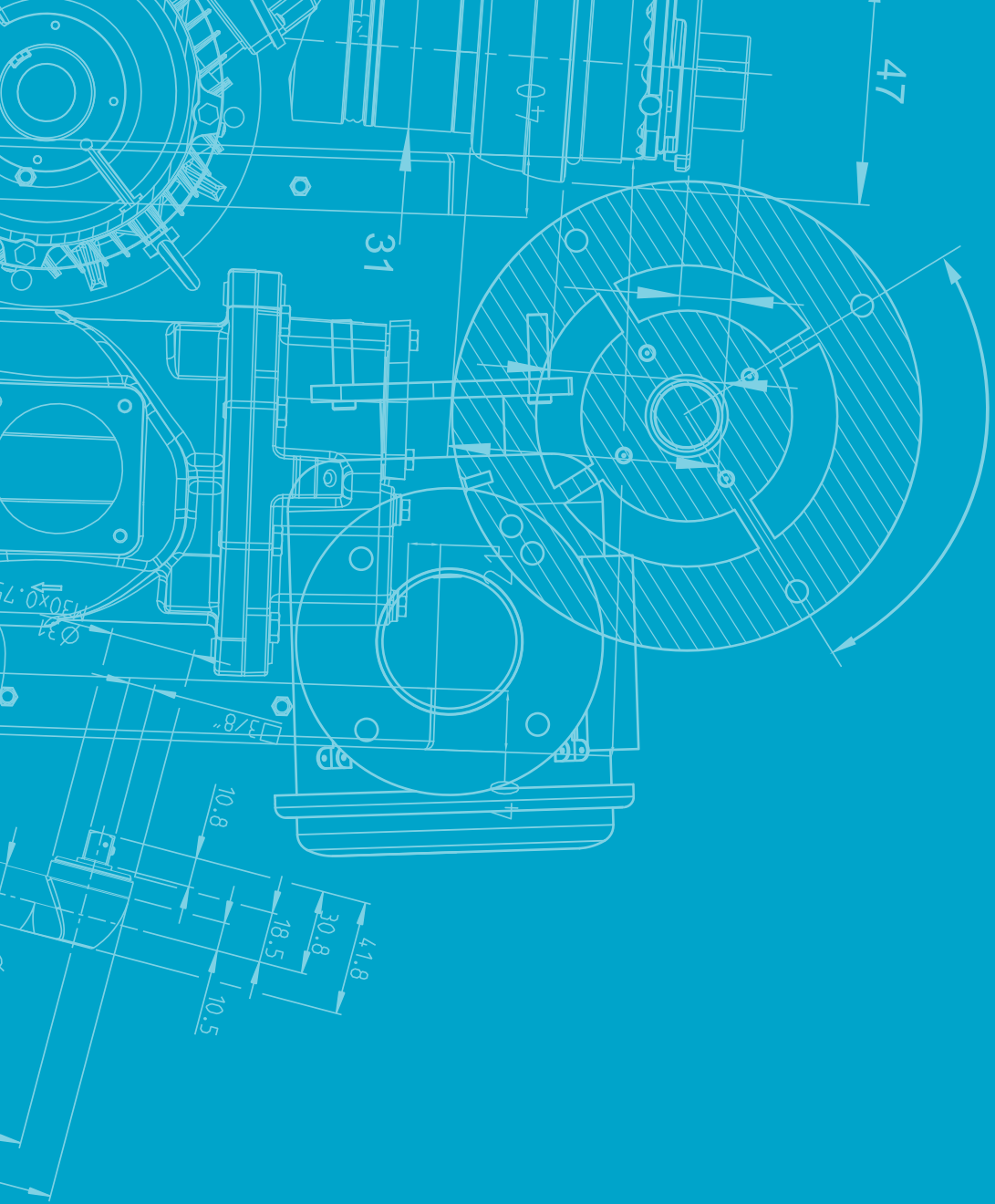


تاسیس ۱۳۶۲
جهان کمپرسور
خدمات مستمر
Jahan Compressor
Since 1983

Instruction book

Oil-injected screw compressors

APF205478
GA 315 VSD

Atlas Copco

Oil-injected screw compressors

GA 315 VSD

APF205478

Instruction book

Original instructions

WARNING



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

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This applies in particular to trademarks, model denominations, part numbers and drawings.

This instruction book is valid for CE as well as non-CE labelled machines. It meets the requirements for instructions specified by the applicable European directives as identified in the Declaration of Conformity.

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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.
    - On units powered by a frequency converter, wait 10 minutes before starting any electrical repair.
    - 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 service switch should only be operated by a trained service specialist from the manufacturer.

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 the 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.
14. It is not allowed to directly use the hot water from the compressor cooling water circuit as process water in pollution-sensitive applications such as the food and pharmaceutical industry.

	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 wheelie bin symbol.

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

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

Disposal of other used material

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

2 General description

2.1 Introduction

General

Figure 1: General view of water-cooled GA VSD

GA VSD (Variable Speed Drive) compressors are single-stage, oil-injected screw compressors directly driven by an electric 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 W VSD are water-cooled compressors.

Pipe connections

- DIN connections for flanges
- ISO for threaded pipes or pipe couplings

SMARTBOX

When ordering the compressor, it is possible (except for Japan and Korea) to choose the free **SMART**BOX option which is mounted in the electrical cabinet. The **SMART**BOX allows read-out of the compressor parameters on a login-protected web site called **SMART**LINK. The connected antenna is mounted on the outside of the electrical cabinet. (Refer to the ***SMART****BOX and* ***SMART****LINK* section.)

2.2 Air and oil system

Flow diagrams

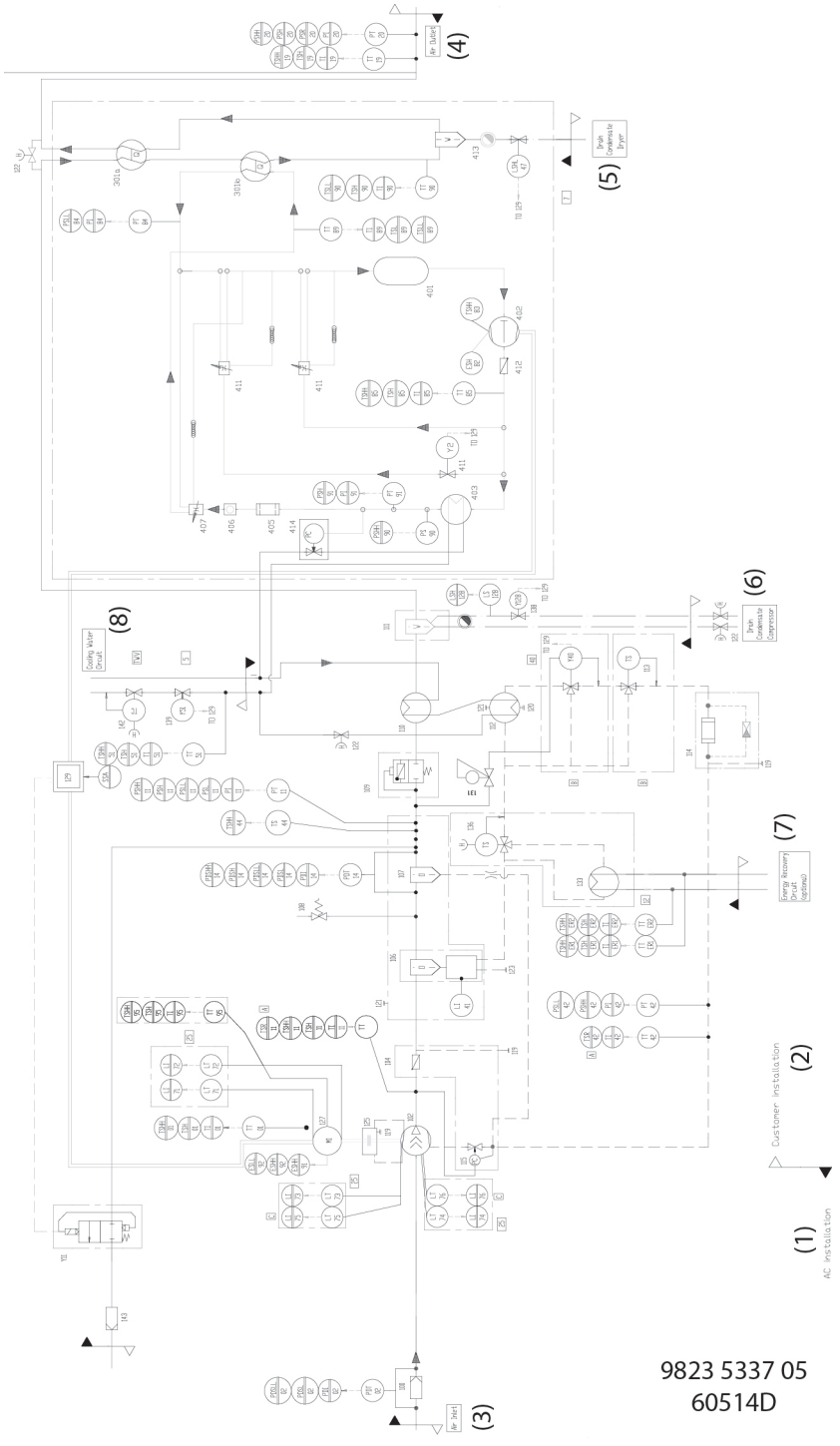


Figure 2: Flow diagram of water-cooled GA VSD compressor

Flow diagram reference	Description
100	Air filter

Flow diagram reference	Description
102	Oil-injected screw compressor stage
104	Check valve
106	Air-oil receiver
107	Oil separator element
108	Safety valve
109	Minimum pressure valve
110	Aftercooler
111	Water separator
112	Oil cooler
113	Thermostatic valve
114	Oil filter with by-pass valve
115	Oil stop valve
119	Drain plug(s)
120	Drain plugs, oil cooler
121	Vent plugs
122	Cock
123	Drain plug (air-oil receiver)
124	Fan(s)
125	Coupling
127	Drive motor
128	Fan motor(s)
129	Control cubicle
132	Pressure control
133	Oil cooler (Energy recovery)
134	Valve (dryer)
136	Thermostatic valve (energy recovery)
138	Electronic water drain
139	Water shut-off valve (option)
142	Thermostatic water valve (option)
301a	Heat exchanger (air-air) of dryer
301b	Heat exchanger (air-refrigerant) of dryer
401	Liquid separator of dryer
402	Piston compressor of dryer
403	Cooler with crossed flow lines of dryer
405	Liquid filter of dryer
406	Sight-glass of dryer
407	Expansion valve of dryer
408	Ventilator of dryer
409	Fan control switch of dryer
410	Pressure shut-down switch of dryer
411	Hot gas by-pass valve
412	Non-return valve
413	Water drain of dryer
Y1	Blow-off valve for Variable Speed Drive compressors
Y2	Dryer: hot gas by-pass valve
Y51	Water shut-off valve (option 5)

Table 1: Component list

Drawing reference	Description
(1)	AC installation
(2)	Customer installation
(3)	Air inlet

Drawing reference	Description
(4)	Air outlet
(5)	Condensate drain of the dryer
(6)	Condensate drain of the compressor
(7)	Energy recovery circuit (optional)
(8)	Cooling water circuit

Table 2: Drawing references

Position of components

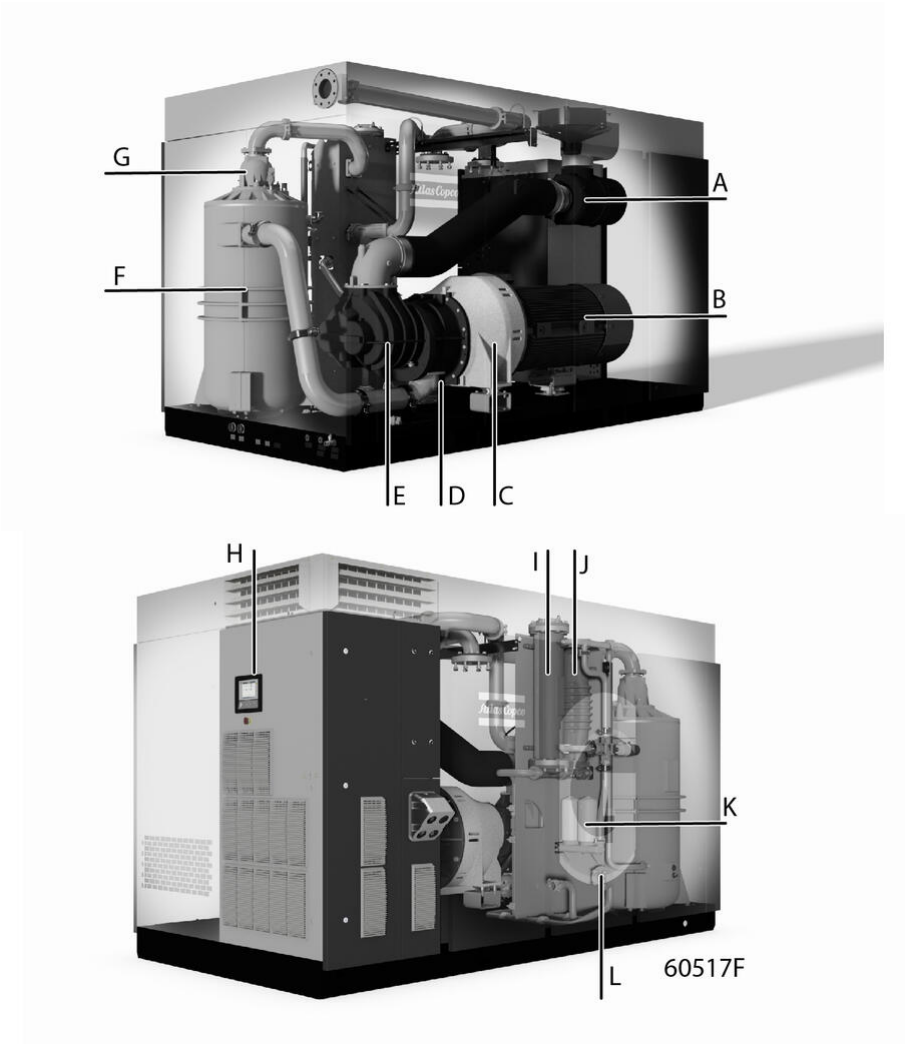


Figure 3: Ghost view of water-cooled GA VSD compressor

Drawing reference	Description
A	Air filter
B	Motor
C	Coupling housing
D	Check valve
E	Compressor stage
F	Air receiver / Oil separator

Drawing reference	Description
G	Minimum pressure valve
H	Electrical cabinet
I	Oil cooler
J	Air cooler
K	Oil filters
L	Thermostatic by-pass valve of oil circuit

Air flow

Air drawn through filter (100 or B) and unloader (101 or A) is compressed in compressor stage (102 or F). Compressed air and oil are discharged through check valve (104 or E) to air receiver / oil separator (106 or G) where oil is separated from the compressed air. The air flows through minimum pressure valve (109 or H) to aftercooler (110 or K).

On GA VSD Pack compressors, the cooled air is discharged through condensate trap (111) and the air outlet towards the air net.

Check valve (104 or E) prevents blow-back of compressed air.

Minimum pressure valve (109 or H) prevents the receiver pressure from dropping below a minimum pressure. The valve has a built-in check valve.

Oil system

Air pressure forces the oil from air receiver / oil separator (106 or G) through oil cooler (112 or J), filters (114 or G) and oil stop valve (115) to the compressor stage (102 or F) and the lubrication points.

Thermostatic by-pass valve (113 or M) prevents overcooling of the oil (and boosts oil warm-up) by avoiding the flow over the oil cooler (112 or J) below a certain temperature.

In the air receiver / oil separator (106 or G) most of the oil is centrifugally removed from the air. Almost all of the remaining oil is removed by the oil separator element (107).

2.3 Cooling and condensate system

Condensate drain system

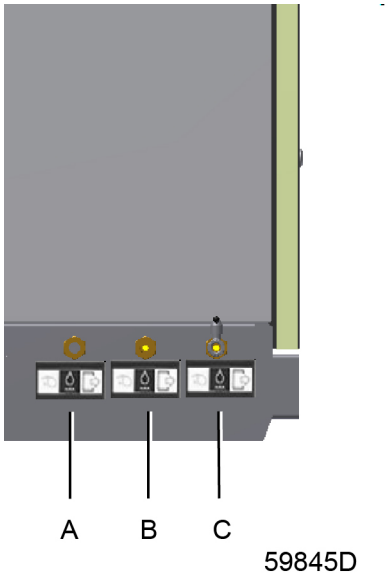


Figure 4: Condensate drain connections

A	Automatic condensate drain of the dryer (only applicable for Full-Feature compressors)
B	Automatic condensate drain of the compressor
C	Manual condensate drain of the compressor

A condensate trap is installed downstream of the air cooler to prevent condensate from entering the air outlet pipe. The trap is provided with following components:

- a level sensor & a solenoid valve (for automatic condensate draining)
- a ball valve (for manual draining)

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

Cooling system

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

2.4 Regulating system

General

The controller has following functions:

- Keep the net pressure within programmable pressure limits by automatically loading and unloading the compressor depending on the air consumption.
- Protect the compressor and monitor components subject to service
- Adapt the minimum working speed to protect the compressor stage bearings. This will enhance the lubrication of the bearings and result in a longer lifetime of the compressor stage.

Extra info, for GA 315 VSD only

The controller protects the compressor by lowering the motor speed whenever an internally measured temperature is exceeding its maximum value.

This may occur when working in a combination of these extreme conditions :

- Ambient temperature > 40 °C (104 °F)
- Voltage 10% lower than the nominal voltage
- Highest possible working pressure
- Running continuously at maximum speed

A rough estimation of the maximum possible derating is given below:

Nominal voltage (V)	10 bar
400	2%

Table 3: GA 315 VSD 50 Hz

2.5 SMARTBOX and SMARTLINK

General

The machine comes with a **SMART**BOX mounted in the electrical cabinet.



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The **SMART**BOX allows read-out of a number of parameters of the machine on a user login-protected web site called **SMART**LINK. The connected antenna is mounted on the outside of the machine.

Safety precautions

It is important to follow all regulations regarding the use of radio equipment, in particular regarding the possibility of radio frequency (RF) interference. Please follow the safety advice given below carefully.

- Respect restrictions on the use of radio equipment in fuel depots, chemical plants or other explosive environments.
- Avoid **SMART**BOX operation close to inadequately protected personal medical devices such as hearing aids and pacemakers. Consult the manufacturers of the medical device to determine if it is adequately protected.

- Avoid **SMART**BOX operation close to other electronic equipment which may also cause interference if the equipment is inadequately protected. Observe any warning signs and manufacturer recommendations.
- Respect a distance from the human body of at least 20 cm (8 inch) during **SMART**BOX operation.
- Do not operate the **SMART**BOX in areas where cellular modems are not advised without proper device certifications. These areas include environments where cellular radio can interfere, such as explosive atmospheres, medical equipment, or any other equipment which may be susceptible to any form of radio interference. The modem can transmit signals that could interfere with this equipment.

SMARTLINK

The machine is **SMART**LINK-ready.

SMARTLINK is Atlas Copco's web-based platform to monitor compressed air installations. It is available in 3 product levels:

- **SMART**LINK Service

  SMARTLINK Service rules out all uncertainties. Scheduling maintenance visits becomes as simple and easy as it should be; the service log book is always just one click away and the online link with Atlas Copco allows to request and quickly receive quotes for spare parts or additional services.

  This product level is free of charge and available for 3 years following the machine purchase.
- **SMART**LINK Uptime

  SMARTLINK Uptime keeps your compressors up and running. By e-mail and/or text, you receive all relevant machine indications (warnings and shutdowns) in advance. Based on this information, you can then take all necessary actions and measures to avoid the risk of a breakdown.

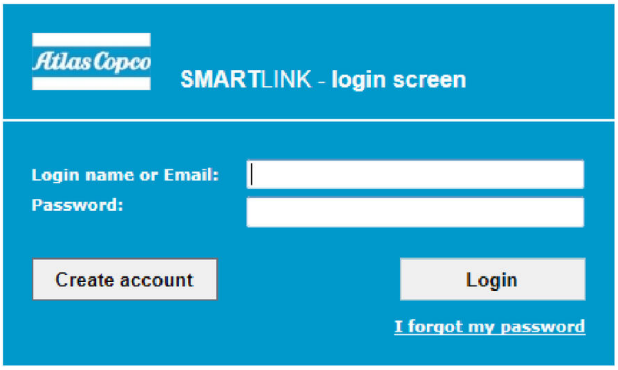
  This product level is available as a free of charge 3-month trial.
- **SMART**LINK Energy

  SMARTLINK Energy safeguards the performance of your equipment. It enables you to continuously monitor and analyze the energy efficiency of the compressor room. You decide which performance indicators, benchmarks and reports are created. You can make accurate and immediate improvements when needed. The results can be used for energy monitoring according to ISO50001.

  This product level is available as a free of charge 3-month trial.

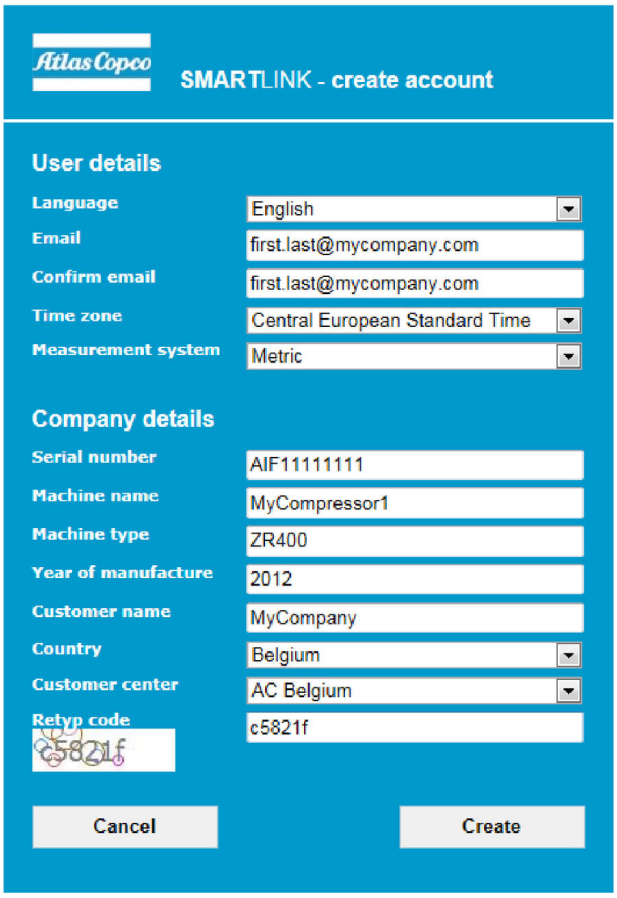
Once a **SMART**LINK level is chosen, gaining access is the next step. To gain access at least one machine **SMART**LINK-ready component (compressor, dryer, ...) is required. Follow the next steps:

- Gather the information about the **SMART**LINK-ready machine(s) (e.g. picture of the data plate; invoice,…)
- Go to the **SMART**LINK web site http://www.atlascopco.com/smartlink
- Click on the left button in the screen below.



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- Use the data of the **SMART**LINK–ready machine to register as a user.



59852F

- You will receive an e-mail with login credentials.
- Go to the **SMART**LINK web site http://www.atlascopco.com/smartlink, log in with the user credentials.
- Enjoy **SMART**LINK!
- In case more **SMART**LINK-ready machines are available, you can add these via *My Profile*.

3 Elektronikon® GraphicPlus controller

3.1 Elektronikon control system

Electronic controller

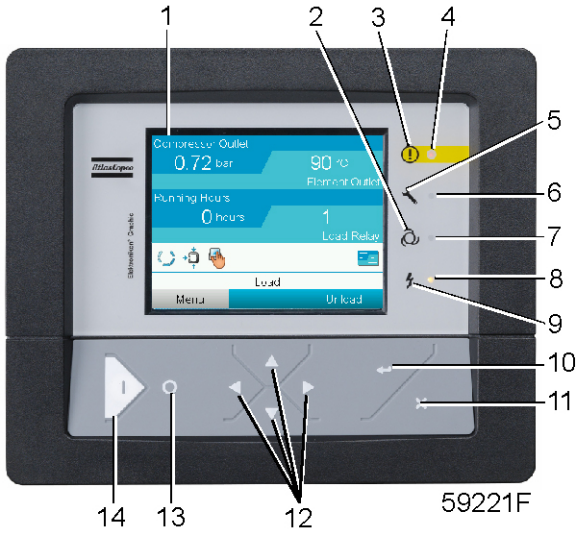


Figure 5: Controller panel

Parts and functions

Reference	Designation	Function
1	Display	Shows the compressor operating condition and a number of icons to navigate through the menu.
2	Pictograph	Automatic operation
3	Pictograph	General alarm
4	General alarm LED	Flashes if a shut-down warning condition exists.
5	Pictograph	Service
6	Service LED	Lights up if service is needed
7	Automatic operation LED	Indicates that the regulator is automatically controlling the compressor.
8	Voltage on LED	Indicates that the voltage is switched on.
9	Pictograph	Voltage on
10	Enter key	Key to select the parameter indicated by the horizontal arrow. Only the parameters followed by an arrow pointing to the right can be modified.
11	Cancel/Escape key	To go to previous screen or to end the current action
12	Scroll keys	Keys to scroll through the menu.
13	Stop button	Button to stop the compressor. LED (7) goes out.
14	Start button	Button to start the compressor. LED (7) lights up indicating that the electronic regulator is operative.

⚠	The Voltage on LED should not be used as a voltage indicator during maintenance.

Main functions

In general, the regulator has the following functions:

- Controlling the motor speed (Variable Speed Drive), reducing the power consumption and pressure band.
- Protecting the compressor.
- Monitoring components - service warning.
- Automatic restart after voltage failure.

Controlling the compressor speed - reducing power consumption and pressure band

VSD compressors optimize the power consumption and reduce the operating pressure band by matching the motor speed to the air net pressure.

The regulator will continuously vary the motor speed maintaining the net pressure as close as possible to the programmed pressure set-point. The pressure fluctuations will be very low.

Indirect stopping

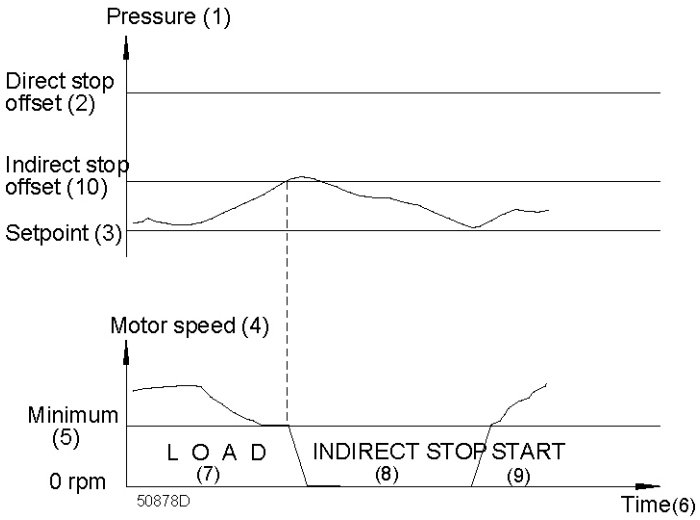


Figure 6: Example of a pressure/time diagram

Ref.	Designation
(1)	Pressure
(2)	Direct stop offset
(3)	Set-point
(4)	Motor speed
(5)	Minimum
(6)	Time
(7)	Load
(8)	Indirect stop
(9)	Start
(10)	Indirect stop offset

If the motor is running at minimum speed and the net pressure rises to a value equal to the sum of the programmed pressure set-point and the programmed indirect stop offset, the compressor will stop.

When the net pressure drops, the regulator will calculate the optimum moment to restart the compressor to avoid the net pressure decreasing below the pressure set-point (anticipated starting).

Direct stopping

If the net pressure should rise to a value equal to the sum of the programmed pressure set-point and the programmed direct stop offset, the compressor will be stopped immediately.

The regulator will calculate the optimum moment to restart the compressor.

3.2 Digital output contacts

Warning

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

Connections for external equipment

The Elektronikon (Mk5) always comes with expansion module IO2 that has a number of digital output contacts which can be used to connect external equipment.

Depending on the optional equipment, extra expansion modules are added to the machine configuration (IO2, IO34).

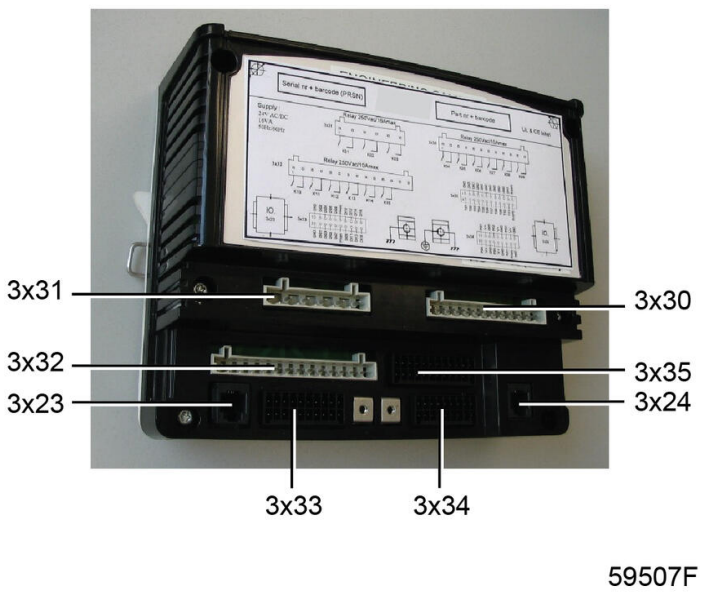


Figure 7: Expansion Module IO2 for Elektronikon (Mk5)

The digital output contacts have following specifications:

Relay	Connector	Maximum load
K01	3 X 31	15 A / 250 V AC 15 A / 30 V DC RC* protected
K02	3 X 31	15 A / 250 V AC 15 A / 30 V DC RC* protected
K03	3 X 31	15 A / 250 V AC 15 A / 30 V DC RC* protected
K04	3 X 31	10 A / 250 V AC 10 A / 30 V DC resistive load
K05	3 X 30	10 A / 250 V AC 10 A / 30 V DC resistive load
K06	3 X 30	10 A / 250 V AC 10 A / 30 V DC resistive load
K07	3 X 30	10 A / 250 V AC 10 A / 30 V DC resistive load
K08	3 X 30	10 A / 250 V AC 10 A / 30 V DC resistive load
K09	3 X 30	10 A / 250 V AC 10 A / 30 V DC resistive load
K10	3 X 32	10 A / 250 V AC 10 A / 30 V DC resistive load
K11	3 X 32	10 A / 250 V AC 10 A / 30 V DC resistive load
K12	3 X 32	10 A / 250 V AC 10 A / 30 V DC resistive load
K13	3 X 32	10 A / 250 V AC 10 A / 30 V DC resistive load
K14	3 X 32	10 A / 250 V AC 10 A / 30 V DC resistive load
K15	3 X 32	10 A / 250 V AC 10 A / 30 V DC resistive load
* = Resistor Capacitor		

3.3 Icons used

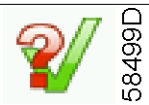
Status icons

Name	Icon	Description

Stopped / Running	 57786F	When the compressor is stopped, the icon is motionless. When the compressor is running, the icon rotates.
Compressor status	 57787F	Motor stopped
	 57788F	Running unloaded
	 57789F	Running loaded
Machine control mode	 59161F	Local start / stop
	 57791F	Remote start / stop
	 57792F	Network control
Automatic restart after voltage failure	 57793F	Automatic restart after voltage failure is enabled
Week timer	 57794F	Week timer is active
Active protection functions	 57795F	Emergency stop
	 57796F	Shutdown
	 57797F	Warning
Service	 57798F	Service required
	 60059F	Error
Main screen	 59162F	Displayed when 2 or 4 line layout is picked.

Main chart	 59163F	Displayed when chart layout is picked.

Menu icons

Icon	Description
 57806F	Converter(s)
 57798F	Service
 57812F	Alarms (warnings, shutdowns)
 57794F	Week timer
 57867F	Info
 58499D	Test
 57815F	Counters
 57820F	Regulation setpoints
 57813F	Inputs
 57814F	Outputs
 57818F	Event history (saved data)
 57817F	Settings

Input icons

Icon	Description
 57799F	Pressure

 57800F	Temperature
 57801F	Digital input
 57802F	Special protection

System icons

Icon	Description
 57805F	Fan (overload)
 57793F	Automatic restart (ARAVF)
 59163F	Main chart
 57803F	Compressor element (LP, HP, ...)
 57808F	Filter(s)
 57806F	Frequency converter
 57809F	Motor
 57810F	Expansion module
 57792F	Network settings/problem
 57812F	General alarm
 58484D	Oil circuit
 57820F	Regulation
 58470D	General settings

 57819F	Access key
 57791F	Remote start/stop (Password protected)

Navigation arrows

Icon	Description
 57821F	Up
 57822F	Down

3.4 Main screen

Control panel



Figure 8: Control panel

(1)	Enter key
(2)	Cancel / Escape key
(3)	Scroll keys

Function

The main screen shows the status of the compressor and is the gateway to all functionality implemented in the controller.

The main screen is shown automatically when the power is switched on. The display switches to sleep mode when no keys are pushed for a programmable time.

Five different main screens can be chosen:

1. Two value lines
2. Four value lines
3. Chart (High resolution)
4. Chart (Medium resolution)
5. Chart (Low resolution)

Two and four value views

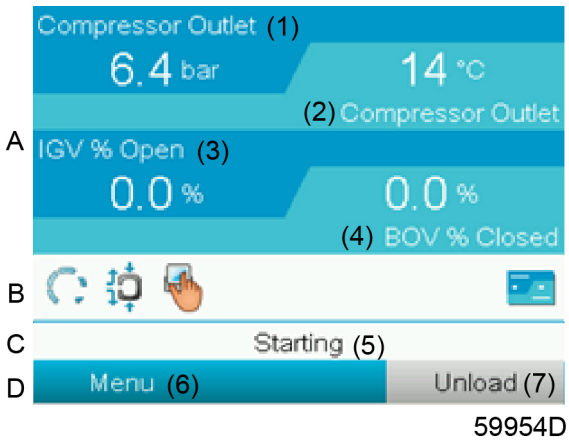


Figure 9: Typical Main screen (Four value lines)

(1), (2)	Compressor Outlet
(3)	Inlet Guide Vanes % Open
(4)	Blow-Off Valve % Closed
(5)	Starting
(6)	Menu
(7)	Unload

Table 4: Text on figures

- **Section A** displays information regarding the compressor operation (e.g. outlet pressure, temperature at compressor outlet).
- **Section B** displays Status icons. Following icon types are shown in this field:
  - Fixed icons

    These icons are always shown in the main screen and cannot be selected by the cursor (e.g. Compressor stopped or running)
  - Shortcut icons

    These icons are always shown in the main screen. If the icon is selected and the Enter key is pushed, the screen will jump to the corresponding menu (e.g. if the icon for Motor stopped or Running Loaded is selected, the screen will jump directly to the regulation menu after pressing the Enter key).
  - Control mode icons

    These icons are always shown in the main screen. If the icon is selected and the Enter key is pushed, the screen jumps to the control mode menu. Following control modes are available:

 59161F	Local control
 57791F	Remote control
 57792F	Network control

- Optional icons

  These icons are only shown if their corresponding function is activated (e.g. week timer, automatic restart after voltage failure, etc.)
- Pop up icons

  These icons pop up if an abnormal condition occurs (warnings, shutdowns, service,...)

To show more information about displayed icons, select the icon using the scroll keys and push the Enter key.

- **Section C** is called the Status bar

  This bar shows the text that corresponds to the selected icon.
- **Section D** shows the Action buttons. These buttons are used:
  - to call-up or program settings
  - to reset a shutdown, service message or emergency stop
  - to have access to all data collected by the controller

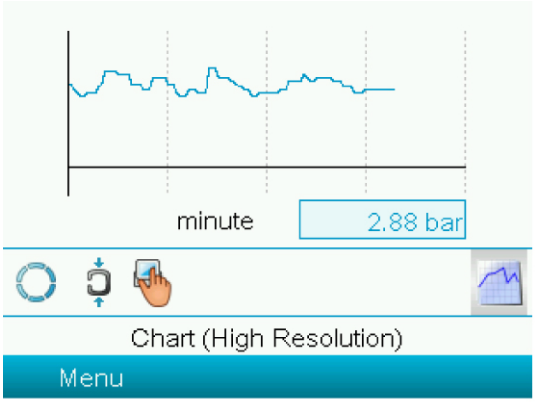
The function of the buttons depends on the displayed menu. The most common functions are:

Designation	Function
Menu	To go to the menu
Modify	To modify programmable settings
Reset	To reset a timer or message

To enable an action button, highlight this button by using the Scroll keys and push the Enter key.

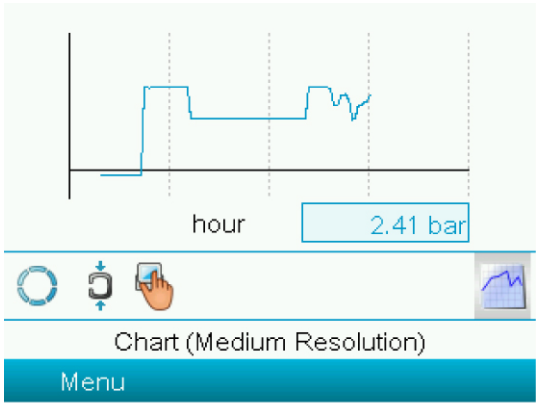
To go back to the previous menu, push the Cancel / Escape key.

Chart views



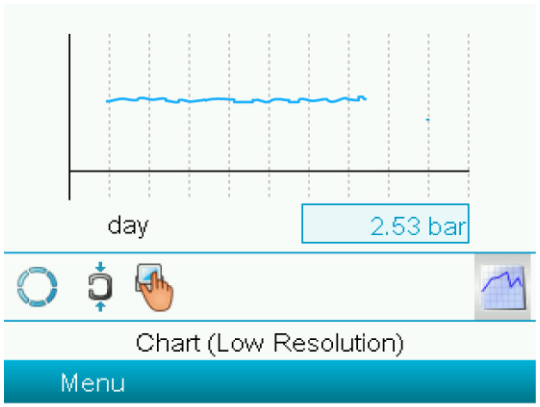
59166D

When the Chart (High Resolution) display is selected, a chart with an X-axis covering 4 minutes is displayed. The value displayed on the Y-axis depends on the selection made in the input screen. Each chart dot represents 1 second.



59167D

When the Chart (Medium Resolution) display is selected, a chart with an X-axis covering 4 hours is displayed. The value displayed on the Y-axis depends on the selection made in the input screen. Each chart dot represents a 1 minute average value.



59168D

When the Chart (Low Resolution) display is selected, a chart with an X-axis covering 10 days is displayed. The value displayed on the Y-axis depends on the selection made in the input screen. Each chart dot represents a 1 hour average value.

3.5 Controller menu structure

Main menu

Press the Enter key to go to the main menu screen that is shown below.



60065F

Menu structure

Please find the tree structure on the 2 top levels below. The items are mentioned as they appear on the screen from top to bottom and left to right. If questions regarding lower levels appear, please consult your local Atlas Copco Customer Centre.

SERVICE PLAN

Topic	Description
Overview	Displays an overview of the running service plans
Service Plan	Displays configuration of the service plans
Next Service	Displays the next service task
History	Displays a log of all automatic shutdowns that have appeared in the past

PROTECTIONS

Topic	Description
General	Displays a list of main protections
Fan	Displays a list of overload fan motor protections
Filter(s)	Displays a list of filter(s) protections
Expansion module	Displays a list of expansion module communication protections
Element(s)	Displays a list of protections related to the compressor stages
Convertor(s)	Displays errors concerning actuators
Main Motor	Displays motor related protections to avoid motor damage
Oil Circuit	Displays a number of protections in the oil circuit

WEEK TIMER

Topic	Description
Week Action Schemes	Displays 4 programmable week action schemes Each week action scheme contains 7 programmable days and these days can contain a number of successive events on selected time slots.

Topic	Description
Week Cycle	Contains 10 weeks and each week can be selected as 1 of the 4 week action schemes
Status	Displays the status (On/Off) of the week timer functionality
Remaining Running Time	Allows to set a timer to keep the compressor running for 1-240 minutes

INFORMATION

Topic	Description
www.atlascopco.com	Refers to the company website where more detailed info on the product can be found
More	The *More* button displays the software versions, addresses, licenses, ...

TEST

Topic	Description
Regreasing Test	Allows to run the motor regreasing program
Safety Valve Test	Allows a functionality check of the safety valve. (This feature can only be enabled by a service technician.)

COUNTERS

Topic	Description
Running hours	Displays the number of hours the compressor has been running in unloaded & loaded mode
Loaded Hours	Displays the number of hours the compressor has been running in loaded mode
Motor Starts	Displays the number of motor starts
Load Relay	Displays the number of load relay toggles (thus unload/load transitions)
Fast Starts	Displays the number of manual motor starts that exceed the automatic motor starts
VSD 1 — 20 % RPM	Displays the number of hours the compressor has been running between 1 % and 20 %
VSD 20 — 40 % RPM	Displays the number of hours the compressor has been running between 20 % and 40 %
VSD 40 — 60 % RPM	Displays the number of hours the compressor has been running between 40 % and 60 %
VSD 60 — 80 % RPM	Displays the number of hours the compressor has been running between 60 % and 80 %
VSD 80 — 100 % RPM	Displays the number of hours the compressor has been running between 80 % and 100 %
Accumulated air volume	Displays the accumulated air volume
Module Hours	Displays the number of hours the module has been powered
Direct stops	Displays the number of compressor stops
Emergency stops	Displays the number of compressor stops by use of the emergency stop

REGULATION

Topic	Description
Unloading pressure 1	The pressure setpoint that is higher than setpoint 1, where the loaded compressor switches to unload
Loading pressure 1	The pressure setpoint that is lower than setpoint 1, where the unloaded compressor switches to load

Topic	Description
Unloading pressure 2	The pressure setpoint that is higher than setpoint 2, where the loaded compressor switches to unload
Loading pressure 2	The pressure setpoint that is lower than setpoint 2, where the unloaded compressor switches to load
Pressure band used	Selection of 1st or 2nd pressure band. A pressure band is a combination of a loading pressure, a setpoint and an unloading pressure
Digital pressure band selection	Allows a remote signal to control the pressure band selection.
Reduced unload pressure	The unload pressure is reduced
Reduced load pressure	The load pressure is reduced
Reduced setpoint	The setpoint is reduced
Setpoint 1	Value of setpoint 1
Indirect stop level 1	Value of indirect stop level 1
Direct stop level 1	Value of direct stop level 1
Setpoint 2	Value of setpoint 2
Indirect stop level 2	Value of indirect stop level 2
Direct stop level 2	Value of direct stop level 2
Setpoint used	Which setpoint is used
Regulation mode	In which regulation mode is the compressor
Digital pressure band selection	Which pressure band is selected
Maximum speed factor	Value of the maximum speed factor

INPUTS

Topic	Description
General	Displays a number of general readouts and bipolar states
Element(s)	Displays a list of readouts related to the compressor stages
Fan	Displays the status of the fan
Filter	Displays the status of the filter
Converter(s)	Displays the status of the converter(s)
Main Motor	Displays a number of readouts and bipolar states concerning the main motor
Network	Displays a number of bipolar states of remote signals
Oil Circuit	Displays a number of readouts and bipolar states concerning the oil circuit

OUTPUTS

Topic	Description
General	Displays a number of analogue and digital outputs
Fan	Displays the activation of the fan
Element(s)	Displays the activation of the element(s)
Converter(s)	Displays the activation of the converter(s)
Oil circuit(s)	Displays the activation of the oil circuit(s)
Main Motor	Displays a number of digital outputs concerning the main motor status

SPM (Shock Pulse Method)

Topic	Description
Motor, drive end	Displays the vibration level at the drive end of the motor
Motor, non-drive end	Displays the vibration level at the non-drive end of the motor

Topic	Description
Low pressure stage, drive end	Displays the vibration level at the drive end of the low pressure compressor stage (when option is chosen)
Low pressure stage, non-drive end	Displays the vibration level at the non-drive end of the low pressure compressor stage (when option is chosen)
Gearbox	Displays the vibration level at the gearbox

EVENT HISTORY

Topic	Description
-	Displays a log file of all shutdowns and shows the status of the type, counters, inputs and outputs at the moment a shutdown appeared

SETTINGS

Topic	Description
Network	Displays the CAN and ethernet configuration
Regulation	Displays settings concerning the compressed air flow regulation
General	Displays settings concerning time, date, unit and display time-out
Automatic Restart	Only displayed when compressor motor voltage < 690V and when ARAVF is available. Automatic Restart After Voltage Failure can only be enabled by a service technician.
Access Key	Displays the controller access level that can be modified with password input
User Password	Displays the availability to use a password to protect the controller from unwanted manipulation
Main Chart	Displays the input and the range of the main chart
Remote control	Displays the remote control mode (Password protected)
Main Motor	Displays the settings of the main motor

3.6 Web server

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

Getting started

	If the unit is equipped with a **SMART**BOX, the network connection of the controller is already in use. To allow the web server functionality, the network cable that is connected to the **SMART**BOX should be unplugged and replaced by the cable of the company network. If both the web server functionality and **SMART**BOX are required, please contact your local Customer Center for support.

Make sure you are logged in as administrator.

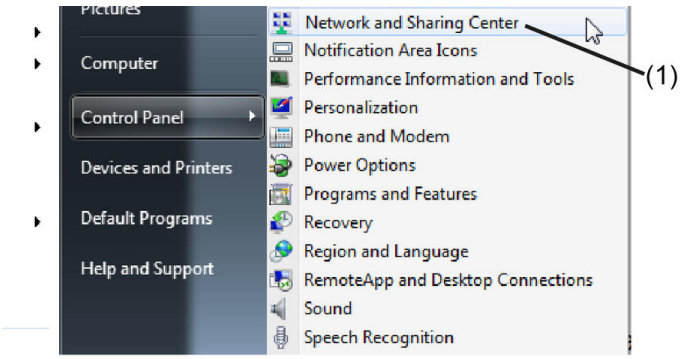
- Use the internal network card from your computer or a USB to LAN adapter.
- Use a UTP cable (CAT 5e) to connect to the controller (see picture below).



81508D

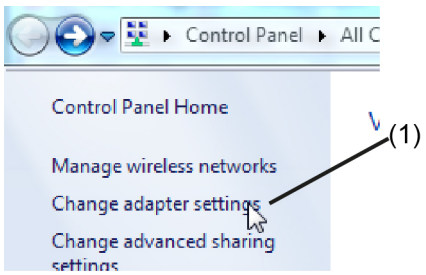
Configuration of the network card

- Go to Network and Sharing Center (1).



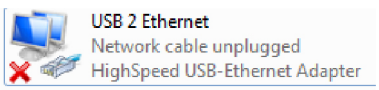
60651D

- Click on Change adapter settings (1).



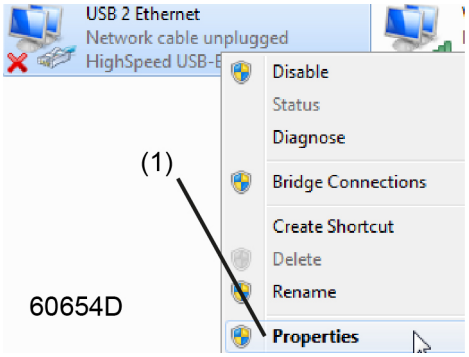
60652D

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

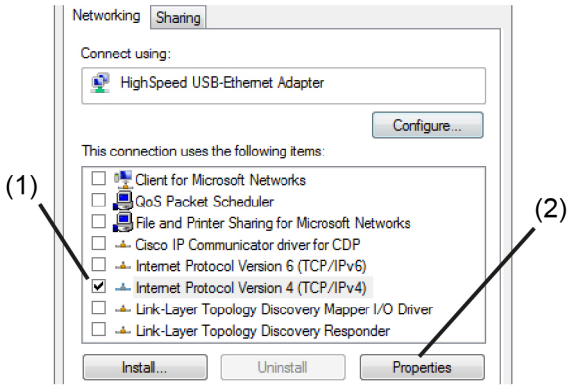


60653D

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

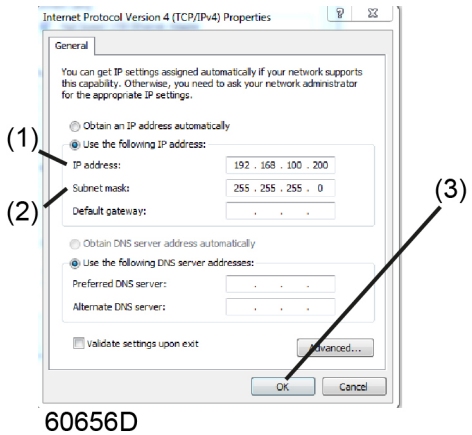


- Use the check box Internet Protocol version +4 (TCP/IPv4) (1) (see picture). To avoid conflicts, uncheck other properties if they are checked. After selecting TCP/IPv4, click on the Properties button (2) to change the settings.



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

  Click OK (3) and close network connections.



Configure a company network (LAN) connection

- Ask your IT department to generate a fixed IP address in your company's network.
- That IP address will be excluded from the DNS server, so it will be reserved for the controller.
- Also get the correct Gateway and Subnet mask settings. For example:
  - IP = 10.25.43.200

- Gateway = 10.25.42.250
- Subnet mask = 255.255.254.0

- Connect the controller to the company's network (LAN) by using a UTP cable (min. CAT 5e).



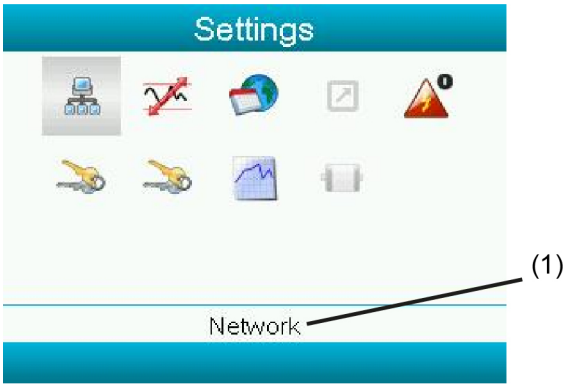
- Adapt the network settings in the controller:
  - Go to Main Menu



  - Go to Settings (1)

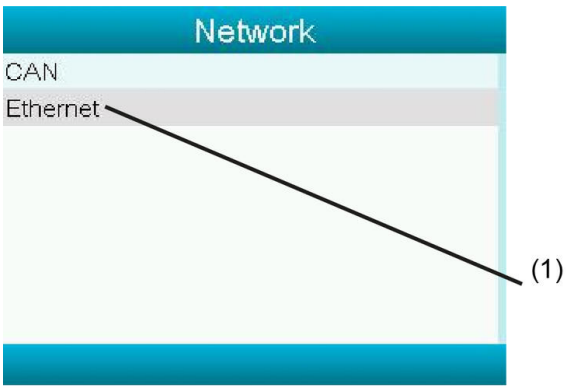


  - Go to Network (1)



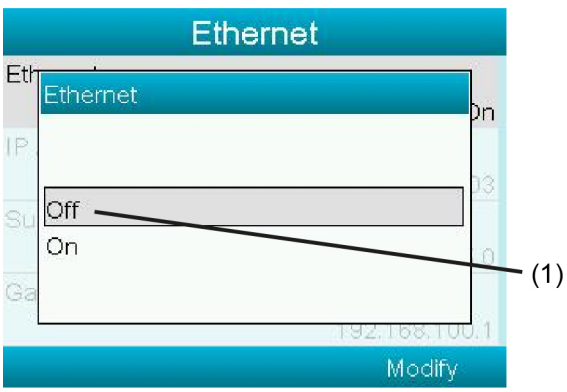
60659D

- Go to Ethernet (1)



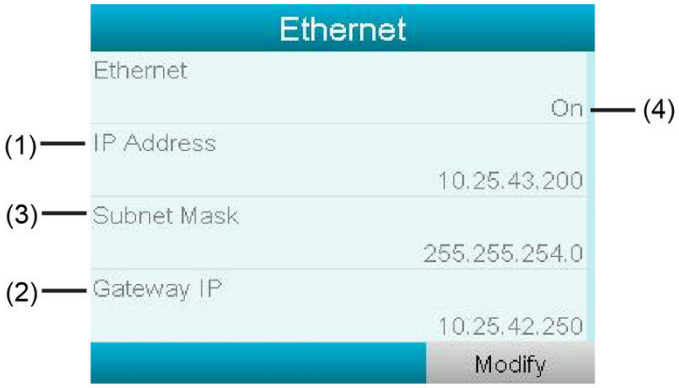
60660D

- Switch Off (1) the Ethernet communication to allow editing the settings



60661D

- Adapt IP Address (1)
- Adapt Gateway IP (2)
- Adapt Subnet Mask (3)
- Switch On (4) the Ethernet communication



- Wait a few minutes so the LAN network can connect to the controller

Configuration of the web server

The internal web server is designed and tested for Microsoft® Internet Explorer.

Also **"Opera", "Mozilla Firefox", "Safari"**and **"Chrome"** should work.

Viewing the controller data

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

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

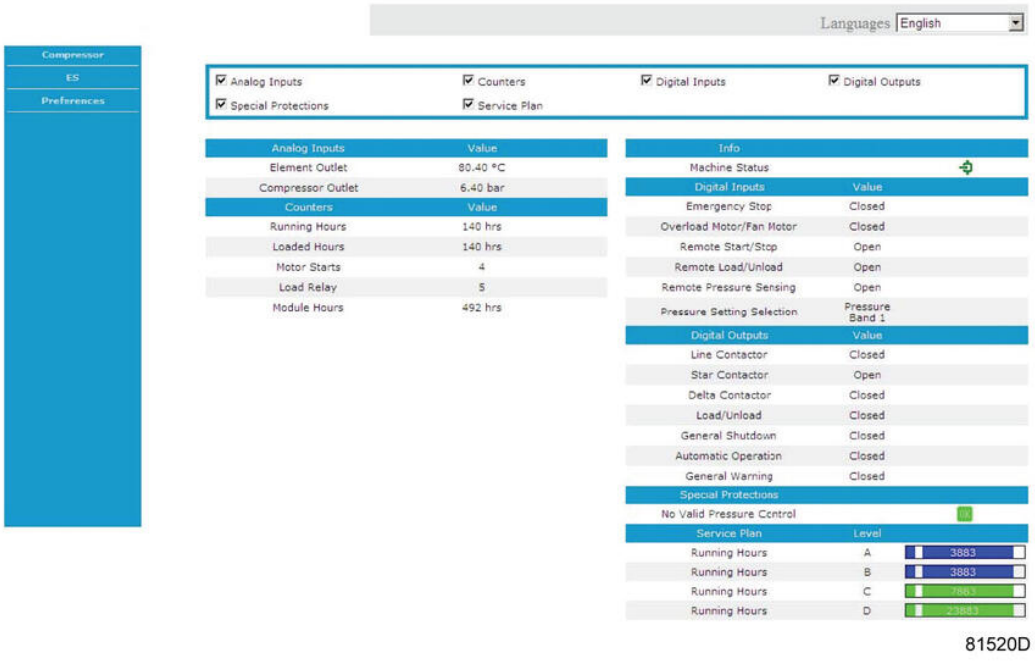
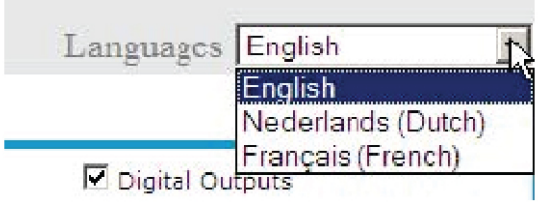


Figure 10: Screen shot (example!)

Navigation and options

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

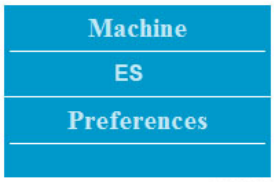


81521D

- On the left side of the interface, you can find the navigation menu.

  If a license for ESi is foreseen, the menu contains 3 buttons.

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



83810D

Unit settings

All unit settings can be displayed or hidden. Put a check mark in front of each point of interest and it will be displayed. Only the machine status is fixed and can not be removed from the main screen.

Analog inputs

Lists all current analog input values. The measurement units can be changed in the preference button from the navigation menu.



81523D

Counters

Lists all current counter values from controller and unit.



81524D

Info status

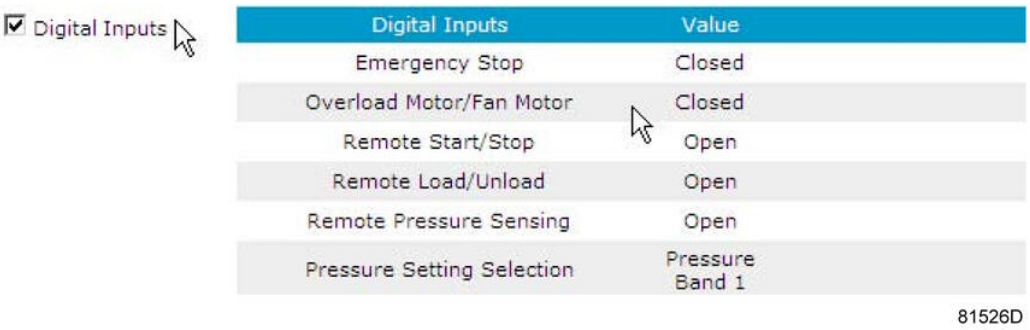
Machine status is always shown on the web interface.



81525D

Digital inputs

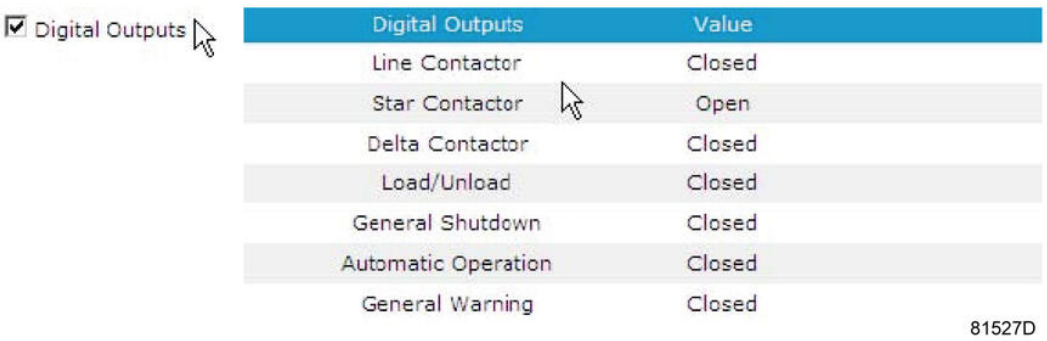
Lists all digital inputs and their status.



81526D

Digital outputs

Lists all digital outputs and their status.



81527D

Special protections

Lists all special protections of the unit.



81528D

Service plan

Displays all levels of the service plan and their status. This screen shot underneath only shows the running hours. It is also possible to show the current status of the service interval.


Service Plan
Service Plan
Level
Running Hours
A
3971
Running Hours
B
3971
Running Hours
C
7971
Running Hours
D
23971
81529D

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.
	• Regarding electromagnetic compatibility, the compressor should comply to the Directive 2014/30/EU and the Harmonized standards EN61000-6-2 and EN61000-6-4.
	• 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

4.2 Dimension drawing

Water-cooled compressor dimensions

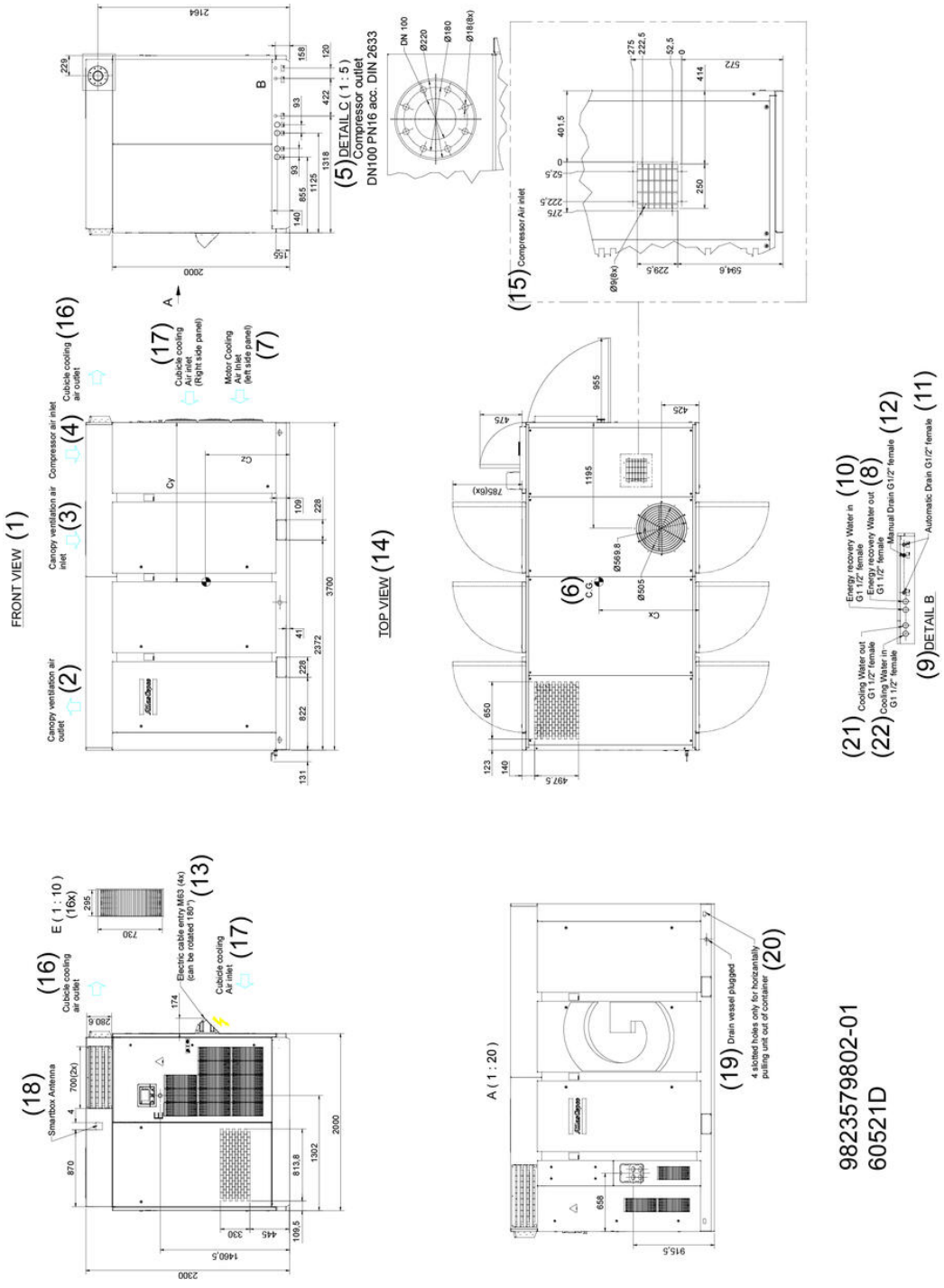


Figure 11: Dimension drawing (in mm) of water-cooled compressors

Drawing reference	Description
(1)	Front view
(2)	Outlet of canopy ventilation air

Drawing reference	Description
(3)	Inlet of canopy ventilation air
(4)	Inlet of compressor air
(5)	Detail C (1:10) of compressor outlet DN100 PN16 acc. DIN 2633
(6)	Center of gravity
(7)	Inlet of motor cooling air
(8)	Water outlet of energy recovery G1 1/2" female
(9)	Detail B
(10)	Water inlet of energy recovery G1 1/2" female
(11)	Automatic drain G 1/2" female
(12)	Manual drain G 1/2" female
(13)	Electric cable entry
(14)	Top view
(15)	Inlet of compressor air
(16)	Outlet of cubicle cooling air
(17)	Inlet of cubicle cooling air
(18)	Smartbox antenna
(19)	Plug of vessel drain
(20)	4 slotted holes (only for horizontally pulling compressor out of container)
(21)	Inlet of cooling water G1 1/2" female
(22)	Outlet of cooling water G1 1/2" female

4.3 Installation proposal

Compressor room example

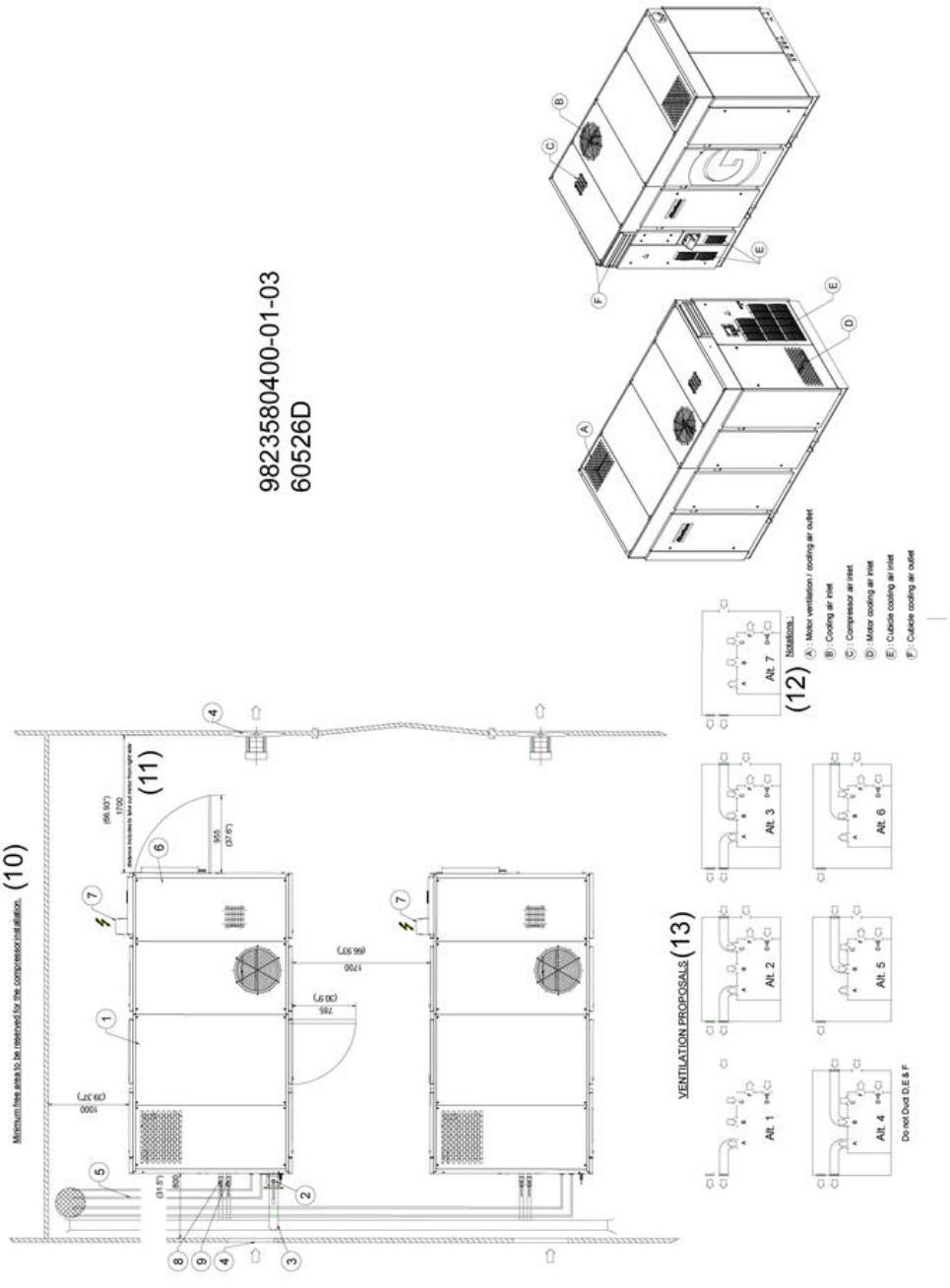
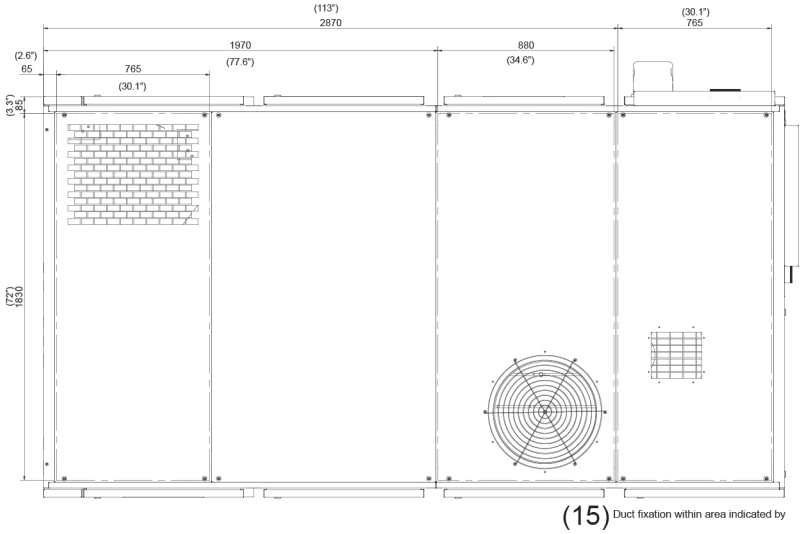


Figure 12: Installation proposal of water-cooled compressors



9823 5804 00-02_04
60529D

Figure 13: Fixation of air ducts on water-cooled compressors

Description

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)	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.
(4)	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: $Qv = 0.1N / dT$ Qv= Required ventilation capacity in m^3/s N = Shaft input of the compressor in kW dT = Compressor room temperature over the outdoor temperature in °C

Reference	Description
(5)	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)
(6)	Control cubicle with monitoring panel
(7)	Main cable entry
(8)	Cooling water inlet pipe
(9)	Cooling water outlet pipe
(10)	Minimum free area to be reserved for the compressor installation
(11)	Distance includes the necessary space to take out the motor from the right side
(12)	Notations
(13)	Ventilation proposals
(15)	Duct fixation within area indicated by
(A)	Cooling air and motor ventilation outlet
(B)	Cooling air inlet
(C)	Compressor air inlet
(D)	Motor cooling air inlet
(E)	Cubicle cooling air inlet
(F)	Cubicle cooling air outlet

Air consumption divided by compressor free air delivery	Correction factor C
0.9	0.10
0.8	0.15
0.7	0.20
0.5	0.25
0.3	0.20
0.2	0.15
0.1	0.10

Table 5: Correction factors

Notes

- All pipes should be connected stress-free to the compressor unit.
- For more information concerning air nets, cooling systems, etc: refer to the compressor installation manual available at your nearest Atlas Copco Customer Centre.
- For dimensions and air flow directions: refer to the *Dimension drawings* section.
- Calculate air receiver volume according to compressor installation manual for a maximum cycle frequency of 1/30 s
- To allow servicing, shut-off valves should be installed at the inlet and the outlet of the cooling water connection.

	For water-cooled compressors, the cooling water system installed outside the compressor must be protected by a safety device with set pressure according to the maximum cooling water inlet pressure.

4.4 Electric cable size

Electrical connections

Drawing reference	Description
(1)	Customer installation
(2)	Compressor motor
(3)	DIP switch setting

	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. Always install the supply cable free of strain.

	• 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:
	  • IEC 60204-1
	  • IEC 60364-5-52
	• 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 the 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. • Display the fuse type information next to the fuse holder of the mains branch. • 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 the 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 **Limits** 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 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: • IEC: XLPE 90 °C (194 °F)

	• 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).

Cable size and main fuses

Electrical approval	Fuse type
IEC	aR

Table 6: Example of possible fuse types

Electrical approval	SSCCR [1]
IEC	gG/gL type 2 [2]

[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 electrical 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.
- 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

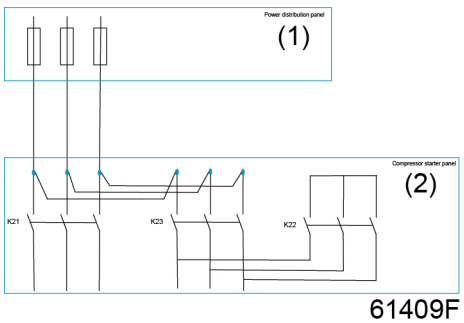


Figure 14: Single supply cables

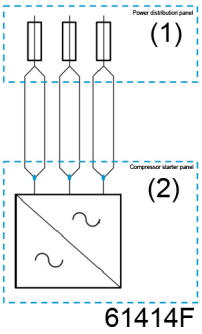


Figure 15: Parallel supply cables

(1): Power distribution panel

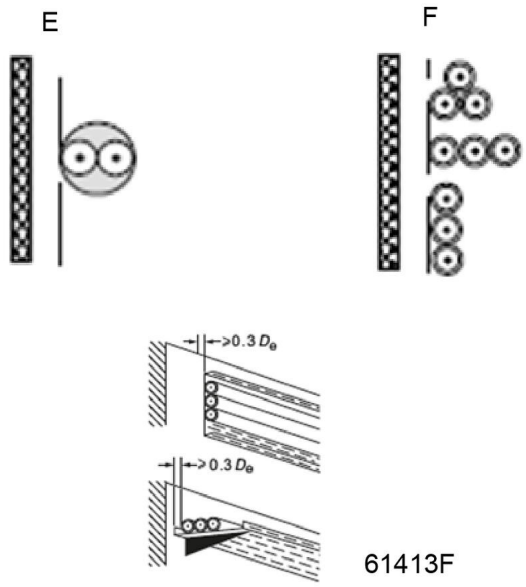
(2): Compressor starter panel

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

Cable sizing according to 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.



Installation method E or F, according to 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.

Cable section	30 °C	40 °C	45 °C	50 °C	55 °C
25 mm²	< 127 A	< 116 A	< 110 A	< 104 A	< 97 A
35 mm²	< 158 A	< 144 A	< 137 A	< 130 A	< 120 A
50 mm²	< 192 A	< 175 A	< 167 A	< 157 A	< 146 A
70 mm²	< 246 A	< 224 A	< 214 A	< 202 A	< 187 A
95 mm²	< 298 A	< 271 A	< 259 A	< 244 A	< 226 A
120 mm²	< 346 A	< 315 A	< 301 A	< 284 A	< 263 A
150 mm²	< 399 A	< 363 A	< 347 A	< 327 A	< 303 A
185 mm²	< 456 A	< 415 A	< 397 A	< 374 A	< 347 A
240 mm²	< 538 A	< 490 A	< 468 A	< 441 A	< 409 A
300 mm²	< 621 A	< 565 A	< 540 A	< 509 A	< 472 A

Table 7: 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 mm²	< 135 A	< 123 A	< 117 A	< 110 A	< 103 A
35 mm²	< 169 A	< 154 A	< 147 A	< 139 A	< 128 A
50 mm²	< 207 A	< 188 A	< 180 A	< 170 A	< 157 A
70 mm²	< 268 A	< 244 A	< 233 A	< 220 A	< 204 A
95 mm²	< 328 A	< 298 A	< 285 A	< 269 A	< 249 A
120 mm²	< 383 A	< 349 A	< 333 A	< 314 A	< 291 A
150 mm²	< 444 A	< 404 A	< 386 A	< 364 A	< 337 A
185 mm²	< 510 A	< 464 A	< 443 A	< 418 A	< 388 A
240 mm²	< 607 A	< 552 A	< 528 A	< 498 A	< 461 A
300 mm²	< 703 A	< 639 A	< 611 A	< 576 A	< 534 A
400 mm²	< 823 A	< 749 A	< 716 A	< 674 A	< 625 A

Table 8: 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 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

Itot = 407 A, maximum ambient temperature is 45 °C, recommended fuse = 500 A.

- **Single supply cables** (3 phases + PE):
  - I = 407 A + 10 % = 407 x 1.1 = 447.7 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 A + 10 %)/2 = (407 x 1.1)/2 = 224 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 mm².

4.5 Quality of safety components

When installing a remote emergency stop button, the following B10d value is advised:

- Emergency stop button: **500 000**

Every three (3) years the emergency circuit shall be tested by pushing the emergency stop button of the unit and the remote emergency stop button.

4.6 Pictographs

Control panel of Elektronikon GraphicPlus controller

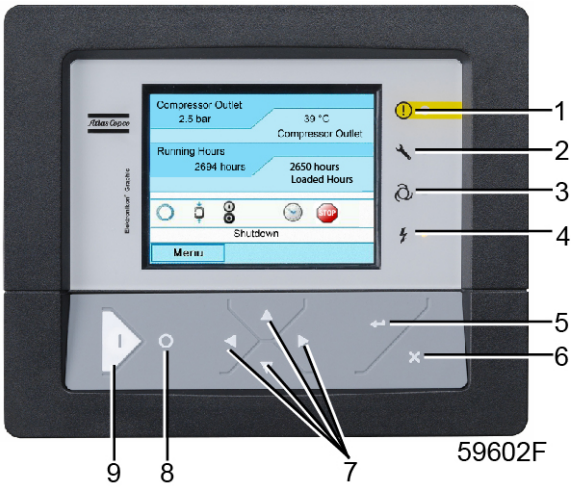
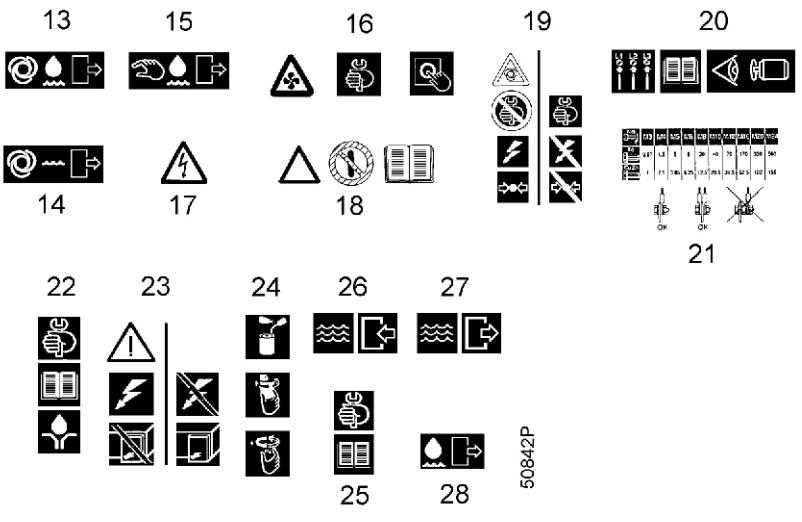


Figure 16: Pictographs on control panel

Reference	Name
1	Alarm
2	Service
3	Automatic operation
4	Voltage on
5	Enter
6	Escape
7	Scroll keys
8	Stop
9	Start

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

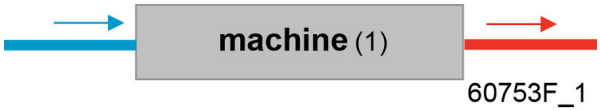
General

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.

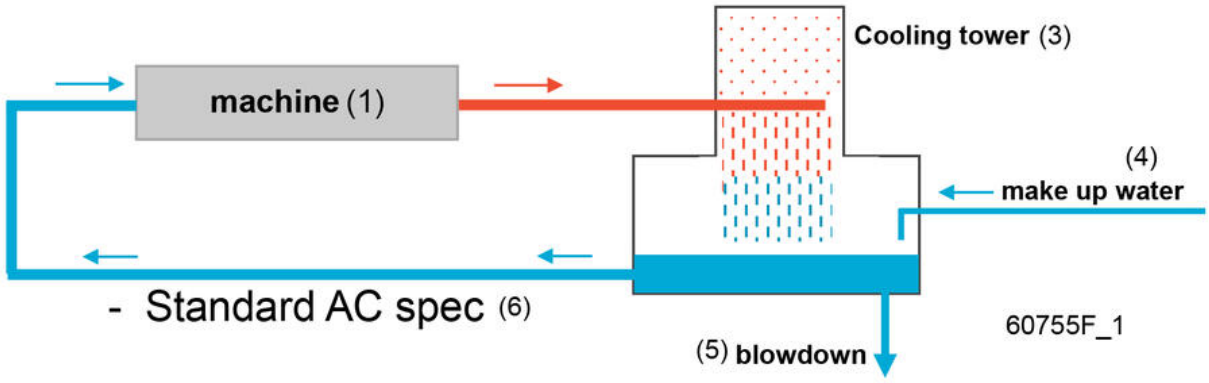
The water requirements refer to untreated water. When water is treated, some parameters will change. Water treatments should be carried out by a specialized water treatment company, taking the responsibility for the performance of the treated cooling water and the compatibility with the materials in 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:

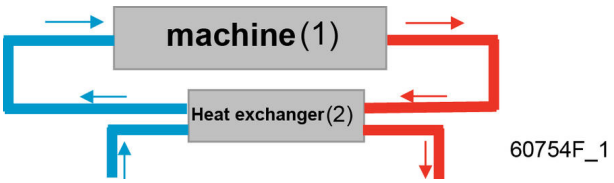
- the type of cooling circuit:
  - open
    - Single Pass



    - 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)

Water quality

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.				

	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)
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	$< 10^5$	$< 10^3$	$< 10^5$	$< 10^3$	$< 10^3$

	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
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.

Table 9: Remarks on the technical specifications

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	$13.12 \times {}^{10}\log(°C+273) + 34.55$
C	$^{10}\log(Ca^{2+}) - 0.4$ (Ca^{2+} expressed as ppm $CaCO_3$)
D	$^{10}\log$(M-Alkalinity) (M-Alkalinity expressed as ppm $CaCO_3$)

RSI and chloride limitation

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.
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

Table 10: Single Pass system

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.
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.

Table 11: Recirculating system, with cooling tower

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.

Table 12: Closed loop system

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

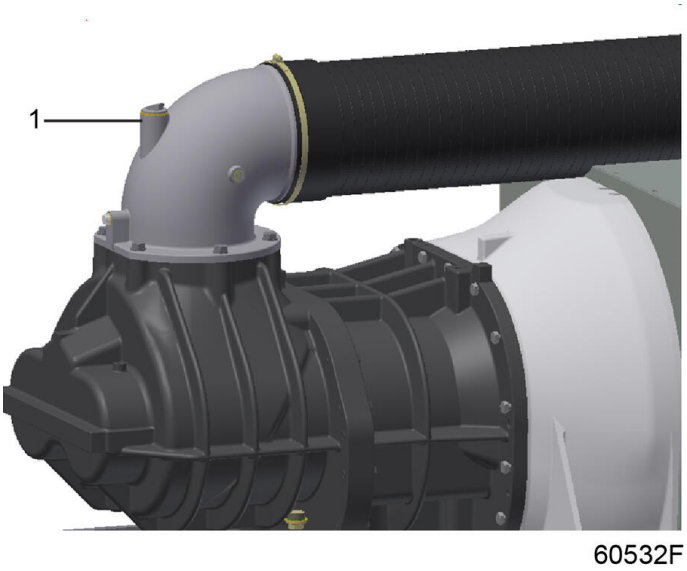


Figure 17: Plug (1) to fill compressor elements at initial start-up

Step	Action
1	Install the compressor. Refer to the following sections: Dimension drawing, Installation proposal and Electric cable section, length and fuse settings.
2	**Stick labels near the control panel to warn the operator that:** • 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	Remove filler plugs (1). Pour approx. 1 l (0.26 US gal/0.22 Imp gal) of oil into the compressor element. Refit the plugs.
5	Check that the compressor is filled with oil; the pointer of the oil level indicator should be in the green range. Refer to the *Oil change* section.

Protection during transport

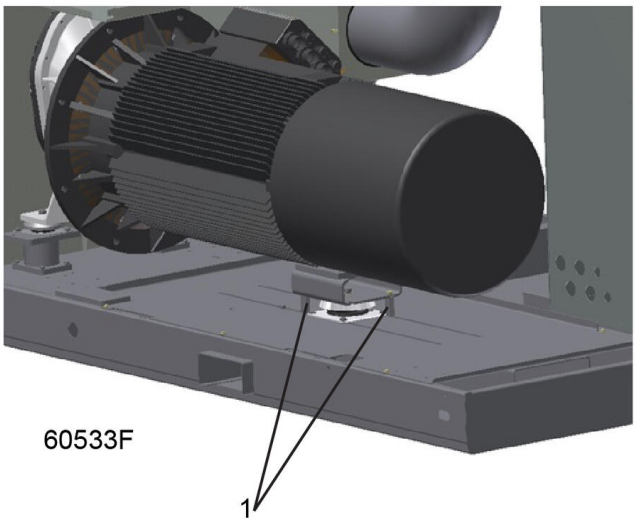


Figure 18: Transport fixtures (1)

Step	Action
1	The coupling housing supports, 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

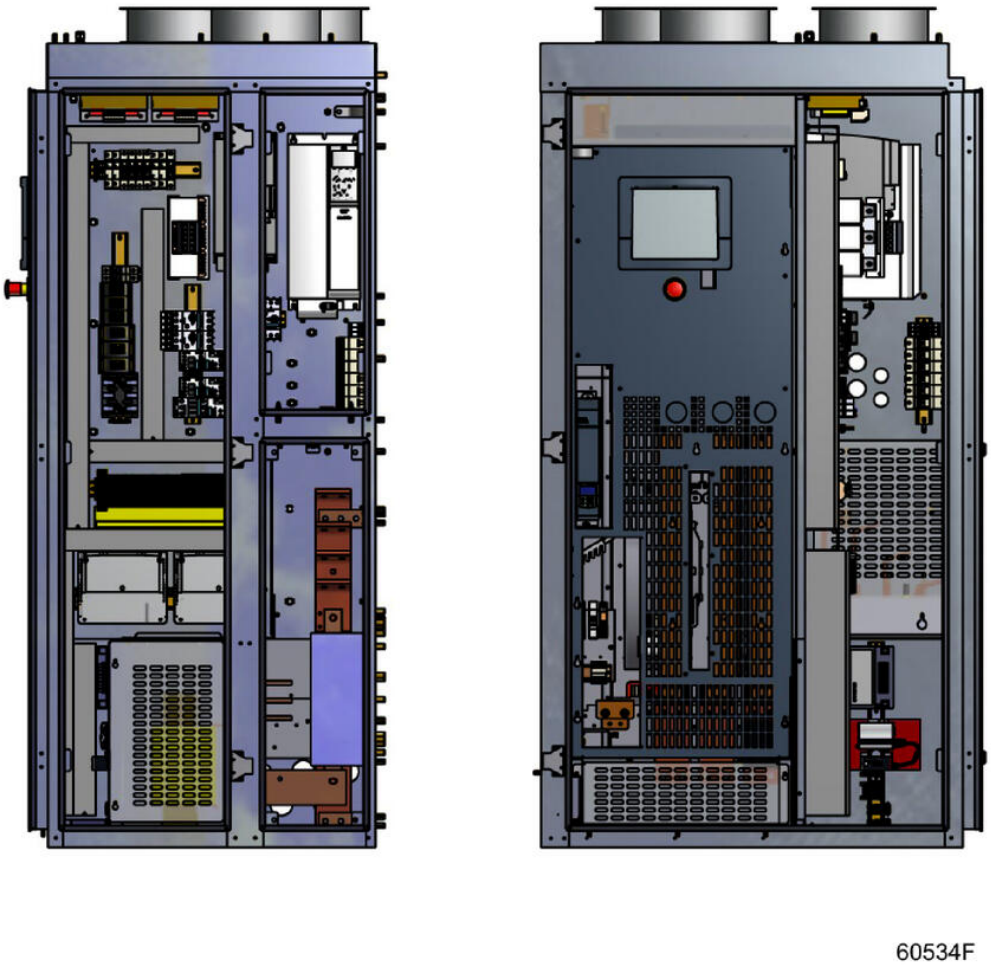


Figure 19: Example of a cubicle

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 transformers (T1/T2) for correct connection.
3	Check the setting of the circuit breakers. Refer to the *Settings of circuit breakers* section.

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

Step	Action
1	Close the drain valves. Refer to the *Cooling and condensate system* section.
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.
4	If the rotation direction is wrong, press the emergency stop button, switch off the voltage and reverse two incoming electric lines. The correct direction of rotation is indicated for the drive motor by an arrow on the gear casing and for the fan motors by arrows on the motor housings.
5	Run the compressor for a few minutes and check that it is operating normally.

5.2 Before starting

Warning

	The operator must apply all relevant Safety precautions.
	If the water system was drained, make sure the drain valves are closed.

Control panel

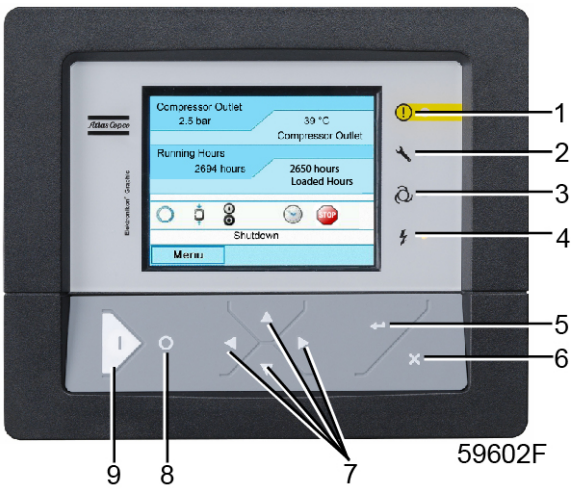


Figure 20: Elektronikon GraphicPlus controller

Reference	Name
1	Alarm
2	Service
3	Automatic operation
4	Voltage on
5	Enter
6	Escape
7	Scroll keys
8	Stop
9	Start

Procedure

Step	Action
1	Switch on the voltage. Voltage on LED lights up.
2	Close the condensate drain valves (see the section Cooling and condensate system).
3	Open the air outlet valve.
4	Check the oil level indicator (see the section Oil change). The pointer should be in the green range or orange range.
5	On water-cooled compressors, open the water shut-off valves and the water regulating valve.

5.3 Starting

Warning

	The operator must apply all relevant Safety precautions.

Control panel

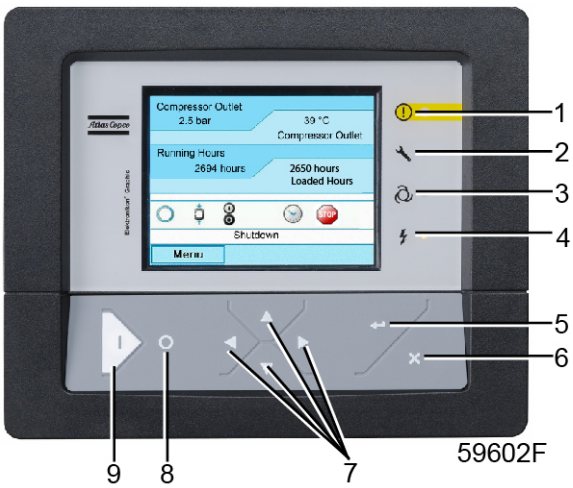


Figure 21: Elektronikon GraphicPlus controller

Reference	Name
1	Alarm
2	Service
3	Automatic operation
4	Voltage on
5	Enter
6	Escape
7	Scroll keys
8	Stop
9	Start

Procedure

Step	Action
1	Press the start button. The compressor starts running in unloaded condition. The automatic operation LED lights up.
2	Approx. 10 seconds later (programmable), the compressor starts running loaded. The status icon on the display of the controller changes from the running unloaded icon to the running loaded icon.
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

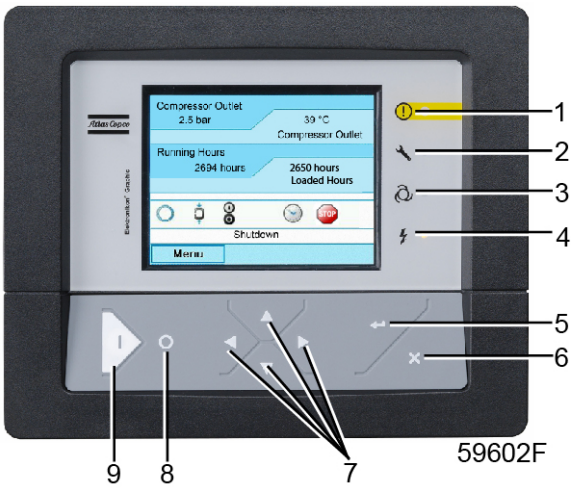


Figure 22: Elektronikon GraphicPlus controller

1. Check the readings on display (1).
2. When reaching the preset unloading pressure, shown on display (1), the compressor will start running unloaded. From now on, the electronic control module will calculate the optimum moment to stop and restart the compressor motor automatically, depending on the maximum permissible number of motor starts and on the air consumption.
3. To unload the compressor manually, select Unload on the display using the cursor keys and press the Enter key. To put the compressor back into automatic operation, select Load on the display using the cursor keys and press the Enter key.

	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

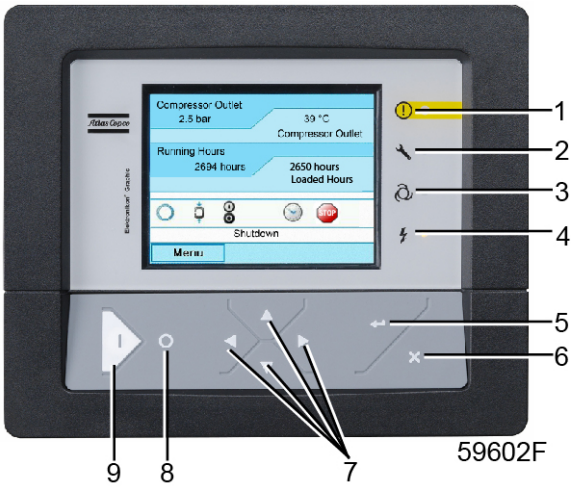


Figure 23: Control panel of Elektronikon GraphicPlus controller

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 alarm LED (1) is alight or blinks.

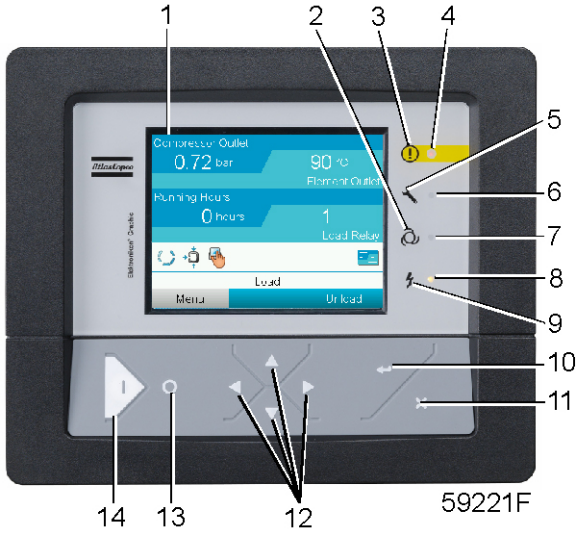
   The display will show a service message if a service plan interval has been exceeded or if a service level for a monitored component has been exceeded. Carry out the service actions of the indicated plans or replace the component and reset the relevant timer.

   Regularly check the Inputs and Outputs menus for a quick look at the compressor status.

5.6 Stopping

Important

	After pressing the stop button, the compressor will run unloaded for 30 seconds. The compressor stops after this period. A start command during this period is ignored. After stopping, the compressor is prevented from restarting within a programmable time (20 seconds). A start command given during this minimum stop time will be memorized; the automatic operation LED lights up. The compressor will start when the minimum stop time has elapsed.



Procedure

	Frequently stopping the compressor using the emergency stop button may damage the compressor. Only use the emergency stop button in case of emergency.

Step	Action
1	Press stop button (13). The compressor will run unloaded for 30 seconds and then stop.
2	To stop the compressor in case of emergency, press the emergency stop button. Alarm LED (4) 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

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.

Step	Action
7	On water-cooled compressors, disconnect the cooling water pipes from the compressor.

Table 13: At the end of the service life of the compressor, proceed as follows:

5.8 Use of air receiver

Instructions

Step	Action
1	This equipment can contain pressurised air and oil; be aware of its potential danger if used improperly.
2	This equipment must only be used as compressed air/oil separator and must be operated within the specified limits.
3	No alterations must be made to this equipment by welding, drilling, grinding or other methods of mechanical working without written permission of the manufacturer. If there is damage to a part under pressure from any cause, the complete part must be replaced.
4	For the oil separator vessel: original bolts have to be used after opening for inside inspection. The bolts must be removed and fitted with the correct tool. The bolts must be tightened with a torque of 355 Nm (+/- 85 Nm). Damaged bolts must not be re-used. O-rings must be replaced.
5	The safety valve is designed in such a way that the pressure will not permanently exceed the maximum allowable operating pressure of the vessel, except for short pressure surges up to 1.1 times the design pressure.
6	Only use oil specified by the manufacturer.
7	Make sure the vessel is fully depressurised before opening the drain plug or fill plug.
8	This vessel and other parts under pressure have been designed and built to guarantee an operational lifetime in excess of 20 years and an infinite number of pressure load cycles. A visual inspection (for damage, non-authorised alterations,...) of the vessel (at the outside and inside) is recommended every 5 years. Make sure the vessel is fully depressurised and isolated before carrying out an internal inspection.
9	At every inspection, also check the oil drain flexible. Replace if there is any wear or damage.

6 Maintenance

6.1 Preventive maintenance schedule

Warning

	**Before carrying out any maintenance, repair work or adjustment, proceed as follows:** • Stop the compressor. • Press emergency stop button (S2). • Close the air outlet valve and open the manual condensate drain valves. • Switch off the voltage. • Open and lock the isolating switch. The operator must apply all relevant Safety precautions.

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

	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.

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 in the middle of the sight-glass.
Weekly	--	Drain condensate from the air receiver, if installed
3-Monthly	--	Clean compressor.
3-Monthly	--	Check for possible leaks.
3-Monthly	500	Check the coolers; clean them if necessary. See the section Coolers.
3-Monthly	--	Remove air filter elements and inspect
Yearly	--	Have safety valve tested
Yearly	--	Have all flexibles inspected
2-Yearly	8000	If Roto-Xtend Duty Fluid is used, change oil
2-Yearly	8000	Replace oil filters
2-Yearly	8000	Replace air filters
Yearly	--	Regrease motor; see section Motors for the grease type, interval and quantity.
2-Yearly	8000	Have oil separator element replaced
When displayed	--	Carry out service action according to the displayed service plans.

	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 loaded and preferably 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 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.
	Never mix greases of different brands or types.

Fan motors

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

Drive motor

The drive motor must be greased with Roto Glide Green (ordering number 2901 8514 00).

Drive motor

Compressor type	Power	Interval D end	Amount D end	Interval ND end	Amount ND end
GA 315 VSD	315 kW	4000 h	30 gr (1.06 oz)	4000 h	30 gr (1.06 oz)

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

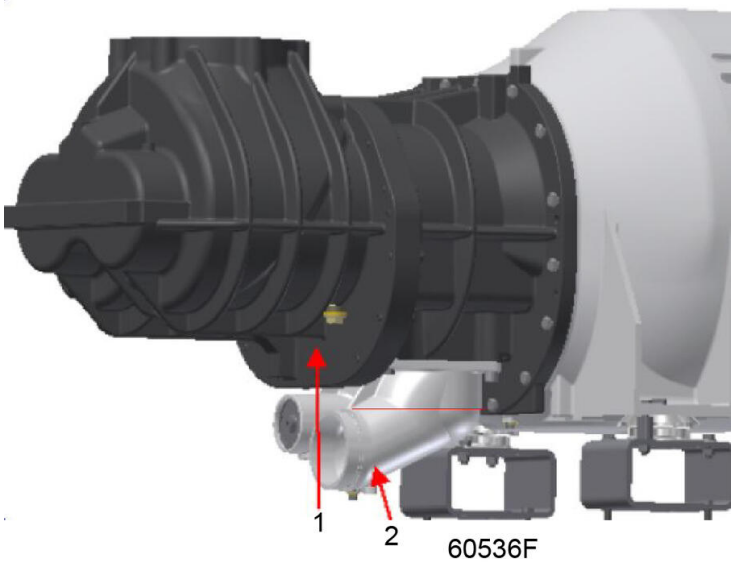


Figure 24: Position of vent, filler and drain plugs on compressor elements

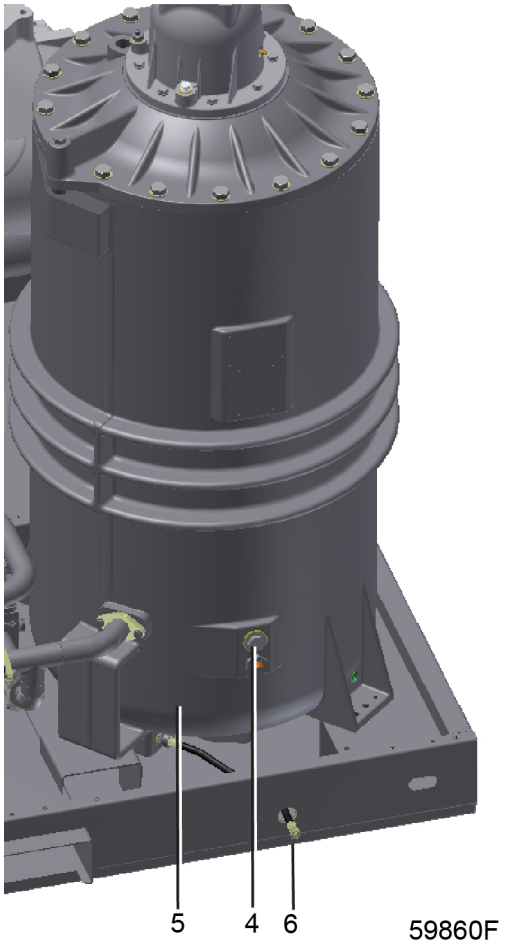


Figure 25: Position of filler and drain plugs on air receiver vessel / oil separator of compressors

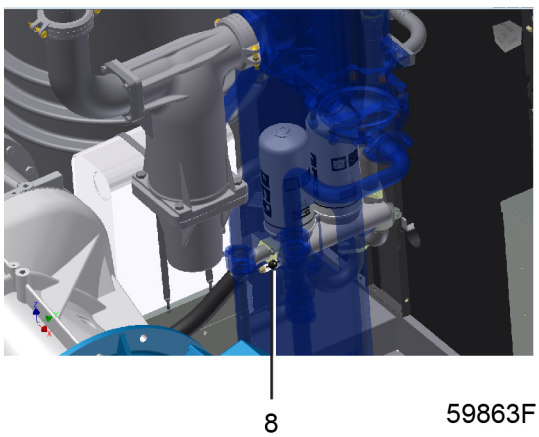


Figure 26: Position of drain plugs of oil filter housing of water-cooled compressors

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 and depressurize by unscrewing plug (4) only one turn to permit any pressure in the system to escape.
2	Loosen vent plugs (7) on top of the oil coolers.
3	Drain the oil by removing the drain plugs. **Plugs are fitted on the:** • Air receiver / Oil separator (5) with drain point (6) • Oil stop valve (1) • Check valve (2) • Oil filter housing (8) • Hose between the oil filter housing and oil coolers of water-cooled compressors Tighten the plugs after draining.
4	Remove filler plug (4). Fill the air receiver / oil separator with oil until the level reaches the filler opening. Refit and tighten plug (4). Tighten the vent plug (7) of the oil cooler.
5	Disconnect the air inlet hose from the inlet bend. Pour 10 liter of oil into the compressor stage. Reinstall the air inlet hose.
6	Run the compressor loaded 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 plug (4) 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 (4).
8	After carrying out all service actions in the relevant “Service Plan”, reset the service warning. Refer to the *Service menu* section.

6.5 Oil filter change

Warning

	Stop the compressor and switch off the voltage. The operator must apply all relevant Safety precautions.

Position of oil filters

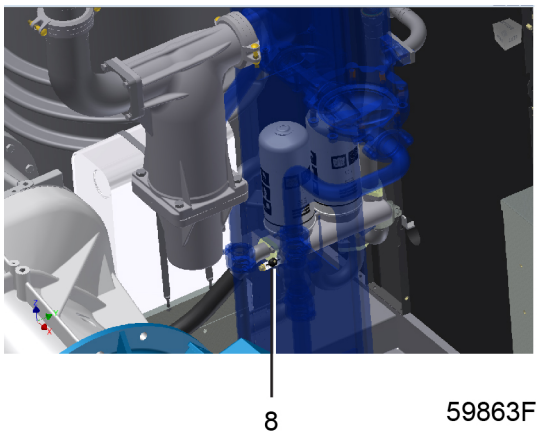


Figure 27: Position of oil filters on water-cooled compressor elements

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.

Step	Action
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 *Service menu* section.

6.6 Storage after installation

Procedure

Run the compressor, e.g. twice a week, until warm.

	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.

6.7 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 Adjustments and servicing procedures

7.1 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

Figure 28: Air filters, GA 200-315 VSD

Step	Action
1	Remove service panel (1) from the compressor.
2	Tilt the brackets (2) of the filter housing cap (3) and remove the filter housing cap.
3	Remove the filter element (4).
4	Fit the new filter element (4).
5	Reinstall the filter housing cap (3) and fasten the brackets (2).
6	Reinstall service panel (1).
7	Reset the service warning after carrying out all service actions in all applicable service plans. Refer to the service menu section of the Elektronikon regulator.

7.2 Coolers

Warning

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

Procedure

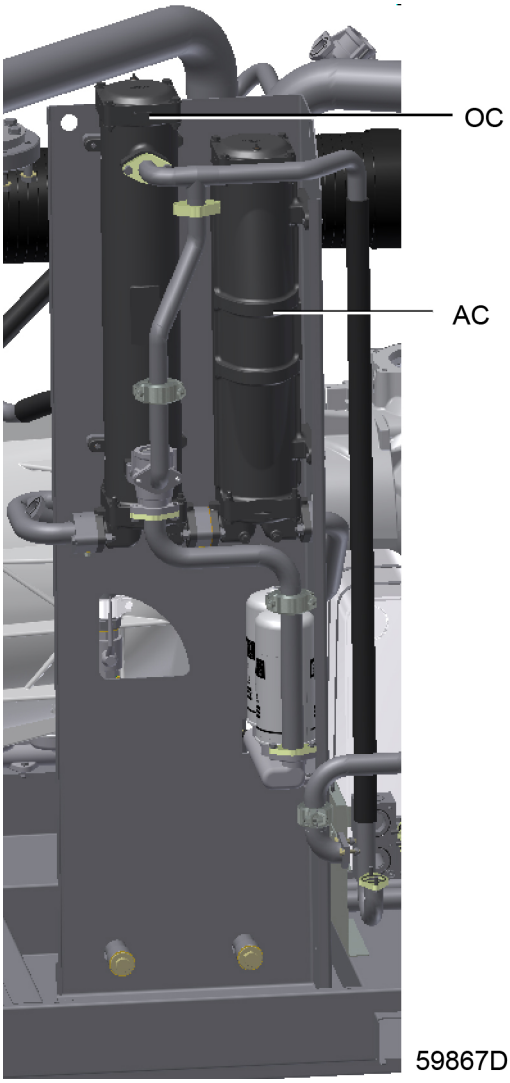


Figure 29: Oil cooler (OC) and air cooler (AC) of water-cooled compressors

Keep the coolers clean to ensure the cooling efficiency.

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

7.3 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

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).

8 Problem solving

8.1 Problem solving

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 valves.
	Open and lock the isolating switch.
	The operator must apply all relevant Safety precautions.

Control panel

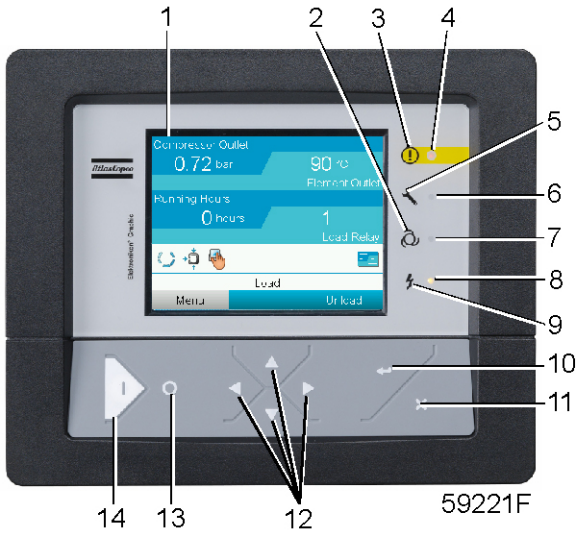


Figure 30: Elektronikon GraphicPlus controller

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 alarm LED (4) 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 alarm LED (4) 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 (10). Using the Scroll keys (12), move the cursor to the protections icon. Push the Enter key (10). Move the cursor to the blinking icon and press the Enter key (10). 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.
	EWD (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 *Coolers* section.
	Air cooler clogged.	Refer to the *Coolers* 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.

9 Technical data

9.1 Readings on display

Important

	The readings are valid when operating under reference conditions. See the section Reference conditions
	The main screen is shown, indicating the actual outlet pressure and status of the compressor. To call up other information such as actually measured pressures and temperatures, see the sections Inputs menu and Outputs menu.

Important readings

Compressor outlet pressure	bar(e) (psig)	Depends on programmed unloading and loading pressures
Pressure drop over air filters	bar	Below 0.05
Pressure difference over oil separator	bar	Below 0.8
Oil injection pressure at the compressor elements	bar(e) (psig)	Depends on programmed unloading and loading pressures
Compressor outlet temperature, water-cooled compressors	˚C	Approx. 26
Compressor stage outlet temperature	˚C	Between 70 and 100
Cooling water temperature	˚C	Below 50

9.2 Reference conditions

Reference conditions

Absolute inlet pressure	bar(a)	1
Relative air humidity	%	0
Air inlet temperature	˚C	20
Nominal working pressure		Refer to the *Compressor data* section
Cooling water inlet temperature	˚C	20
Cooling water temperature rise	˚C	10

9.3 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.

Absolute inlet pressure	bar	1
Maximum air inlet/ambient temperature	˚C	46
Minimum air inlet/ambient temperature	˚C	0
Maximum inlet temperature of cooling medium, open circuit	˚C	46
Minimum cooling medium inlet temperature	˚C	0
Maximum working pressure		Refer to the *Compressor data* section
Maximum inlet temperature of cooling medium, closed circuit	˚C	40
Maximum outlet temperature of cooling medium, open circuit	˚C	50
Maximum outlet temperature of cooling medium, closed circuit	˚C	60
Maximum cooling medium inlet pressure	bar(e)	10
Maximum altitude	m	1000

9.4 Settings of safety valves

Compressor type	Setting
For GA Pack compressors with a maximum working pressure of 8.5 or 10 bar	14 bar (e)

9.5 Settings for overload relay, fuses and circuit breakers

Setting of fan protection for water-cooled 50 Hz IEC compressors

Model	Supply voltage [V]	Short circuit current rating	Net	Q16 (A)	F16 (A)
GA 315 VSD	400	SSCCR	TT/TN	1.1	-

9.6 Compressor data

Data for GA 10 bar (145 psi) 50 Hz compressors

	Unit	GA 315 VSD
Maximum working pressure, GA Pack	bar	10
Nominal working pressure	bar	9.5
Maximum speed at maximum working pressure	rpm	2538
Total electrical power input for water-cooled Pack compressors	kW	398.2
Mean sound pressure level for water-cooled compressors	dB(A)	76
Cooling medium flow for water-cooled Pack compressors	l/s	5.8
Oil capacity for water-cooled compressors (approximately)	l	105
Weight of water-cooled Pack compressors	kg	5150

* For exact value: Contact your Atlas Copco Customer Center for specific data of your machine configuration

10 Pressure equipment directives

Types of air receivers / oil separator vessels

Depending on the compressor type, the air receiver / oil separator vessel and the position of the data plate will differ. Refer to the following drawings.

Figure 31: Model 1

Following factors are applicable for Model 1:

- casting factor of the cover: 0.8
- welding factor of the vessel: 0.7

Figure 32: Model 2

Model 2 has a casting factor (of cover and vessel) of 0.8

Text on figure:

Reference	Description
(1)	Cover serial number here
(2)	Data plate here

PED instructions and re-inspection data for GA 200 VSD up to GA 315 VSD compressors

This machine is a pressure assembly of category IV according to 2014/68/EU.

Parts of article 4.3 of 2014/68/EU are subject to Sound Engineering Practice (SEP).

Parts of category I according to 2014/68/EU are integrated into the machine and fall under the exclusion of article 1.2, (f)(i).

Parts subject to the Simple Pressure Vessel Directive 2014/29/EU are excluded from 2014/68/EU according to article 1.2 (c).

Components subject to 2014/68/EU Pressure Equipment Directive greater than or equal to category I:

- Oil separator vessel : Cat IV

  Depending on the model a design standard is applicable:

  - Model 1: AD-Merkblätter 2000
  - Model 2: ASME section VIII div. 1

  The design pressure of the vessel is 15 bar (218 psi).

  Fatigue is calculated for an infinite lifetime, considering a dp as mentioned in the below table.

- Safety valve : Cat IV

  Design code : AD-Merkblätter, A2

The compressor range contains 6 different air receivers / oil separator vessels. The part number is mentioned on the data plate of the vessel.

Model	Part number	Volume (l / GAL(US) / GAL(UK) / cuft)	Delta p (dp) (barg / psig)	Minimum wall thickness of the vessel (mm / in)	Minimum wall thickness of the cover (mm / in)
1	1623 0279 08 or 1635 1279 08	290 / 76.6 / 63.8 / 10.2	7.5 / 109	4.9 / 0.193	8.5 / 0.335
1	1623 0412 08 or 1635 1412 08	250 / 66.0 / 55.0 / 8.8	11 / 160	4.9 / 0.193	8.5 / 0.335
1	1623 0489 08 or 1635 1489 08	210 / 55.5 / 46.2 / 7.4	14 / 203	5.8 / 0.228	8.5 / 0.335
1	1623 1765 08 or 1635 1765 08	290 / 76.6 / 63.8 / 10.2	14 / 203	5.8 / 0.228	8.5 / 0.335
1	1635 7167 88	560 / 147.9 / 123.2 / 19.8	9.1 / 132	6.9 / 0.272 (bottom 6.3 / 0.248)	16 / 0.630
2	1623 9044 08	473 / 125.0 / 104.0 / 16.7	9.1 / 132	11 / 0.433	16 / 0.630

Table 14: Specifications of air receivers / oil separator vessels

11 Documentation

Declaration of conformity

Typical example of a Declaration of Conformity document

EU DECLARATION OF CONFORMITY

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

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

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

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

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

.....(4)..... is authorized to compile the technical file.

	Conformity of the specification to the directives	Conformity of the product to the specification and by implication to the directives
Issued by	Engineering	Manufacturing
Name	.....	.....
Signature	.....	.....
Date	.....	.....
Place	.....	.....

Form 5009 xxxx xx
ed. xx, xxxx-xx-xx

....(5)....

58397_3D

Figure 33:

(1): Manufacturer

(2): Applicable directives

(3): Standards used

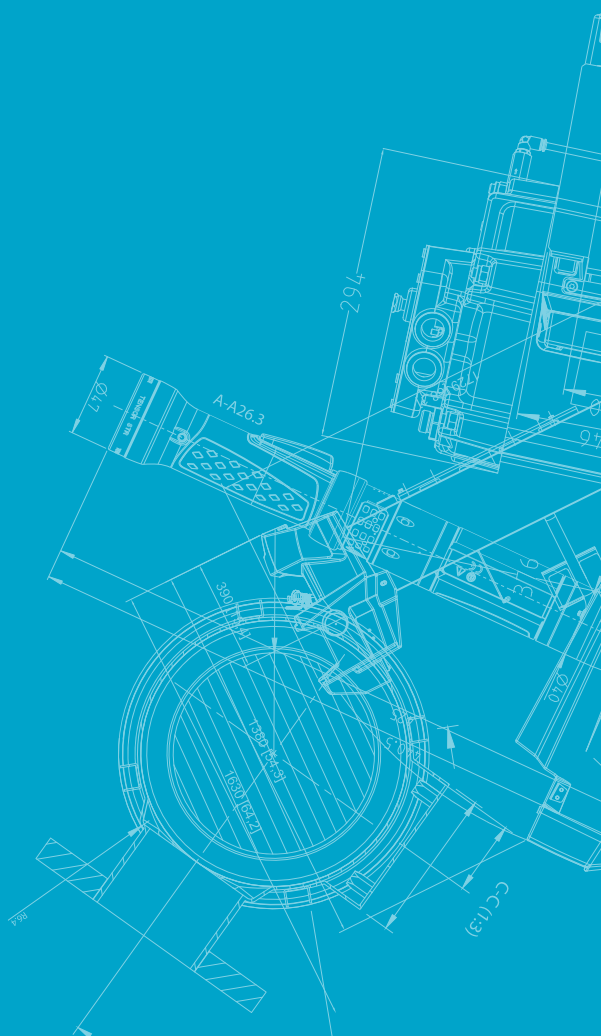
(4): Technical file holder

(5): Contact address of the manufacturer

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

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

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