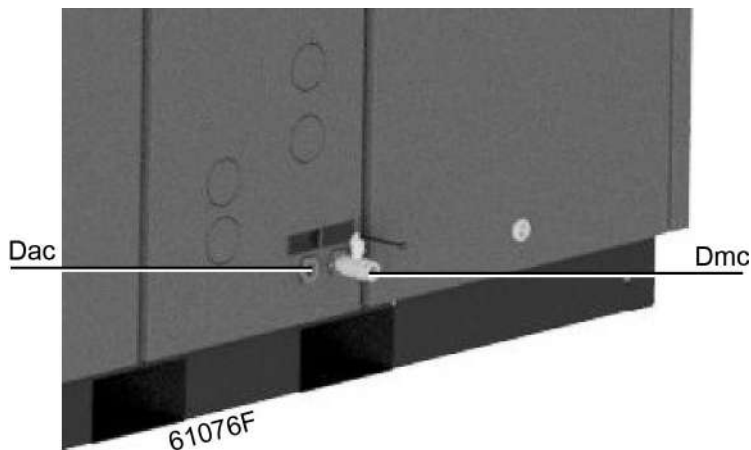
Air pressure forces the oil from air receiver (AR) through the oil filter (OF).

The filtered oil flows through the cooling channels of the interior permanent magnet (IPM) motor to the compressor element (E) and the lubrication points.

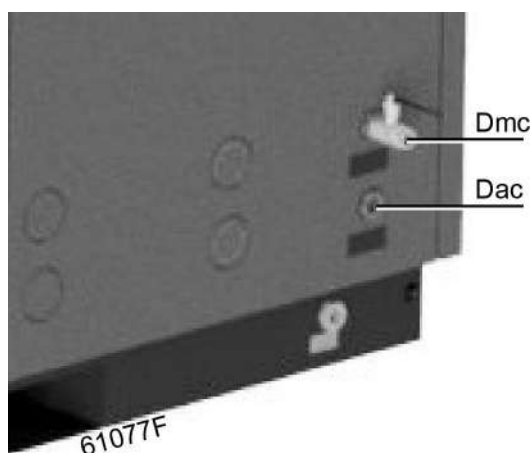
The oil circuit has an extra thermostatic bypass valve that will send extra oil to the compressor element when the oil temperature is getting too high.

2.3 Cooling and condensate system

Condensate drain system



Condensate drains, Pack version



Condensate drains, Full-Feature version

Reference	Designation
Dac	Automatic condensate drain outlet
Dmc	Manual condensate drain outlet

A condensate trap is installed downstream of the air cooler to prevent condensate from entering the air outlet pipe. The trap is provided with a level sensor and solenoid valve for automatically draining condensate and with a manual drain valve.

This condensate can contain small amounts of oil and should be processed according to local environmental legislation.

On Full-Feature units, the condensate formed in the dryer collects in the lower part of the heat exchanger/evaporator. When the condensate in the electronic drain reaches a certain level, it is drained via the automatic drain outlet (Dac)

Cooling system

On air-cooled compressors, the air and oil coolers are cooled by frequency controlled fans. Compressor running parameters will define the cooling fan speed.

Water-cooled compressors are provided with a cooling water system.

2.4 Regulating system

Description

When the compressor 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 compressor, the net pressure increases further.

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

When the pressure continues to increase although the motor already operates at minimum speed, the regulator 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 compressor is stopped immediately (without first decreasing the motor speed).

No compressed air is lost when the compressor is stopped in automatic operation, below a certain working pressure, thus saving valuable energy.

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



The pressure in the oil separator vessel is only released to the atmosphere when the compressor is stopped manually or in case of an emergency stop.

2.5 Energy recovery system

General description



The maximum allowed pressure at the water side of the heat exchanger is 10 bar (145 psi).

The energy required in any compression process and the main motor losses are mainly transformed into heat. The major part of the transformed heat is dissipated through the oil system. The Atlas Copco energy recovery systems are designed to recover most of the above-mentioned heat as warm or hot water without any adverse influence on the compressor performance.

After the compression stage, the oil is separated from the compressed air. The compressed air flows to the aftercooler and the oil flows to the oil cooler. The energy in the oil is recovered by installing a heat exchanger in front of the oil cooler.

The energy recovery systems can be applied as low temperature rise / high water flow systems (e.g. central heating in closed water circuits) or as high temperature rise / low water flow systems (e.g. pre-heating of boiler feed water in open water circuits).

Main components

The system mainly comprises:

- Oil/water heat exchanger (HE)
- Energy recovery valve (Y152)
- Oil by-pass valve (Y151)
- Temperature sensors for water inlet and outlet
- The necessary pipes, brackets, bolts, etc.

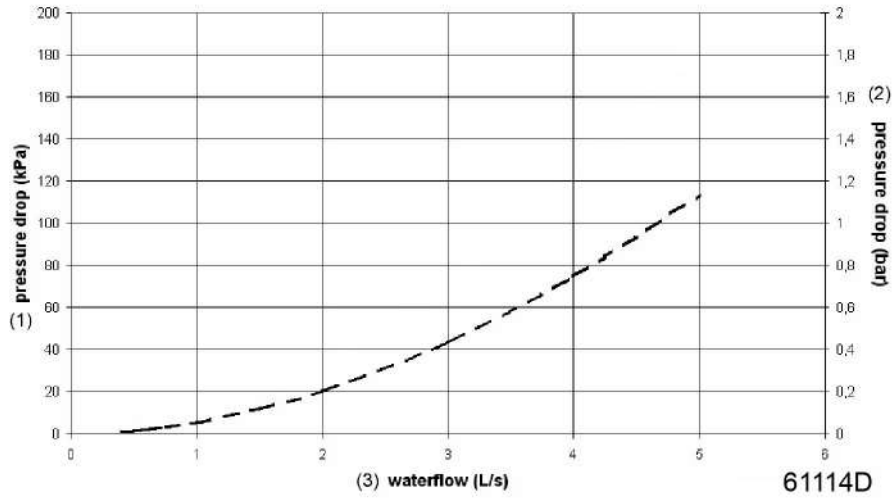
Installation

The package includes:

- a general by-pass system, to shut down the energy recovery system
- a by-pass system to prevent the oil outlet temperature from dropping below the minimum value.

When the Energy Recovery system is working, this by-pass system makes the oil flow through the Energy Recovery heat exchanger instead of the normal oil cooler

Energy recovery system



Pressure drop, water side

Text on figure

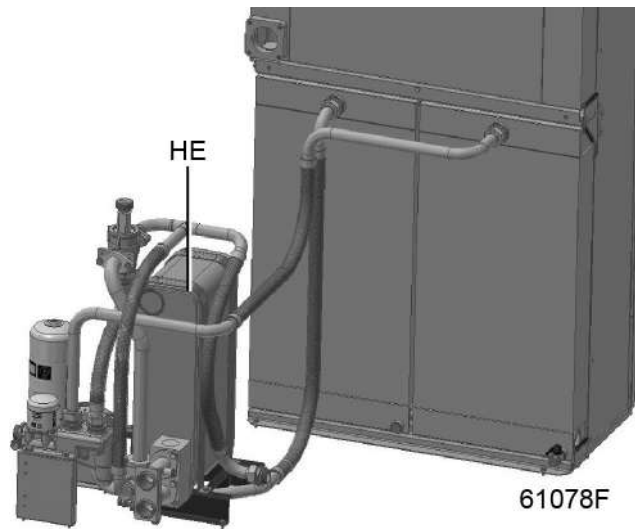
(1)	Pressure drop (kPa)
(2)	Pressure drop (bar)
(3)	Water flow (l/s)

$$pd = 4.23 F^2 + 1.62 F$$

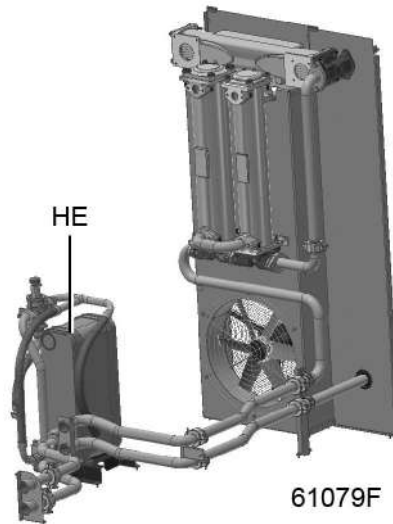
With:

- pd = pressure drop in kPa
- F = water flow in l/s

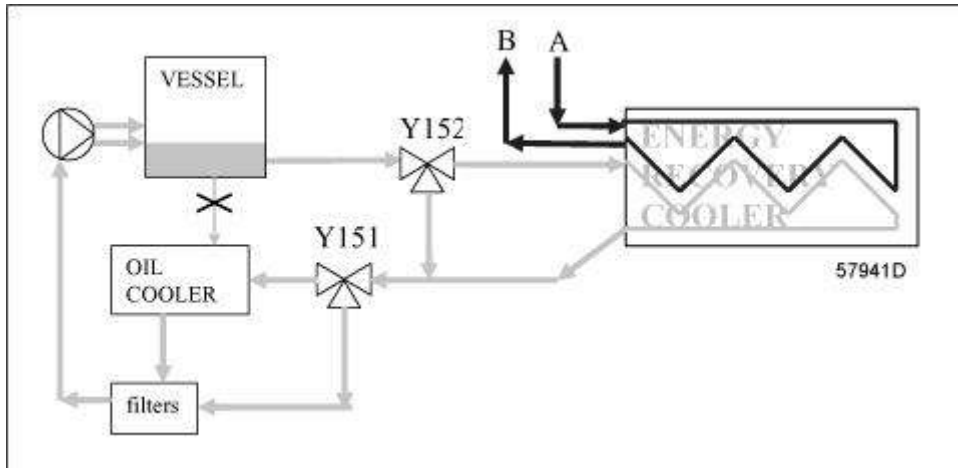
	The pressure drops calculated with the formulas above are indicative.
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Energy recovery system for air-cooled compressors



Energy recovery system for water-cooled compressors



Flow diagram

The recovery water enters the unit at the heat exchanger inlet connection. In the heat exchanger the compression heat is transferred from the compressor to the water. The water leaves the heat exchanger via the outlet connection.

Installation

The compressor frame is prepared for the Energy Recovery system. The connection pipes are accessible on machines with the factory option Energy Recovery.

Operation

The compressor oil flow is controlled by two thermostatic valves (Y151 and Y152). Y152 controls the oil flow over the energy recovery cooler and Y151 controls the oil flow through the oil cooler and thus the element outlet temperature. Ex factory the thermostat setting of Y151 is chosen in a way that the element outlet temperature is 90 °C (194 °F) +/- 5 °C (9 °F).

Recoverable Energy

The graphs of the *Principal data* section below represent the performance for each power variant at reference working pressure. The curves represent the limits of the energy recovery area and were obtained with the temperature of the element outlet as indicated in the graph. All points below the curve with Tc = 85 °C (185 °F) are possible working points where the recovered energy is maximized for lower element outlet temperatures.

The formula to calculate the amount of recovered energy is:

$$Q \text{ (kW)} = 4.2 \times q \text{ (l/s)} \times dT \text{ (}^\circ\text{C)}$$

with

- q = water flow in l/s
- dT = temperature difference between water at inlet and outlet

Selection of the thermostatic valve

To avoid condensate in the oil circuit, it is very important that the element outlet temperature always exceeds the condensation temperature. In worst case conditions (e.g. air inlet of 46 °C (115 °F) and relative humidity (R.H.) of 50 %), tc (compressor outlet stage temperature) should be above 85 °C (185 °F) for units with working pressures up to 10 bar (150 psi). This means that: to prevent condensation in these worst case conditions, the curves with tc= 85 °C (185 °F) are

the lower limit of the energy recovery (for compressors with working pressure up to 10 bar (150 psi)).

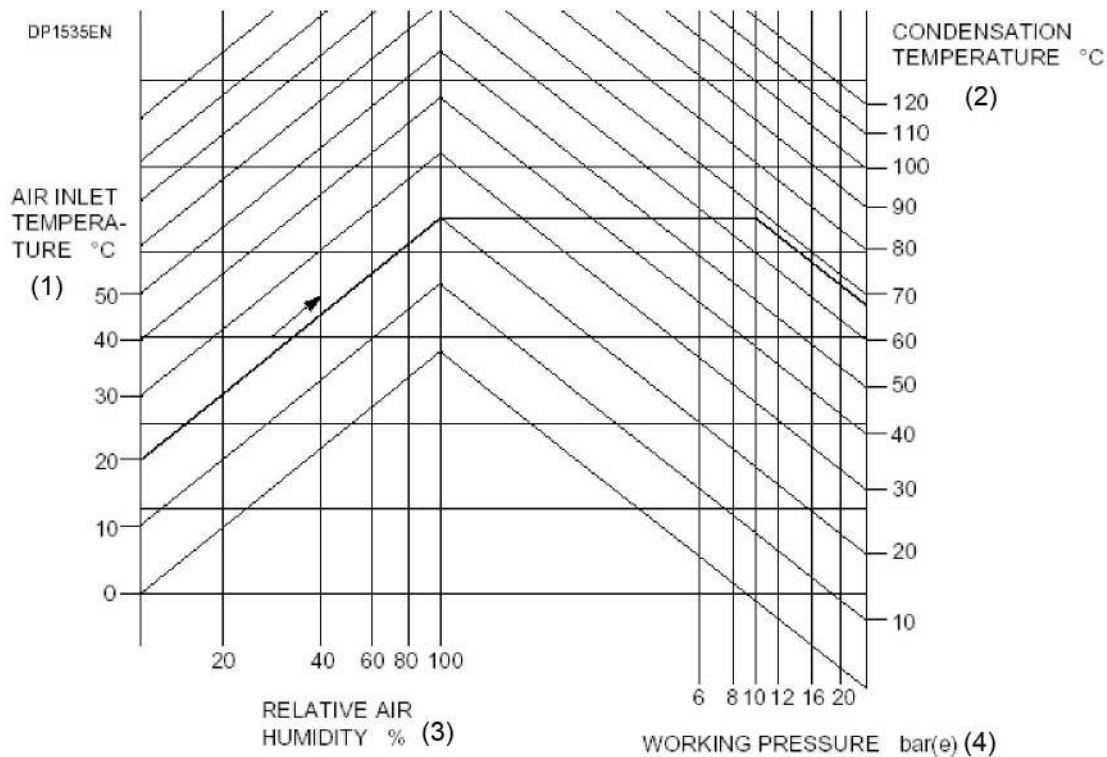
If the air inlet temperature and R.H. are known, t_c can be lower than the limits above and can be calculated from the curves below. The compressor stage outlet temperature should exceed this value by adapting the thermostatic valve Y151 in the thermostatic valve housing of the oil cooling system of the standard compressor. To obtain a higher element outlet temperature (with a high energy recovery water flow and/or low energy recovery water inlet temperature) (to get a higher water outlet temperature), a thermostatic valve with an indicated temperature higher than the standard factory mounted has to be mounted in the thermostatic valve housing of the oil cooling system of the standard compressor. A list of standard thermostat settings for Y151 can be found below.

The cooling water circuit of the energy recovery is by default protected against steam generation by a compressor shut down at cooling water temperatures of the energy recovery of 95 °C (203 °F). When the thermostat valve selection is done for a compressor stage outlet temperature running above 95 °C (203 °F), the compressor might trip at this limit value. This could happen whenever the heat dissipation in the customer's installation stops (e.g. when the pump in the customer's installation stops) or the heat dissipation is lower than the heat recovered from the compressor. This results in a gradual temperature increase on the energy recovery cooling medium system until the shut-down value has been reached. In this case following measures can be taken to prevent an unwanted shut down:

- Manually switch off energy recovery by use of the hand wheel.
- Ask an Atlas Copco technician to increase the shut down value of the cooling water temperature of the energy recovery in the Elektronikon controller. It is advised to choose a temperature higher than the selected compressor element outlet temperature but at least 5 °C (9 °F) below the boiling point of the applied cooling medium and never higher than 120 °C (248 °F).



The thermostatic valve of the energy recovery (Y152) always needs to have an indicated temperature equal to or higher than that of the thermostatic valve in the thermostatic valve housing of the oil cooling system of the standard compressor.



59979D

Condensation point determination

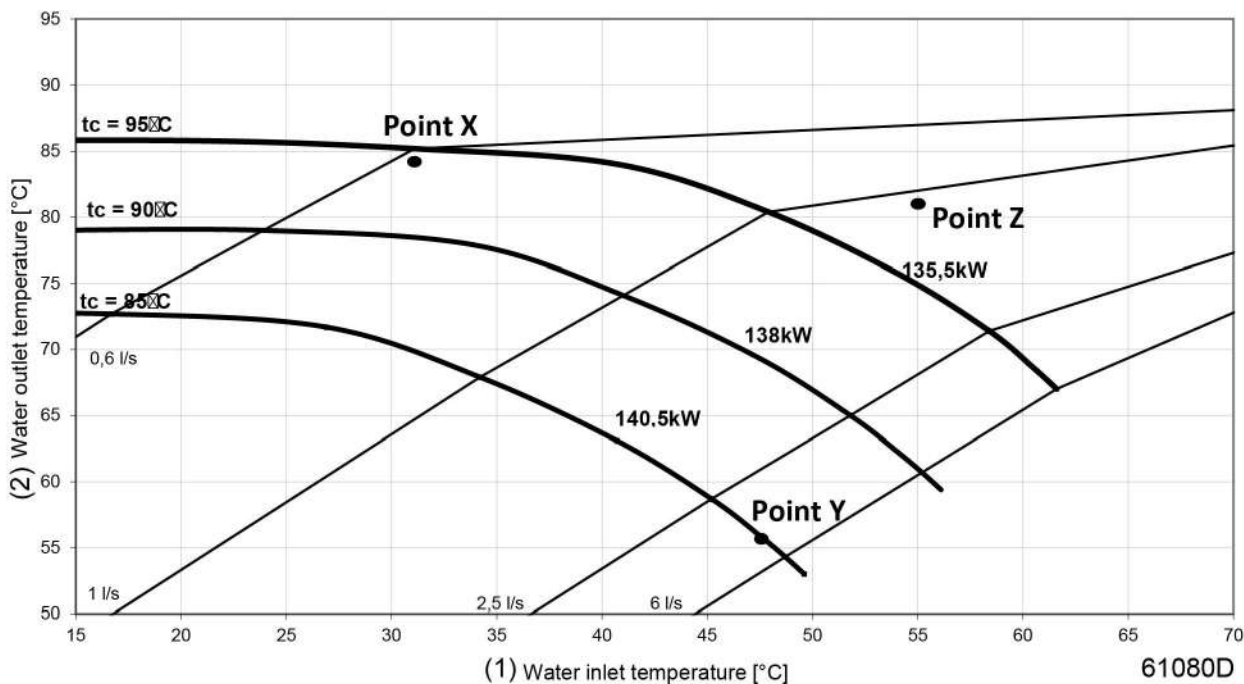
Text on figure

(1)	Air inlet temperature (°C)
(2)	Condensation temperature (°C)
(3)	Relative humidity (%)
(4)	Working pressure (bar(e))

Thermostatic valve Y151

Working pressure	Set point
8.5 bar	65 °C
125 psi	167 °F
10 bar	75 °C
150 psi	167 °F

Calculation examples



Text on figure

(1)	Water outlet temperature (°C)
(2)	Water inlet temperature (°C)

Example point X

High temperature rise, low water flow application, e.g. pre-heating of boiler feed water in open circuit:

- Compressor unit: GA 160 VSD+ - 50 Hz
- Working pressure: 8 bar / 116 psi
- Water flow: 0.6 l/s / 1.27 cfm
- Water inlet temperature: 31 °C / 88 °F
- Water outlet temperature: 85 °C / 185 °F

The formula to calculate the amount of recovered energy results in (2):

- $4.2 \times 0.6 \times (85 - 31) = 136 \text{ kW}$ (± as indicated on the curve)

The outlet temperature for a water flow of 0.6 l/s can be calculated backwards from formula (2):

- $T_{\text{outlet}} = 31 + (136 / (4.2 \times 0.6)) = 85 \text{ °C}$ (185 °F)

Total pressure drop on waterside is (1):

- $pd = (4.23 \times 0.6^2) + (1.62 \times 0.6) = 2.5 \text{ kPa} = 25 \text{ mbar}$ (0.36 psi)

Example point Y

Low temperature rise, high water flow application, e.g. central heating in closed circuit:

- Compressor unit: GA 160 VSD+ - 50 Hz
- Working pressure: 8 bar / 116 psi
- Water flow: 4 l/s / 0.87 cfm
- Water inlet temperature: 47.5 °C / 117.5 °F

- Water outlet temperature: 55.9 °C / 132.6 °F

The formula to calculate the amount of recovered energy results in (2):

- $4.2 \times 4 \times (55.9 - 47.5) = 141 \text{ kW}$ (± as indicated on the curve of 85 °C)

The outlet temperatures for a water flow of 4 l/s can be calculated backwards from formula (2):

- $T_{\text{outlet}} = 47.5 + (141 / (4.2 \times 4)) = 55.9 \text{ °C}$ (132.6 °F)

Total pressure drop on waterside is (1):

- $pd = (4.23 \times 4^2) + (1.62 \times 4) = 74 \text{ kPa} = 0.74 \text{ bar}$ (10.73 psi)

Example point Z

- Compressor unit: GA 160 VSD+ -50 Hz
- Working pressure: 8 bar / 116 psi
- Water flow: 1 l/s / 2.12 cfm
- Water inlet temperature: 55 °C / 131 °F
- Water outlet temperature: 82.0 °C / 179.6 °F

The formula to calculate the amount of recovered energy results in (2):

- $4.2 \times 1 \times (82 - 55) = 113.4 \text{ kW}$

The outlet temperatures for a water flow of 1 l/s can be calculated backwards from formula (2):

- $T_{\text{outlet}} = 55 + (113.4 / (4.2 \times 1)) = 82 \text{ °C}$ (179.6 °F)

Total pressure drop on waterside is (1):

- $pd = (4.23 \times 1^2) + (1.62 \times 1) = 5.85 \text{ kPa} = 58.5 \text{ mbar}$ (0.85 psi)

This proves that it is possible to work at higher temperatures, but with less heating power.

The temperature of the vessel can be set to 100 °C (212 °F) as well. The installation can work in a higher curve, to obtain a higher water outlet temperature. This setting must be done by a service technician of Atlas Copco.

- Compressor unit: GA 160 VSD+
- Working pressure: 8 bar / 116 psi
- Water inlet temperature: 30 °C / 86 °F
- Water outlet temperature: 60 °C / 140 °F

The lowest curve is the maximum energy that can be recovered. If it is necessary to work in the area below the lowest curve, you have to calculate with the 140.5 kW anyway.

$$dT = 30 \text{ °C} / 54 \text{ °F} \quad (60 \text{ °C} - 30 \text{ °C} / 140 \text{ °F} - 86 \text{ °F})$$

$$c = 4.2 \text{ J/kgK} \quad (\text{for water})$$

$$Q = 140.5 \text{ kW} \quad (\text{lowest curve})$$

$$\text{Formula for recovered energy is : } \Rightarrow Q = m \times c \times dT$$

$$\Rightarrow m = Q / (c \times dT)$$

$$\Rightarrow m = 140.5 / (4.2 \times 30)$$

$$\Rightarrow m = 1.115 \text{ l/s}$$

Additional safety precautions

- The parts must only be lifted using suitable equipment in accordance with the applicable safety regulations. Loose or pivoting parts must be securely fastened before lifting.

- Wear a safety helmet when working in the area of overhead or lifting equipment.
- Protect hands to avoid injury from hot machine parts, e.g. during draining of oil.
- Protection caps, bags, etc. must be removed before connecting the pipes.
- Water hoses must be of correct size and suitable for the working pressure.
- The water connections must be free of strain.
- Pipe work or other parts with a temperature in excess of 70 °C (158 °F) must be guarded or insulated. Other high-temperature pipe work must be clearly marked.
- The water system installed outside the machine has to be protected by a safety device with set pressure according to the maximum cooling water inlet pressure.
- All maintenance work shall only be undertaken when the machine has cooled down.
- Never weld or perform any operation involving heat near the oil system.

3 Elektronikon™ Touch controller

3.1 Controller



The Touch 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 (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.



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

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 element outlet temperature 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.



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.

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.

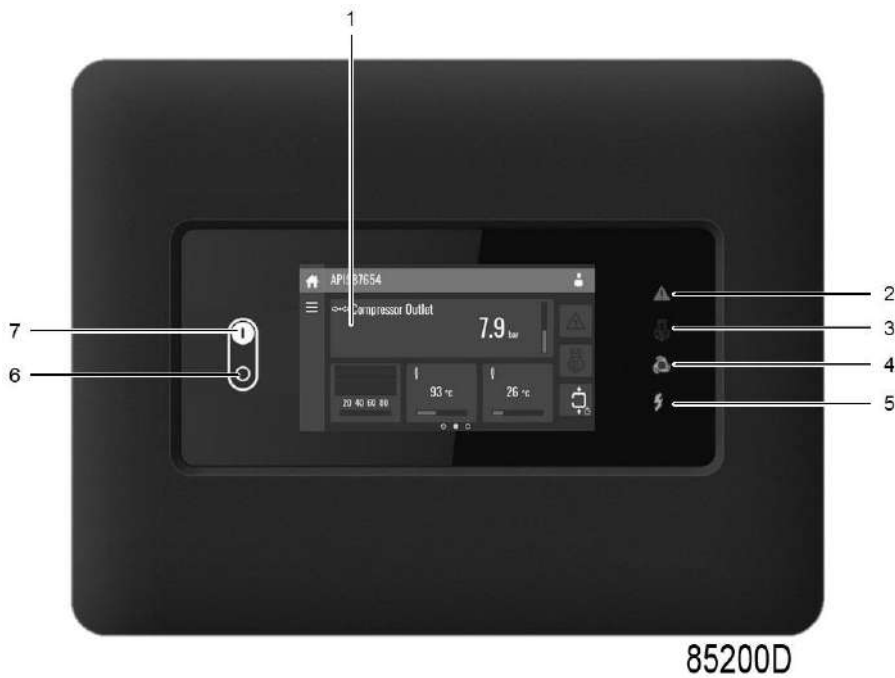
Automatic restart after voltage failure (ARAVF)

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. If desired, the function can be activated. Consult your supplier.



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

3.2 Control panel





















Control panel





















Parts and functions

Reference	Designation	Function
1	Touchscreen	Shows the unit operating condition and a number of icons to navigate through the menu. 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	This button stops the unit.
7	Start button	This button starts the unit. The operation sign (4) lights up. The controller is operative.


3.3 Icons used

Menu icons

Menu	Icon	Menu	Icon	Menu	Icon
Data	 85233D	Status	 85239D		
		Inputs	 85240D		
		Outputs	 85241D		
		Counters	 85242D		
		Aux. 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		





Menu	Icon	Menu	Icon	Menu	Icon
Machine Settings	 85237D	Alarms	 85239D		
		Regulation	 85246D		
		Control Parameters	 85247D		
		Aux. Equipment Parameters	 85243D	Converter(s)	 85251D
		Auto Restart	 85274D	Fan	 85255D
				Internal SmartBox	 85256D
Controller Settings	 85238D	Network Settings	 85246D	Ethernet Settings	 85257D
				CAN Settings	 85258D
		Localisation	 85247D	Language	 85259D
				Date/Time	 85260D
				Units	 85261D
		User Password	 85248D		
		Help	 85249D		
Information	 85250D				

Status icons

Icon	Description
 85262D	Motor Stopped


 85263D	Motor Stopped Wait
 85264D	Running Unloaded
 85265D	Manual Unload
 85266D	Running Unloaded Wait
 85267D	Running Loaded
 85268D	Failed to Load
 85269D	Running Loaded Wait
 85270D	Manual Stop
 85271D	Machine Control Mode, Local
 85272D	Machine Control Mode, Remote
 85273D	Machine Control Mode, LAN
 85274D	Automatic Restart After Voltage Failure
 85275D	Week Timer Active




System icons


Icon	Description
 85276D	Basic User
 85277D	Advanced User
 85278D	Service User
 85279D	Antenna 25%

 85280D	Antenna 50%
 85281D	Antenna 75%
 85282D	Antenna 100%
 85283D	Change between screens (indication)
 85284D	Energy recovery
 85285D	Dryer
 85286D	Element
 85287D	Drain(s)
 85288D	Analogue Output
 85289D	Menu
 85290D	Reset
 85291D	Auto Restart
 85292D	Filter(s)
 85293D	Cooler
 85294D	Valve(s)
 85295D	Power Meter

Input icons

Icon	Description
 85296D	Pressure

 85297D	Temperature
 85298D	Special Protection
 85299D	Open
 85300D	Closed

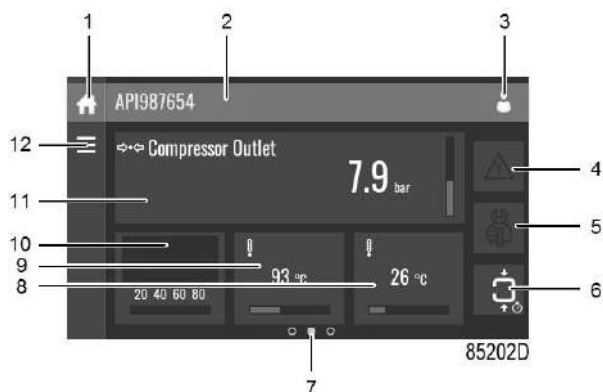
	This chapter gives a general survey of available icons. Not all icons mentioned in this chapter are applicable to every machine.
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3.4 Main screen

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.

Reference	Designation	Function
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	Indicates which page you currently see. The middle indication is the main screen, left is the menu screen and at the right the quick access screen. Swipe left or right to go to another screen.
8, 9, 10, 11	These fields can contain a history chart, an input or a counter value, depending on the type of the machine.	Tap the field to view the type of measurement. This will be shown in the screen information bar. Examples of inputs: <ul style="list-style-type: none"> • Ambient temp • Outlet • Dryer dewpoint Examples of counters: <ul style="list-style-type: none"> • Running hours • Load relay • Loaded hours
12	Menu button	The menu button is always shown and can be tapped to go to the menu.

3.5 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.

Function	Description
Setpoints	Several setpoints can be modified by tapping this icon.
Control mode	The control mode can be changed by tapping this icon. <ul style="list-style-type: none"> • Local control via start/stop buttons • Remote control via digital input(s) • LAN control via the network. When in Remote or LAN control, the start/stop buttons on the controller will not work.
Display language	The display language of the controller can be changed by tapping this icon.
Manual unload (only on fixed speed units)	When tapped, the machine will go in Manual unload mode until the icon is tapped again.
Week timer	Week timers can be set by tapping this icon.
Remaining running time	The Remaining running time can be set and modified by tapping this icon.
Internal SmartBox	The reception quality of the internal antenna can be monitored. <div style="text-align: center;">  </div> 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%.
Auto restart	Auto restart can be activated by tapping this icon.

3.6 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

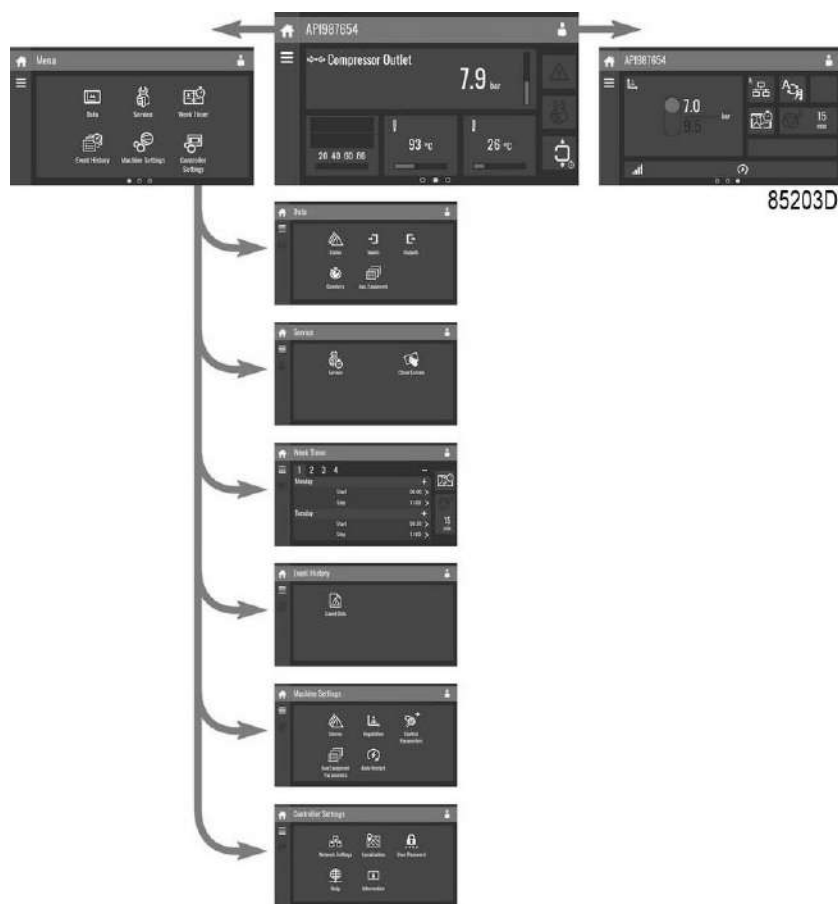


Reference	Designation	Function
(1)	Data	The data menu contains the status of the unit, information about the Inputs, Outputs and Counters. The Auxiliary equipment can also be viewed through this menu.

Reference	Designation	Function
(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. The Auto 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

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



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

3.7 Data menu

Function

This screen is used to display the following submenus:

- Status
- Inputs
- Outputs
- Counters
- Aux. Equipment

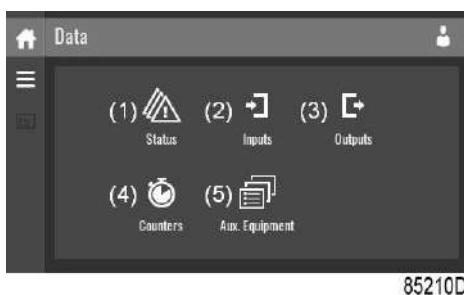
These submenus can be entered by tapping the icons.

Procedure

To enter the Data menu screen:

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

Description



Reference	Designation
(1)	Status menu
(2)	Inputs menu
(3)	Outputs menu
(4)	Counters menu
(5)	Auxiliary equipment menu

Status menu

Tap the Status icon to enter the Status menu.



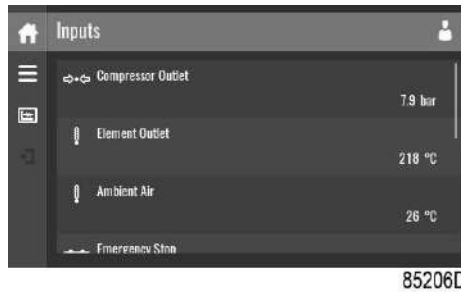
This menu shows the current status of the unit.

If an alarm is active, it can be viewed by tapping the alarm message. To reset an alarm, tap the reset button (1).

	<p>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.</p>
--	--

Inputs menu

Tap the Inputs icon to enter the Inputs menu.



This menu shows information about all the inputs.

Outputs menu

Tap the Outputs icon to enter the Outputs menu.

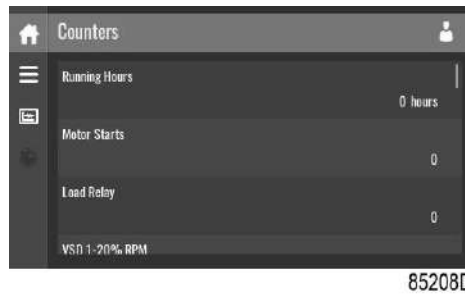


This menu shows information about all the outputs.

	<p>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.</p>
	<p>Stop the unit and switch off the supply before connecting external equipment. Check the Safety precautions.</p>

Counters menu

Tap the Counters icon to enter the Counters menu.

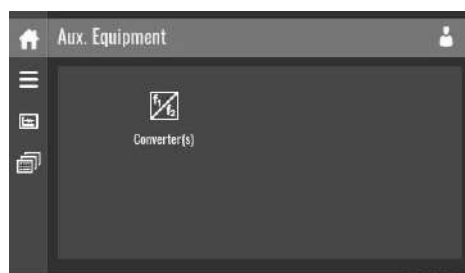


85208D

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

Auxiliary equipment menu

Tap the Aux. Equipment icon to enter the Aux. equipment menu.



85209D

This menu shows an overview of all auxiliary equipment fitted.

3.8 Service menu

Function

This screen is used to display the following submenus:

- Service
- Service functions (Only 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

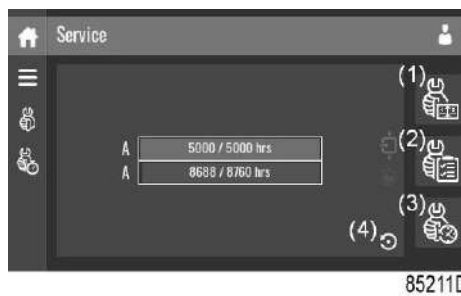
Description



Reference	Designation
(1)	Service
(2)	Service functions (Only visible as advanced user)
(3)	Clean screen

Service menu

Tap the Service icon to enter the Service menu.



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:

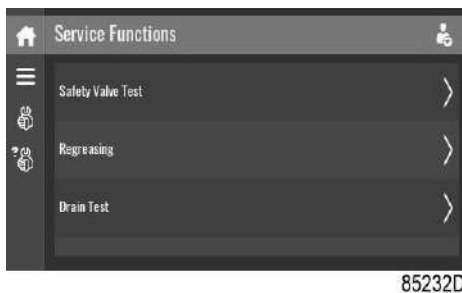
1. Tap the desired service plan. A selection screen will pop up.
2. Change the Running Hours by tapping ‘-’ or ‘+’.
3. Confirm by tapping ‘V’ or decline by tapping ‘X’.

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 (Only visible as advanced user)

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

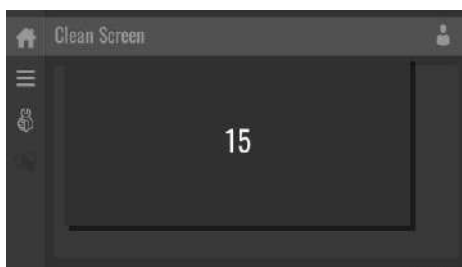


85232D

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 touchscreen.



85212D

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

3.9 Week timer menu

Function

This screen is used to set up to 4 different week 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



85214D

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'.

3.10 Event history menu

Function

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

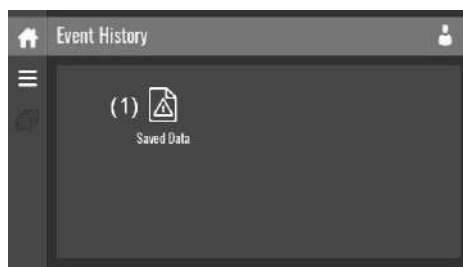
These submenus can be entered by tapping the icons.

Procedure

To enter the Event history menu screen:

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

Description

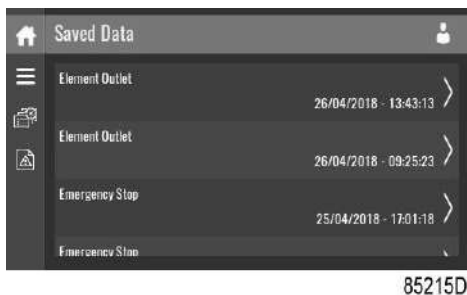


85216D

Reference	Designation
(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.

3.11 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

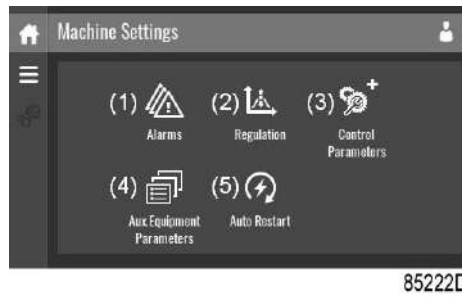
These submenus can be entered by tapping the icons.

Procedure

To enter the Machine settings menu screen:

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

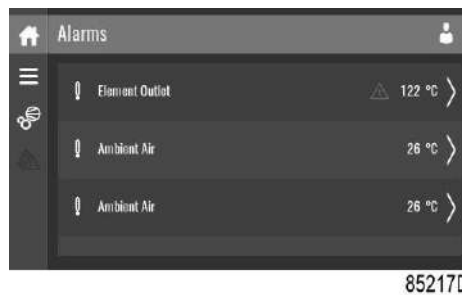
Description



Reference	Designation
(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.



A list of all alarms is shown.

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

Regulation menu

Tap the Regulation icon to enter the Regulation menu.



Setpoints or pressure bands can be modified through this menu.

Modify a setting

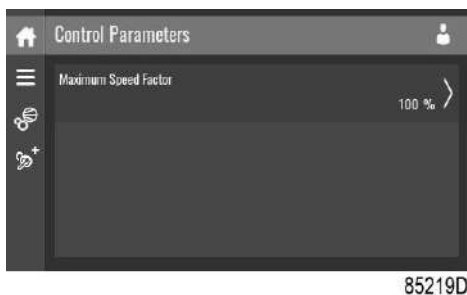
When tapping a list item, a selection screen pops up. The user can modify the setting by tapping '–' or '+' and can confirm by tapping 'V' or decline by tapping 'X'.

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'.

Control parameters menu

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



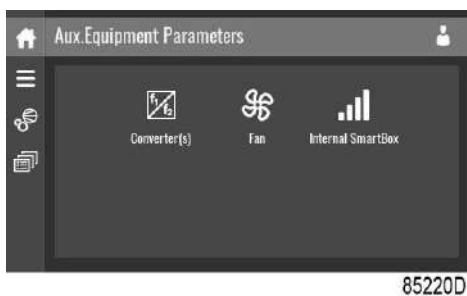
This menu shows information about the Control Parameters.

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 auxiliary equipment parameters menu.



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

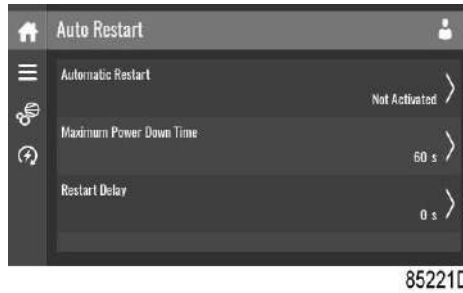
Through this menu, the parameters of the auxiliary equipment can be changed.

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.



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 clicking 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'.

3.12 Controller settings menu

Function

This screen is used to display the following submenus:

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

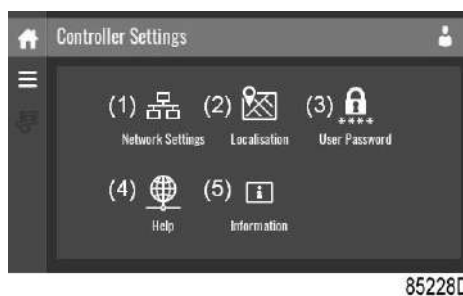
These submenus can be entered by tapping the icons.

Procedure

To enter the Controller Settings menu screen:

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

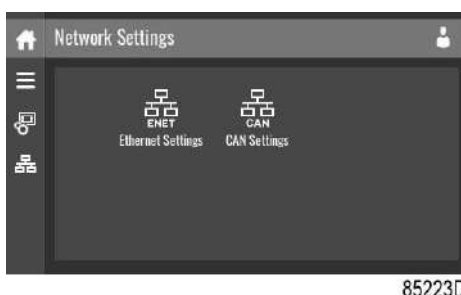
Description



Reference	Designation
(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.



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.



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

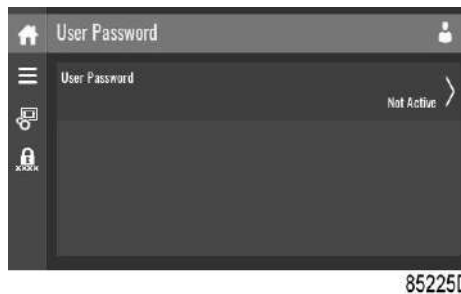
When tapping a list item, a selection screen pops up. The user can modify the setting by tapping ‘-’ or ‘+’ and can confirm by tapping ‘V’ or decline by tapping ‘X’.

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.



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.



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.



This menu shows information about the controller.

3.13 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



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



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



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 [Quick access screen](#).

In the service menu, an extra menu item is now available. See [Service menu](#).

4 Installation

4.1 Installation remarks

General



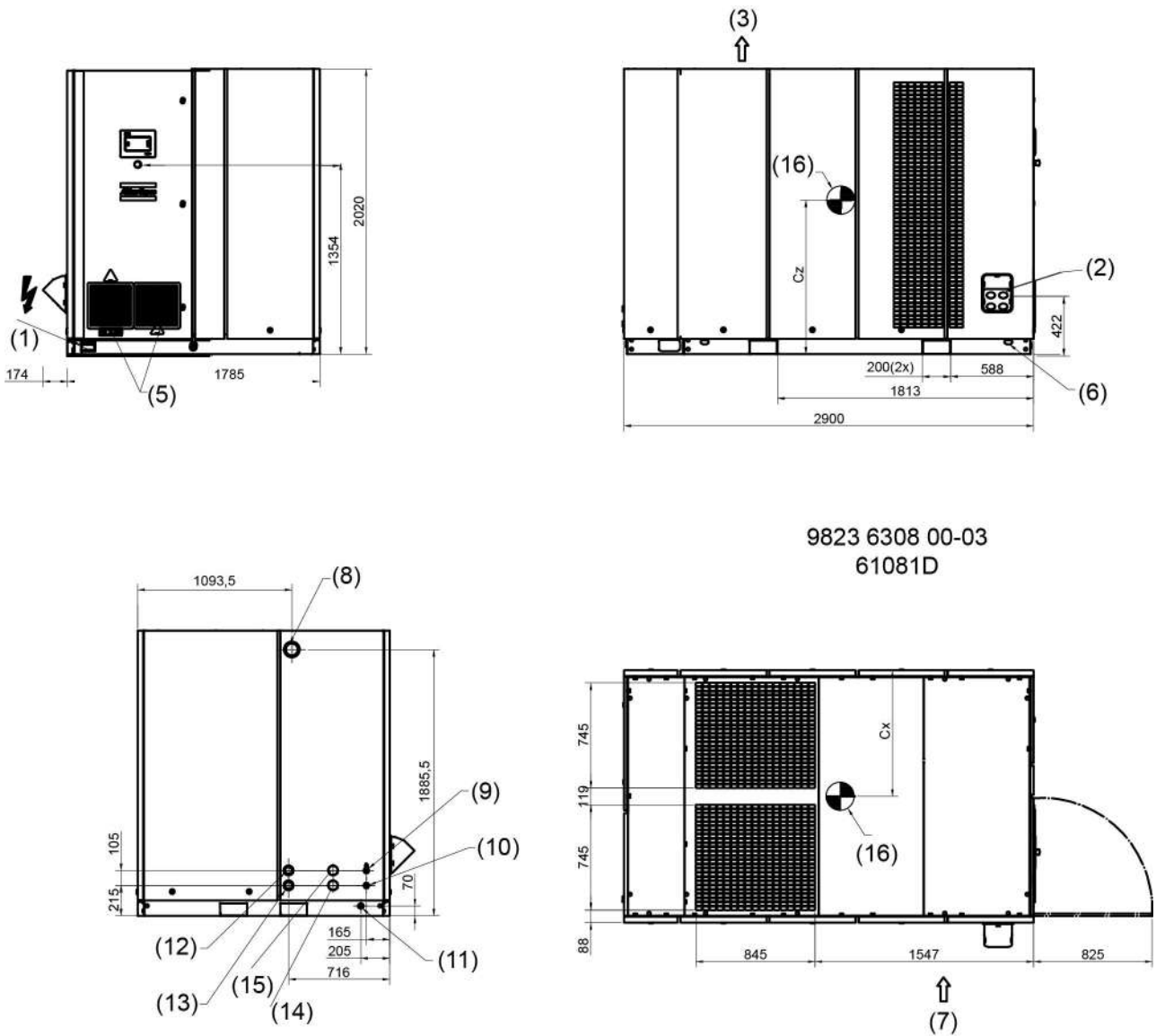
- The compressor is intended for indoor use only.
- Working with machinery controlled by a frequency converter requires special safety precautions, which depend on the type of network (TN, TT or IT). Consult Atlas Copco.
- When good EMC practices for installation are followed, the compressor qualifies for installation in EMC category C3, according to EN61800-3, for use in a 2nd environment (a 2nd environment includes all establishments other than those directly connected to a low voltage power supply network which supplies buildings used for domestic purposes).
- Cooling air for starter cabinet:
Contamination levels (ambient) according to IEC 60721-3-3
 - Chemical gases: Class 3C2
 - Solid particles: Class 3S2
 - No conductive dust allowed
 - No condensation allowed
 - Maximum allowed relative humidity is 60 % in the presence of corrosive gases



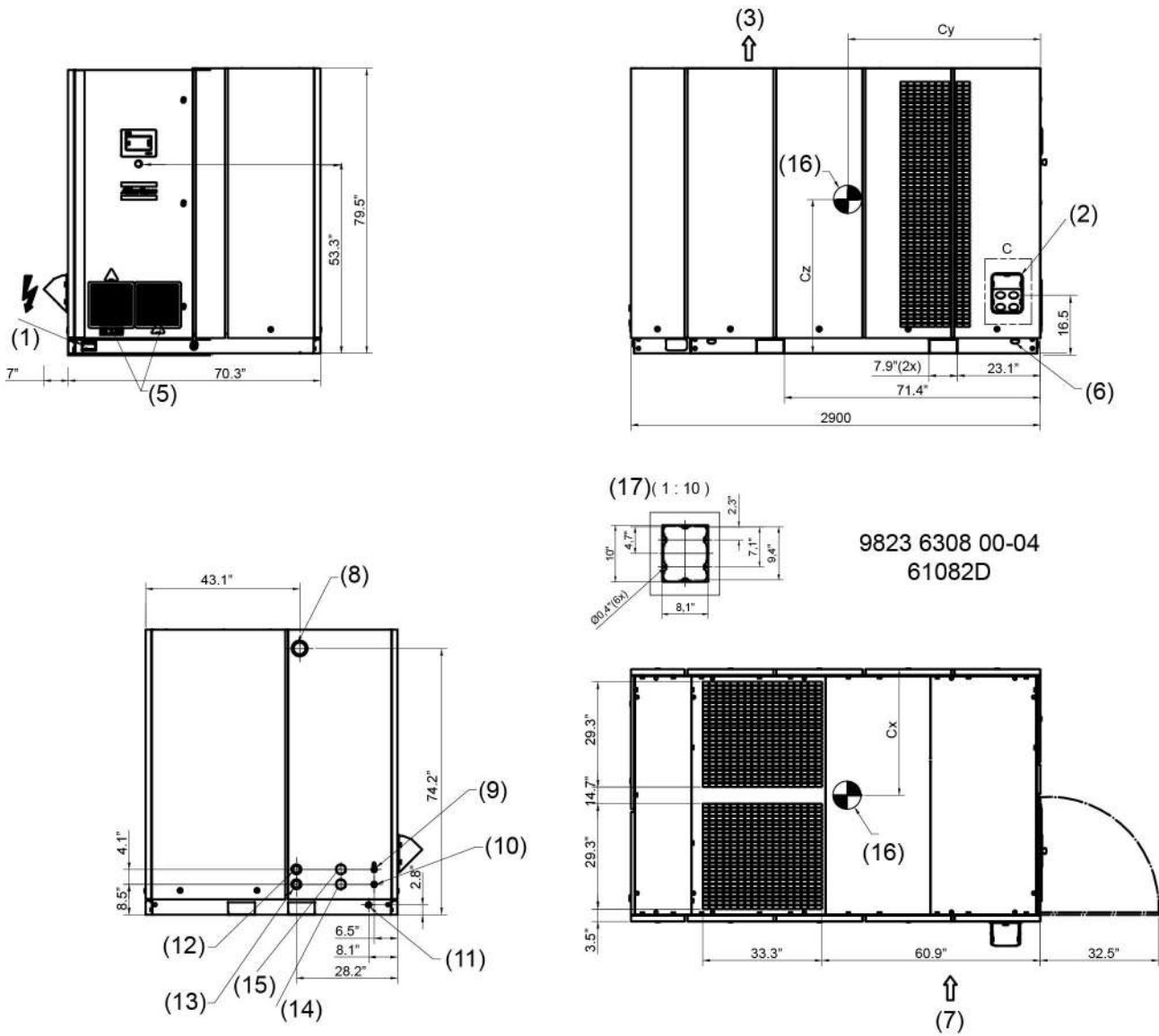
The compressor is not intended to be used on a low-voltage public network which supplies domestic premises. Radio frequency interference can be expected if used on such a network.

4.2 Dimension drawing

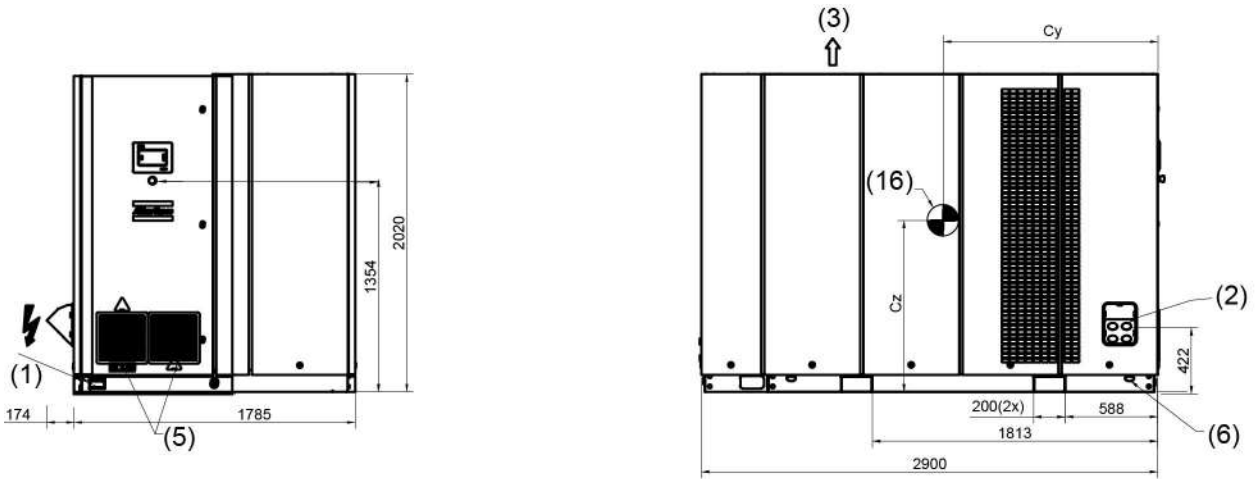
Compressor dimensions



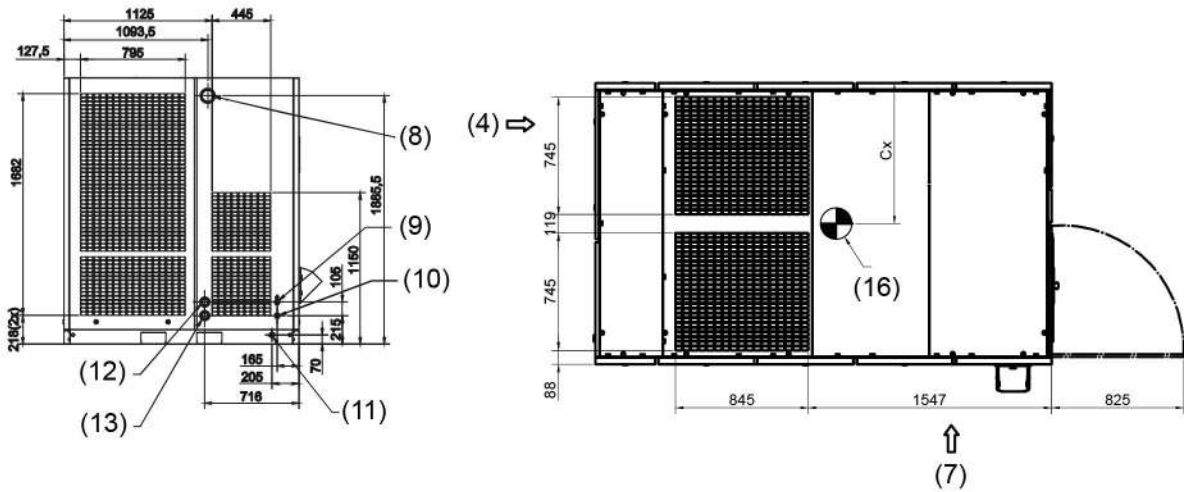
Dimension drawing of water-cooled Full-Feature compressor, metric units



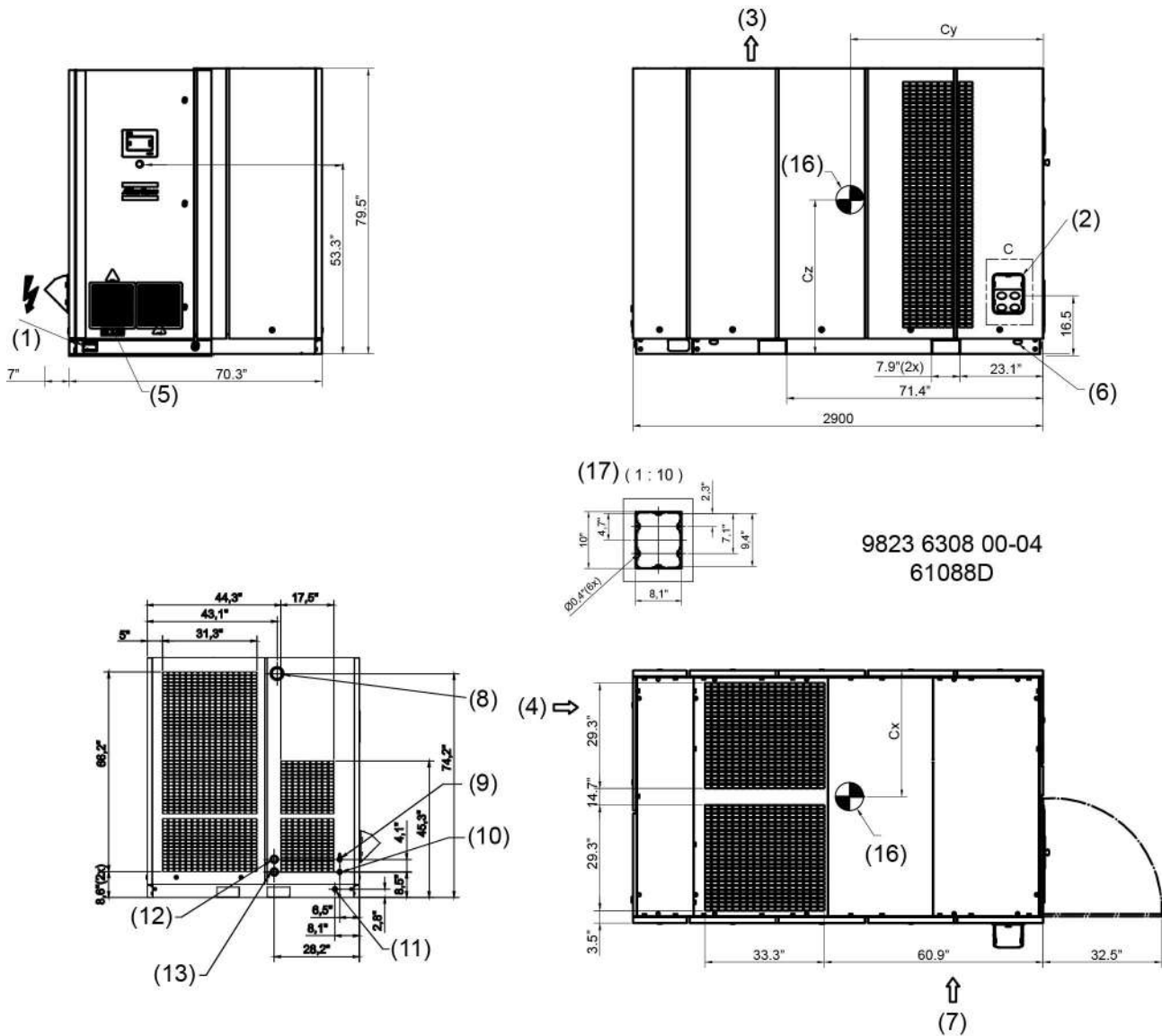
Dimension drawing of water-cooled Full-Feature compressor, imperial units



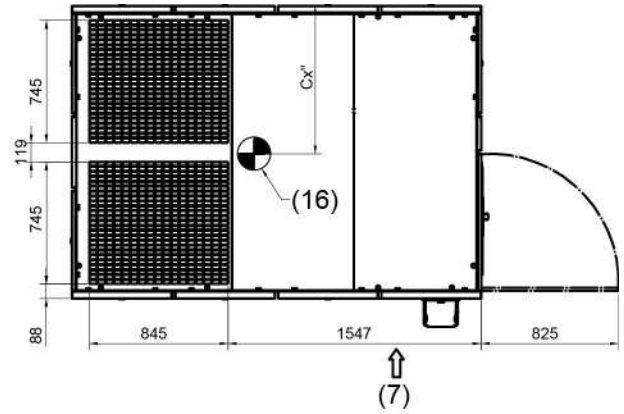
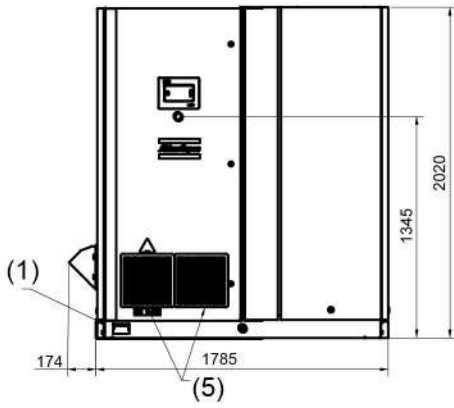
9823 6308 00-03
61087D



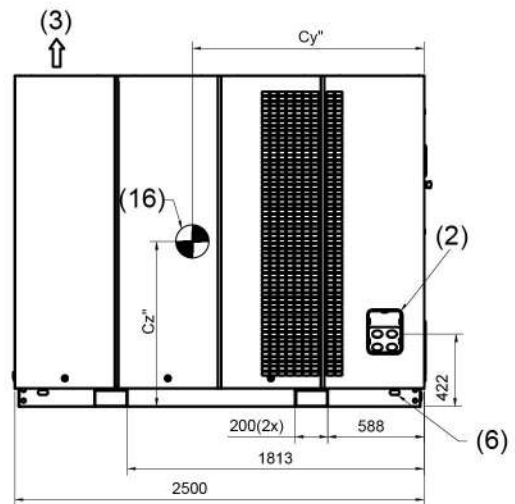
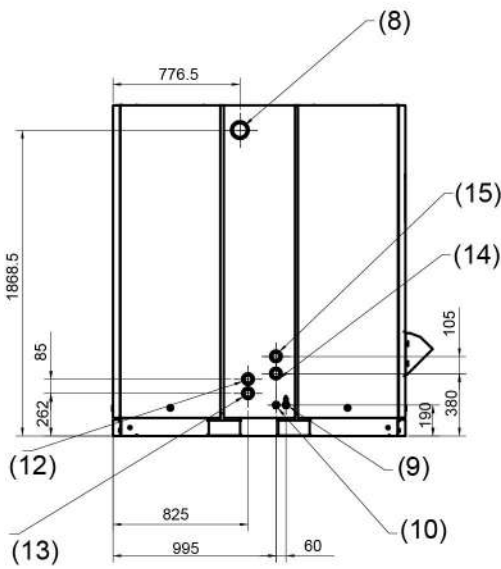
Dimension drawing of air-cooled Full-Feature compressor, metric units



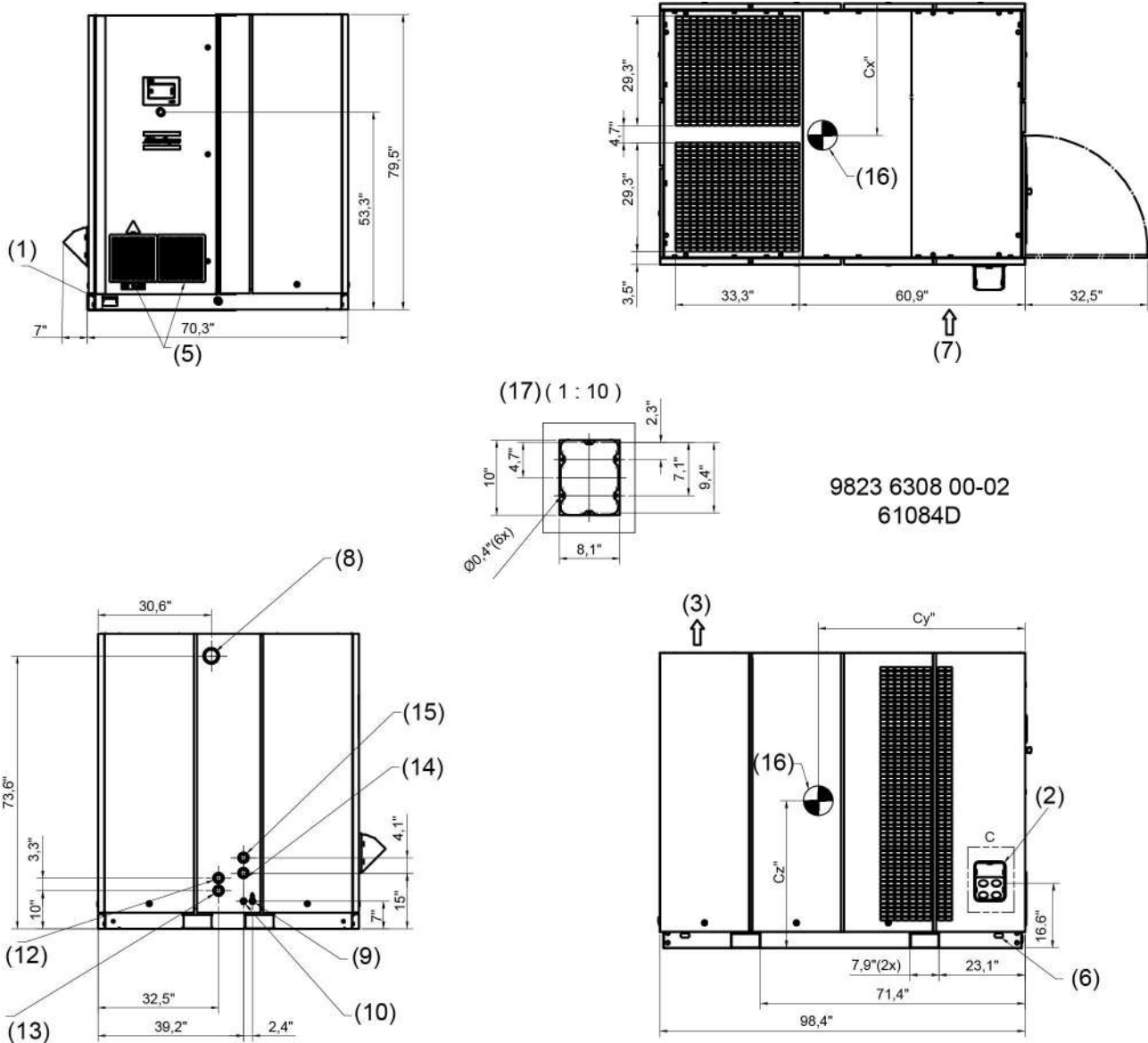
Dimension drawing of air-cooled Full-Feature compressor, imperial units



9823 6308 00-01
61083D



Dimension drawing of Pack compressor, metric units



Dimension drawing of Pack compressor, imperial units

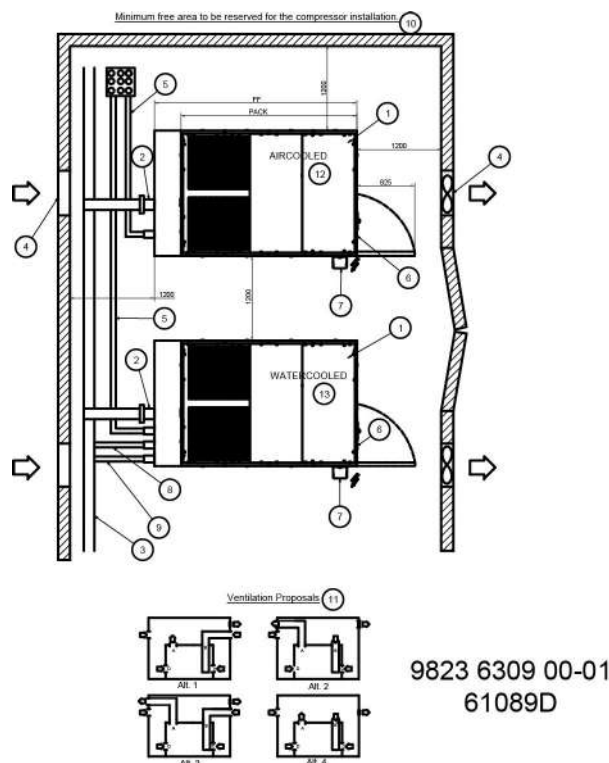
Reference table

Reference	Description
(1)	Data plate
(2)	Electrical cable entry (cable box, optional CTS kit)
(3)	Air-cooled compressor: Cooling air outlet Air-cooled compressor: Dryer cooling air outlet Water-cooled compressor: Canopy ventilation outlet
(4)	Air-cooled compressor: Dryer cooling air inlet
(5)	Cubicle ventilation inlet
(6)	4 slotted holes

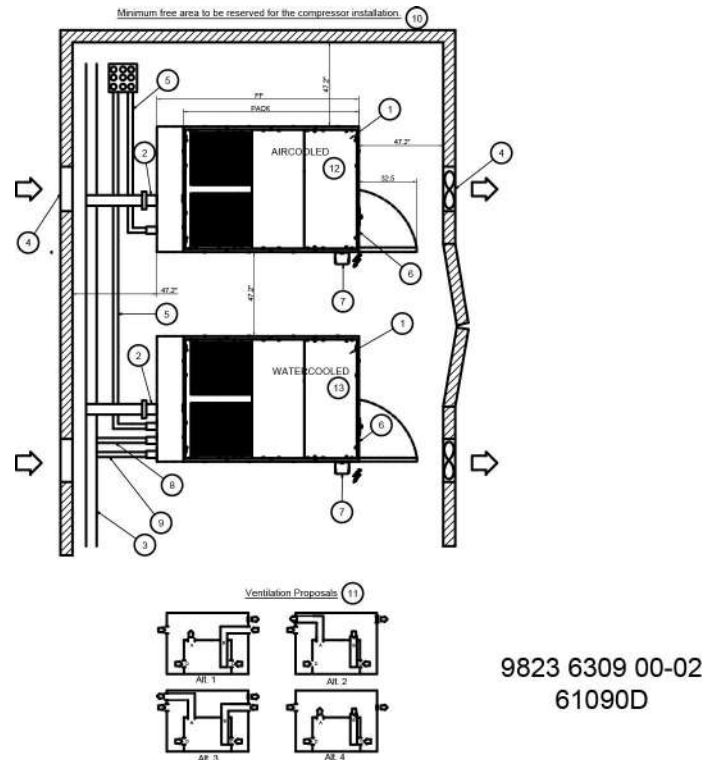
Reference	Description
(7)	Compressor air inlet Air-cooled compressor: Cooling air inlet Water-cooled compressor: Canopy ventilation inlet
(8)	Compressed air outlet
(9)	Manual drain, compressor
(10)	Automatic drain, compressor
(11)	Automatic drain, dryer
(12)	Energy recovery water outlet
(13)	Energy recovery water inlet
(14)	Water-cooled compressor: Cooling water inlet Air-cooled compressor: Not used
(15)	Water-cooled compressor: Cooling water outlet Air-cooled compressor: Not used
(16)	Centre of gravity
(17)	Detail C

4.3 Installation proposal

Compressor room example



Compressor room example, metric units



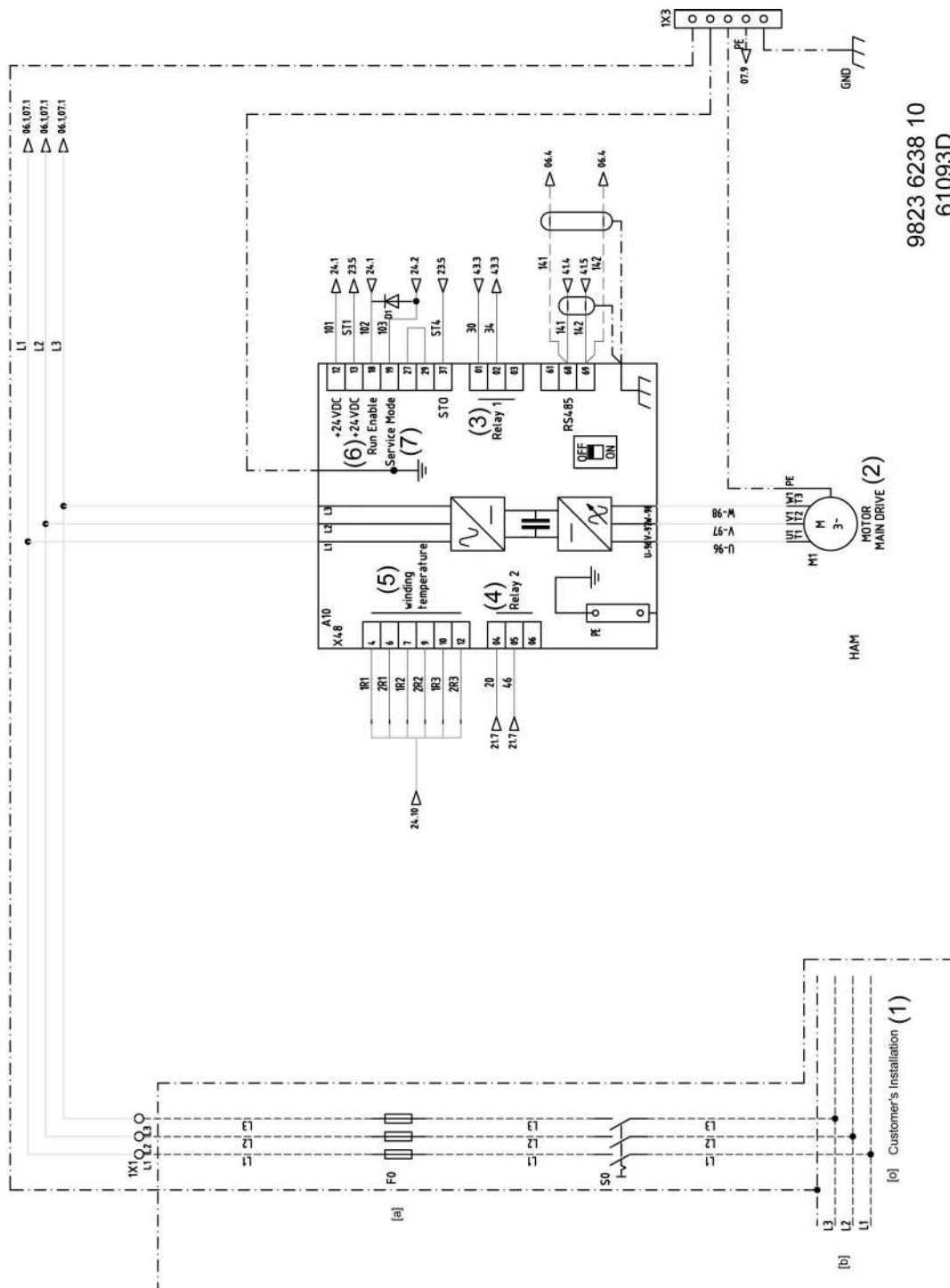
Compressor room example, imperial units

Text on figures

Reference	Description
(1)	Install the compressor on a level floor suitable for taking its weight.
(2)	Compressed air outlet valve (not in scope of supply).
(3)	<p>For SI units Delivery pipe: The maximum pipe length can be calculated as follows: $L = (dp \times d^5 \times p) / (450 \times Qc^{1.85})$ L = Length of pipe in m dp = Pressure drop (recommended maximum = 0.1 bar) d = Inner diameter of the outlet pipe in mm p = Absolute pressure at the compressor outlet in bar(a) Qc = Free air delivery of the compressor in l/s The connection of the air delivery pipe is made on top of the main air net pipe in order to minimize carry-over of possible condensate residue.</p>
(3)	<p>For British/American units: Delivery pipe: The maximum pipe length can be calculated as follows: $L = 1470 \left((dp \times d^5 \times p) / (Qc^{1.85}) \right)$ L = Length of pipe in ft dp = Pressure drop (recommended maximum = 1.45 psi) d = Inner diameter of the outlet pipe in inch p = Absolute pressure at the compressor outlet in psi Qc = Free air delivery of the compressor in cfm The connection of the air delivery pipe is made on top of the main air net pipe in order to minimize carry-over of possible condensate residue.</p>


Reference	Description
(4)	<p>For SI units</p> <p>Ventilation: The inlet grid(s) and ventilation fan must be installed in such a way that any re-circulation of cooling air to the compressor is avoided. The air velocity to the grid(s) has to be limited to 5 m/s The maximum allowable pressure drop over all cooling ducts together is 30 Pa The maximum air temperature at the compressor intake opening is 46 °C (50 °C for HAT version), minimum 0 °C The required ventilation to limit the compressor room temperature can be calculated as follows: $Q_v = 0.92N / dT$ (air-cooled unit) $Q_v = 0.1N / dT$ (water-cooled unit) Qv= Required ventilation capacity in m³/s N = Shaft input of the compressor in kW dT = Compressor room temperature over the outdoor temperature in °C</p>
(4)	<p>For British/American units:</p> <p>Ventilation: The inlet grid(s) and ventilation fan must be installed in such a way that any re-circulation of cooling air to the compressor is avoided. The air velocity to the grid(s) has to be limited to 5 m/s The maximum allowable pressure drop over all cooling ducts together is 4.35 x 10 psi The maximum air temperature at the compressor intake opening is 114.8 °F (122 °F for HAT version), minimum 32 °F The required ventilation to limit the compressor room temperature can be calculated as follows: $Q_v = 2845 \times (0.92N) / dT$ (air-cooled unit) $Q_v = 2845 \times (0.1N) / dT$ (water-cooled unit) Qv= Required ventilation capacity in cfm N = Shaft input of the compressor in hP dT = Compressor room temperature over the outdoor temperature in °F</p>
(5)	<p>Drain pipes to condensate collector. The drain pipes may not enter in the collector. Individual drain pipes may not be interconnected to avoid interference Compressor condensate contains oil. Depending on local legislation, it is recommended to install an oil/water separator (consult Atlas Copco)</p>
(6)	Control cubicle with monitoring panel
(7)	Main cable entry
(8)	Cooling water inlet pipe (only water-cooled unit)
(9)	Cooling water outlet pipe (only water-cooled unit)
(10)	Minimum free area to be reserved for the compressor installation
(11)	Ventilation proposals
(12)	Air-cooled compressor
(13)	Water-cooled compressor
(A)	Cooling air outlet (air-cooled unit) Dryer cooling air outlet (air-cooled Full-Feature unit) Canopy ventilation outlet (water-cooled unit)
(B)	Compressor air inlet Cooling air inlet (air-cooled unit) Canopy ventilation inlet (water-cooled unit)
(C)	Cubicle ventilation air inlet
(D)	Dryer cooling air inlet (only air-cooled Full-Feature unit)


4.4 Electrical connections



Reference	Description
(1)	Customer's installation
(2)	Main drive motor
(3)	Relay 1
(4)	Relay 2
(5)	Winding temperature
(6)	Run enable

Reference	Description
(7)	Service mode

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

	<p>Warnings</p> <ul style="list-style-type: none"> • Obey local regulations if they are stricter than the regulations mentioned in this document. • Obey the applicable electrical directives when installing and connecting the compressor to the power circuit: <ul style="list-style-type: none"> • IEC 60204-1 • IEC 60364-5-52 • CSA/UL <ul style="list-style-type: none"> • UL: UL508A • CSA: C22.2 • 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). • Use the original cable entry. • Full load (compressor) package currents are calculated and available on Technical data sheet. For cable section selection purposes, we suggest to add 10% to compensate for any under-voltages that might occur in the installation. • Use copper wires only. • Caution <ul style="list-style-type: none"> • Always double-check the fuse size versus the calculated cable size. If required, reduce the fuse size or enlarge the cable size. • Cable length should not exceed the maximum length according to IEC 60204 (table.10). • Display the fuse type information next to the fuse holder of the mains branch. • Connect the power cable with the correct cable lugs on the terminals in the electrical cabinet. • Do not connect more than one (1) cable lug at one side of a contactor terminal or copper bar, unless specified otherwise. • Respect a minimum of 10 mm IEC (1/2" CSA/UL branch circuit) between stripped cable ends for low voltage installations. • Fuses are maximum allowed values to protect installed compressor electrical panel. • Apply the listed cable sections on main supply cables AND earth cable. • Do not exceed the ambient temperature listed in the <i>Limits</i> section to avoid cable damage. • Mount all cables on a horizontally ventilated cable tray. • Do not stack or group cables as this avoids heat dissipation. • Connect the power cable with the correct (CSA certified) cable lugs on the terminals in the electrical cabinet. • Respect a minimum distance of 10 mm (0.4") between stripped cable ends. • Use only the prescribed cable types: <ul style="list-style-type: none"> • IEC: XLPE 90 °C (194 °F) • CSA-UL: (R, RW, T) multicore 110 °C (230 °F) • Display the fuse type information next to the fuse holder of the mains branch.
---	--

Cable size and main fuses

Overview of fuse types

Electrical approval	Fuse type
IEC	aR
CSA/UL	class RK5 ¹

¹ Class RK5 according UL248-9

Electrical approval	SSCCR ¹
IEC	gG/gL type 2 ²
CSA	HRC form II

¹ SSCCR = Standard Short Circuit Current Rating

² gG/gL type 2 according to IEC609471-4-1, IEC60269, DIN43620, VDE0636

³ Class RK5 according UL248-9

Maximum fuse size

- The pre-described fuses mentioned in the Technical Data Sheet (TDS) or on the service diagram are the maximum main fuses to protect the installed compressor electrical panel.
- The pre-described fuse types are to be used.
- Final cable and fuse selection will depend on the customer's installation and local legislation.
- Installing smaller fuses of the same type/class might lead to smaller main feeder cables.
- Always double-check the fuse size versus the calculated cable size. If required, reduce the fuse size or enlarge the cable size.
- Cable length should not exceed the maximum length according to IEC 60204 (table 10).
- Obey local regulations if they are stricter than the examples mentioned in this document.

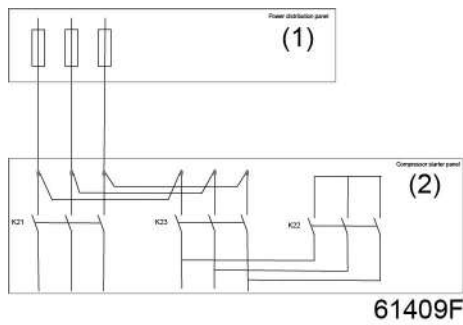
Package current

The Package current mentioned on the technical data sheet is defined as follows:

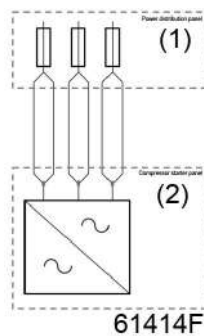
- Package current is the current the compressor uses:
 - At reference conditions
 - At 100 % load
 - At maximum pressure
 - At nominal voltage
 - Before service interval (so including fouled filters, etc...)

The pre-described fuses on the technical data sheet are the maximum main fuses to protect the installed compressor electrical panel.

Cable configuration



Single supply cables



Parallel supply cables

(1): Power distribution panel

(2): Compressor starter panel

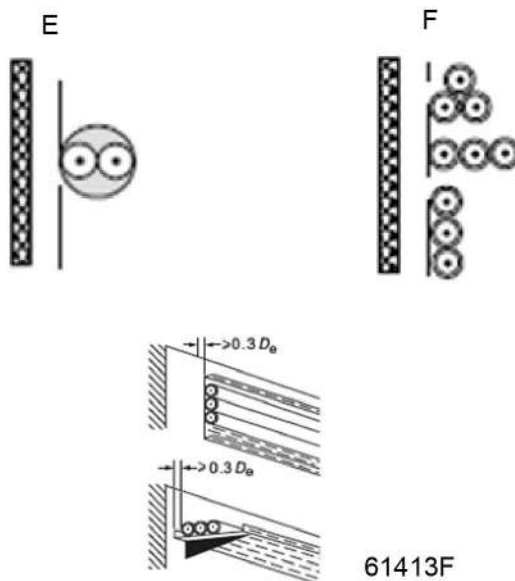
Fuse calculations for IEC are done according to IEC 60364–4–43 (Low voltage electrical installations — Part 4–43: protection against overcurrent).

Fuse calculations for cUL, CSA and UL: The indicated fuse size is the maximum fuse size in order to protect the motor.

Cable sizing according IEC

The tables below indicate the current carrying capacities of cables for commonly used installation methods, calculated according to standard IEC 60364-5-52 (Electrical installations of buildings part 5 - selection and erection equipment and section 52 - current carrying capacities in wiring systems).

The allowed currents are valid for XLPE (Cross-linked polyethylene) insulated cables with three loaded copper conductors and for maximum conductor temperature 90 °C, reference temperature 30 °C.



61413F

Installation method E or F, according table B.52.1;

Single-core or multi-core cables, touching in free air;

Clearance to wall not less than 0,3 times cable diameter for method E or one cable diameter for method F.

Maximum allowable current in function of the ambient temperature for installation method E (Multi-core cables with 3 loaded conductors and maximum conductor temperature 90 °C)

Cable section	30 °C	40 °C	45 °C	50 °C	55 °C
25 mm ²	< 127 A	< 116 A	< 110 A	< 104 A	< 97 A
35 mm ²	< 158 A	< 144 A	< 137 A	< 130 A	< 120 A
50 mm ²	< 192 A	< 175 A	< 167 A	< 157 A	< 146 A
70 mm ²	< 246 A	< 224 A	< 214 A	< 202 A	< 187 A
95 mm ²	< 298 A	< 271 A	< 259 A	< 244 A	< 226 A
120 mm ²	< 346 A	< 315 A	< 301 A	< 284 A	< 263 A
150 mm ²	< 399 A	< 363 A	< 347 A	< 327 A	< 303 A
185 mm ²	< 456 A	< 415 A	< 397 A	< 374 A	< 347 A
240 mm ²	< 538 A	< 490 A	< 468 A	< 441 A	< 409 A
300 mm ²	< 621 A	< 565 A	< 540 A	< 509 A	< 472 A

Maximum allowable current in function of the ambient temperature for installation method F (Single-core cables with 3 loaded conductors and maximum conductor temperature 90 °C)

Cable section	30 °C	40 °C	45 °C	50 °C	55 °C
25 mm ²	< 135 A	< 123 A	< 117 A	< 110 A	< 103 A
35 mm ²	< 169 A	< 154 A	< 147 A	< 139 A	< 128 A
50 mm ²	< 207 A	< 188 A	< 180 A	< 170 A	< 157 A
70 mm ²	< 268 A	< 244 A	< 233 A	< 220 A	< 204 A
95 mm ²	< 328 A	< 298 A	< 285 A	< 269 A	< 249 A
120 mm ²	< 383 A	< 349 A	< 333 A	< 314 A	< 291 A

Cable section	30 °C	40 °C	45 °C	50 °C	55 °C
150 mm ²	< 444 A	< 404 A	< 386 A	< 364 A	< 337 A
185 mm ²	< 510 A	< 464 A	< 443 A	< 418 A	< 388 A
240 mm ²	< 607 A	< 552 A	< 528 A	< 498 A	< 461 A
300 mm ²	< 703 A	< 639 A	< 611 A	< 576 A	< 534 A
400 mm ²	< 823 A	< 749 A	< 716 A	< 674 A	< 625 A

Cable calculation method for IEC

- Single supply cables (3 phases + PE):
 - Add 10 % to the total package current (Package current from the technical data sheets).
 - Install fuses on each supply cable which are smaller than or equal to the Max. fuse values from the technical data sheets or the instruction manual.
 - Connection between contactors must be made by means of copper bars.
- Parallel supply cables (2 x (3 phases + PE)):
 - Add 10 % to the total package current (Package current from the technical data sheets) and divide by 2.
 - Multiply the ampacity of the cables with the reduction factors per table B.52.17 of IEC 60364-5-52 (Method E or F), (*typically 0.8*).
 - Install fuses which are smaller than or equal to the Max. fuse values of the technical data sheets or the instruction manual.
- Size of the PE cable:
 - For supply cables up to 16 mm²: same size as supply cables.
 - For supply cables between 16 mm² and 35 mm²: 16 mm².
 - For supply cables larger than 35 mm²: half the size of the supply wires.

Always check the voltage drop over the cable (less than 5 % of the nominal voltage is recommended).

Example of supply cable calculation

$I_{tot} = 407 \text{ A}$, maximum ambient temperature is 45 °C, recommended fuse = 500 A.

- **Single supply cables** (3 phases + PE):
 - $I = 407 \text{ A} + 10 \% = 407 \times 1.1 = 447.7 \text{ A}$

The table for method E (multi-core cable), 90 °C cable temperature and ambient temperature of 45 °C allows a maximum current of 468 A for a 240 mm² cable. So use a multi-core cable of 3 x 240 mm² + 120 mm².
- **Parallel supply cable** 2 x (3 phases + PE):
 - $I = (407 \text{ A} + 10 \%)/2 = (407 \times 1.1)/2 = 224 \text{ A}$

For a single-core cable of 95 mm², method F, 90 °C cable temperature and ambient temperature of 45°C, the maximum current is 285 A x 0.8 = 228 A. So two (2) parallel (single-core) cables of 3 x 95 mm² + 50 mm² are sufficient.

For a multi-core cable of 95 mm², method E, 90 °C cable temperature and ambient temperature of 45°C, the maximum current is 259 A x 0.8 = 207 A. This 95 mm² cable would be too small, so you need to install a cable with a bigger section.

Looking at a multi-core cable of 120 mm², method E, 90 °C cable temperature and ambient temperature of 45°C, the maximum current is 301 A x 0.8 = 240 A. The right selection in this case would then be two (2) parallel cables of 3 x 120 mm² + 70 mm³.

Cable sizing according UL

The table below indicates the current carrying capacities of cables for commonly used installation methods, according to standard UL 508A. Ampacities of insulated conductors, copper 75°C.

AWG or kcmil	Ampacity
10	< 30 A
8	< 50 A
6	< 65 A
4	< 85 A
3	< 100 A
2	< 115 A
1	< 130 A
1/0	< 150 A
2/0	< 175 A
3/0	< 200 A
4/0	< 230 A
250	< 255 A
300	< 285 A
350	< 310 A
400	< 335 A
500	< 380 A

Note: The above table has been prepared for user convenience. Only the latest editions of the UL standard and its amendment(s) are to be considered as the official documents.

Cable calculation method for UL

Calculation method according UL 508A

- Single supply cables (3 phases + PE)::
 - Add 25 % to the total package current (Package current from the technical data sheets).
 - Install fuses on each supply cable which are smaller than or equal to the Max. fuse values from the technical data sheets or instruction manual.
 - Connection between contactors must be made by means of copper bars.
- Parallel supply cables (2 x (3 phases + PE)):

 - Add 25% to the total package current (Package current from the technical data sheets) and divide by 2.
 - Install fuses which are smaller than or equal to the Max. fuse values from the technical data sheets or instruction manual.

- Size of the PE cable
 - Use the maximum allowed ampacity of the selected supply cables and compare with the value in the table below according to UL508A.

Ampacity	Size of PE
< 90 A	8 AWG
< 125 A	6 AWG
< 150 A	6 AWG

Ampacity	Size of PE
< 200 A	4 AWG
< 225 A	2 AWG
< 400 A	1/0 AWG
< 500 A	1/0 AWG
< 800 A	2/0 AWG
< 1000 A	3/0 AWG

Note: The above table has been prepared for user convenience. Only the latest editions of the UL standard and its amendment(s) are to be considered as the official documents.

Always check the voltage drop over the cable (less than 5 % of the nominal voltage is recommended).

Example of supply cable calculation

$I_{\text{package}} = 128 \text{ A}$, maximum ambient temperature is $30 \text{ }^{\circ}\text{C}$, maximum fuse = 200 A

- **Single supply cables** (3 phases + PE):
 - $I = 128 \text{ A} + 25 \% = 128 \times 1.25 = 160 \text{ A}$
 - For AWG2/0, the maximum current is 175 A, which is sufficient => use AWG2/0
 - So use a cable of 3 x AWG2/0 + AWG4
- **Parallel supply cable** 2 x (3 phases + PE):
 - $I = (128 \text{ A} + 25 \%)/2 = (128 \times 1.25)/2 = 80 \text{ A}$
 - For AWG4, the maximum current is 85 A, which is sufficient => use AWG4
 - So use a cable of 2x (3 x AWG4 + AWG8)

4.5 Quality of safety components

When installing a remote emergency button, the following B10d values are advised:

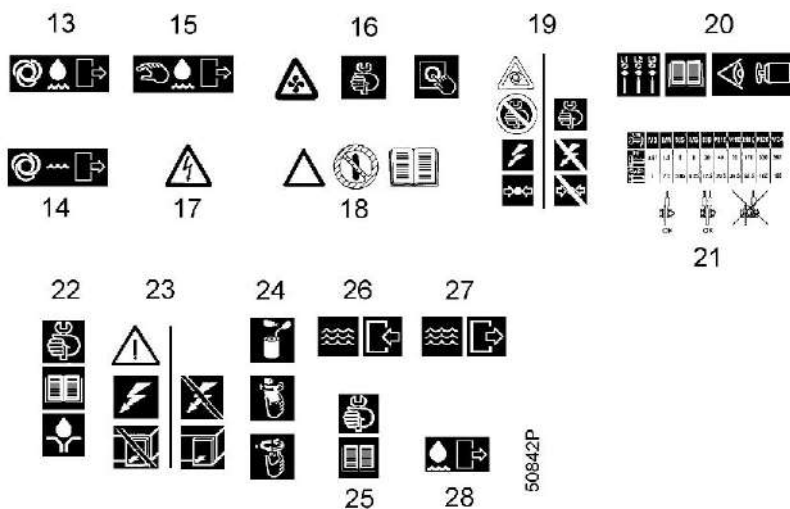
- Emergency stop button: **500 000**

4.6 Pictographs

Control panel of Elektronikon controller

Refer to the chapter Controller panel for pictographs of the Elektronikon controller.

Other locations



Reference	Description
13	Automatic condensate drain
14	Automatic condensate drain for optional oil/water separator (type OSD)
15	Manual condensate drain
16	Stop the compressor before maintenance or repair
17	Warning: under tension
18	Read Instruction book before starting the compressor
19	Switch off the voltage and depressurize the compressor before maintenance or repair
20	Before connecting the compressor electrically, consult the Instruction book for the motor rotation direction
21	Torques for steel (Fe) or brass (CuZn) bolts
22	Consult the Instruction book before greasing
23	Switch off the voltage before removing the protecting cover inside the electric cabinet
24	Oil the gaskets, screw on the filters and tighten by hand (approx. one half turn)
25	Consult the Instruction book before maintenance or repair
26	Cooling water inlet
27	Cooling water outlet
28	Oil outlet

4.7 Cooling water requirements

General

Cooling water needs to fulfill requirements in order to avoid problems of scaling, fouling, corrosion or bacterial growth. 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 guide line 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 anti-freeze products. They should be provided with suitable stabilizers and inhibitors.

Specifications also depend on the criteria mentioned below:

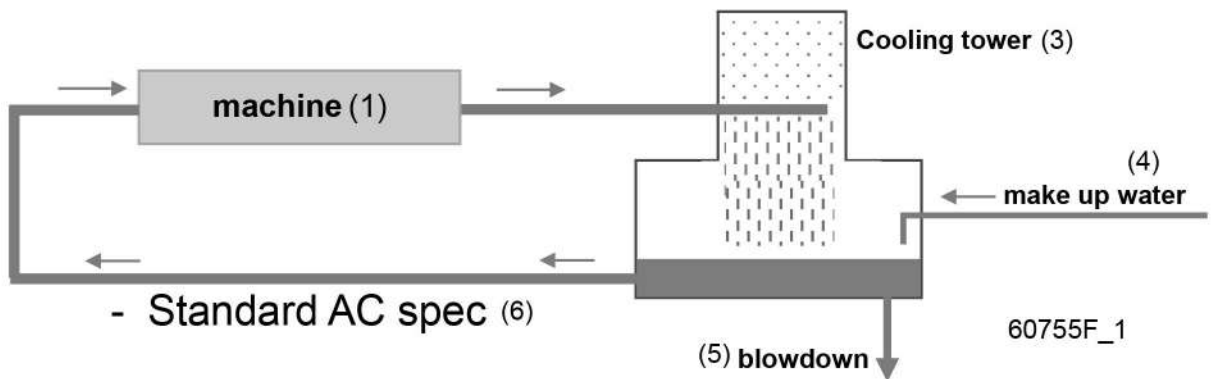
- the type of cooling circuit:

- open

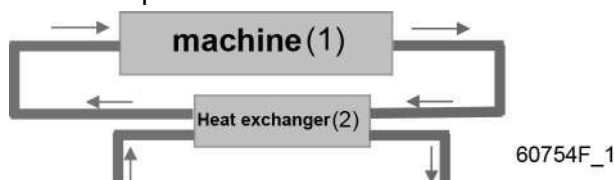
- Single Pass



- recirculation with cooling tower



- closed loop



Reference	Description
(1)	Machine
(2)	Heat exchanger
(3)	Cooling tower
(4)	Make up water
(5)	Blowdown
(6)	Standard Atlas Copco specification

- the application:

- standard (max water temperature 65°C / 149°F at the outlet)
- Energy Recovery (water temperature up to 95°C / 203°F)

A full instruction for handling cooling water data is available at Atlas Copco.

In case water is not in line with recommended values or if any doubt, please refer to Atlas Copco.

Technical specifications

	Parameter	Unit	Single Pass (65°C / 149°F)	Single Pass (95°C / 203°F)	Recirculating (65°C / 149°F)	Closed System (65°C / 149°F)	Closed System (95°C / 203°F)	
1	pH		6.8 - 9.3	6.8 - 9.3	6.8 - 9.3	7.5 - 9.3	7.5 - 9.3	
2	Conductivity	µS / cm	< 1500	< 600	< 4000	< 1500	50 - 600	
3	Total Dissolved Solids	mg / L	TDS to be measured for calculating RSI.					
4	Ca-hardness	ppm CaCO ₃	< 500	< 2	< 500	< 1000	< 50	
5	Total Alkalinity	ppm CaCO ₃	No limits indicated. To be measured for calculating RSI.					
6	Ryznar Stability Index (RSI)		5.6 - 7.5	N.A.	5.6 - 7.5	5.6 - 7.5	5.6 - 7.5	
7	Chlorine	ppm	< 0.5	—	< 0.5	—	—	
8	Chlorides	ppm	< 500 (*)	< 100	< 500 (*)	< 500 (*)	< 100	
9	Nitrates	ppm	No limits indicated. To be measured for calculating RSI.					
10	Sulphates	ppm	< 1000	< 200	< 1000	< 400	< 200	
11	Chemical Corrosion Index		< 5	< 1	< 5	< 1	< 1	
12	Iron	ppm	< 1	< 0.2	< 1	< 1	< 0.2	
13	Manganese	ppm	< 0.2	< 0.05	< 0.2	< 0.2	< 0.05	
14	Copper	ppm	< 1	< 0.2	< 1	< 1	< 0.2	
15	Ammonium	ppm	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	
16	Suspended Solids (max 10µ)	ppm	< 10	< 1	< 10	< 10	< 1	
17	Oil or Grease	ppm	< 1	< 1	< 1	< 1	< 1	
18	Biology	CFU / mL	< 10 ⁵	< 10 ³	< 10 ⁵	< 10 ³	< 10 ³	

Remarks on the technical specifications

	Parameter	Remarks
1	pH	For stainless steel systems without other materials, pH can be down to 6. For closed loop systems, higher pH values are possible
2	Conductivity	Conductivity and TDS linked with conversion factor (theoretical factor possible, but practical determination recommended at least once)
6	Ryznar Stability Index (RSI)	Recommended actions : see table for RSI
7	Chlorine	or shock treatment max. 2 ppm for 30 min/day
8	Chlorides	(*) Limit 200 ppm applicable when RSI < 5.6 or RSI > 7.5

	Parameter	Remarks
10	Sulphates	Rejection < 2000 ppm. To be measured for calculating RSI.
11	Chemical Corrosion Index	Index = (Chlorides + Sulphates + Nitrates) / (M-Alkalinity) (all expressed in meq/l)
15	Ammonium	limit not applicable for Cu-free systems
16	Suspended Solids (max 10µ)	No particles > 10µ allowed. (Particles <0.5µ not considered).
18	Biology	Anaerobic biology in closed system never allowed.

Ryznar Stability Index (RSI)

The Ryznar Stability Index (RSI) is a parameter for predicting whether water will tend to dissolve or precipitate calcium carbonate. The adhesion of scaling deposits 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 :

$$RSI = 2 * pH_s - pH$$

Symbol	Explanation
pH	Measured pH (at room temperature) of water sample
pH _s	pH at saturation

The pH_s is calculated by using :

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

Symbol	Calculation
A	$(^{10}\log(TDS) - 1) / 10$
B	$13.12 \times ^{10}\log(^{\circ}C + 273) + 34.55$
C	$^{10}\log(Ca^{2+}) - 0.4$ (Ca ²⁺ expressed as ppm CaCO ₃)
D	$^{10}\log(M\text{-Alkalinity})$ (M-Alkalinity expressed as ppm CaCO ₃)

RSI and chloride limitation

Single Pass system

RSI	Chloride limit	Water condition	Maximum 65°C / 149°F	Maximum 95°C / 203 °F
RSI < 3.9	200 ppm	Very high scale formation	Water cannot be used.	Not applicable.

RSI	Chloride limit	Water condition	Maximum 65°C / 149°F	Maximum 95°C / 203 °F
4.0<RSI<5.5	200 ppm	High scale formation	Regular control and descaling operation necessary. Not recommended for plate heat exchangers	Not applicable.
5.6<RSI<6.2	350 ppm	Slight scale formation	Water treatment not necessary. Occasional inspection recommended.	Not applicable.
6.3<RSI<6.8	500 ppm	Neutral water	Water treatment not necessary. Occasional inspection recommended.	Water treatment not necessary. Occasional inspection recommended.
6.9<RSI<7.5	350 ppm	Slight corrosion	Water treatment not necessary. Occasional inspection recommended.	Water treatment not necessary. Occasional inspection recommended.
7.6<RSI<9.0	200 ppm	Strong corrosion	Regular control necessary. Avoid interruption of operation	Regular control necessary. Avoid interruption of operation
9.1<RSI<11	200 ppm	Very strong corrosion	Regular control necessary. Avoid interruption of operation	Regular control necessary. Avoid interruption of operation
RSI>11	200 ppm	Very strong corrosion	Regular control necessary. Avoid interruption of operation	Regular control necessary. Avoid interruption of operation

Recirculating system, with cooling tower

RSI	Chloride limit	Water condition	Maximum 65°C / 149°F
RSI<3.9	200 ppm	Very high scale formation	Water cannot be used.
4.0<RSI<5.5	200 ppm	High scale formation	Regular control and descaling operation necessary. Not recommended for plate heat exchangers
5.6<RSI<6.2	350 ppm	Slight scale formation	Water treatment not necessary. Occasional inspection recommended.
6.3<RSI<6.8	500 ppm	Neutral water	Water treatment not necessary. Occasional inspection recommended.

RSI	Chloride limit	Water condition	Maximum 65°C / 149°F
6.9<RSI<7.5	350 ppm	Slight corrosion	Water treatment not necessary. Occasional inspection recommended.
7.6<RSI<9.0	200 ppm	Strong corrosion	Regular control necessary. Use of corrosion inhibitor recommended
9.1<RSI<11	200 ppm	Very strong corrosion	Regular control necessary. Use of corrosion inhibitor recommended
RSI>11	200 ppm	Very strong corrosion	Water cannot be used.



Closed loop system

RSI	Chloride limit	Water condition	Maximum 65°C / 149°F and 95°C / 203°F
RSI<3.9	200 ppm	Very high scale formation	Water cannot be used.
4.0<RSI<5.5	200 ppm	High scale formation	Treat water to reduce scaling character
5.6<RSI<6.2	350 ppm	Slight scale formation	Water treatment not necessary. Occasional inspection recommended.
6.3<RSI<6.8	500 ppm	Neutral water	Water treatment not necessary. Occasional inspection recommended.
6.9<RSI<7.5	350 ppm	Slight corrosion	Water treatment not necessary. Occasional inspection recommended.
7.6<RSI<9.0	200 ppm	Strong corrosion	Regular control necessary. Use of corrosion inhibitor recommended
9.1<RSI<11	200 ppm	Very strong corrosion	Regular control necessary. Use of corrosion inhibitor recommended
RSI>11	200 ppm	Very strong corrosion	Water cannot be used.

5 Operating instructions

5.1 Initial start-up

Warning

	The operator must apply all relevant Safety precautions .
	Switch off the voltage before making any adjustment.

Outdoor/altitude operation

If the compressor is installed outdoors or if the air inlet temperature can be below freezing point, precautions must be taken. In this case, and also if operating at high altitude, consult Atlas Copco.

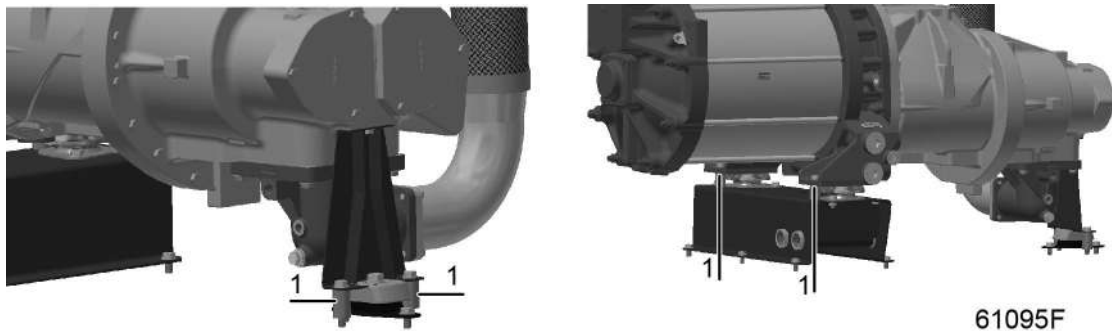
Moving/lifting

The compressor can be moved by a lift truck using the slots in the frame. 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 not to damage the compressor. The lifting equipment must be placed in such a way that the compressor is lifted perpendicularly. Lift gently and avoid twisting.

General preparations

Step	Action
1	Install the compressor, see the sections Dimension drawing , Installation proposal and Main fuses and supply cables .
2	Stick labels near the control panel to warn the operator that: <ul style="list-style-type: none"> • the compressor may start automatically after a voltage failure • the compressor is automatically started and stopped • the compressor may be remotely controlled
3	A number of VCI (Volatile Corrosion Inhibitor) plates are provided inside the bodywork to protect the compressor against corrosion. Remove the plates.
4	If the compressor has not run for the past 6 months, it is required to improve the lubrication of the compressor element before starting. Fill up the compressor element as described in section Oil change (paragraph: Filling the compressor element with oil) .
5	<p>Check the oil level. The oil level should reach the bottom of the oil filler neck (FC).</p> <div style="text-align: center;"> <p>61094F FC GI</p> </div> <p>The minimum level should reach the oil sight-glass (GI) when the compressor is stopped. If needed, top up the oil. Take care that no dirt drops into the oil system. Refit and tighten the filler plug (FC).</p>

Protection during transport



Transport fixtures

Step	Action
1	The gear casing, motor support and air receiver supports are secured to the frame, immobilizing the vibration dampers during transport.
2	Remove the bushes (1) from the gear casing supports and the motor support.
3	Remove the brackets fitted next to the air receiver supports.

Electric cabinet


Step	Action
1	Check that the electrical connections correspond to the local codes. The installation must be earthed and protected by fuses in all phases. An isolating switch must be fitted.
2	Check the wires on the transformers for correct connection.
3	Check the setting of the circuit breakers.

In the cabinet door, a filter is foreseen. Sufficient ventilation is guaranteed.

Water circuit

Step	Action
1	Check that the cooling water drain valves (customer's installation) in the inlet and outlet lines are closed.
2	Check that the water shut-off valves (customer's installation) are open.
3	Open the water regulating valve and check for water flow.


Start up

	On Full-Feature compressors, switch on the voltage 4 hours before starting in order to energize the crankcase heater of the refrigerant compressor.
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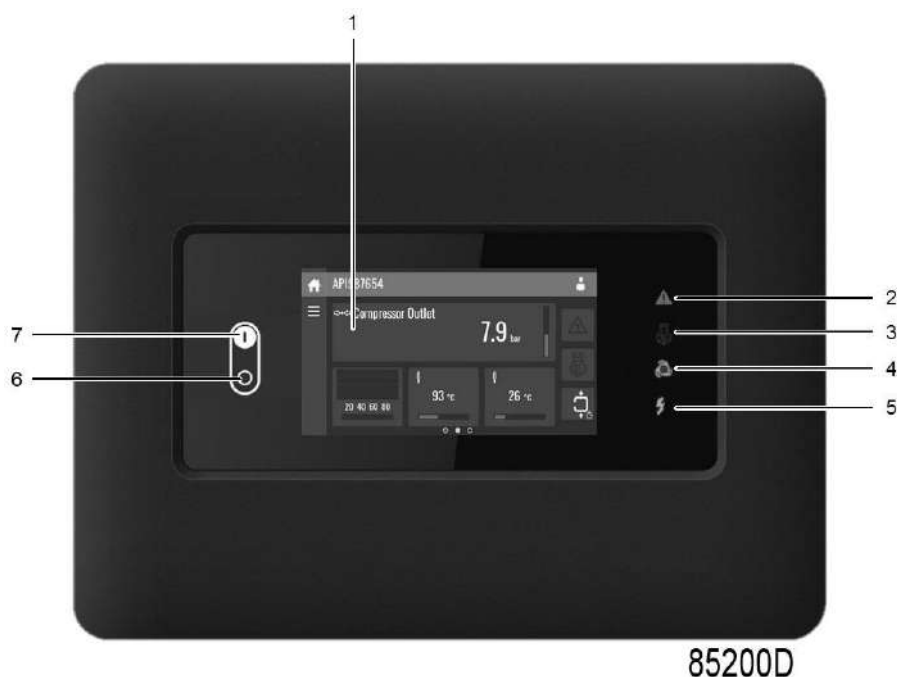
Step	Action
1	Close the drain valves (see the section Cooling and condensate system).
2	Switch on the voltage.
3	Start the compressor and stop it immediately. Check the rotation direction of the drive motor while the motor is coasting to a stop. Have confirmation of correct rotation direction of the motor, look at the Elektronikon readout of the vessel pressure. The vessel pressure should have slightly risen during the short period of operation. On air-cooled compressors, check the rotation direction of the fan motor. The fan is visible through the grating in the air inlet panel (see section Dimension drawing). The correct rotation direction is indicated by arrows on the fan inlet plate. On Full-Feature compressors, open the door of the dryer compartment and check the rotation direction of the fan motors of the condenser. The correct rotation direction is indicated by an arrow.
4	If the rotation direction is wrong, press the emergency stop button, switch off the voltage and reverse two incoming electric lines. If the rotation direction of the fan motor is wrong, consult your Atlas Copco customer centre.
5	Run the compressor for a few minutes and check that it is operating normally.

5.2 Before starting

Warning

	<p>The operator must apply all relevant safety precautions. If the water system was drained, close the drain valves. Switch off your mobile phone when in the vicinity of a VSD compressor which is under tension.</p>
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Control panel



Reference	Designation	Function
1	Touchscreen	Shows the compressor operating condition and a number of icons to navigate through the menu. 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 compressor is running in automatic operation.
5	Voltage sign	Indicates that the voltage is switched on.
6	Stop button	This button stops the compressor.
7	Start button	This button starts the compressor. The operation sign (4) lights up. The controller is operative.

Procedure

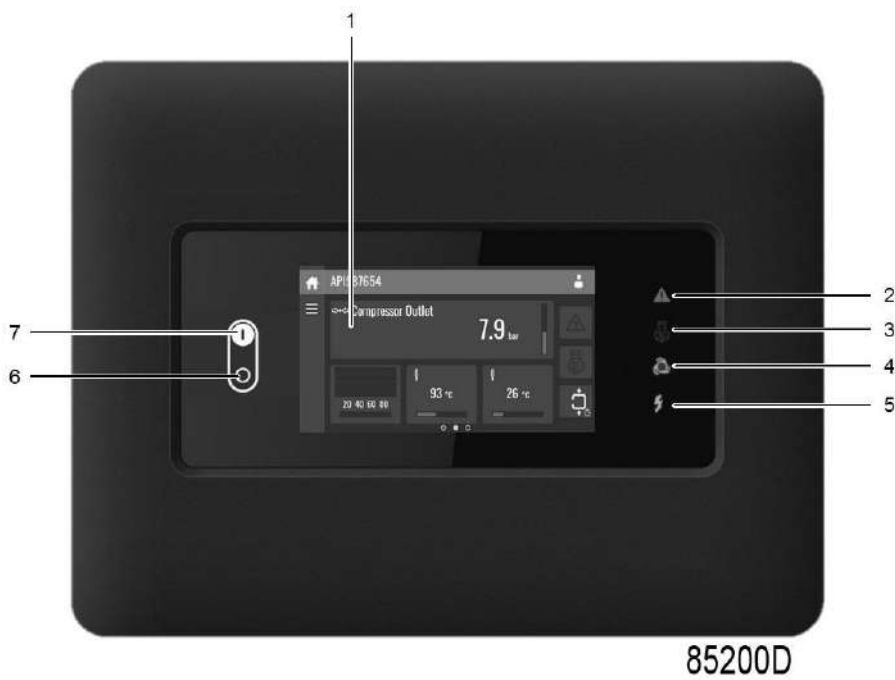
Step	Action
1	Switch on the voltage. The voltage sign (5) lights up.
2	Close the condensate drain valves.
3	Open the air outlet valve.
4	Check the oil sight-glass. Minimum level should reach the oil sight-glass when the compressor is stopped.
5	Open the water shut-off valves and the water regulating valve.

5.3 Starting

Warning

	The operator must apply all relevant Safety precautions .
	On Full-Feature compressors, switch on the voltage 4 hours before starting in order to energize the crankcase heater of the refrigerant compressor.

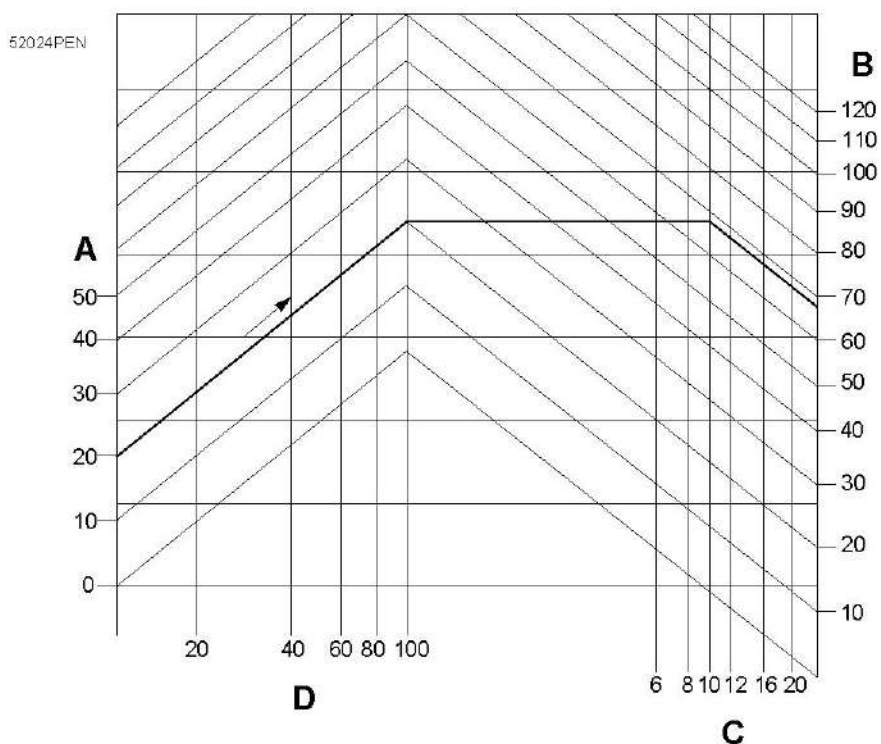
Control panel



Reference	Designation	Function
1	Touchscreen	Shows the compressor operating condition and a number of icons to navigate through the menu. 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 compressor is running in automatic operation.
5	Voltage sign	Indicates that the voltage is switched on.
6	Stop button	This button stops the compressor.
7	Start button	This button starts the compressor. The operation sign (4) lights up. The controller is operative.

Procedure

Step	Action
1	Press the start button. The compressor starts running in unloaded condition. The operation sign (4) lights up.
3	On water-cooled compressors, regulate the cooling water flow with the compressor running loaded. Adjust the water flow to obtain the most suitable air temperature at the outlet of the compressor elements. The temperature must be between 2 and approx. 7 °C (4 and approx. 13 °F) above the relevant temperature in the diagram.



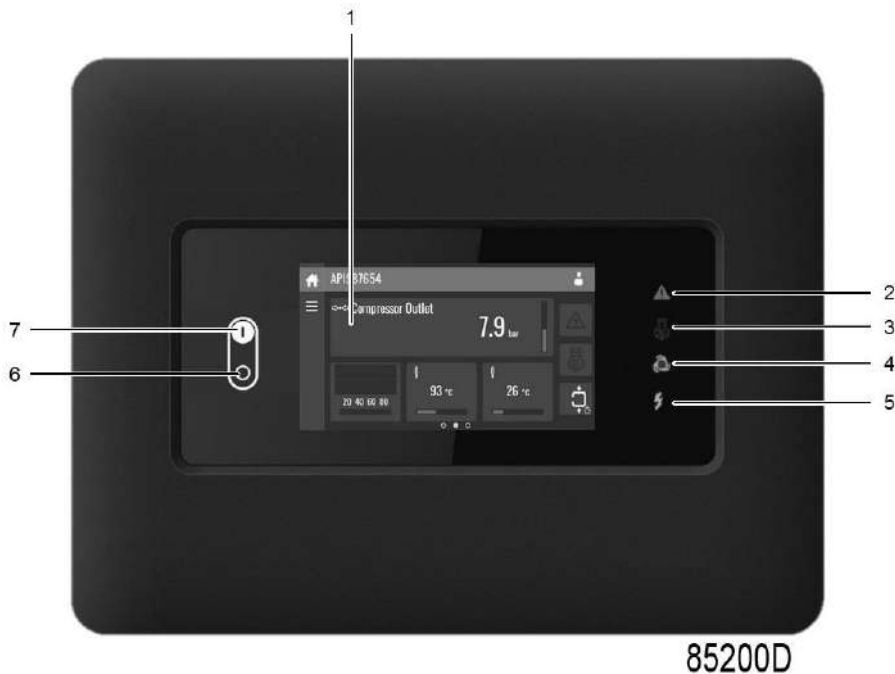
Reference	Name
A	Air inlet temperature in °C
B	Condensation temperature in °C
C	Effective working pressure in bar
D	Relative air humidity in %

5.4 During operation

Warning


	The operator must apply all relevant Safety precautions .
	The operator should immediately stop the machine in case of oil leaks internally in the machine as well as externally and consult a competent technician to resolve the cause. The machine should not be restarted before the problem has been remedied.
	The load cycle of the compressor must be limited to maximum two cycles per minute.

Description




Reference	Designation	Function
1	Touchscreen	Shows the compressor operating condition and a number of icons to navigate through the menu. 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 compressor is running in automatic operation.
5	Voltage sign	Indicates that the voltage is switched on.
6	Stop button	This button stops the compressor.
7	Start button	This button starts the compressor. The operation sign (4) lights up. The controller is operative.

1. Check the readings on the display.
2. On Full-Feature compressors, regularly check the pressure dew-point on the display of the control panel. The pressure dew-point will deviate from nominal if the air inlet conditions or volume differ from nominal.

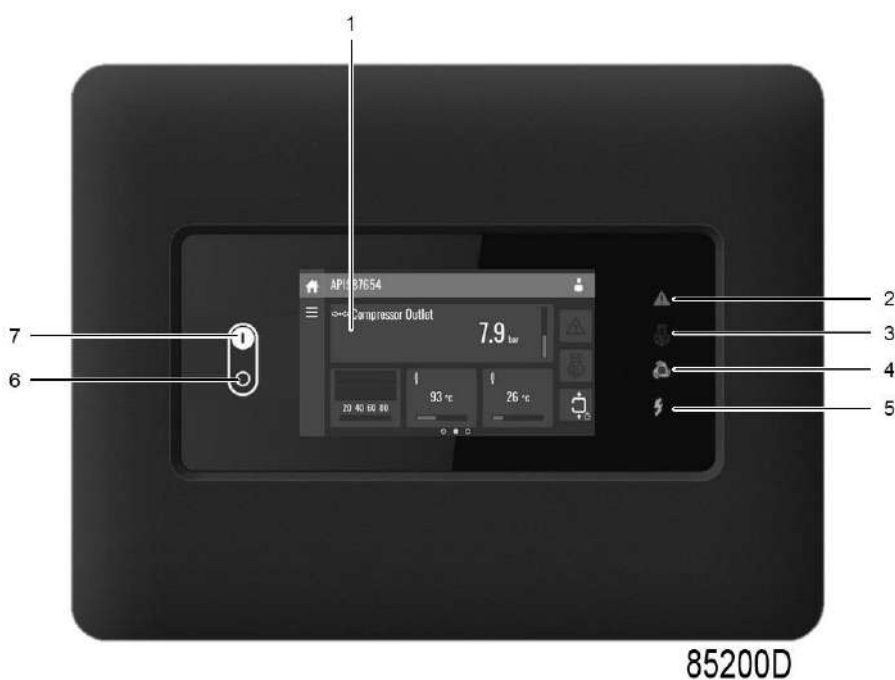
	If the compressor is stopped, it may start automatically.
---	---

5.5 Checking the display

Warning

	Before carrying out any maintenance, repair work or adjustment, stop the compressor, press the emergency stop button and switch off the voltage. Close the air outlet valve and open the manual condensate drain valve.
---	---

Description

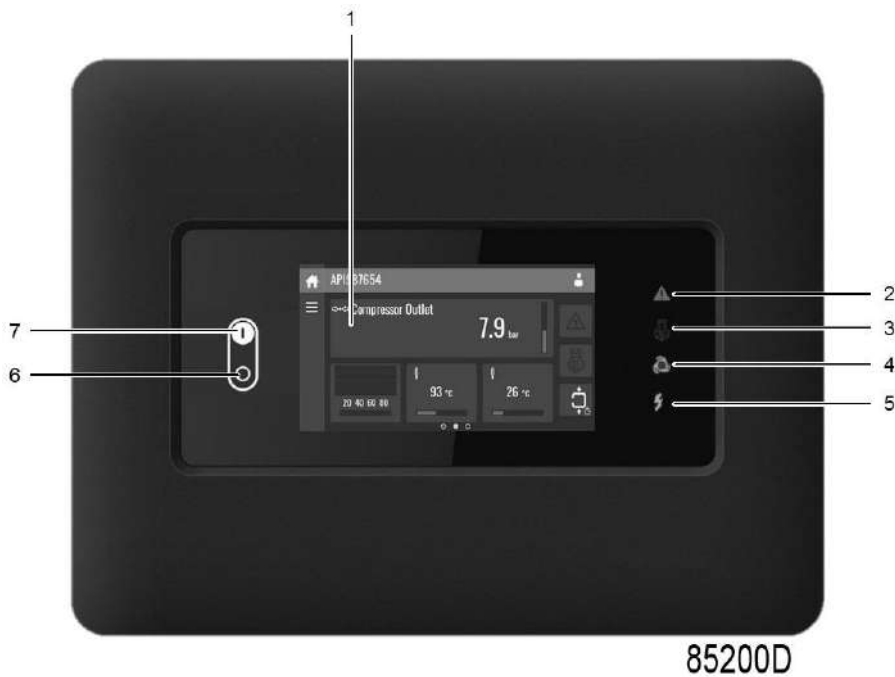


Reference	Designation	Function
1	Touchscreen	Shows the compressor operating condition and a number of icons to navigate through the menu. The screen can be operated by touch.
2	Warning sign	Flashes in case of a shut-down, is lit in case of a warning condition.
3	Service sign	Is lit when service is needed.
4	Operation sign	Is lit when the compressor is running in automatic operation.

Reference	Designation	Function
5	Voltage sign	Indicates that the voltage is switched on.
6	Stop button	This button stops the compressor.
7	Start button	This button starts the compressor. The operation sign (4) lights up. The controller is operative.

1. Regularly check the display for readings and messages. Normally, the main display is shown.
2. Always check the display and remedy the trouble if the warning sign (2) is alight or blinks. The display will show a service message 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. Regularly check the Inputs and Outputs menus for a quick look at the compressor status.


5.6 Stopping



Reference	Designation	Function
1	Touchscreen	Shows the compressor operating condition and a number of icons to navigate through the menu. 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 compressor is running in automatic operation.
5	Voltage sign	Indicates that the voltage is switched on.
6	Stop button	This button stops the compressor.

Reference	Designation	Function
7	Start button	This button starts the compressor. The operation sign (4) lights up. The controller is operative.

Procedure

	Frequently stopping the compressor using the emergency stop button may damage the compressor. Only use the emergency stop button in case of emergency.
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Step	Action
1	Press stop button (6). The compressor will coast down and then stop.
2	To stop the compressor in case of emergency, press the emergency stop button. The warning sign (2) starts flashing. After remedying the trouble, unlock the emergency stop button by pulling it back.
3	Close the air outlet valve.
4	Open the condensate drain valves.
5	Switch off the voltage.
6	On water-cooled compressors, close the water shut-off valves.
7	On water-cooled compressors, if the compressor is installed in a room where freezing temperatures are expected, drain the cooling system by opening the drain valves in the water inlet and outlet pipes (customer's installation).

5.7 Taking out of operation

Disconnecting the compressor

At the end of the service life of the compressor, proceed as follows:

Step	Action
1	Stop the compressor and close the air outlet valve.
2	Switch off the voltage and disconnect the compressor from the mains. On VSD compressors, wait at least 6 minutes as hazardous high voltage remains on the condensers of the start and speed regulation unit.
3	Depressurize the compressor by opening the drain valve and loosening the oil filler plug one turn.
4	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.
5	Drain the oil and condensate circuits. On water-cooled compressors, drain the water circuits.
6	Disconnect the compressor condensate piping from the condensate drain net.
7	On water-cooled compressors, disconnect the cooling water pipes from the compressor.

5.8 Use of air receiver


Instructions

1. This vessel may only be used for separating oil from compressed air and this within the limits of pressure and temperature as specified on the nameplate.
2. A safety valve must be installed by the user to protect the vessel against overpressure. The protection must ensure that the pressure will not permanently exceed the maximum allowable working pressure.
3. The user must take precautions to ensure that the vessel operates in the temperature range between -10 °C (14 °F) and 120 °C (248 °F).
4. To guarantee a proper operation, the intake air must be filtered.
5. A draining valve must be foreseen by the user to protect the vessel against overfilling by oil.
6. The vessel must be mounted in an installation that will operate at atmospheric pressure.
7. The user must avoid storing/installing the separator in badly ventilated rooms, near heating sources or inflammable substances. The user must protect the vessel by a casing in case of outdoor erection.
8. Pipe connections must be mounted tension free by means of flexible couplings.
9. The vessel must be mounted with the foreseen attachment points. In areas with risk of earthquakes or installations subjected to reaction forces and moments of inertia from supporting constructions, anchor pads must be used.
10. The vessel must be foreseen with an earthing.
11. The user must make the customer aware of possible high surface temperature of the vessel.
12. The user must provide the customer with instructions regarding safe emptying, cleaning, inspecting (also internally), maintenance and daily operation.
13. After the vessel has been opened, the original bolts must be used for closing. Herewith the maximum torque has to be respected.
14. No modifications may be carried out on the vessel by welding, drilling or by any other way of mechanical operation, without written permission of the manufacturer.
15. This vessel was designed and manufactured respecting the functional specifications. An inspection of the inside is for this reason not really necessary as long as the vessel is used within the limits and applications for which it has been designed. However it is possible that local legislation requires an internal inspection.

6 Maintenance

6.1 Preventive maintenance schedule

Warning

	<p>Before carrying out any maintenance, repair work or adjustment, proceed as follows:</p> <ul style="list-style-type: none"> • Stop the compressor. • Press the emergency stop button. • Close the air outlet valve and open the manual condensate drain valves. • For compressors equipped with electronic water drains, press the test buttons on top of the electronic drains until the air system between the air receiver and the outlet valve is fully depressurized. • Switch off the voltage. • Open and lock the isolating switch. <p>The operator must apply all relevant Safety precautions.</p>
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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.

General

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

Preventive maintenance schedule

	<p>The maintenance schedule is prior to the maintenance warnings displayed on the controller. It is the responsibility of the owner to carry out the required maintenance at the appropriate moment.</p>
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Period	Running hours	Operation
Daily	8	Check readings on display.
Daily	8	Check that condensate is discharged during loading.
Daily	8	Check oil level. Before starting, the level should be above the sight-glass.
3-Monthly	--	Check for air-, water- and oil leakages.
3-Monthly	--	Check the contamination on the air- and oil-cooler surface, clean externally if necessary.
3-Monthly	--	Check the condition of the cooling fan assembly.
3-Monthly	--	Check the condition of the air filters and cubicle filters, replace if necessary.
See Oils	--	Change oil.

Contact Atlas Copco to schedule the following maintenance intervals:

- Yearly or 8000 hours

- 2 Yearly or 16000 hours
- 5 Yearly or 40000 hours



When operating in a dusty atmosphere, inspect the air filters more frequently. Always use Atlas Copco filters. The separator element must also be replaced when the pressure difference over the element exceeds 0.8 bar (12 psi). Check the pressure drop when the compressor is running with a stable working pressure. Damaged flexibles must be replaced immediately.

Service agreements

Atlas Copco Customer Centres have a range of service agreements to suit your needs:

- An Inspection Plan
- A Preventive Maintenance Plan
- A Warranty+ Plan
- A Total Responsibility Plan

Contact your Customer Centre to set up a tailor-made service agreement. It will ensure optimum operational efficiency, minimize downtime and reduce the total life cycle costs.

Service plan

A number of service operations are grouped (called Level A, Level B, Level C...). Each level stands for a number of service actions to be carried out at the time intervals programmed in the Elektronikon regulator.

When a level is reached, a message will appear on the screen. After carrying out all service actions, the interval timers must be reset using the "Reset" key in the "Service" menu. Consult your Atlas Copco Service Centre.

6.2 Motors

Warning



- Stop the compressor and switch off the voltage. The operator must apply all relevant [Safety precautions](#).

Fan motors

The bearings of the fan motors are greased for life. The fan motor must be replaced after 40000 operating hours.

Bearing maintenance

The motor bearing is lubricated by oil injection. Re-greasing is not necessary.

6.3 Oil specifications

Atlas Copco Roto-Xtend Duty Fluid

Atlas Copco Roto-Xtend Duty Fluid is a high-quality synthetic lubricant for oil-injected scroll and screw compressors which keeps the compressor in excellent condition. Roto-Xtend Duty Fluid can be used for compressors operating at ambient temperatures between 0 °C (32 °F) and 46 °C (115 °F) (see section [Service kits](#)).

Important



Never mix oils of different brands or types.

6.4 Oil change

Warning

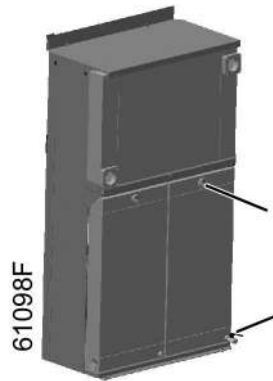


The operator must apply all relevant [Safety precautions](#).

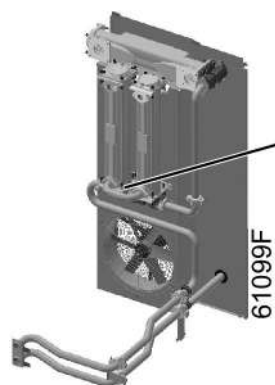
Vent, filler and drain plugs



Oil drain plugs on compressor elements, gearbox and drive motor



Vent and drain plugs on air-cooled compressors



Filler and drain plugs on water-cooled compressors


Procedure

Step	Action
1	Run the compressor until warm. Stop the compressor. Close the air outlet valve. Switch off the voltage. Wait a few minutes. Depressurize by unscrewing the plug only one turn to permit any pressure in the system to escape.
2	Loosen the vent plugs on top of the oil coolers.
3	Drain the oil by removing the drain plugs. Plugs are fitted on the: <ul style="list-style-type: none"> • Air receiver / Oil separator with drain point • Element outlet • Drive motor • Gearbox • Oil coolers of air-cooled compressors • Oil filter housing • Hose between the oil filter housing and oil coolers of water-cooled compressors Tighten the plugs after draining.

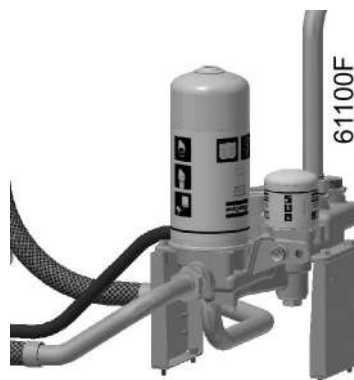
Step	Action
4	Remove the filler plug. Fill the air receiver / oil separator with oil until the level reaches the filler opening. Refit and tighten the plug. Tighten the vent plug of the oil cooler.
5	Disconnect the air inlet hose from the inlet valve. Pour 10 liter of oil into the compressor stage. Reinstall the air inlet hose.
6	Run the compressor for a few minutes to allow the oil cooler by-pass valve to open. Stop the compressor. Wait a few minutes.
7	Depressurize the system by unscrewing the plug only one turn to permit any pressure in the system to escape. Remove the plug. Fill the air receiver / oil separator with oil until the level reaches the filler opening. Tighten the filler plug.
8	After carrying out all service actions in the relevant "Service Plan", reset the service warning. Refer to the <i>Service menu</i> section.

6.5 Oil filter change

Warning

	<p>Stop the compressor and switch off the voltage. The operator must apply all relevant Safety precautions.</p>
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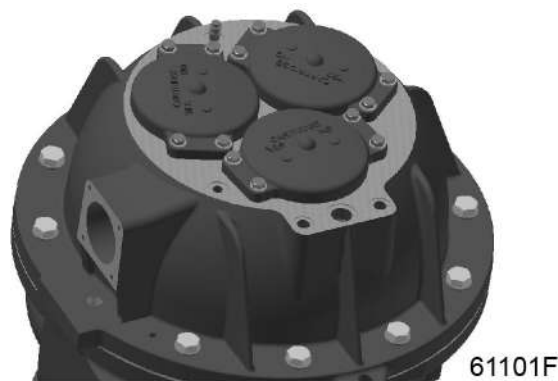
Position of oil filters



Procedure

Step	Action
1	Stop the compressor, close the air outlet valve and switch off the voltage. Wait a few minutes and depressurize the air receiver by unscrewing the oil filler plug (of the air receiver) only one turn to permit any pressure in the system to escape.
2	Use an oil pan to avoid possible oil spillage. Unscrew the oil filters only one turn and wait a few minutes to let the oil of the filter flow back into the oil separator. Remove the oil filters.
3	Clean the filter seats on the manifold. Oil the gaskets of the new filters and screw the filters into place until the gaskets contact their seats. Then tighten with a maximum torque of 10 Nm.
4	Tighten the oil filler plug (of the air receiver).
5	Reset the service warning after carrying out all service actions in the relevant Service Plan. Refer to the <i>Service menu</i> section.

6.6 Oil separator change



Procedure

Step	Action
1	Stop the compressor, close the air outlet valve and switch off the voltage. Wait a few minutes and depressurize the air receiver by unscrewing the oil filler plug (of the air receiver) only one turn to permit any pressure in the system to escape.
2	Unscrew the bolts fixing the small vessel covers marked to have an oil separator element below them.
3	Remove the oil separator cartridges and replace them by new cartridges. Mind correct angular positioning of the cartridges.
4	Tighten the oil filler plug (of the air receiver).
5	Reset the service warning after carrying out all service actions in the relevant Service Plan. Refer to the <i>Service menu</i> section.

6.7 Storage after installation

Procedure

Run the compressor, e.g. once a week, until warm plus 5–10 minutes.



If the compressor is going to be stored without running from time to time, protective measures must be taken. Consult the Atlas Copco Customer Centre.

6.8 Service kits

General

Service kits comprise all parts needed for servicing components and offer the benefits of genuine Atlas Copco parts while keeping the maintenance budget low. All service kits are indicated in the relevant Parts Lists.

Atlas Copco Roto-Xtend Duty Fluid

Roto-Xtend Duty Fluid can be ordered in the following quantities:

- 5-litre can: 2901 1700 00
- 20-litre can: 2901 1701 00
- 209-litre drum: 2901 1702 00

See [Oil specifications](#).

7 Integrated dryer

7.1 Introduction

Description

The air dryer removes moisture from compressed air by cooling the air to near freezing point. This causes water to condense. The condensate is automatically drained. The air is warmed up before leaving the dryer (approx. 5 °C (9 °F) below the incoming air temperature).

The air dryer cools down the compressed air to the preset temperature. Any formed condensate is automatically drained.

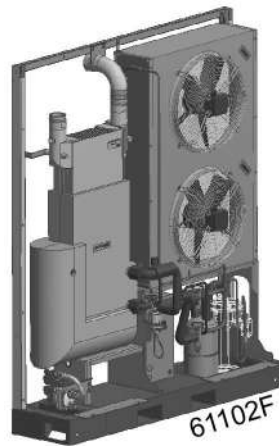
The electronic regulator keeps the pressure dew-point stable at no load by opening or closing the solenoid valve of the hot-gas by-pass.

On air-cooled dryers, the condenser has a cooling fan controlled by a pressure sensor.

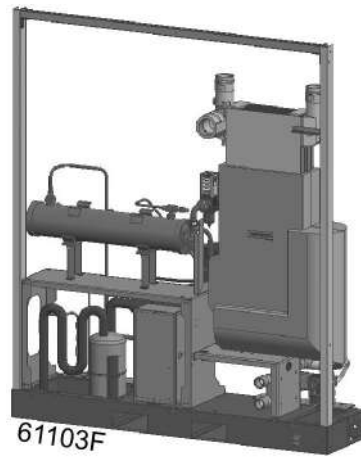
Water-cooled dryers have a water regulating valve in the water outlet of the condenser.

The descriptions mentioned in this book are valid for both air-cooled and water-cooled dryers.

General view



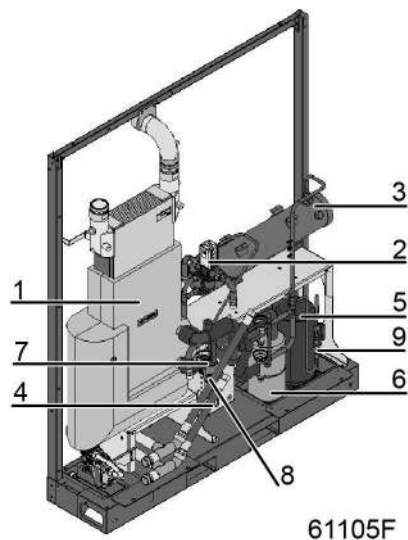
Air-cooled dryer



61103F

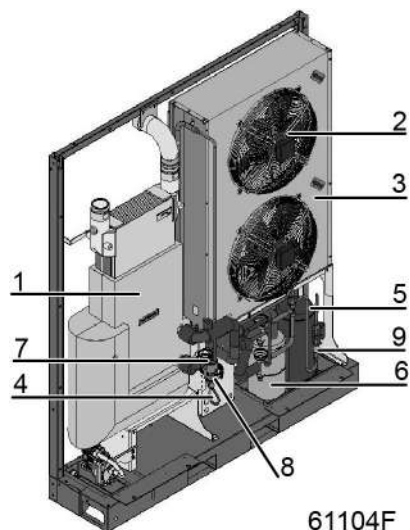
Water-cooled dryer

Position of components



61105F

Water-cooled dryer

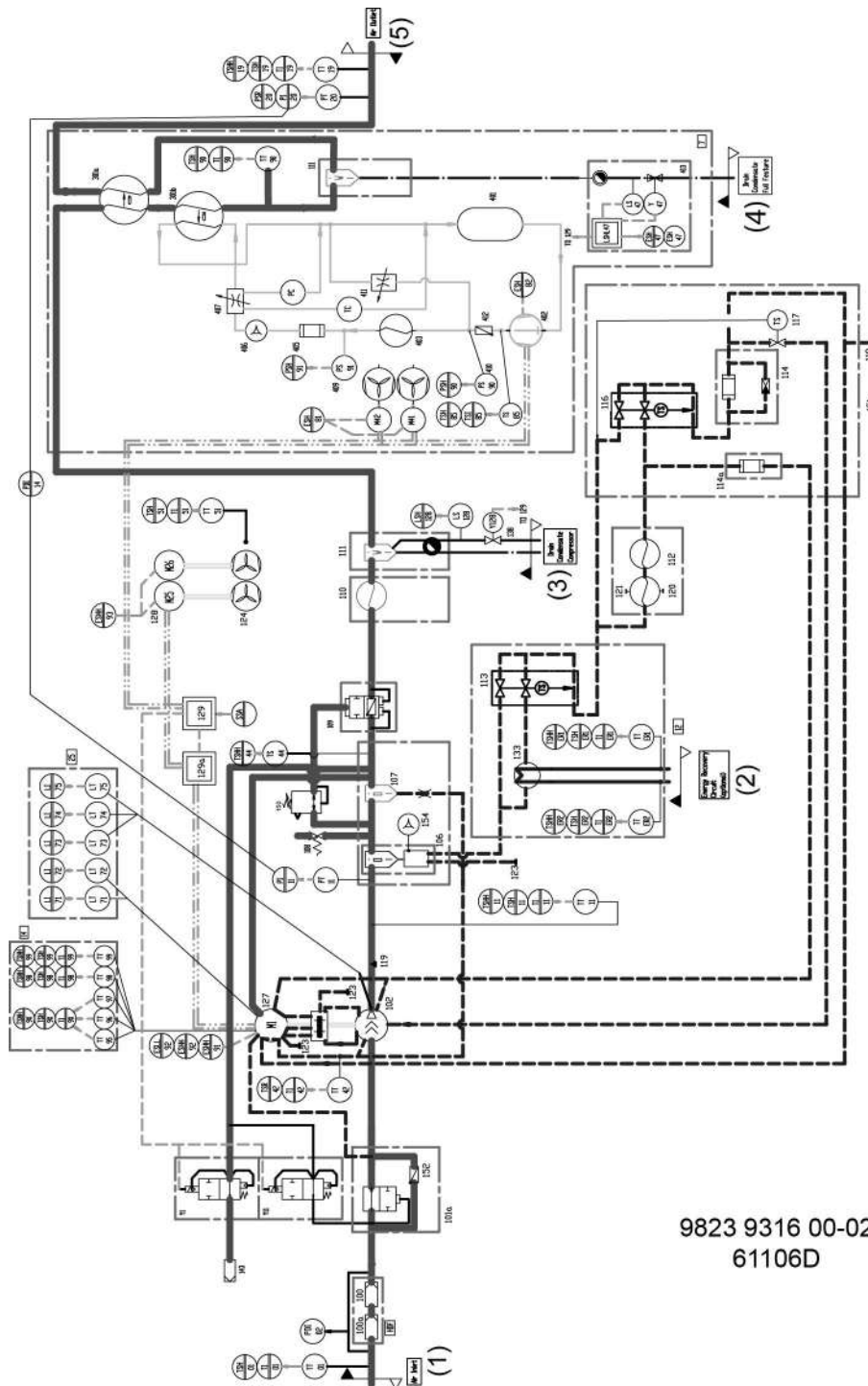


Air-cooled dryer

1	Heat exchanger
2	On air-cooled dryers, cooling fan(s) On water-cooled dryers, water regulating valve
3	On air-cooled dryers, air-cooled condenser On water-cooled dryers, water-cooled condenser
4	Sight-glass
5	Refrigerant compressor
6	Liquid separator
7	Thermostatic expansion valve
8	Refrigerant dryer/filter
9	Non-return valve

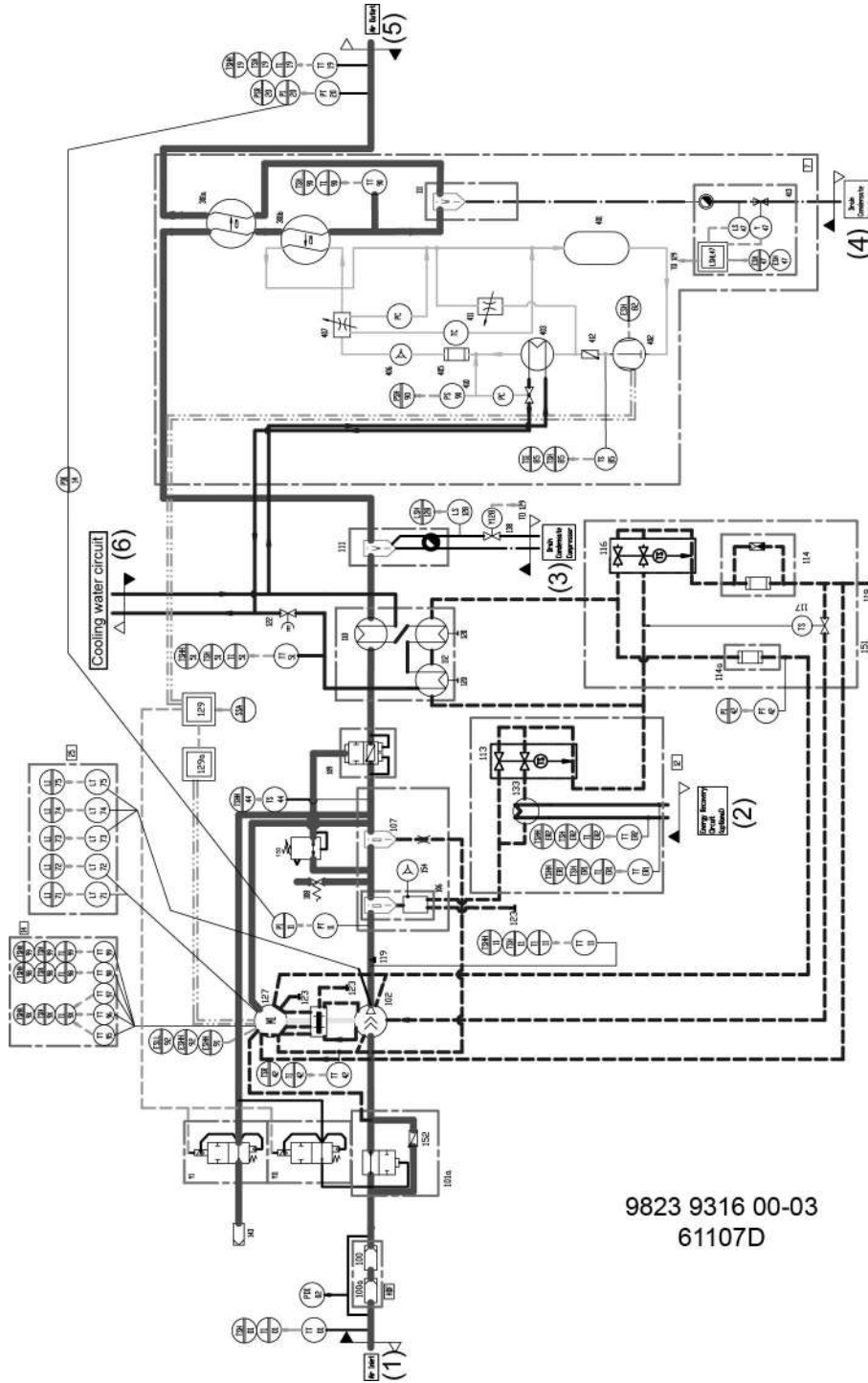
7.2 Air and refrigerant system

Flow diagram



9823 9316 00-02
61106D

Air-cooled dryer



9823 9316 00-03
61107D

Water-cooled dryer

Reference	Name
301a	Air/air heat exchanger
301b	Air/refrigerant heat exchanger
111	Condensate separator
410	Non-return valve

Reference	Name
403	Air-cooled condenser (air-cooled version) Water-cooled condenser (water-cooled version)
408	Fan blower (air-cooled version) Water regulating valve (water-cooled version)
407	Thermostatic expansion valve
90	Pressure shut-down switch
405	Refrigerant dryer/filter
401	Liquid separator
412	Hot-gas by-pass valve
402	Refrigerant compressor
411	Solenoid valve
406	Sight-glass
89, 90	Temperature sensor
90	Pressure sensor
413	Automatic drain

Description air system

Compressed air enters heat exchanger (301a) and is cooled by the outgoing, cold, dried air. Water in the incoming air starts to condense. The air then flows through heat exchanger/ evaporator (301b) where the refrigerant evaporates causing the air to be further cooled to close to the evaporating temperature of the refrigerant. More water in the air condenses. The cold air then flows through separator (111) where all the condensate is separated from the air.

The condensate collects in the electronic water drain (413) and is automatically drained. The cold, dried air flows through heat exchanger (301a), where it is warmed up by the incoming air to approx. 5 °C (9 °F) below the incoming air temperature.

Condensation in the air net cannot occur unless the air is cooled to below the pressure dew-point indicated on the control panel.

Description refrigeration system

Refrigerant compressor (402) delivers hot, high-pressure refrigerant gas, which flows through condenser (202), where most of the refrigerant condenses.

The liquid flows through refrigerant dryer/filter (405) to thermostatic expansion valve (407) via sight-glass (406). The refrigerant leaves the thermostatic expansion valve at evaporating pressure.

The refrigerant enters evaporator (301b), where it withdraws heat from the compressed air by further evaporation at constant pressure. The heated refrigerant leaves the evaporator and is sucked in by refrigerant compressor (402) via liquid separator (401).

The dryers are provided with a sight-glass (406). The sight-glass allows the refrigerant flow in the line to be checked. During normal operation, the liquid flow must be clear. In general, vapor bubbles indicate a shortage of refrigerant. Note that fluctuations in the load may cause bubbles to pass in the flow for a short time. The centre of the glass is provided with a moisture indicator which is green when the liquid refrigerant is free of moisture. It will turn yellow when the

refrigerant contains moisture, indicating that the refrigerant dryer/filter (405) needs to be replaced.

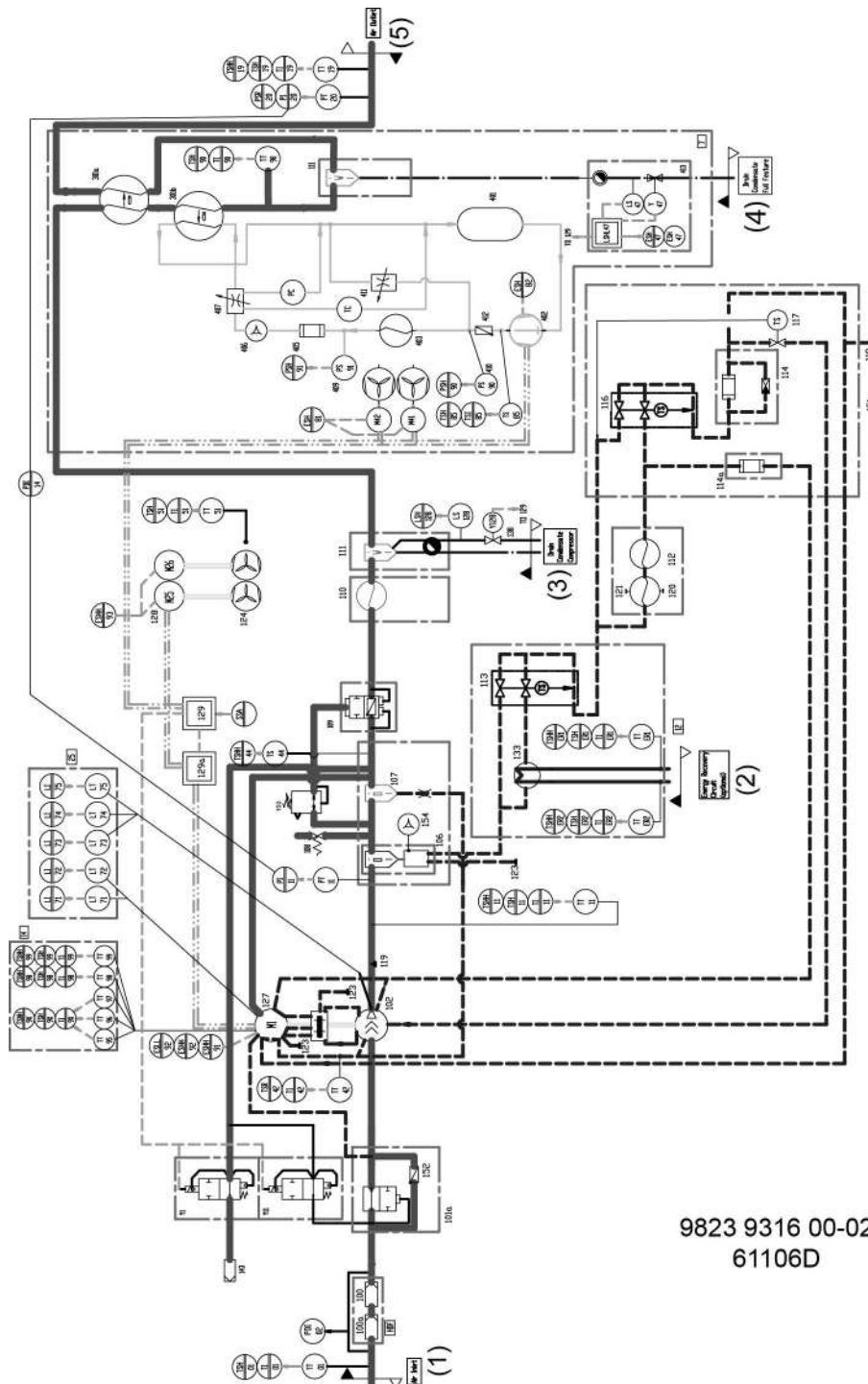
Refrigerant gas specifications

Please check the data plate of the integrated dryer for the type designation and refer to the table below.

Dryer	Cooling method	Refrigerant gas	Global Warming Potential	Amount (kg)	Amount (lbs)	Tonnes of CO2 equivalent
ID 365	air	R410A	2088	3.8	8.4	7.9
ID 525	air	R410A	2088	5.8	12.8	12.1
ID 365	water	R410A	2088	4.2	9.3	8.8
ID 525	water	R410A	2088	4.8	10.6	10.0

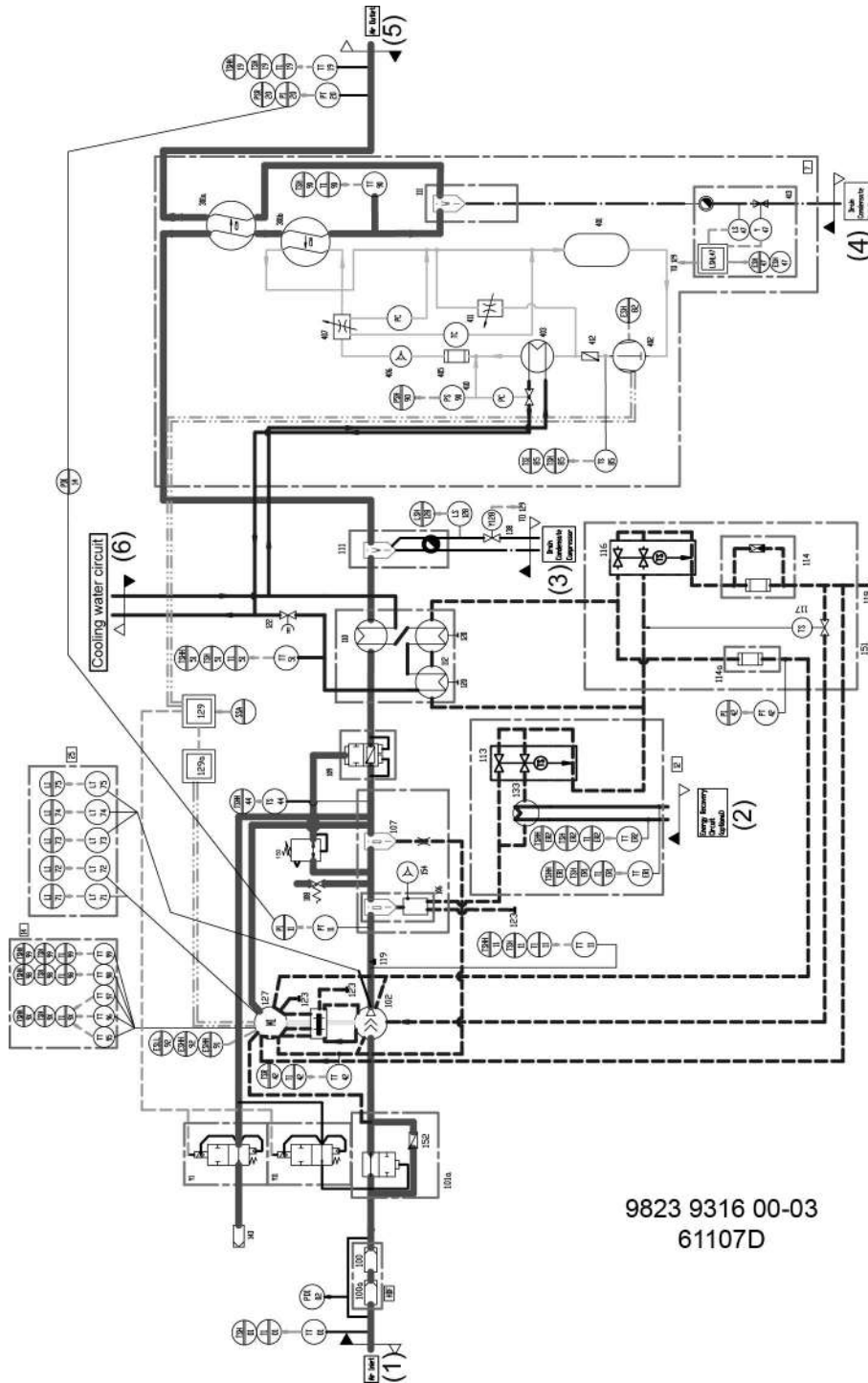
7.3 Automatic regulation system

Air and refrigerant flow diagram



9823 9316 00-02
61106D

Air and refrigerant flow diagram for air-cooled dryer



9823 9316 00-03
61107D

Air and refrigerant flow diagram for water-cooled dryer

Description

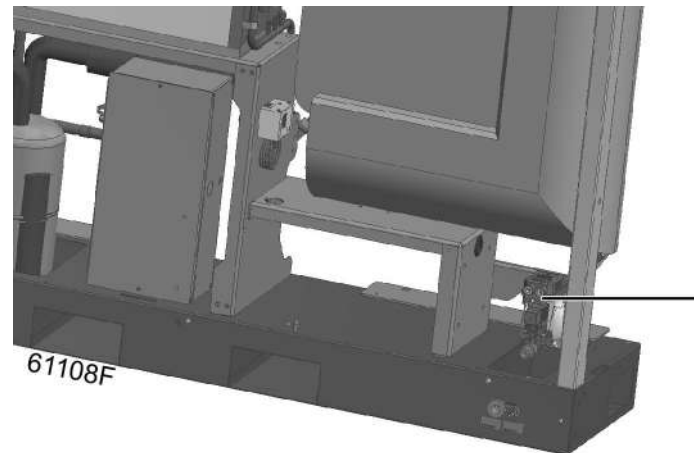
The condenser pressure must be kept as constant as possible to obtain stable operation, therefore:

- For air-cooled versions, the regulator stops and starts the cooling fans
- For water-cooled versions, the water regulating valve in the water outlet regulates the cooling water flow

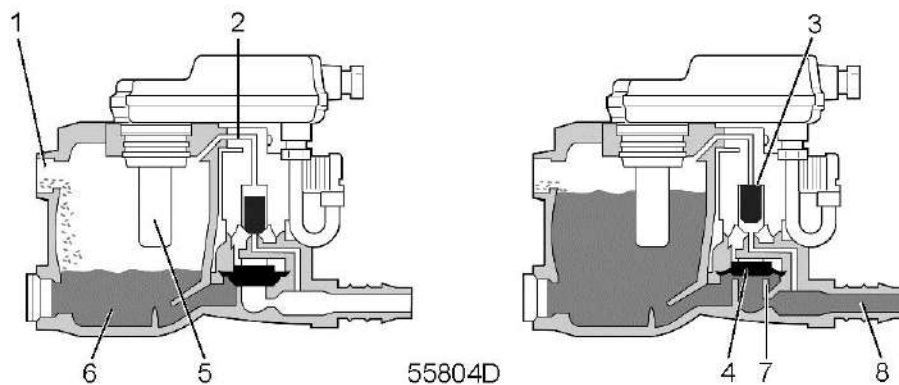
When at partial or no load the dew-point pressure stays below the set-point, the regulator opens solenoid valve (411) and hot, high-pressure gas is fed through hot-gas by-pass valve (412) to the evaporator circuit to prevent the evaporator temperature from dropping below 0 °C (32 °F).

7.4 Condensate drain system

Description



Electronic water drain location



Electronic water drain functioning

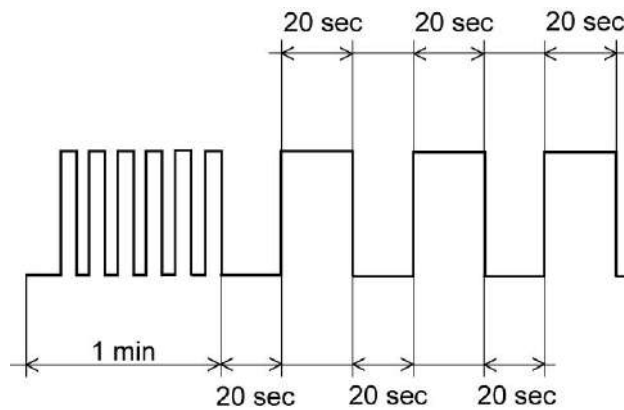
1	Inlet
2	Supply line
3	Pilot valve
4	Diaphragm
5	Sensor
6	Collector
7	Valve seat
8	Outlet

The condensate enters the electronic water drain via inlet (1) and accumulates in collector (6). A capacitive sensor (5) continuously measures the liquid level.

The pilot valve (3) is activated as soon as the collector is filled up to a certain level. Diaphragm (4) opens outlet (8), discharging the condensate.

When the collector has been emptied, the outlet closes quickly without wasting compressed air.

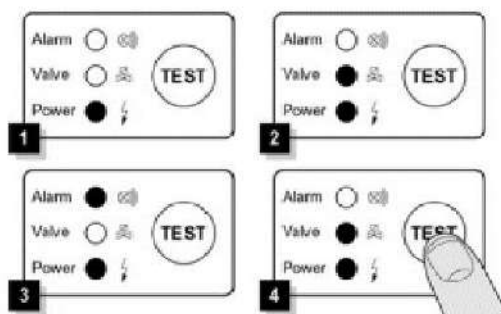
When the controller registers a malfunction, the red alarm LED on the control panel of the electronic water drain starts flashing, a warning appears on the display of the regulator and the electronic drain valve will automatically change to the alarm mode, opening and closing the valve according to a sequence as shown below. This condition continues until the fault is remedied. If the fault is not remedied automatically, maintenance is required.



59646D

Drain frequency during alarm condition

Testing the Electronic water drain



51342F

Control panel

Briefly press the TEST button and check that the valve opens for condensate discharge.

Checking the alarm signal

- Press and hold the test button for at least 1 minute.
- Check that the alarm LED flashes.

- Check that a warning is generated on the display of the regulator.
- Release the test button.

7.5 Electrical system

Dryer protection

The high-pressure shut-down switch stops the compressor motor when the pressure in the refrigerant circuit reaches the upper set-point of the switch.

After tripping:

- The switch must be reset manually by pressing its reset knob and by pressing the Cancel/escape key on the controller.

The compressor motor has a built-in thermic protection. If the thermic protection trips, the compressor motor will be stopped. The compressor will restart when the motor windings have cooled down, which may take up to 3 hours.

7.6 Regulation

General description

The electronic regulator automatically controls the dryer, i.e.:

- keeps the pressure dew-point stable
- stops the dryer whenever necessary
- restarts the dryer when required

In general, the regulator has following functions:

- controlling the dryer
- protecting the dryer

Controlling the dryer

In order to keep the condenser pressure constant:

- For air-cooled versions, the regulator starts and stops the fan motor(s) as necessary.
- For water-cooled versions, the water regulating valve regulates the cooling water flow.

Protecting the dryer

Shut-down

- In case the pressure in the refrigerant circuit is too high, the dryer will be stopped.
- For air-cooled versions, the dryer will also be stopped if there is an overload of a fan motor.

Warning

- A warning message appears if the electronic water drain is malfunctioning.

7.7 Maintenance instructions

Important



The dryers contain refrigerant HFC.
 When the automatic operation LED is lit, starting and stopping of the dryer are controlled automatically.
 If the dryer start/stop timer is active, the dryer may start automatically, even if it was stopped manually.

Safety precautions

When handling refrigerant R404A or R410A (refer to dryer data plate), all applicable safety precautions must be observed. The following points are stressed:

- Contact of refrigerant with the skin will cause freezing. Special gloves must be worn and, if there is contact 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; therefore, safety glasses must be worn.
- Refrigerants R404A and R410A are poisonous. Do not inhale refrigerant vapors. Check that the working area is adequately ventilated.

When removing the side panels of the dryer, be aware that internal elements such as the pipes can reach a temperature of 120 °C (248 °F). Therefore, wait until the dryer has cooled down before removing the side panels.

Before starting any maintenance or repairs, switch off the voltage. Isolate the dryer from the air net.

Local legislation

Local legislation may impose that:

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

Warranty and product liability

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

Service agreements

Customer Centres have a range of service agreements to suit your needs:

- An Inspection Plan.
- A Preventive Maintenance Plan.
- A Total Responsibility Plan.

Contact your Customer Centre to arrange a tailor-made service agreement. This will ensure optimum operational efficiency, minimize downtime and reduce the total life cycle costs.


General

The following remarks should be kept in mind:

- Keep the dryer clean.
- On air-cooled dryers, brush or blow off the finned surface of the condenser regularly.
On water-cooled dryers, regularly check for water leaks.
- Inspect and clean the electronic water drain once a year .

7.8 Problem solving

Attention

	Use only authorized parts. Any damage or malfunction caused by the use of unauthorized parts is not covered by Warranty or Product Liability. Apply all relevant Safety precautions .
	Before carrying out any maintenance or repairs on the dryer, stop the dryer and switch off the voltage. Open the isolating switch to prevent an accidental start. Isolate the dryer from the air net.

Faults and remedies (general)

	Condition	Fault	Remedy
-	Pressure dew-point too high	Ambient temperature too high	Check and correct; if necessary, draw cooling air via a duct from a cooler place or relocate dryer
		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
		Automatic drain system clogged	Have the system cleaned
-	Condenser pressure too high or too low on air-cooled dryers	Fan control switch out of order	Replace
		Fan or fan motor out of order	Check fan/fan motor
		Ambient temperature too high	Check and correct; if necessary, draw cooling air via a duct from a cooler place or relocate dryer
		Condenser externally clogged	Clean condenser
-	Condenser pressure too high or too low on water-cooled dryers	Cooling water system clogged	Have cooling water system cleaned
		Cooling water temperature too high	Check and correct as necessary
-	Compressor stops or does not start	Electric power supply to compressor is interrupted	Check and correct as necessary

	Condition	Fault	Remedy
		Motor overload protection of refrigerant compressor motor has tripped	Have motor checked For resetting: see the section Electrical system
		High-pressure switch tripped	See above
-	Condensate drain remains inoperative	Automatic drain system clogged	Flush the assembly by opening manual drain valve. Have system inspected
-	Condensate trap continuously discharges air and water	Automatic drain system out of order	Have system checked. If necessary replace automatic drain
-	Evaporator pressure is too high or too low at unload	Hot-gas by-pass valve incorrectly set or out of order	Have hot-gas by-pass valve adjusted
		Condenser pressure too high or too low	See above
		Shortage of refrigerant	Have circuit checked for leaks and recharged

8 Adjustments and servicing procedures

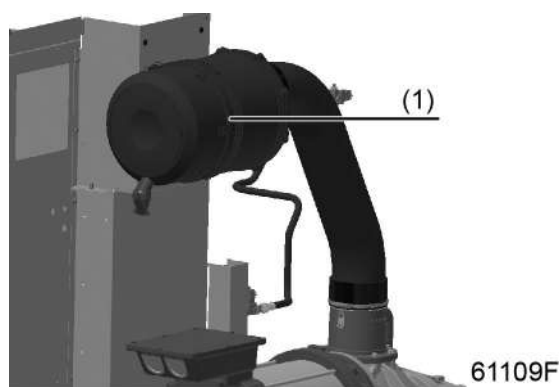
8.1 Air filters

Warning



Stop the compressor, close the air outlet valve, press the emergency stop button and switch off the voltage. The operator must apply all relevant [Safety precautions](#).

Position of air filters



Air filters (1)

Procedure

Step	Action
1	Remove the filter elements (1).
2	Fit the new filter elements (1).
3	Reset the service warning after carrying out all service actions in all applicable service plans. Refer to the service menu section of the regulator.

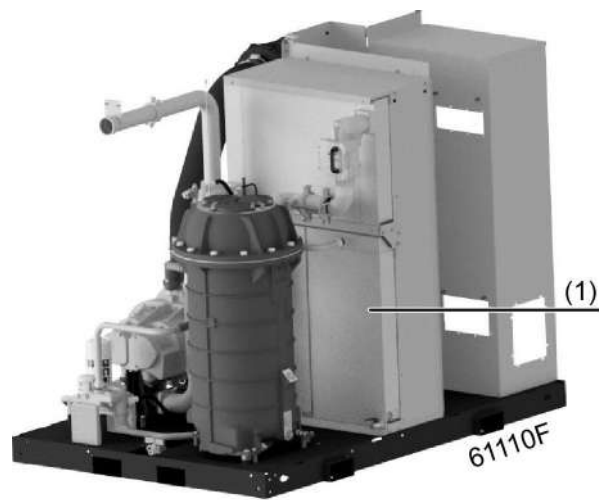
8.2 Coolers

Warning

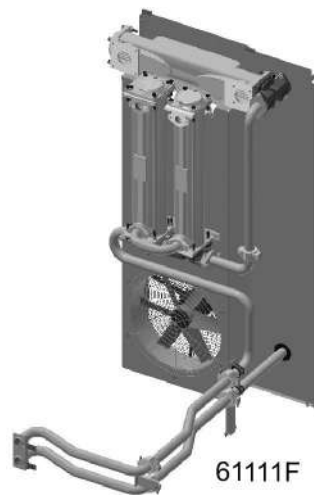


Stop the compressor, press the emergency stop button and switch off the voltage. The operator must apply all relevant [Safety precautions](#).

Procedure

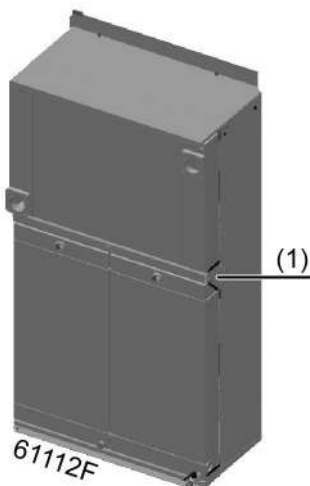


Air-cooled cooler block



Water-cooled cooler block

On air-cooled compressors proceed as follows:




Service panel of the air-cooled cooler

Step	Action
1	Open the service door at the cooler side.
2	Remove the service panel (1) at the cooler side.
3	Remove any dirt from the coolers with a fibre brush, brush in the direction of the fins. Also remove any dirt from the fans.
4	Clean the coolers 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).
5	If it is necessary to clean the coolers with a cleaning agent, consult Atlas Copco.
6	Mount the service panel.
7	Close the door.

On water-cooled compressors, consult the Atlas Copco Customer Centre if it is necessary to clean the coolers.

8.3 Safety valve

Warning

	Stop the compressor and switch off the voltage. The operator must apply all relevant Safety precautions .
	Never run the compressor without safety valves.
	No adjustments are allowed.

Testing



Location of safety valve on air-cooled compressor


The valve can be tested on a separate compressed air line.

Consult the Atlas Copco Customer Centre if the valve does not open at the correct pressure (see the section [Settings of safety valve](#)).

9 Problem solving

9.1 Problem solving

Warning

	<p>Before carrying out any maintenance, repair work or adjustment, stop the compressor, press the emergency stop button and switch off the voltage. Close the air outlet valve and open the manual condensate drain valves.</p>
	<p>Open and lock the isolating switch.</p>
	<p>The operator must apply all relevant Safety precautions.</p>

Control panel



Reference	Name
1	Start button
2	Stop button
3	Warning sign
4	Service sign
5	Operation sign
6	Voltage sign

Faults and remedies

A service message appears on the display

Stop the compressor and carry out the indicated service actions. Reset the message. Refer to the *Service menu* section.

A shut-down warning message appears on the display

The warning sign (3) will light up indicating that the temperature at the outlet of the compressor elements is too high. The message disappears as soon as the cause of the problem is remedied.

Unit is shut down

The warning sign (3) will flash indicating either that the outlet temperature is too high or that the motor overload relay has tripped. Remedy the problem.
 Move the cursor to the action button *Menu* and push the Enter key. Using the Scroll keys, move the cursor to the protections icon. Push the Enter key. Move the cursor to the blinking icon and press the Enter key. Move the cursor to the Reset button and press the enter key again.

Multiple shut-down

If there are multiple sequential failures with short time intervals on a specific shut-down functionality, consult your Atlas Copco Customer Centre.

Excessive oil consumption

Have the compressor inspected by your Atlas Copco Customer Centre.

Condition	Fault	Remedy
Condensate is not discharged from condensate traps during loading.	Discharge pipe of condensate trap clogged.	Check and correct as necessary.
	WSD (electronic water drain) malfunctioning.	Consult Atlas Copco.


Condition	Fault	Remedy
Compressor air delivery or pressure below normal.	Air consumption exceeds air delivery of compressor.	Check equipment connected.
	Choked air filters.	Replace filters.
	Air leakage.	Check and correct.

Condition	Fault	Remedy
Compressor element outlet temperature or delivery air temperature above normal.	Oil level too low.	Check and correct.
	Oil coolers clogged.	Refer to the <i>Coolers</i> section.
	Air cooler clogged.	Refer to the <i>Coolers</i> section.
	On air-cooled compressors, insufficient cooling air or cooling air temperature too high.	Check and correct as necessary.
	On water-cooled compressors, cooling water flow too low.	Increase flow.
	On water-cooled compressors, restriction in cooling water system.	Consult Atlas Copco Customer Centre.

10 Technical data

10.1 Readings on display

Important

	The readings are valid when operating under reference conditions. See the section Reference conditions.
	Normally the main display is shown, indicating the actual air outlet pressure and the actual compressor status. The arrow down key allows the operator to call up other information such as actually measured pressures and temperatures.

Important readings

Compressor outlet pressure	bar(e) (psig)	Depends on running speed and working pressure
Pressure drop over air filters	bar	Below 0.05
Pressure drop over air filters	psi	Below 0.73
Pressure difference over oil separator	bar	Below 0.8
Pressure difference over oil separator	psi	Below 12
Oil injection pressure at the compressor elements	bar(e) (psig)	Depends on working pressures
Compressor outlet temperature, air-cooled Pack compressors	°C	Approx. 28
Compressor outlet temperature, air-cooled Pack compressors	°F	Approx. 82
Compressor outlet temperature, air-cooled Full-Feature compressors	°C	Approx. 25
Compressor outlet temperature, air-cooled Full-Feature compressors	°F	Approx. 77
Compressor outlet temperature, water-cooled compressors	°C	Approx. 22
Compressor outlet temperature, water-cooled compressors	°F	Approx. 72
Cooling air inlet temperature of Pack compressor	°C	Below 46
Cooling air inlet temperature of Pack compressor	°F	Below 115
Cooling air inlet temperature of Full-Feature compressor	°C	Below 46
Cooling air inlet temperature of Full-Feature compressor	°F	Below 115
Cooling air inlet temperature of Pack compressor (high ambient temperature variant)	°C	Below 50
Cooling air inlet temperature of Pack compressor (high ambient temperature variant)	°F	Below 122
Cooling water temperature	°C	Below 50
Cooling water temperature	°F	Below 122
Pressure dew-point	°C	Approx. 3
Pressure dew-point	°F	Approx. 37

10.2 Reference conditions

Reference conditions

Absolute inlet pressure	bar(a)	1
Absolute inlet pressure	psi	14.5
Relative air humidity	%	0
Air inlet temperature	°C	20
Air inlet temperature	°F	68
Nominal working pressure		See Compressor data
Cooling medium inlet temperature	°C	20
Cooling medium inlet temperature	°F	68
Cooling water temperature rise	°C	10
Cooling water temperature rise	°F	18

10.3 Limits

Limits



The compressor will automatically adapt its minimum working speed when necessary to protect the compressor element bearings. This will improve the lubrication of the bearings and thus will result in a longer lifetime of the compressor element.

Minimum air inlet/ambient temperature	°C	0
Minimum air inlet/ambient temperature	°F	32
Maximum air inlet/ambient temperature	°C	46
Maximum air inlet/ambient temperature	°F	115
Maximum air inlet/ambient temperature of Pack compressors (high ambient temperature variant)	°C	50
Maximum air inlet/ambient temperature of Pack compressors (high ambient temperature variant)	°F	122
Minimum cooling air temperature	°C	0
Minimum cooling air temperature	°F	32
Maximum cooling air temperature	°C	46
Maximum cooling air temperature	°F	115
Maximum cooling air temperature of Pack compressors (high ambient temperature variant)	°C	50
Maximum cooling air temperature of Pack compressors (high ambient temperature variant)	°F	122
Maximum working pressure		See section Compressor data
Maximum cooling water inlet temperature	°C	40
Maximum cooling water inlet temperature	°F	104

Maximum cooling water outlet temperature (open systems)	°C	50
Maximum cooling water outlet temperature (open systems)	°F	122
Maximum cooling water outlet temperature (recirculating systems)	°C	60
Maximum cooling water outlet temperature (recirculating systems)	°F	140
Maximum cooling water inlet pressure	bar(e)	10
Maximum cooling water inlet pressure	psig	145

10.4 Settings of safety valve

The safety valve setting is 12 bar.

The safety valve setting is 174 psig.

10.5 Settings of overload relays, fuses and circuit breakers

Setting of fan protection for air-cooled compressors

Supply voltage (V)	Q25/Q26 (A)
380	5.7
400	5.7
440	5.7
460	5.7

Setting of fan protection for water-cooled compressors

Supply voltage (V)	Q16 (A)
380	1.1
400	1.1
440	1.1
460	1.1

Setting of dryer protection for air-cooled Full-Feature 50 Hz compressors

Model	Working pressure (bar)	Supply voltage (V)	Q40 (A)	Q41, Q42 (A)
GA 110 VSD+	8.5	400	12	1.9
GA 110 VSD+	10	400	10	1.3
GA 132 VSD+	8.5	400	12	1.9
GA 132 VSD+	10	400	12	1.9
GA 160 VSD+	8.5	400	12	1.9
GA 160 VSD+	10	400	12	1.9

Setting of dryer protection for water-cooled Full-Feature 50 Hz compressors

Model	Working pressure (bar)	Supply voltage (V)	Q40 (A)
GA 110 VSD+	8.5	400	12
GA 110 VSD+	10	400	10
GA 132 VSD+	8.5	400	12
GA 132 VSD+	10	400	12
GA 160 VSD+	8.5	400	12
GA 160 VSD+	10	400	12

Setting of dryer protection for air-cooled Full-Feature 60 Hz compressors

Model	Working pressure (psi)	Supply voltage (V)	Q40 (A)	Q41, Q42 (A)
GA 110 VSD+	125	380	12	2
GA 110 VSD+	150	380	9.5	1.45
GA 110 VSD+	125	440	12	2
GA 110 VSD+	150	440	9.5	1.45
GA 110 VSD+	125	460	12	2
GA 110 VSD+	150	460	9.5	1.45
GA 132 VSD+	125	380	12	2
GA 132 VSD+	150	380	12	2
GA 132 VSD+	125	440	12	2
GA 132 VSD+	150	440	12	2
GA 132 VSD+	125	460	12	2
GA 132 VSD+	150	460	12	2
GA 160 VSD+	125	380	12	2
GA 160 VSD+	150	380	12	2
GA 160 VSD+	125	440	12	2
GA 160 VSD+	150	440	12	2
GA 160 VSD+	125	460	12	2
GA 160 VSD+	150	460	12	2

Setting of dryer protection for water-cooled Full-Feature 60 Hz compressors

Model	Working pressure (psi)	Supply voltage (V)	Q40 (A)
GA 110 VSD+	125	380	12
GA 110 VSD+	150	380	9.5
GA 110 VSD+	125	440	12
GA 110 VSD+	150	440	9.5
GA 110 VSD+	125	460	12
GA 110 VSD+	150	460	9.5
GA 132 VSD+	125	380	12
GA 132 VSD+	150	380	12

Model	Working pressure (psi)	Supply voltage (V)	Q40 (A)
GA 132 VSD+	125	440	12
GA 132 VSD+	150	440	12
GA 132 VSD+	125	460	12
GA 132 VSD+	150	460	12
GA 160 VSD+	125	380	12
GA 160 VSD+	150	380	12
GA 160 VSD+	125	440	12
GA 160 VSD+	150	440	12
GA 160 VSD+	125	460	12
GA 160 VSD+	150	460	12

Maximum customer fuse setting

Model	Supply voltage (V)	Electrical approval	Field circuit protection (A)	Type, field circuit protection
GA 110 VSD+	380	IEC	3x550	aR
GA 110 VSD+	400	IEC	3x550	aR
GA 110 VSD+	440	IEC	3x550	aR
GA 110 VSD+	460	CSA-UL	3x550	Bussmann 170M
GA 110 VSD+	525	IEC	3x550	aR
GA 110 VSD+	575	CSA-UL	3x550	Bussmann 170M
GA 132 VSD+	380	IEC	3x550	aR
GA 132 VSD+	400	IEC	3x550	aR
GA 132 VSD+	440	IEC	3x550	aR
GA 132 VSD+	460	CSA-UL	3x550	Bussmann 170M
GA 132 VSD+	525	IEC	3x550	aR
GA 132 VSD+	575	CSA-UL	3x550	Bussmann 170M
GA 160 VSD+	380	IEC	3x630	aR
GA 160 VSD+	400	IEC	3x630	aR
GA 160 VSD+	440	IEC	3x630	aR
GA 160 VSD+	460	CSA-UL	3x630	Bussmann 170M
GA 160 VSD+	525	IEC	3x550	aR
GA 160 VSD+	575	CSA-UL	3x550	Bussmann 170M

10.6 Compressor data

For high ambient temperature versions operating above 46 °C (115 °F) a derating factor has been applied. The derating factor lowers the maximum motor speed/input power (at constant maximum pressure) to avoid overheating of the oil circuit and motor.

Data for 50 Hz, 8.5 bar (123.3 psi) Full-Feature compressors

	Units	GA 110 VSD+	GA 132 VSD+	GA 160 VSD+
Effective working pressure	bar(g)	7	7	7
Effective working pressure	psi(g)	101	101	101
Motor shaft speed	rpm	3872	3556	3293
Maximum effective working pressure	bar(g)	8.3	8.3	8.3
Maximum effective working pressure	psi(g)	101	101	101
Air-cooled compressor version				
Total electrical power input	kW	136.2	162.2	197.1
Total electrical power input	hp	182.6	217.4	164.2
Mean sound pressure level	dB(A)	77	78	79
Oil capacity (approx.)	l	106	110	110
Oil capacity (approx.)	US gal	28	29.05	29.05
Oil capacity (approx.)	Imp gal	23.32	24.2	24.2
Oil capacity (approx.)	cu.ft	3.74	3.88	3.88
Water-cooled compressor version				
Total electrical power input	kW	133.5	159	191.6
Total electrical power input	hp	179	213.1	256.8
Mean sound pressure level	dB(A)	74	74	76
Oil capacity (approx.)	l	94	98	98
Oil capacity (approx.)	US gal	24.83	25.89	25.89
Oil capacity (approx.)	Imp gal	20.68	21.56	21.56
Oil capacity (approx.)	cu.ft	3.32	3.46	3.46
Cooling medium flow	l/s	2.1	2.5	3.1
Cooling medium flow	cfm	4.4	5.3	6.6

Data for 50 Hz, 8.5 bar (123.3 psi) Pack compressors

	Units	GA 110 VSD+	GA 132 VSD+	GA 160 VSD+
Effective working pressure	bar(g)	7	7	7
Effective working pressure	psi(g)	101	101	101
Motor shaft speed	rpm	3919	3598	3329
Maximum effective working pressure	bar(g)	8.5	8.5	8.5
Maximum effective working pressure	psi(g)	123.8	123.8	123.8
Air-cooled compressor version				
Total electrical power input	kW	131.4	157.6	192.2
Total electrical power input	hp	176.1	211.3	257.6
Mean sound pressure level	dB(A)	77	78	79
Oil capacity (approx.)	l	106	110	110
Oil capacity (approx.)	US gal	28	29.05	29.05
Oil capacity (approx.)	Imp gal	23.32	24.2	24.2
Oil capacity (approx.)	cu.ft	3.74	3.88	3.88
Water-cooled compressor version				
Total electrical power input	kW	130.4	155.9	188.3
Total electrical power input	hp	174.8	209	252.4
Mean sound pressure level	dB(A)	74	74	76
Oil capacity (approx.)	l	94	98	98
Oil capacity (approx.)	US gal	24.83	25.89	25.89
Oil capacity (approx.)	Imp gal	20.68	21.56	21.56
Oil capacity (approx.)	cu.ft	3.32	3.46	3.46
Cooling medium flow	l/s	2.1	2.5	3.1
Cooling medium flow	cfm	4.4	5.3	6.6

Data for 50 Hz, 10 bar (145 psi) Full-Feature compressors

	Units	GA 110 VSD+	GA 132 VSD+	GA 160 VSD+
Effective working pressure	bar(g)	9.5	9.5	9.5
Effective working pressure	psi(g)	137.8	137.8	137.8
Motor shaft speed	rpm	3362	3700	3460
Maximum effective working pressure	bar(g)	9.8	9.8	9.8
Maximum effective working pressure	psi(g)	142.1	142.1	142.1
Air-cooled compressor version				
Total electrical power input	kW	137.7	163.2	197
Total electrical power input	hp	184.6	218.8	264.1
Mean sound pressure level	dB(A)	78	77	78
Oil capacity (approx.)	l	106	110	110
Oil capacity (approx.)	US gal	28	29.05	29.05
Oil capacity (approx.)	Imp gal	23.32	24.2	24.2
Oil capacity (approx.)	cu.ft	3.74	3.88	3.88
Water-cooled compressor version				

	Units	GA 110 VSD+	GA 132 VSD+	GA 160 VSD+
Total electrical power input	kW	134.3	159.2	191.3
Total electrical power input	hp	180	213.4	256.4
Mean sound pressure level	dB(A)	73	74	74
Oil capacity (approx.)	l	94	98	98
Oil capacity (approx.)	US gal	24.83	25.89	25.89
Oil capacity (approx.)	Imp gal	20.68	21.56	21.56
Oil capacity (approx.)	cu.ft	3.32	3.46	3.46
Cooling medium flow	l/s	2	2.4	3
Cooling medium flow	cfm	4.2	5.1	6.4

Data for 50 Hz, 10 bar (145 psi) Pack compressors

	Units	GA 110 VSD+	GA 132 VSD+	GA 160 VSD+
Effective working pressure	bar(g)	9.5	9.5	9.5
Effective working pressure	psi(g)	137.8	137.8	137.8
Motor shaft speed	rpm	3400	3700	3495
Maximum effective working pressure	bar(g)	10	10	10
Maximum effective working pressure	psi(g)	145	145	145
Air-cooled compressor version				
Total electrical power input	kW	132.2	158.6	192.2
Total electrical power input	hp	177.2	212.6	257.6
Mean sound pressure level	dB(A)	78	77	78
Oil capacity (approx.)	l	106	110	110
Oil capacity (approx.)	US gal	28	29.05	29.05
Oil capacity (approx.)	Imp gal	23.32	24.2	24.2
Oil capacity (approx.)	cu.ft	3.74	3.88	3.88
Water-cooled compressor version				
Total electrical power input	kW	130.5	156.3	188.4
Total electrical power input	hp	174.9	209.5	252.5
Mean sound pressure level	dB(A)	73	74	74
Oil capacity (approx.)	l	94	98	98
Oil capacity (approx.)	US gal	24.83	25.89	25.89
Oil capacity (approx.)	Imp gal	20.68	21.56	21.56
Oil capacity (approx.)	cu.ft	3.32	3.46	3.46
Cooling medium flow	l/s	2.1	2.4	3
Cooling medium flow	cfm	4.4	5.1	6.4

Data for 60 Hz, 125 psi (8.6 bar) Full-Feature compressors

	Units	GA 110 VSD+	GA 132 VSD+	GA 160 VSD+
Effective working pressure	bar(g)	6.9	6.9	6.9
Effective working pressure	psi(g)	100	100	100
Motor shaft speed	rpm	3895	3577	3311
Maximum effective working pressure	bar(g)	8.9	8.9	8.9
Maximum effective working pressure	psi(g)	129.1	129.1	129.1
Air-cooled compressor version				
Total electrical power input	kW	136.8	162.2	197.1
Total electrical power input	hp	183.4	217.4	264.2
Mean sound pressure level	dB(A)	79	80	80
Oil capacity (approx.)	l	106	110	110
Oil capacity (approx.)	US gal	28	29.05	29.05
Oil capacity (approx.)	Imp gal	23.32	24.2	24.2
Oil capacity (approx.)	cu.ft	3.74	3.88	3.88
Water-cooled compressor version				
Total electrical power input	kW	133.6	159	191.6
Total electrical power input	hp	179.1	213.1	256.8
Mean sound pressure level	dB(A)	75	75	77
Oil capacity (approx.)	l	94	98	98
Oil capacity (approx.)	US gal	24.83	25.89	25.89
Oil capacity (approx.)	Imp gal	20.68	21.56	21.56
Oil capacity (approx.)	cu.ft	3.32	3.46	3.46
Cooling medium flow	l/s	2.1	2.5	3.1
Cooling medium flow	cfm	4.4	5.3	6.6

Data for 60 Hz, 125 psi (8.6 bar) Pack compressors

	Units	GA 110 VSD+	GA 132 VSD+	GA 160 VSD+
Effective working pressure	bar(g)	6.9	6.9	6.9
Effective working pressure	psi(g)	100	100	100
Motor shaft speed	rpm	3943	3619	3348
Maximum effective working pressure	bar(g)	9.1	9.1	9.1
Maximum effective working pressure	psi(g)	132	132	132
Air-cooled compressor version				
Total electrical power input	kW	132.1	157.6	192.2
Total electrical power input	hp	177.1	211.3	257.6
Mean sound pressure level	dB(A)	79	80	80
Oil capacity (approx.)	l	106	110	110
Oil capacity (approx.)	US gal	28	29.05	29.05
Oil capacity (approx.)	Imp gal	23.32	24.2	24.2
Oil capacity (approx.)	cu.ft	3.74	3.88	3.88
Water-cooled compressor version				

	Units	GA 110 VSD+	GA 132 VSD+	GA 160 VSD+
Total electrical power input	kW	130.6	155.9	188.5
Total electrical power input	hp	175.1	209	252.7
Mean sound pressure level	dB(A)	75	75	77
Oil capacity (approx.)	l	94	98	98
Oil capacity (approx.)	US gal	24.83	25.89	25.89
Oil capacity (approx.)	Imp gal	20.68	21.56	21.56
Oil capacity (approx.)	cu.ft	3.32	3.46	3.46
Cooling medium flow	l/s	2.1	2.5	3.1
Cooling medium flow	cfm	4.4	5.3	6.6

Data for 60 Hz, 150 psi (10.4 bar) Full-Feature compressors

	Units	GA 110 VSD+	GA 132 VSD+	GA 160 VSD+
Effective working pressure	bar(g)	10.4	10.4	10.4
Effective working pressure	psi(g)	150	150	150
Motor shaft speed	rpm	3209	3555	3313
Maximum effective working pressure	bar(g)	10.7	10.7	10.7
Maximum effective working pressure	psi(g)	155.2	155.2	155.2
Air-cooled compressor version				
Total electrical power input	kW	138	163.2	197
Total electrical power input	hp	185	218.8	264.1
Mean sound pressure level	dB(A)	80	79	80
Oil capacity (approx.)	l	106	110	110
Oil capacity (approx.)	US gal	28	29.05	29.05
Oil capacity (approx.)	Imp gal	23.32	24.2	24.2
Oil capacity (approx.)	cu.ft	3.74	3.88	3.88
Water-cooled compressor version				
Total electrical power input	kW	134.7	159.2	191.5
Total electrical power input	hp	180.6	213.4	256.7
Mean sound pressure level	dB(A)	75	75	76
Oil capacity (approx.)	l	94	98	98
Oil capacity (approx.)	US gal	24.83	25.89	25.89
Oil capacity (approx.)	Imp gal	20.68	21.56	21.56
Oil capacity (approx.)	cu.ft	3.32	3.46	3.46
Cooling medium flow	l/s	2	2.5	3
Cooling medium flow	cfm	4.2	5.3	6.4

Data for 60 Hz, 150 psi (10.4 bar) Pack compressors

	Units	GA 110 VSD+	GA 132 VSD+	GA 160 VSD+
Effective working pressure	bar(g)	10.4	10.4	10.4
Effective working pressure	psi(g)	150	150	150
Motor shaft speed	rpm	3242	3590	3345

	Units	GA 110 VSD+	GA 132 VSD+	GA 160 VSD+
Maximum effective working pressure	bar(g)	10.9	10.9	10.9
Maximum effective working pressure	psi(g)	158.1	158.1	158.1
Air-cooled compressor version				
Total electrical power input	kW	132.8	158.6	192.2
Total electrical power input	hp	178	212.6	257.6
Mean sound pressure level	dB(A)	80	79	80
Oil capacity (approx.)	l	106	110	110
Oil capacity (approx.)	US gal	28	29.05	29.05
Oil capacity (approx.)	Imp gal	23.32	24.2	24.2
Oil capacity (approx.)	cu.ft	3.74	3.88	3.88
Water-cooled compressor version				
Total electrical power input	kW	131.3	156.3	188.6
Total electrical power input	hp	176	209.5	252.8
Mean sound pressure level	dB(A)	75	75	76
Oil capacity (approx.)	l	94	98	98
Oil capacity (approx.)	US gal	24.83	25.89	25.89
Oil capacity (approx.)	Imp gal	20.68	21.56	21.56
Oil capacity (approx.)	cu.ft	3.32	3.46	3.46
Cooling medium flow	l/s	2.1	2.5	3.1
Cooling medium flow	cfm	4.4	5.3	6.6

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