Atlas Copco

Oil-sealed rotary screw vacuum pumps

GHS 350 VSD+, GHS 585 VSD+, GHS 730 VSD+,
GHS 900 VSD+, GHS 350 VSD+ Turbo,
GHS 585 VSD+ Turbo, GHS 730 VSD+ Turbo

Instruction Book

6996 0227 40
Issue C

This page has been intentionally left blank.

Atlas Copco

Oil-sealed rotary screw vacuum pumps

GHS 350 VSD+, GHS 585 VSD+, GHS 730 VSD+,
GHS 900 VSD+, GHS 350 VSD+ Turbo,
GHS 585 VSD+ Turbo, GHS 730 VSD+ Turbo

From following serial No. onwards: API 850 800

Instruction book

Original instructions

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.

2017 - 09

No. 6996 0227 40 Issue C

www.atlascopco.com

Table of contents

1 Safety precautions 7

1.1 Safety icons 7

1.2 General precautions 7

1.3 Safety precautions during installation 8

1.4 Safety precautions during operation 9

1.5 Safety precautions during maintenance or repair 10

2 General description 12

2.1 What is vacuum and how is flow rate understood 12

2.2 Introduction 13

2.3 Flow diagram 15

2.4 Condensate system 16

2.5 Regulating system 16

2.6 Electrical system 17

3 Elektronikon® Graphic controller 18

3.1 Elektronikon® Graphic controller 18

3.2 Control panel 20

3.3 Icons used 21

3.4 Main screen 24

3.5 Calling up menus 27

3.6 Inputs menu 28

3.7 Outputs menu 31

3.8 Counters 33

3.9 Control mode selection 34

3.10 Service menu 36

3.11 Modifying the setpoint 39

3.12 Event history menu 41

3.13 Modifying general settings 43

3.14 Info menu 46

3.15 Week timer menu 47

3.16 User password menu 55

3.17 Web server 56

3.18 Programmable settings 64

4 Installation 66

4.1 Dimension drawings 66

4.2 Installation proposal 68

4.3 Electrical connections 71

4.4 Pictographs 75

5 Operating instructions 77
5.1 Initial start-up 77
5.2 Starting 78
5.3 During operation 79
5.4 Taking out of operation 80
5.5 Stopping 80
6 Maintenance 81
6.1 Preventive maintenance schedule 81
6.2 Oil specifications 85
6.3 Drive motor 86
6.4 Air filter 86
6.5 Oil and oil filter change 87
6.6 Coolers 90
6.7 Oil separator change 90
6.8 Pressure switch 91
6.9 Service kits 92
6.10 Storage after installation 92
6.11 Disposal of used material 92
7 Problem solving 93
8 Technical data 102
8.1 Reading on display 102
8.2 Electrical cable size and fuses 103
8.3 Reference condition and limitations 110
8.4 Vacuum pump data 110
8.5 Technical data Elektronikon® controller 116
9 Instructions for use 117
10 Guidelines for inspection 118
11 Declaration of conformity 119

1 Safety precautions

1.1 Safety icons

Explanation

	Danger for life
	Warning
	Important note

1.2 General precautions

General 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.
4. The vacuum pump is designed for handling atmospheric air only. No other gases, vapors or fumes should be exposed to the vacuum pump intake or processed by the vacuum pump.
5. Before any maintenance, repair work, adjustment or any other non-routine checks:
    - Stop the vacuum pump
    - Press the emergency stop button
    - Switch off the voltage
    - Make sure that the vacuum pump system is at atmospheric pressure level.
    - 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!

	In a domestic environment, this product may cause radio interference in which case supplementary mitigation measures are required.

6. Avoid contact with pump intake during operation.
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 not allowed to walk or stand on the unit or on its components.

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. 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. Water handling capacity is limited.
4. Any blanking flanges, plugs, caps and desiccant bags must be removed before connecting the pipes.
5. Vacuum connection and discharge pipes must be of correct size and suitable for the working pressure and temperature. Never use frayed, damaged or worn hoses. Distribution pipes and connections must be of the correct size and suitable for the working pressure.
6. The aspirated air must be free of flammable fumes, vapours and particles, e.g. paint solvents that can lead to internal fire or explosion.
7. The external force extended on the in- and outlet connection is limited to 10 kg; the connection pipes must be free of strain. No supports may be fixed to the canopy of the machine..
8. 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, 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 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.
9. 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 inlet.
10. 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 pump.
11. 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.
12. Never remove or tamper with the safety devices, guards or insulation fitted on the machine.
13. 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.
14. If the ground is not level or can be subject to variable inclination, consult the manufacturer.

15. Pump outlet air contains traces of oil mist. Ensure compatibility with the working environment.
16. Any vacuum pump placed in an application with inlet gas stream temperatures above the published maximum temperature should be approved by Atlas Copco prior to start-up.
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.

	Also consult sections Safety precautions during operation and Safety precautions during maintenance or repair. These precautions apply to machinery processing or consuming air or inert gas. Processing of any other gas requires additional safety precautions typical to the application which are not included herein. Some precautions are general and cover several machine types and equipment; hence some statements may not apply to your machine.

1.4 Safety precautions during operation

	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 vacuum pump during operation.
2. Use only the correct type and size of hose end fittings and connections. 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, vapours 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 vacuum pumps 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
   - There are no leaks
   - 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
   - Electrical cabinet air cooling filters are not clogged
9. If warm cooling air from vacuum pumps 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. Do not remove any of, or tamper with, the sound-damping material.
11. Never remove or tamper with the safety devices, guards or insulations fitted on the machine.

12. The oil separator tank can be slightly pressurised. Do not open and do not leave oil filler or drain plugs open during operation.
13. Do not use the pump as a compressor.
14. Never run the pump without the air intake filter mounted.
15. On water-cooled vacuum pumps using open circuit cooling towers, protective measures must be taken to avoid the growth of harmful bacteria such as Legionella pneumophila bacteria.

	Also consult sections Safety precautions during installation and Safety precautions during maintenance or repair. These precautions apply to machinery processing or consuming air or inert gas. Processing of any other gas requires additional safety precautions typical to the application which are not included herein. Some precautions are general and cover several machine types and equipment; hence some statements may not apply to your machine.

1.5 Safety precautions during maintenance or repair

	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.
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. Before removing any component, effectively isolate the machine from all sources of under- and/or overpressure and make sure that the pump system is at atmospheric pressure level.
8. Never use flammable solvents or carbon tetrachloride for cleaning parts. Take safety precautions against toxic vapors of cleaning liquids.
9. Scrupulously observe cleanliness during maintenance and repair. Keep dirt away by covering the parts and exposed openings with a clean cloth, paper or tape.
10. 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.
11. 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.
12. Never use a light source with open flame for inspecting the interior of a machine, pressure vessel, etc.
13. Make sure that no tools, loose parts or rags are left in or on the machine.
14. 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.
15. 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 vacuum pump drive shaft has been reinstalled.

16. Every time the separator element is renewed, examine the discharge and the inside of the oil separator vessel for carbon deposits; if excessive, the deposits should be removed.
17. Protect the motor, air filter, electrical and regulating components, etc. to prevent moisture from entering them, e.g. when steam cleaning.
18. 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 vacuum pump are in good condition. If damaged, replace it by genuine material from the manufacturer to prevent the sound pressure level from increasing.
19. Never use caustic solvents which can damage materials of the air net, e.g. polycarbonate bowls.
20. Faults or wearing of seals may cause oil lubricant leaks. Avoid dispersion in soil and pollution of other materials.

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

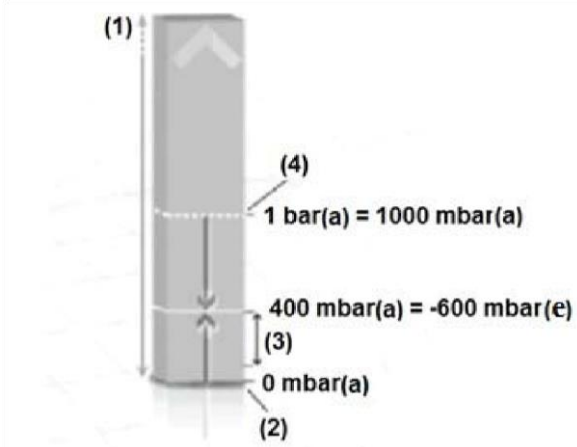
2 General description

2.1 What is vacuum and how is flow rate understood

What is vacuum and how to denote

A vacuum is any pressure in a system that is below the ambient atmospheric pressure. It can be denoted in absolute terms or in effective (gauge) terms:

- mbar(a) – absolute pressure – denotes how much the pressure is above absolute zero vacuum.
- (minus) mbar(e) – the effective or gauge pressure – denotes how much the pressure is below the local atmospheric pressure.



Reference	Designation
1	Pressure
2	Absolute vacuum
3	Typical GHS pump working range (400 mbar(a) – 10 mbar(a))
4	Atmospheric pressure

Atmospheric pressure at sea level is roughly 1 bar or 1000 mbar. A typical working range for the GHS pumps is 400 mbar(a) to 10 mbar(a). From the illustration it can be seen clearly that this range is also equivalent to -600 mbar(e) and -990 mbar(e).

It is important to understand which type of reference is required before selecting a pressure instrument for measuring the vacuum. It must be noted that the distinction doesn't matter for a pressure difference (delta P; e.g. pressure loss), since it is always the result of subtracting 2 pressures (whether stated as absolute or effective pressures).

Flow rate definitions

There are 2 common but different ways to denote flow rate in vacuum. The first one is based on the displacement or volumetric flow rate and the second one is based on the throughput or mass flow rate. Atlas Copco vacuum pumps use volumetric flow rate to denote performance, the unit being Am^3/hr.

Displacement/volumetric flow rate

For the relevant pressure range, when a GHS pump operates at quasi constant motor speed (rotations per minute) and since the compression chambers have fixed dimensions, the same volume of air is pumped from inlet to outlet with falling pressure level. Over the relevant pressure range, this makes the volumetric flow rate quasi independent of the vacuum level. It is the expression of the flow rate inside the piping at the governing vacuum level (Am^3/hr), and always higher than the throughput in mass flow rate.

Throughput in mass flow rate

Even if the volumetric flow rate is quasi unchanged with falling pressure level, the number of molecules in that pumped volume is not. By definition: the deeper the vacuum, the lower the amount of molecules in the same volume of air. This means that the mass flow will decrease with decreasing (absolute) pressure. It is clear that a flow rate must be stated at a certain vacuum level when using this denotation.

2.2 Introduction

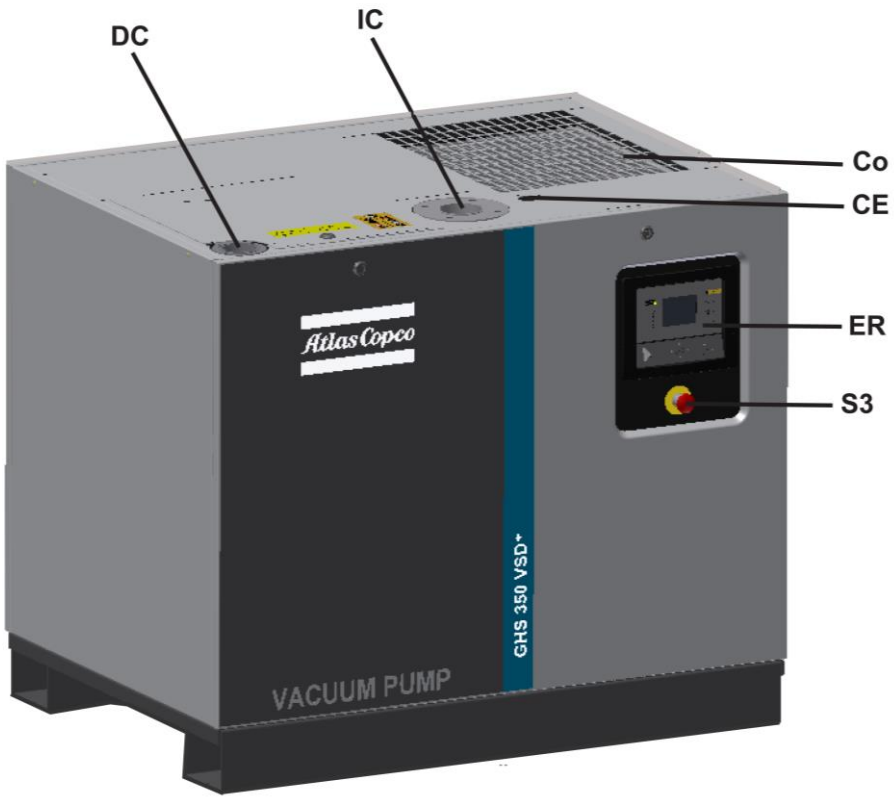
The GHS 350 VSD+ up to GHS 900 VSD+ are single-stage, oil-sealed screw vacuum pumps driven by an electric motor.

The vacuum pumps are controlled by the Atlas Copco Elektronikon® Graphic regulator (ER).

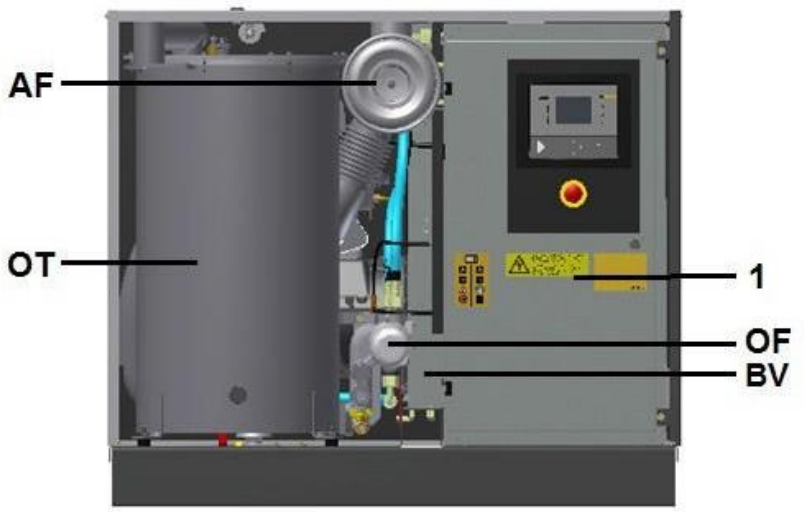
The regulator is fitted to the front door. An electric cabinet (1) comprising fuses, transformers, relays, etc. is located behind this door.

The vacuum pumps use VSD (Variable Speed Drive) technology. This means: automatic adjustment of the motor speed, depending on the process demand.

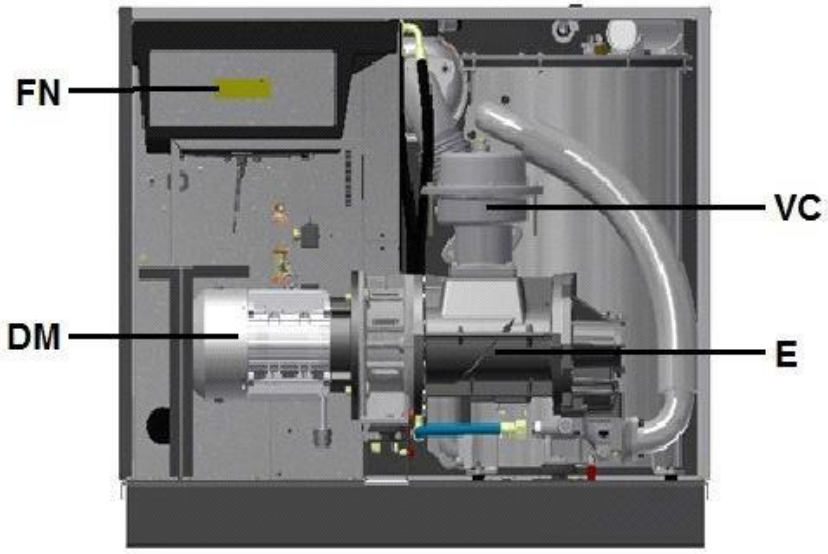
The vacuum pumps are air-cooled and are enclosed in a sound-insulated bodywork.



Front view



Open view front

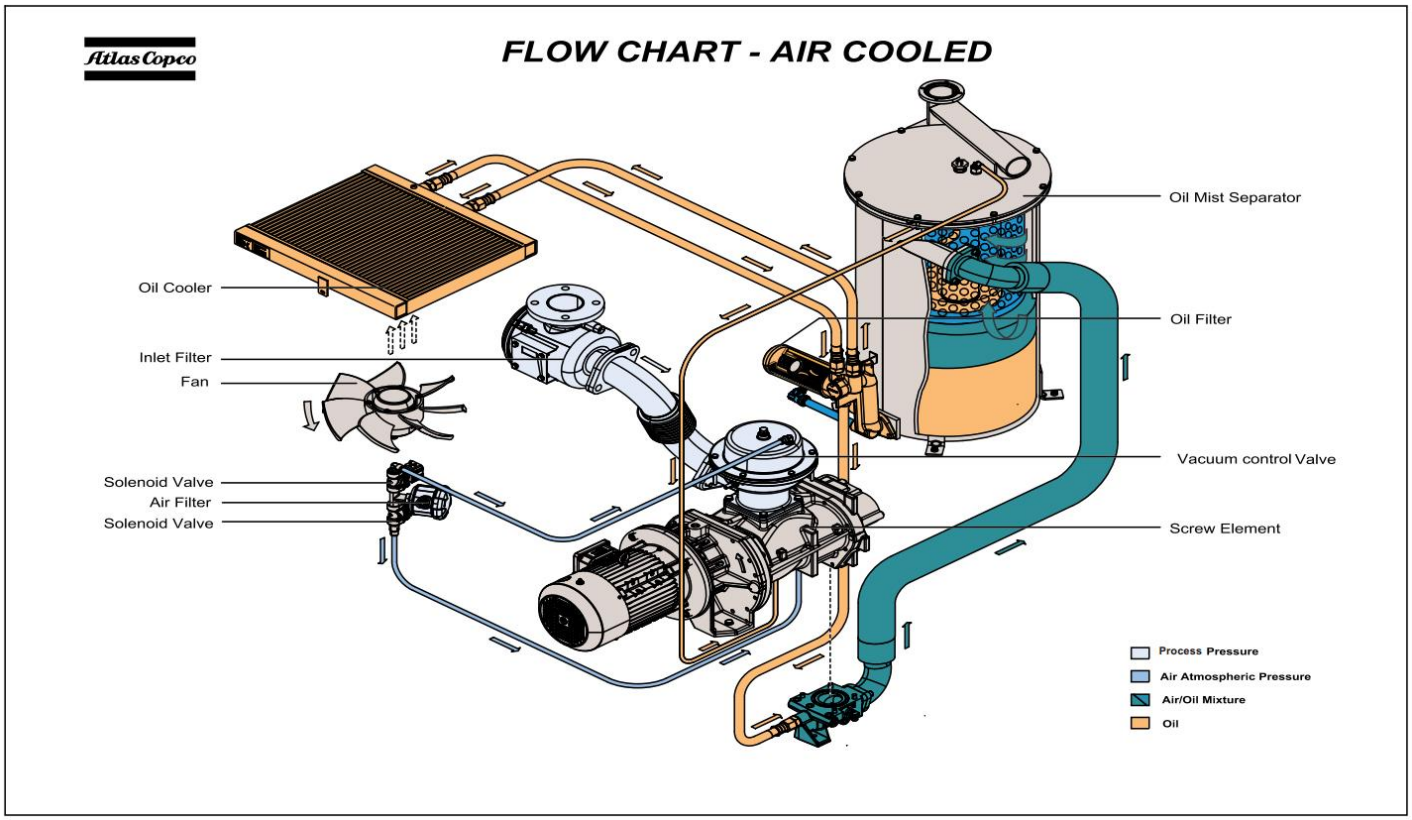


Open view back

Reference	Name
AF	Air intake filter
Co	Oil cooler
E	Element
ER	Elektronikon® Graphic controller
FN	Cooling fan
DM	Drive motor
OF	Oil filter
OT	Oil separator tank
S3	Emergency stop button
1	Electric cabinet
VC	Vacuum control valve

Reference	Name
IC	Inlet connection
BV	Thermostatic bypass valve
DC	Discharge connection
CE	Cable entry

2.3 Flow diagram



Air flow

Air comes in through air intake filter (AF) and Vacuum Control Valve (VC) and is displaced by the vacuum pump element (E).

A mixture of air and oil flows into the oil separator tank (OT).

After passing the air/oil separator filter, clean air, conditioned to a few parts per million, is discharged through the outlet.

Oil system

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

The oil system has a thermostatic bypass valve (BV).When the oil temperature is below 83 °C (181 °F) (87°C (189°F) for optional high water handling capacity versions), the bypass valve shuts off the oil supply from the oil cooler (Co).

Air pressure forces the oil from oil separator tank through the oil filter (OF). The oil cooler (Co) is bypassed. When the oil temperature has increased up to 83 °C (181 °F) (87°C (189° F) for optional high water handling capacity versions), bypass valve (BV) starts opening the supply from the oil cooler (Co). At approx. 95°C (203°F) (104°C (219°F) for optional high water handling capacity versions), all

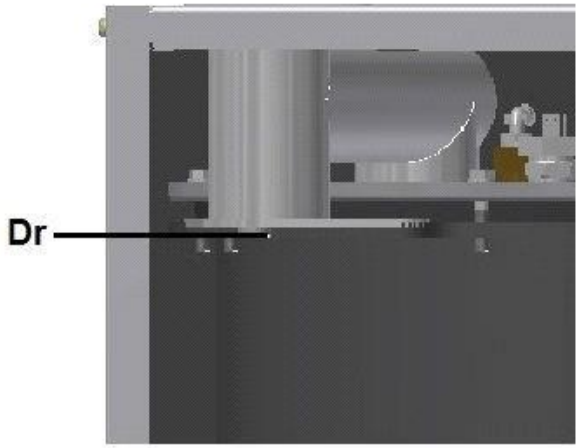
the oil flows through the oil cooler. The filtered oil flows into the vacuum pump element (E).

Cooling

The cooling system has an oil cooler (Co).

The fan (FN) blows air over the coolers. This fan is set to run on or off, depending on the operating conditions, according to a specific algorithm.

2.4 Condensate system



When discharge piping is used, water in the discharge air can condense in the piping and is accumulated in the collector of the outlet pipe, where a drain point (Dr) is available.

When the pump leaves the factory, this drain point is sealed with a threaded plug, but can be exchanged by a G1/4" connector with tube to drain the condensate. Preventing condensate collection in the oil separator will extend oil life.

Consult local regulations, which are applicable for water drainage.

2.5 Regulating system

Description

If the vacuum process demand is less than the throughput of the vacuum pump, the vacuum pressure decreases. When the pressure is lower than the set-point (desired vacuum pressure), the regulator decreases the motor speed.

If the vacuum pressure decreases and the motor operates at minimum speed, the regulator stops the motor. When the motor is stopped automatically and the vacuum pressure comes to the set-point, the regulator starts the motor again.

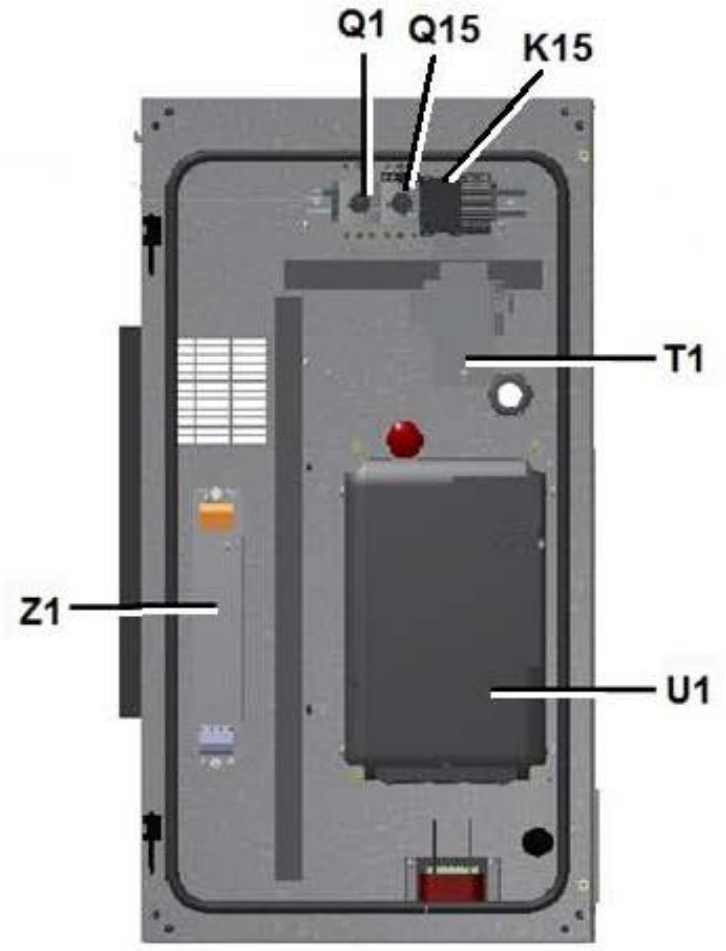
Turbo version

The regulation system of the Turbo version is designed to handle fast cycling duties. When the vacuum pressure reaches the set-point, the regulator will keep the motor running at increased speed for an adjustable time before the regulator decreases the motor speed.

2.6 Electrical system

Electric components

The electrical system has following components:



Electrical cabinet (typical example)

Reference	Description
T1	Transformer
Q15	Circuit breaker
Q1	Circuit breaker
K15	Contactor
Z1	EMC filter
U1	Frequency converter

Electrical diagrams

You can find the complete electrical diagram inside the electric cabinet.

3 Elektronikon® Graphic controller

3.1 Elektronikon® Graphic controller

Control panel

Display of the Elektronikon® Graphic controller

Introduction

The Elektronikon® controller has following functions:

- Controlling the vacuum pump
- Protecting the vacuum pump
- Monitoring components subject to service
- Automatic restart after voltage failure (made inactive)

Automatic control of the vacuum pump operation

The controller maintains the pressure within programmable limits by automatically adapting the motor speed. A number of programmable settings, e.g. the set point, the minimum stop time and the maximum number of motor starts and several other parameters are hereby taken into account.

The controller stops the vacuum pump whenever possible to reduce the power consumption and restarts it automatically when the pressure decreases. For High Water Handling Capability pumps, the pump is equipped with a purge cycle which prevents and removes condensed water in the sealing oil.

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

Protecting the Vacuum pump

Shut-down

Several sensors are provided on the vacuum pump. If one of the measurements succeeds the programmed shut down level, the vacuum pump will be stopped. This will be indicated on display (1) and general alarm LED (2) will blink.

Remedy the trouble and reset the message. See also the Inputs menu.

	Before remedying, consult the Safety precautions.

Shut-down warning

A shut-down warning level is a programmable level below the shut-down level.

If one of the measurements succeeds the programmed shut-down warning level, a message will appear on display(1) and general alarm LED(2) will light up, to warn the operator that the shut-down warning level is exceeded.

The message disappears as soon as the warning condition disappears.

Warning

A warning message will appear if:

- Element outlet temperature is too high
- Pump discharge pressure is too high
- Purge cycle was not successful (temperature not reached within requested time)

Service warning

A number of service operations are grouped (called Service Plans). Each Service Plan has a programmed time interval. If a time interval is exceeded, a message will appear on display (1) to warn the operator to carry out the service actions belonging to that Service Plan.

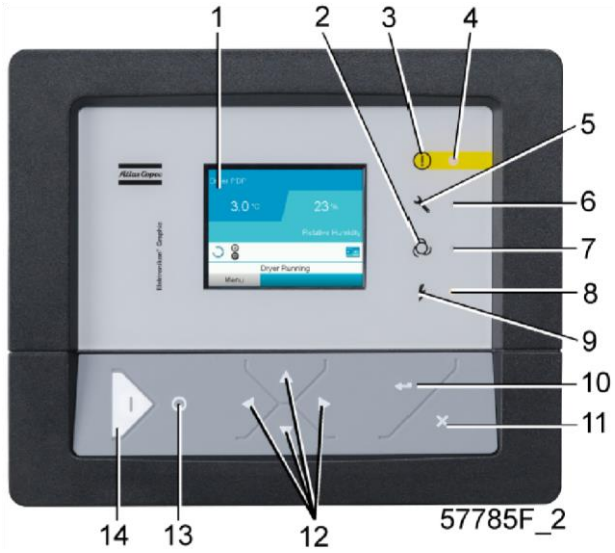
Automatic restart after voltage failure

The regulator has a built-in function to automatically restart the vacuum pump if the voltage is restored after voltage failure. For vacuum pumps leaving the factory, this function is made inactive. If desired, the function can be activated. Consult the Atlas Copco Customer Center.

	If activated and provided the regulator was in the automatic operation mode, the vacuum pump will automatically restart if the supply voltage to the module is restored.

3.2 Control panel

Elektronikon regulator

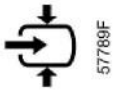


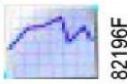
Elektronikon regulator

Reference	Designation	Function
1	Display	Shows the vacuum pump 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 vacuum pump.
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	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 vacuum pump LED (7) goes out.
14	Start button	Button to start the vacuum pump LED (7) lights up indicating that the Elektronik on regulator is operative.

3.3 Icons used

Status icons

Name	Icon	Description
Stopped/Running		When the vacuum pump is stopped, the icon stands still. When the vacuum pump is running, the icon is rotating.
Vacuum pump status		Motor stopped
		Running Purge and Intermediate states
		Running Vacuum Control
Machine control mode		Local start/stop
		Remote start/stop
		Network control
Automatic restart after voltage failure		Automatic restart after voltage failure is active
Week timer		Week timer is active
Active protection functions		Emergency stop
		Shutdown
		Warning

Name	Icon	Description
Service		Service required
Main screen display	 59162F	Value lines display icon
	 82196F	Chart display icon
General icons	 81105D	No communication / network problem
	 82418D	Not valid

Input icons

Icon	Description
	Pressure
 57800F	temperature
 57801F	Digital input
 57802F	Special protection

System icons

Icon	Description
 57803F	Vacuum pump element
 57805F	Fan
 57806F	Frequency converter
 57809F	Motor
 57792F	Network problem
 57812F	General alarm

Menu icons

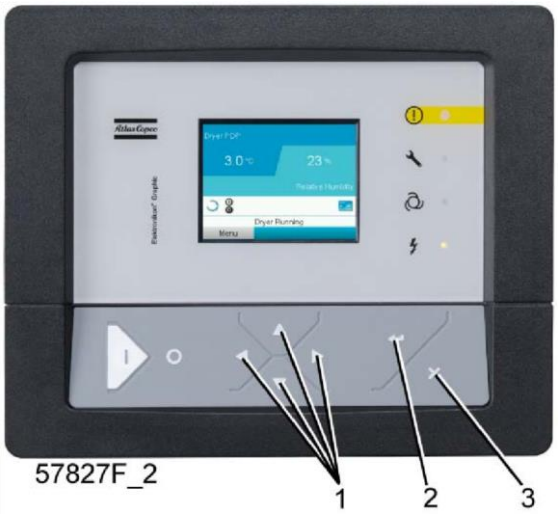
Icon	Description
	Inputs
	Outputs
	Alarms (Warnings, shutdowns)
	Counters
	Test
	Settings
	Service
	Saved data
	Access key/User password
	Network
	Regulation
	Info

Navigation arrows

Icon	Description
	Up
	Down

3.4 Main screen

Control panel



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

Function

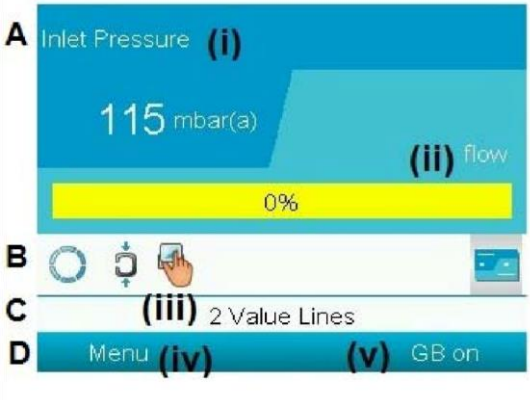
The Main screen is the screen that is shown automatically when the voltage is switched on and one of the keys is pushed. It is switched off automatically after a few minutes when no keys are pushed.

Typically, 5 different main screen views 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 lines screens

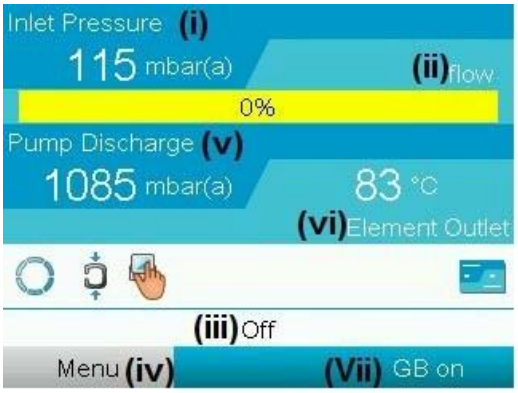
This type of Main screen shows the value of 2 or 4 parameters (see section Inputs menu).



Typical Main screen (2 value lines)

Text on figures

(i)	Inlet pressure
(ii)	Flow
(iii)	Vacuum control, shutdown,... (text varies upon the vacuum pumps actual condition)
(iv)	Menu
(v)	ES,...(text varies upon the vacuum pumps actual condition)



Typical Main screen (4 value lines)

Text on figures

(i)	Inlet pressure
(ii)	Flow
(iii)	Off, Shutdown,... (text varies upon the vacuum pumps actual condition)
(iv)	Menu
(v)	Discharge pressure
(vi)	Element outlet
(vii)	vacuum control, purge, preparing to go online,.(text varies upon the vacuum pumps actual condition)

- Section A shows information regarding the vacuum pump operation (e.g. the Inlet pressure or the temperature at the vacuum pump outlet). On Vacuum pumps with a frequency converter, the load degree (flow) is given in % of the maximum flow at the actual inlet pressure.
- Section B shows 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. vacuum pump stopped or running, vacuum pump status (running, running unloaded or motor stopped).
  - 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 call up more information about the icons shown, select the icon concerned using the *scroll* keys and press 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 motor overload, service message or emergency stop
  - To have access to all data collected by the regulator

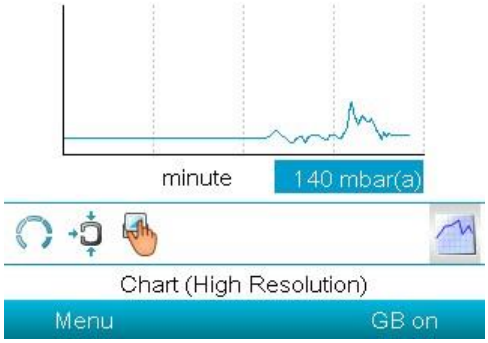
The function of the buttons depends on the displayed menu. The most common functions are:

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

To activate an action button, highlight the button by using the *Scroll* keys and press the *Enter* key. To go back to the previous menu, press the *Escape* key.

Chart views

Instead of viewing values, it is also possible to view a graph of one of the input signals (see section Inputs menu) in function of the time.



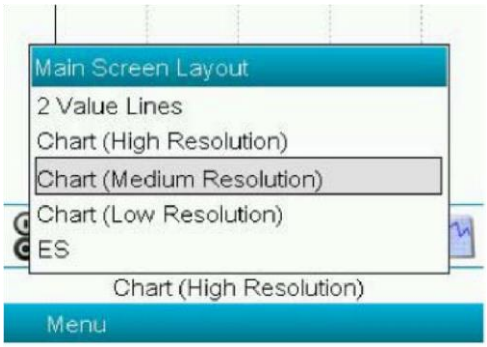
When Chart (High Resolution) is selected, the chart shows the variation of the selected input (in this case the pressure) per minute. Also the instantaneous value is displayed. The screen shows the last 4 minutes.

The switch button (icon) for selecting other screens is changed into a small Chart and is highlighted (active). When the Chart (Medium Resolution) is selected, the chart shows the variation of the selected input per hour. The screen shows the last 4 hours.

When the Chart (Low Resolution) is selected, the chart shows the variation of the selected input per day. The screen shows the evolution over the last 10 days.

Selection of a main screen view

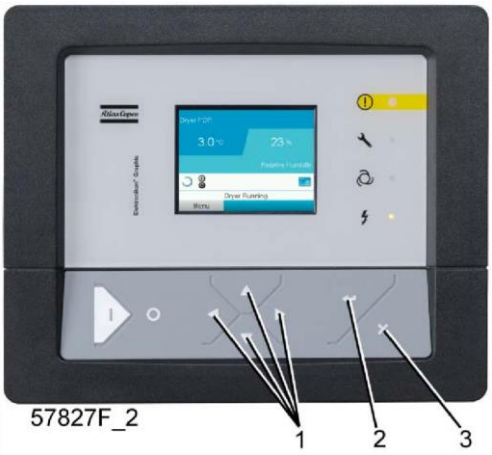
To change between the different screen layouts, select the far right icon in the control icons line (see value lines display icon or chart display icon in section Icons used) and press the *Enter* key. A screen similar to the one below opens:



Select the layout required and press the *Enter* key. See also section Inputs menu.

3.5 Calling up menus

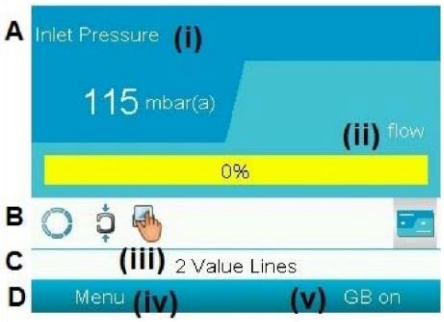
Control panel



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

Description

When the voltage is switched on, the main screen is shown automatically.

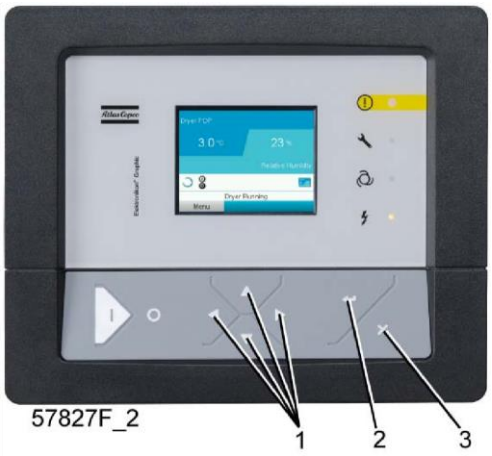


- To go to the Menu screen, select *Menu*, using the *Scroll* keys
- Press the *Enter* key to select the *menu*. Following screen appears:

- The screen shows a number of icons. Each icon indicates a menu item. By default, the Pressure Settings (Regulation) icon is selected. The status bar shows the name of the menu that corresponds with the selected icon.
- Use the *Scroll* keys to select an icon.
- Press the *Escape* key to return to the Main screen.

3.6 Inputs menu

Control panel



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

Menu icon, inputs

Function

- To display the actual value of the measured data (analog inputs) and the status of the digital inputs (e.g. emergency stop contact, motor overload relay, etc.).
- To select the digital input to be shown on the chart in the main screen.

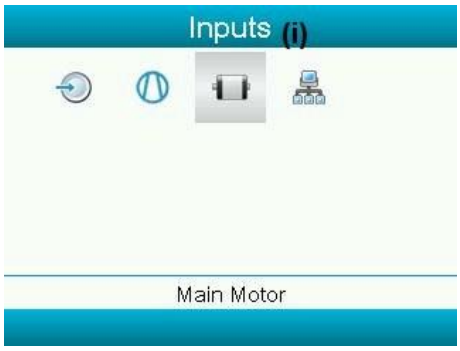
Procedure

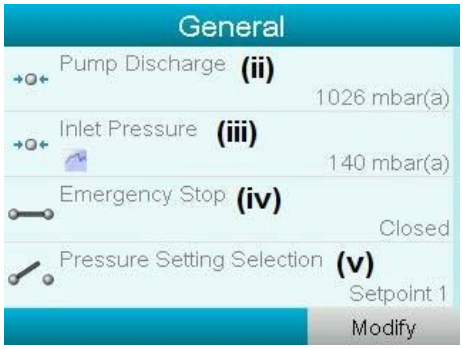
Starting from the Main screen (see Main screen):

- Move the cursor to the action button Menu and press the *enter* key, following screen appears:

(i)	Menu
(ii)	Regulation

- Using the *scroll* keys, move the cursor to the inputs icon (see above, section Menu icon)
- Press the enter key, a screen similar to the one below appears:





(i)	Inputs
(ii)	Discharge pressure
(iii)	Inlet pressure
(iv)	Emergency stop
(v)	Pressure setting selection

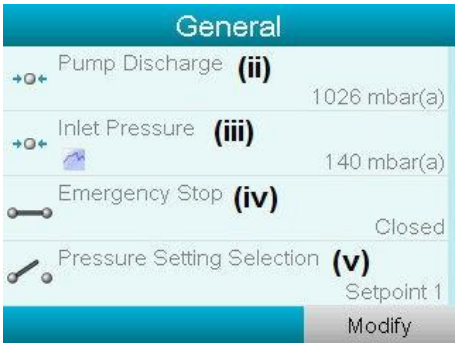
- The screen shows a list of all inputs with their corresponding icons and readings.

- If an input is in warning or shutdown, the original icon is replaced by the warning or shutdown icon respectively (i.e. the Stop icon and the Warning icon in the screen shown above).

A small chart icon, shown below an item in the list means this input signal is shown on the chart at the main screen. Any analog input can be selected.

Selecting another input signal as main chart signal

With the Modify button active (light grey background in above screen), press the Enter button on the controller. A screen similar to the one below appears:

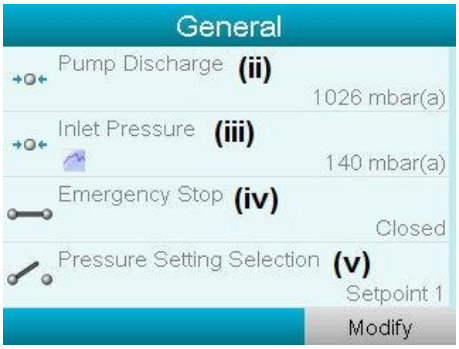


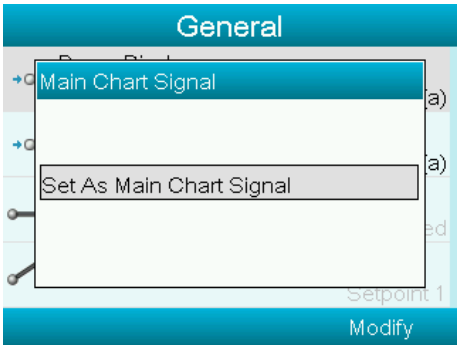
The first item in the list is highlighted. In this example, the inlet Pressure is selected (chart icon). To change, press the *Enter* button again: a pop-up window opens:

Press *Enter* again to remove this input from the chart. Another confirmation pop-up opens:

Select *Yes* to remove or *No* to quit the current action.

In a similar way, another input signal can be highlighted and selected as Main Chart signal:





(i)	Set as main chart signal

3.7 Outputs menu

Control panel

Menu icon, outputs

Function

To call up Information regarding the actually measured data and the status of some outputs such as the motor overload protection.

Procedure

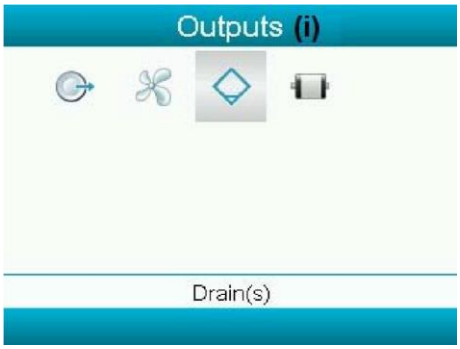
Starting from the Main screen (see Main screen):

- Move the cursor to the action button Menu and press the *enter* key (2),following screen appears:

Text on figures

(i)	Menu
(ii)	Regulation

- Move the cursor to the outputs icon (see above, section *Menu* icon, using the *scroll* keys(1)
- Press the *enter* key (2), a screen similar to the one below appears:



(i)	Outputs
(ii)	Modulating Valve
(iii)	Gas ballast
(iv)	Automatic Operation
(v)	General warning

- The screen shows a list of all output switches and their corresponding icons and readings.
- If an input is in warning or shut down, the original icon is replaced by the warning or shut down icon respectively.

3.8 Counters

Control panel

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

Menu icon, counters

Function

To call up:

- The running hours
- The number of motor starts
- The number of hours that the regulator has been powered up
- Fan starts
- Emergency stops

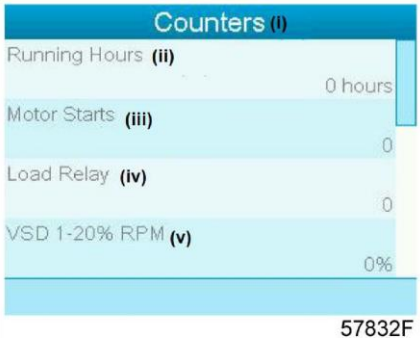
Procedure

- Starting from the Main screen (see Main screen):
- Move the cursor to the action button Menu and press the *enter* key (2),following screen appears:

Text on figures

(i)	Menu
(ii)	Regulation

- Using the *scroll* keys, move the cursor to the counters icon (see above, section Menu icon)
- Press the *enter* key, following screen appears:



Text on figures

(i)	Counters
(ii)	Running hours
(iii)	Motor starts
(iv)	Load relay
(v)	VSD 1-20 % rpm in % (the percentage of the time during which the motor speed was between 1 and 20 %)

- The screen shows a list of all counters with their actual readings.

3.9 Control mode selection

Control panel

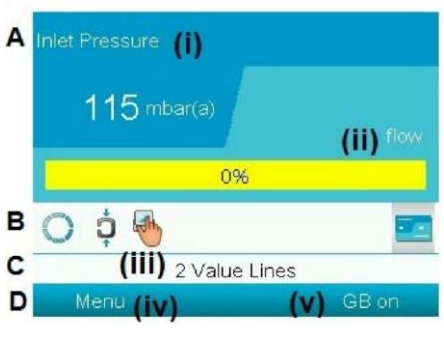
(1)	Scroll keys
(2)	Enter key
(3)	Escape key

Function

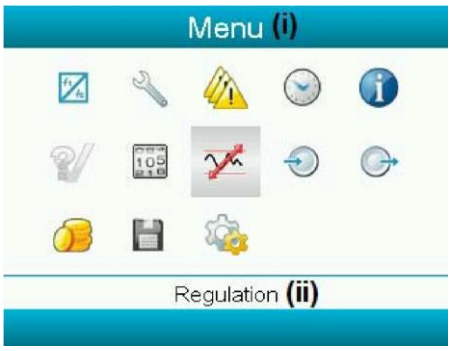
To select the control mode, i.e. whether the vacuum pump is in local control, remote control or controlled via a local area network (LAN).

Procedure

Starting from the main screen, make sure the button Menu (iv) is selected:



Next, use the *scroll* buttons to go to the *regulation* icon (ii) and press the *enter* button:



There are 3 possibilities:

- Local control
- Remote control
- LAN (network) control

After selecting the required regulation mode, press the enter button on the controller to confirm your selection. The new setting is now visible on the main screen. See section Icons used for the meaning of the icons.

3.10 Service menu

Control panel

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

Menu icon, Service

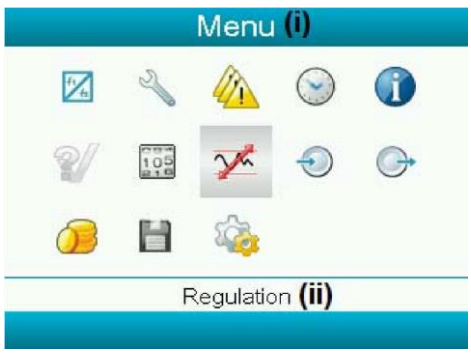
Function

- To reset the service plans which are carried out.
- To check when the next service plans are to be carried out.
- To find out which service plans were carried out in the past.
- To modify the programmed service intervals.

Procedure

Starting from the Main screen,

- Move the cursor to the action button Menu and press the *Enter* key. Following screen appears:



- Using the Scroll keys, move the cursor to the Service icon (see above, section Menu icon).
- Press the *Enter* key. Following screen appears:

Text on figures

(i)	Service
(ii)	Overview
(iii)	Service plan
(iv)	Next service
(v)	History

- Scroll through the items to select the desired item and press the *Enter* key to see the details as explained below.

Overview

Text on figures

(i)	Overview
(ii)	Running Hours
(iii)	Real Time hours
(iv)	Reset

Example for service level (A):

The figures at the left are the programmed service intervals. For Service interval A, the programmed number of running hours is 4000 hours (upper row) and the programmed number of real time hours is 8760 hours, which corresponds to one year (second row). This means that the controller will launch a service warning when either 4000 running hours or 8760 real hours are reached, whichever comes first. Note that the real time hours counter keeps counting, also when the controller is not powered.

The figures within the bars are the number of hours to go till the next service intervention. In the example above, the Vacuum pump was just started up, which means it still has 4000 running hours or 8280 hours to go before the next Service intervention.

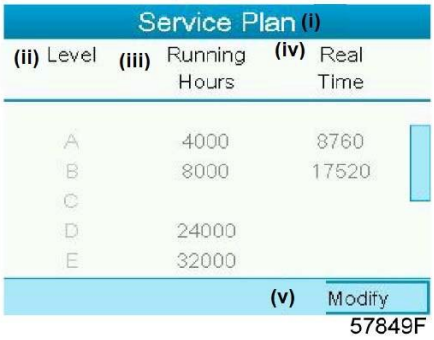
Service plans

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

When a service plan interval is reached, a message will appear on the screen.

After carrying out the service actions related to the indicated levels, the timers must be reset.

From the Service menu above, select Service plan (3) and press Enter. Following screen appears:

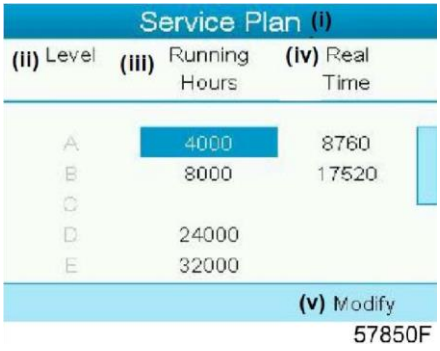


Text on figures

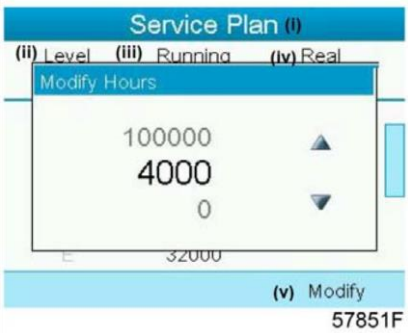
(1)	Service plan
(2)	Level
(3)	Running hours
(4)	Real time hours
(5)	Modify

Modifying a service plan

Dependant on the operating conditions, it can be necessary to modify the service intervals. (By default the service plan in Electronikon controller is for normal application and needs to be changed when running in medium or harsh applications). To do so, use the *Scroll* keys to select the value to be modified. A screen similar to the one below appears:



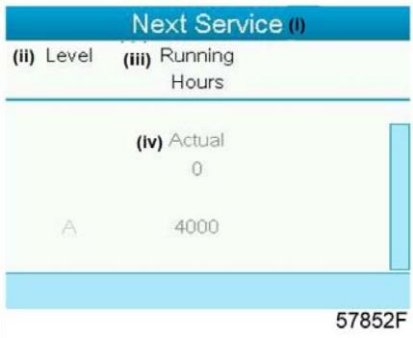
Press the *Enter* key. Following screen appears:



Modify the value as required using the↑ or ↓ *scroll* key and press the *Enter* key to confirm.

Note: Running hours can be modified in steps of 100 hours, real time hours can be modified in steps of 1 hour.

Next Service



Text on figures

(i)	Next service
(ii)	Level
(iii)	Running hours
(iv)	Actual

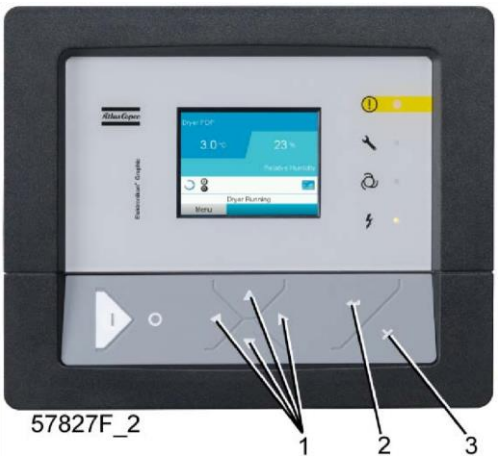
In the example above, the A Service level is programmed at 4000 running hours, of which 0 hours have passed.

History

The History screen shows a list of all service actions done in the past, sorted by date. The date at the top is the most recent service action. To see the details of a completed service action (e.g. Service level, Running hours or Real time hours), use the *Scroll* keys to select the desired action and press the *Enter* key.

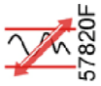
3.11 Modifying the setpoint

Control panel



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

Menu icon, setpoint



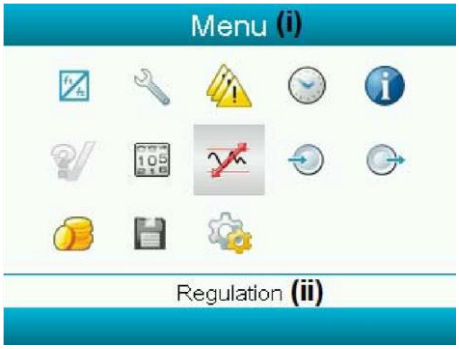
Function

On vacuum pumps with a frequency converter driven main motor, it is possible to program two different setpoints. This menu is also used to select the active setpoint.

Procedure

Starting from the Main screen,

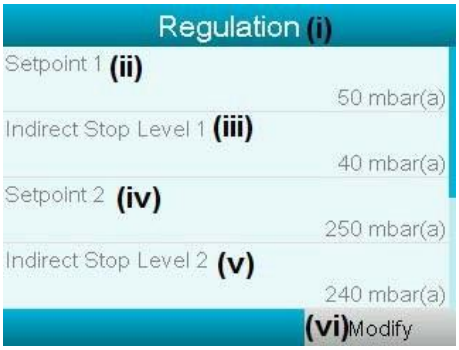
- Highlight the action key Menu using the Scroll keys and press the Enter key. Following screen appears:



Text on figures

(i)	Menu
(ii)	Regulation

- Activate the menu by pressing the enter key. A screen similar to the one below appears:

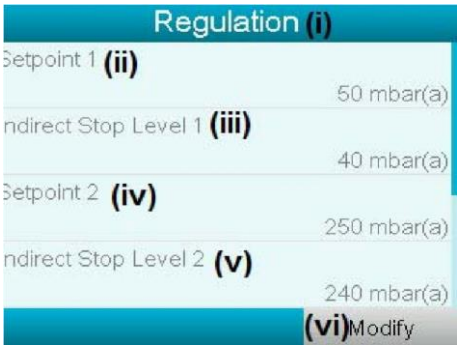


Text on figures

(i)	Regulation
(ii)	setpoint 1
(iii)	Indirect stop level 1
(iv)	setpoint
(v)	Indirect stop level 2
(vi)	Modify

- The screen shows the actual settings.

To modify the settings, move the cursor to the action button Modify and press the *Enter* key. Following screen appears:



- The first line of the screen is highlighted. Use the Scroll keys (1) to highlight the setting to be modified and press the Enter key (2). Following screen appears:

The upper and lower limit of the setting is shown in grey, the actual setting is shown in black. Use the up or down key of the *Scroll* keys to modify the settings as required and press the *Enter* key to accept.

If necessary, change the other settings as required in the same way as described above.
Indirect stop: occurs when the pressure decreases to the pre-set Indirect stop setpoint (= setpoint minus Indirect stop level). The motor will decelerate to minimum speed and the inlet valve will close.

Both settings (Indirect stop level and direct stop level) are programmable, see section Programmable settings.

3.12 Event history menu

Control panel

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

Menu icon, Event History

Function

To call up the last shut-down and last emergency stop data.

Procedure

Starting from the Main screen,

- Move the cursor to the action button Menu and press the Enter key. Following screen appears:

- Using the *Scroll* keys, move the cursor to the *Event History* icon (see above, section Menu icon)
- The list of last shut-down and emergency stop cases is shown.

Example of Event History screen

- Scroll through the items to select the desired shut-down or emergency stop event.
- Press the Enter key to find the date, time and other data reflecting the status of the vacuum pump when that shut-down or emergency stop occurred.

3.13 Modifying general settings

Control panel

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

Menu icon, Settings

Function

To display and modify a number of settings.

Procedure

Starting from the Main screen,

- Move the cursor to the action button Menu and press the Enter key. Following screen appears:

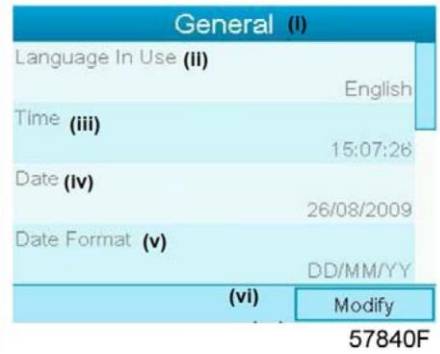
- Next, move the cursor to the Settings icon (see above, section menu icon).using the Scroll keys.
- Press the Enter key. Following screen appears:

This screen shows again a number of icons. By default, the User Password icon is selected. The status bar shows the description that corresponds with the selected icon. Each icon covers one or more items, such as

- Access level
- Elements
- Fan
- Converter(s)
- Motor/Starter
- General
- Automatic restart after voltage failure (ARAVF)
- Network
- Regulation
- Remote

For adapting certain parameters, a password may be necessary.

Example: Selecting the General Settings icon gives the possibility to change e.g. the language, the date, the date format, etc.:



Text on figures

(i)	General
(ii)	Language used
(iii)	Time
(iv)	Date
(v)	Date format
(vi)	Modify

- To modify, select the Modify button using the *Scroll* keys and press the *Enter* key.
- A screen similar to the one above is shown, the first item (Language) is highlighted. Use the key of the *Scroll* keys to select the setting to be modified and press the *Enter* key.
- A pop-up screen appears. Use the up or down key to select the required value and press the Enter key to confirm.

In the setting menu, it is possible to adjust:

- Runtime at minimum pressure- Gas Ballast (Automatic - Manual)

For Humid version pumps:

- Maximum Pre Purge Time
- Maximum Pre Purge Time during Operation
- Post Purge Time
- Manual Purge Time

3.14 Info menu

Control panel

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

Menu icon, Info

Function

To show the Atlas Copco internet address.

Procedure

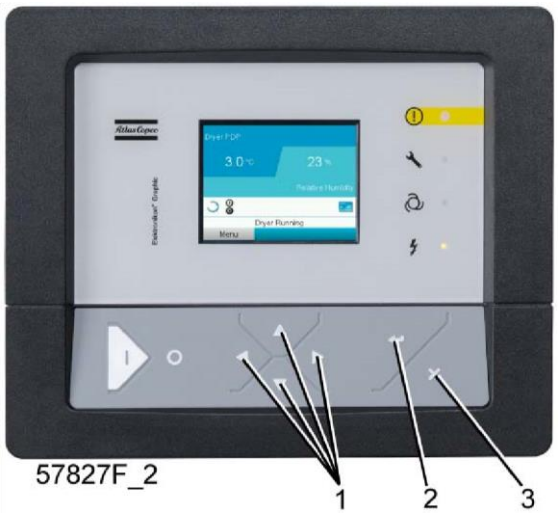
Starting from the Main screen,

- Move the cursor to the action button Menu and press the Enter key. Following screen appears:

- Using the Scroll keys, move the cursor to the Info icon (see above, section Menu icon).
- Press the Enter key. The Atlas Copco internet address appears on the screen.

3.15 Week timer menu

Control panel



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

Menu icon, Week timer

Function

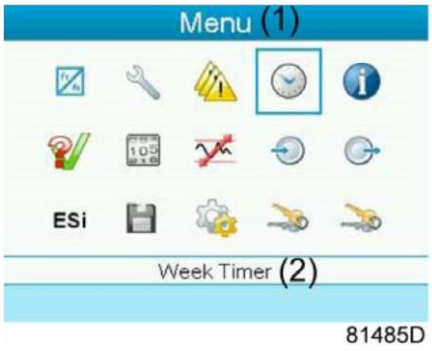
- To program time-based start/stop commands for the vacuum pump.
- To program time-based change-over commands for the net pressure band.
- Four different week schemes can be programmed.
- A week cycle can be programmed, a week cycle is a sequence of 10 weeks. For each week in the cycle, one of the four programmed week schemes can be chosen.

	Important remark: In the Elektronikon you can select different timers on one day.(up to 8 actions). It is however not possible to program 2 actions at the same time. The solution: leave at least 1 minute in between 2 actions. Example: Start Vacuum pump: 5.00 AM, Pressure setpoint 2: 5.01 AM (or later).

Procedure

Starting from the Main screen (see Main screen),

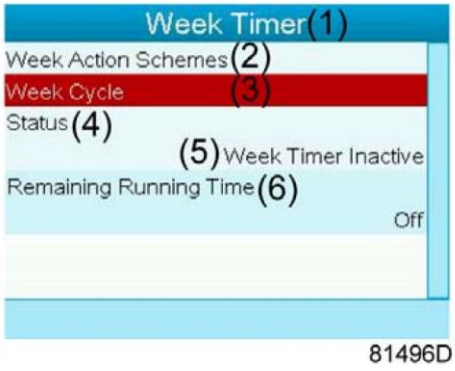
- Move the cursor to the action button Menu and press the *Enter* key. Use the *Scroll* buttons to select the *Timer* icon.



Text on figures

(1)	Menu
(2)	Week Timer

- Press the *Enter* key on the controller. Following screen appears:



(1)	Week Timer
(2)	Week Action Schemes
(3)	Week Cycle
(4)	Status
(5)	Week Timer Inactive
(6)	Remaining Running Time

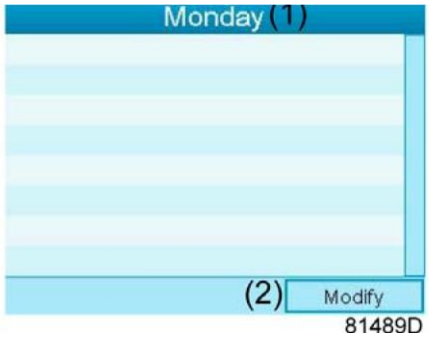
The first item in this list is highlighted in red. Select the item requested and press the *Enter* key on the controller to modify.

Programming week schemes

- Select Week action schemes and press *Enter*. A new window opens. The first item in the list is highlighted in red. Press the *Enter* key on the controller to modify Week Action Scheme 1.

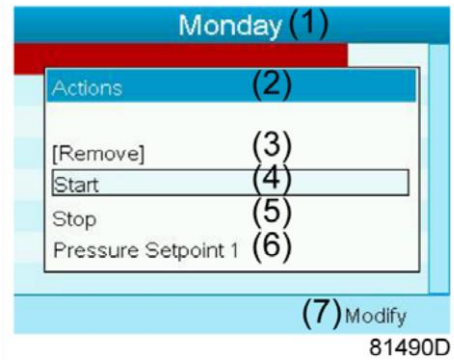
(1)	Week Action Scheme 1
(2)	Monday
(3)	Tuesday
(4)	Wednesday
(5)	Thursday
(6)	Friday
(7)	Saturday
(8)	Sunday

- A new window opens. The Modify action button is selected. Press the *enter* button on the controller to create an action.



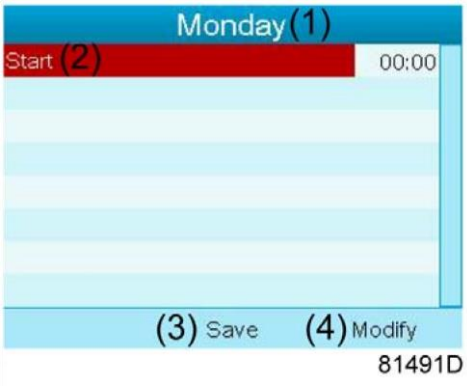
(1)	Monday
(2)	Modify

- A new pop-up window opens. Select an action from this list by using the Scroll keys on the controller. When ready press the Enter key to confirm.



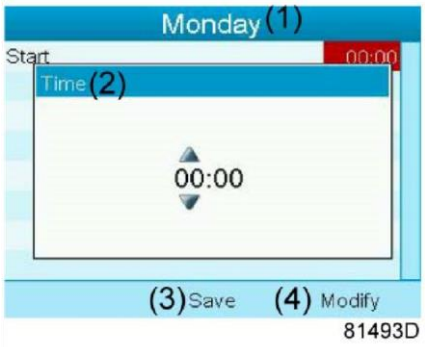
(1)	Monday
(2)	Actions
(3)	Remove
(4)	Start
(5)	Stop
(6)	Pressure setpoint 1
(7)	Modify

- A new window opens. The action is now visible in the first day of the week.



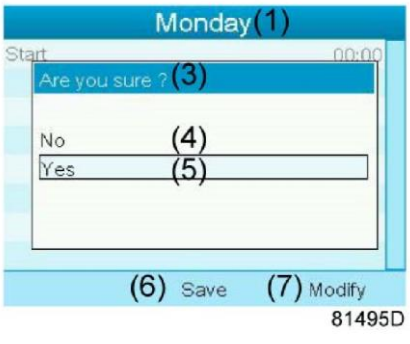
(1)	Monday
(2)	Start
(3)	Save
(4)	Modify

- A pop-up window opens. Use the up or down key of *Scroll* keys to modify the values of the hours. Use the ← or Scroll keys to go to the minutes.



(1)	Monday
(2)	Start
(3)	Save
(4)	Modify

- A new pop-up window opens. Use the *Scroll* keys on the controller to select the correct actions. Press the *Enter* key to confirm.



(1)	Monday
(3)	Are you sure?
(4)	No

(5)	Yes
(6)	Save
(7)	Modify

Press the *Escape* key to leave this window.

- The action is shown below the day the action is planned.

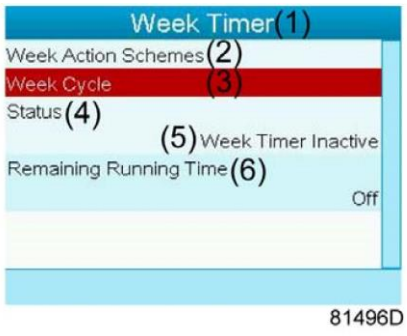
(1)	Week Action Scheme 1
(2)	Monday - Start
(3)	Tuesday
(4)	Wednesday
(5)	Thursday
(6)	Friday
(7)	Saturday
(8)	Sunday

Press the *Escape* key on the controller to leave this screen.

Programming the week cycle

A week cycle is a sequence of 10 weeks. For each week in the cycle, one of the four programmed week schemes can be chosen.

- Select Week Cycle from the main Week Timer menu list.



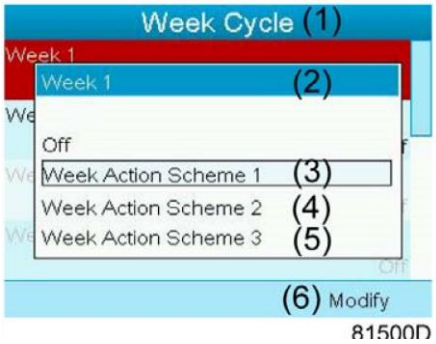
(1)	Week Timer
(2)	Week Action Schemes
(3)	Week Cycle
(4)	Status
(5)	Week Timer Inactive
(6)	Remaining Running Time

- A list of 10 weeks is shown.

(1)	Week Cycle
(2)	Week 1
(3)	Week 2
(4)	Week 3
(5)	Week 4
(6)	Modify

Press twice the *Enter* key on the controller to modify the first week.

- A new window opens. Select the action, example: Week Action Scheme 1

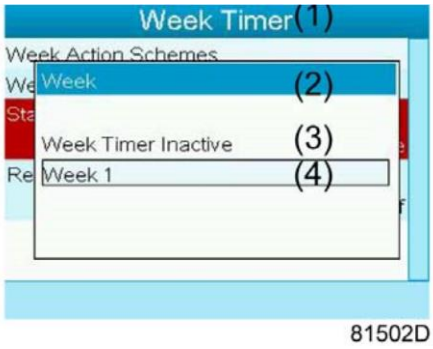


(1)	Week Cycle
(2)	Week 1
(3)	Week Action Scheme 1
(4)	Week Action Scheme 2
(5)	Week Action Scheme 3
(6)	Modify

- Check the status of the Week Timer.
  Use the *Escape* key on the controller to go back to the main Week Timer menu. Select the status of the Week Timer.

(1)	Week Timer
(2)	Week Action Schemes
(3)	Week Cycle
(4)	Status
(5)	Week Timer Inactive
(6)	Remaining Running Time

- A new window opens. Select Week 1 to set the Week Timer active.



(1)	Week Timer
(2)	Week
(3)	Week Timer Inactive
(4)	Week 1

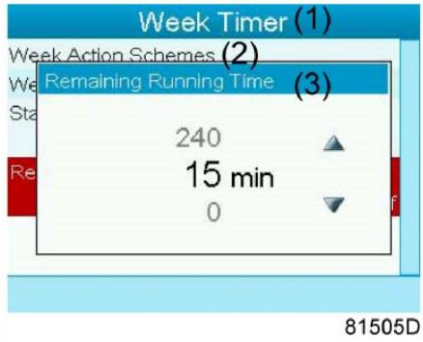
- Press the *Escape* key on the controller to leave this window. The status shows that week 1 is active.

(1)	Week Timer
(2)	Week Action Schemes
(3)	Week Cycle
(4)	Status
(5)	Remaining Running Time

- Press the *Escape* key on the controller to go to the main Week Timer menu. Select Remaining Running Time from the list and press the *Enter* key on the controller to Modify.

(1)	Week Timer
(2)	Week Action Schemes
(3)	Week Cycle
(4)	Status
(5)	Remaining Running Time

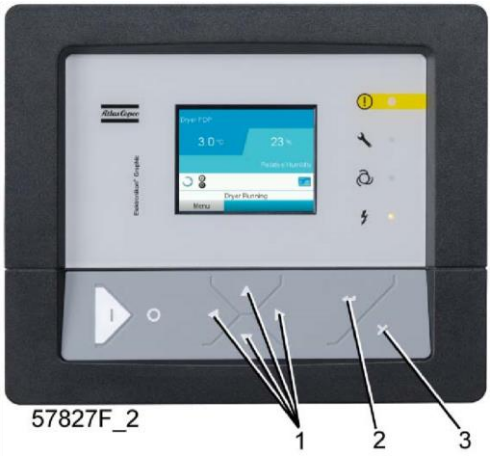
- This timer is used when the week timer is set and for certain reasons the Vacuum pump must continue working, for example, 1 hour, it can be set in this screen. This timer is prior to the Week Timer action.



(1)	Week Timer
(2)	Week Action Schemes
(3)	Remaining Running Time

3.16 User password menu

Control panel



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

Menu icon, Password

Function

If the password option is activated, it is impossible for not authorized persons to modify any setting.

Procedure

Starting from the Main screen (see Main screen),

- Move the cursor to *Menu* and press the *Enter* key (2). Following screen appears:

- Using the Scroll keys, select the Settings icon (see section Modifying general settings)
- Press the Enter key. Following screen appears:

- Move the cursor to the *Password* icon (see above, section Menu icon)
- Select *Modify* using the *Scroll* keys and press the *Enter* key. Next, modify the password as required.

3.17 Web server

Getting started

- All Elektronikon Mk5 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.
- If the compressor is equipped with a **SMART**BOX, the network connection of the Elektronikon 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 Atlas Copco Customer Centre for support.

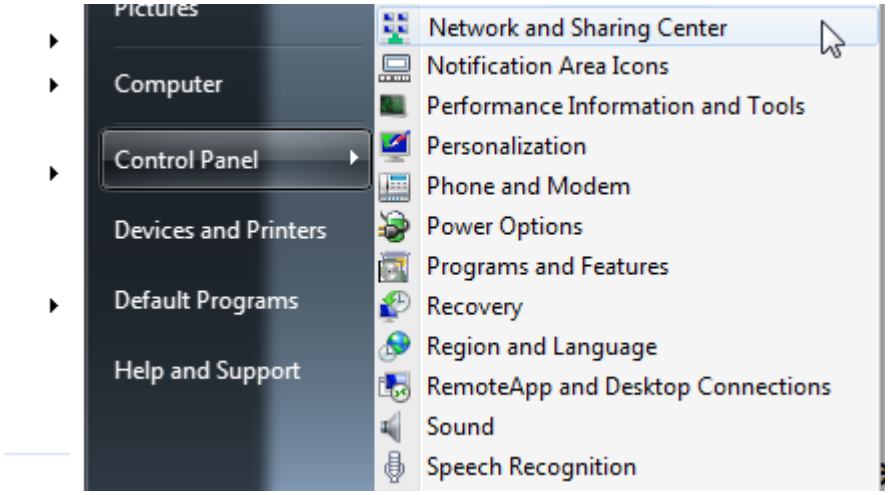
Configure a dedicated PC connection

- Make sure you are logged in as administrator to change IP settings.
- Use the internal network card from your computer or an USB to LAN network card.(see picture)

- Use an UTP cable (CAT 5e) to connect to the controller. (see picture)

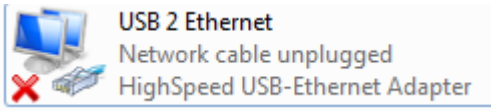
Configure the network card

- Go the ‘Network and Sharing Center’:

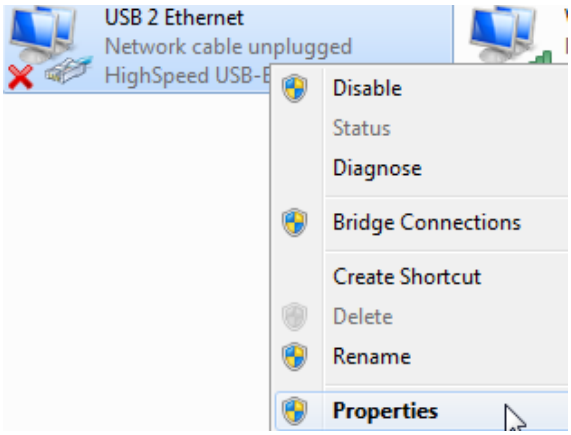


- Click “Change adapter settings”.

- Select the Local Area connection which is connected to the controller.

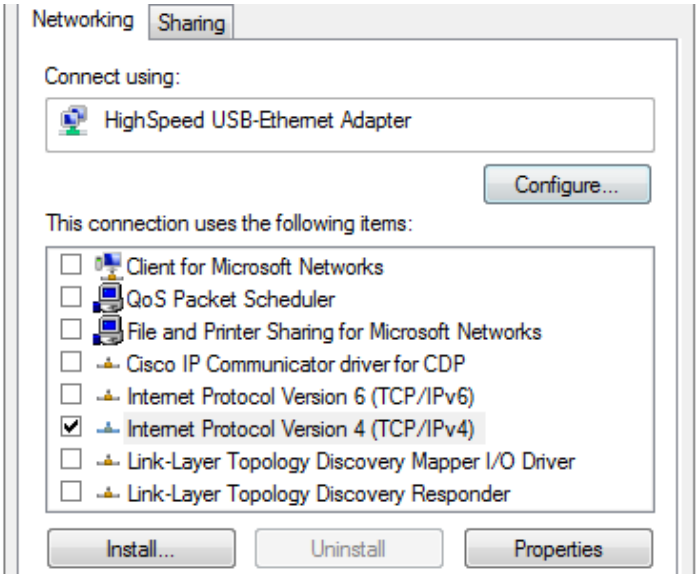


- Click with the right button and select properties.

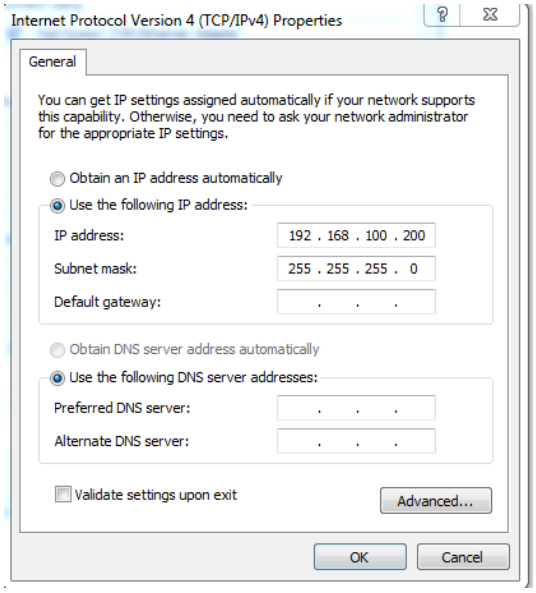


- Use the checkbox Internet Protocol version 4 (TCP/IPv4) (see picture).
- To avoid conflicts uncheck other properties if they are checked.

- After selecting TCP/IPv4 click on the properties button to change the settings.



- Use the following settings:
  - IP Address 192.168.100.200
  - Subnetmask 255.255.255.0
- Click ok and close network connections



Configure a company network (LAN) connection

- Ask your companies IT responsible or IT department to generate a fixed IP address in your companies network.
- That IP address will be excluded from the DNS server, so it will be reserved for the Elektronikon Mk5
- 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 your Elektronikon Mk5 to the company's network (LAN) by using an UTP cable (min. CAT 5e). (see picture)

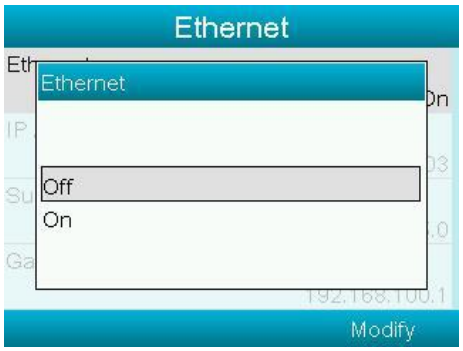
- Adapt network settings in the Elektronikon Mk5:
  - Go to 'Main Menu'

  - Go to 'Settings

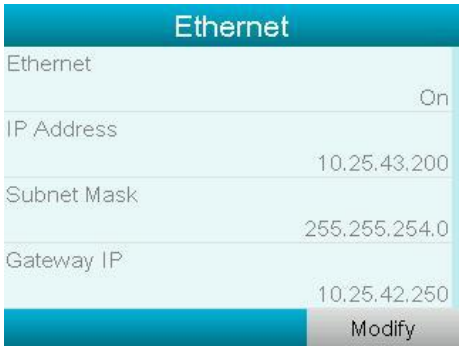
- Go to ‘Network’

- Go to ‘Ethernet

- Switch ‘Off’ the Ethernet communication to allow editing the settings



- Adapt IP address
- Adapt Gateway address
- Adapt Subnet mask
- Switch ‘On’ the Ethernet communication again



- Wait some minutes so the LAN network can connect to the Elektronikon Mk5.

Configuration of the web server.

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

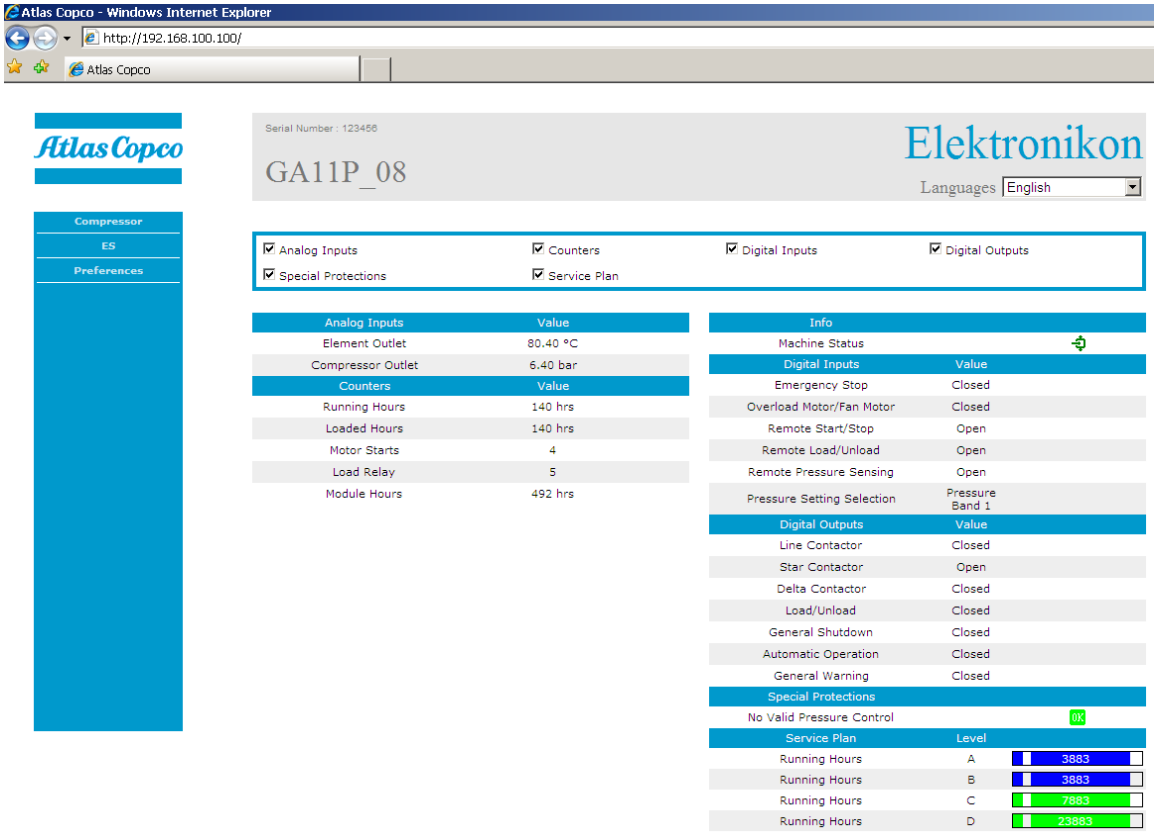
Configure your web interface of the Elektronikon

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

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

Open your browser

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



Navigation en options

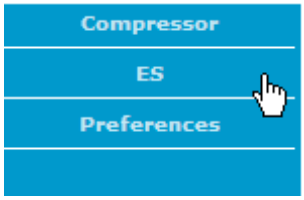
The banner shows the compressor type and the language selector

In this example three languages are installed on the controller

On the left site of the interface you can find the navigation menu.

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

- Compressor: shows all compressor settings.
- Es: shows the ESi status if a license is provided.
- Preferences: Change temperature and pressure unit.

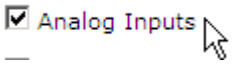


Compressor settings

All compressor settings can be displayed or hidden. Put a mark in front of each point of interest and it will be displayed.

Only the machine status is fixed and cannot be removed from the main screen.

Analog Inputs

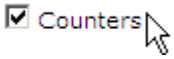


Analog inputs show: the compressor units.

These units can be changed in the preference button from the navigation menu.

Analog Inputs	Value
Element Outlet	131.90 °F
Compressor Outlet	110.21 psi

Counters



Counters give an overview of all actual counters from controller and compressor.

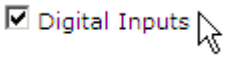
Counters	Value
Running Hours	29 hrs
Loaded Hours	29 hrs
Motor Starts	3
Load Relay	4
Module Hours	549 hrs

Info Status

Machine status is always shown on the web interface

Info	
Machine Status	

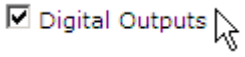
Digital Inputs



Gives an overview of all Digital inputs and status

Digital Inputs	Value
Emergency Stop	Closed
Overload Motor/Fan Motor	Closed
Remote Start/Stop	Open
Remote Load/Unload	Open
Remote Pressure Sensing	Open
Pressure Setting Selection	Pressure Band 1

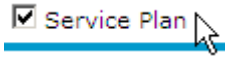
Digital Outputs



Shows a list of all the digital outputs and status

Digital Outputs	Value
Line Contactor	Closed
Star Contactor	Open
Delta Contactor	Closed
Load/Unload	Closed
General Shutdown	Closed
Automatic Operation	Closed
General Warning	Closed

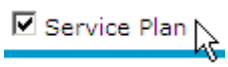
Special Protections



Give an overview of all special protections of the compressor.

Special Protections	
No Valid Pressure Control	OK

Service Plan



Shows all levels of the service plan and status.

This screen only shows the running hours.

It is also possible to show the actual status of the service interval.

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

3.18 Programmable settings

Vacuum pump/motor

		Minimum setting	Factory setting	Maximum setting
Set-point 1 and 2, Workplace vacuum pumps	mbar(a)	5	50	1000
Set-point 1 and 2, Workplace vacuum pumps	Torr	3,75	37,5	750
Indirect stop level	mbar	0	10	100
Indirect stop level	Torr	0	7,5	75
Proportional band	%	5	10	15
Integration time	sec	0,5	5	10
Analog setpoint selection		Off	Off	On
Analog Stop Offset	mbar(a)	0	5	100
Maximum speed factor	%	70	100	100
Force Maximum Speed		Off	Off	On

Parameters

		Minimum setting	Factory setting	Maximum setting
Run time at minimum pressure	sec	0	30	300
Maximum pre purge time	min	1	15	20
Maximum post purge time	min	1	30	180
Maximum pre purge time during operation	sec	1	120	600
Manual purge time	min	0	30	120
Minimum stop time	sec	5	5	30
Power recovery time	sec	10	10	3600
Restart delay	sec	0	0	1200
Communication time-out	sec	10	30	60
Fan motor starts per day (air-cooled vacuum pumps)		1	240	240

Protections

		Minimum setting	Factory setting	Maximum setting
Vacuum pump element outlet temperature (shut-down warning level)	°C	50	110	119
Vacuum pump element outlet temperature (shut-down warning level)	°F	122	230	246
Vacuum pump element outlet temperature (shut-down level)	°C	111	120	120
Vacuum pump element outlet temperature (shut-down level)	°F	232	248	248

Service plan

The built-in service timers will give a Service warning message after their respective pre-programmed time interval has elapsed.

For specific data, see section Preventive Maintenance.

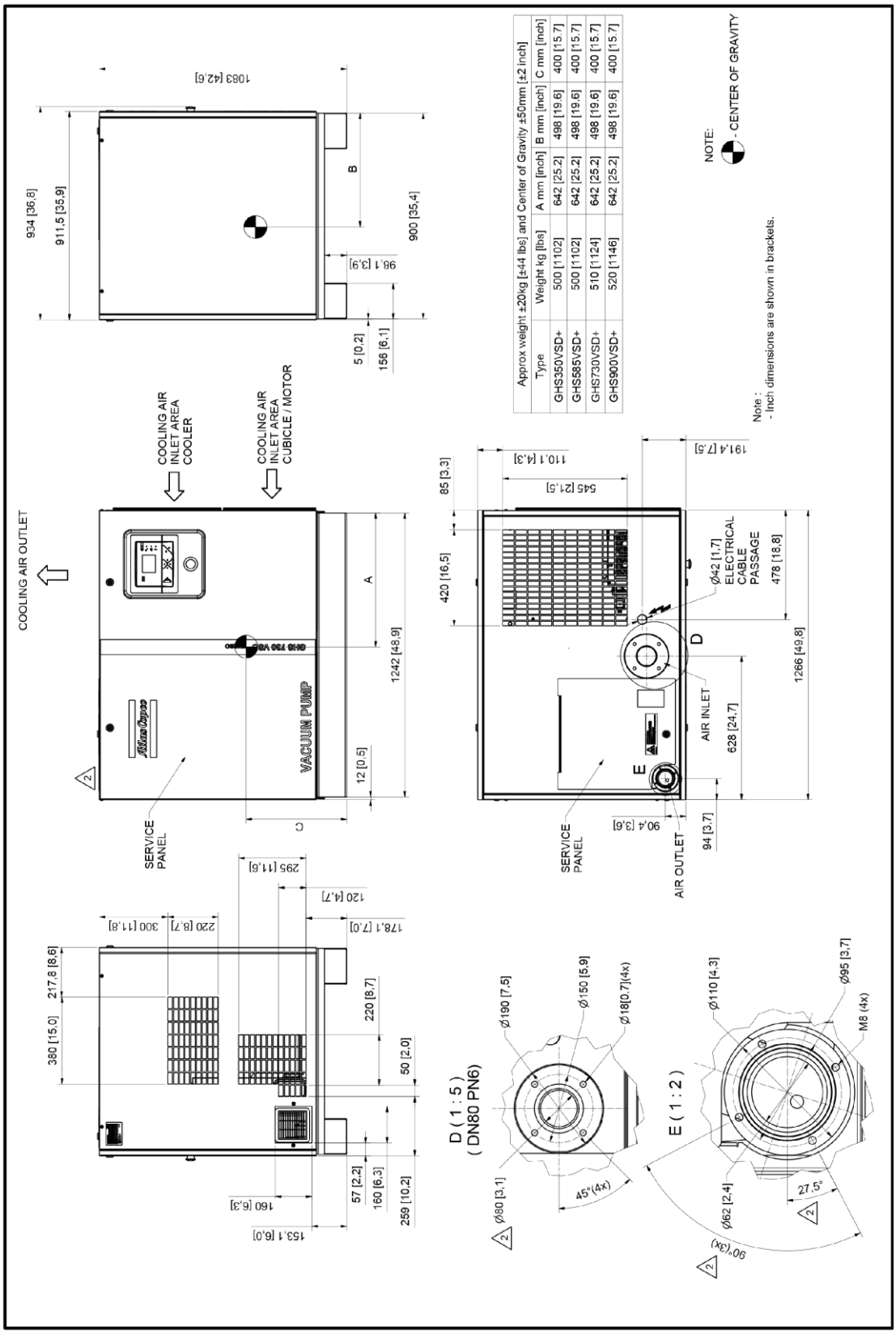
Consult Atlas Copco if a timer setting needs to be changed. The intervals must not exceed the nominal intervals and must coincide logically. See section Modifying general settings.

Terminology

Term	Explanation
ARAVF	Automatic Restart After Voltage Failure. See section Elektronikon regulator.
Power recovery time	Is the period within which the voltage must be restored to have an automatic restart. Is accessible if the automatic restart is activated. To activate the automatic restart function, consult Atlas Copco.
Restart delay	This parameter allows to programme that not all Vacuum pumps are restarted at the same time after a power failure (ARAVF active).
Vacuum pump element outlet	The recommended minimum setting is 110 °C (230 °F). For testing the temperature sensor, the setting can be decreased to 50 °C (122 °F). Reset the value after testing. The regulator does not accept inconsistent settings, e.g. if the warning level is programmed at 95 °C (203 °F), the minimum limit for the shut-down level changes to 96 °C (204 °F). The recommended difference between the warning level and shut-down level is 10 °C (18 °F).
Delay at signal	Is the time period during which the warning signal must exist before the warning message appears.
Delay at start	Is the time period after starting which must expire before generating a warning. The setting should be less than the setting for the delay at signal.
Minimum stop time	Once the Vacuum pump has automatically stopped, it will remain stopped for the minimum stop time, whatever happens with the system pressure.
Proportional band and integration time	The settings for the Proportional band and integration time are determined by experiment. Altering these settings may damage the Vacuum pump. Consult Atlas Copco.

4 Installation

4.1 Dimension drawings

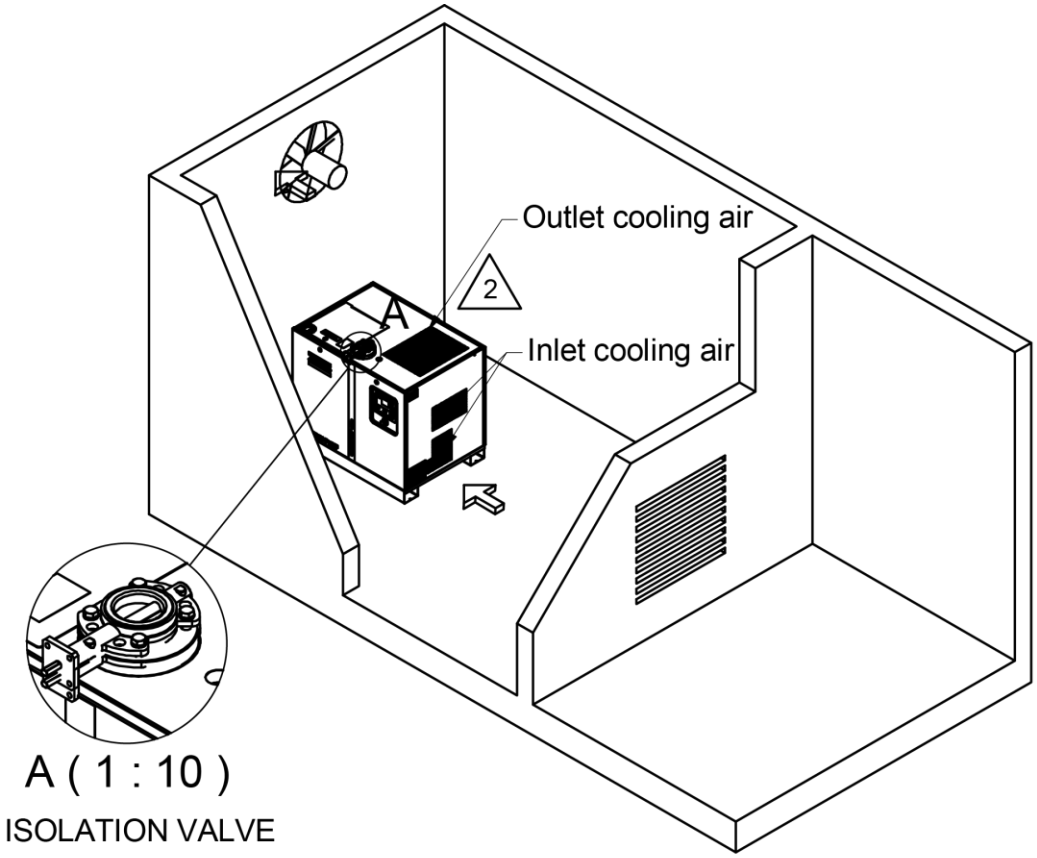


Center of gravity and weight

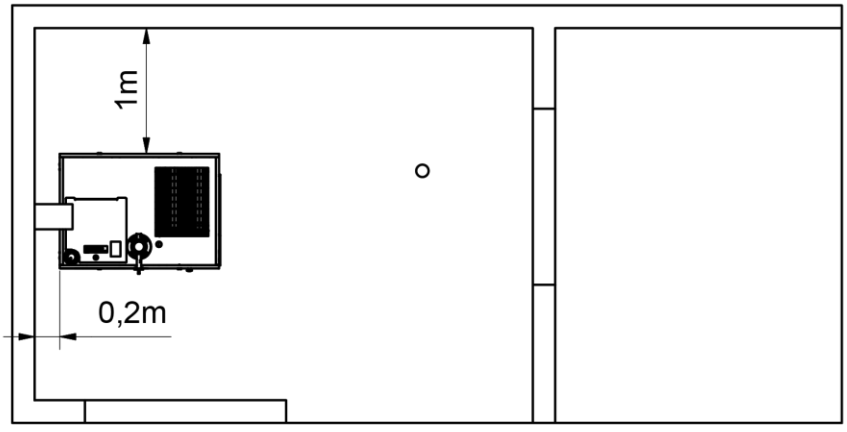
Type	L (mm)	L (inches)	W (mm)	W (inches)	H (mm)	H (inches)	Weight (Kg)	Weight (lbs)
GHS 350VSD+	642	25	498	20	400	16	500	1102
GHS 585VSD+	642	25	498	20	400	16	500	1102
GHS 730VSD+	642	25	498	20	400	16	510	1124
GHS 900VSD+	642	25	498	20	400	16	520	1146

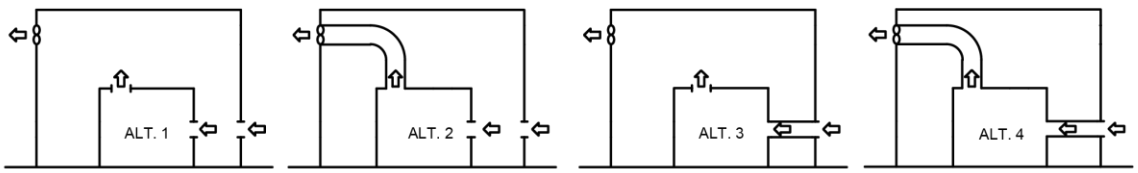
Dimensions +/- 10 mm or 0.3 inches
Weights (oil included) +/- 20 kg or 44 lbs

4.2 Installation proposal



Allow sufficient space (1m of clearance on all sides and top of the vacuum pump) for safe and proper installation, daily inspection and maintenance.





1) Location:

Locate the vacuum pump on a level surface that is clean, well lit, well ventilated and capable taking the weight of the pump. The entire length of the frame base must be supported. Shim where necessary (do not use wood). Ambient temperature should not exceed temperatures listed on the specifications.

All models are intended for indoor installation.

Do not locate the unit where the hot exhaust air from other vacuum pumps or heat generating equipment may be drawn into the unit. Never restrict the flow of exhaust air from the fluid cooler.

The heated exhaust air must be exhausted to the outside to prevent high ambient conditions in the room.

2) Piping connections:

The vacuum distribution and piping system, including the vacuum pump and all related components, must be designed in accordance with generally accepted engineering practices. For instance, inlet pipe work should slope away from the vacuum pump. Improperly designed distribution systems can cause damage to the vacuum pump. Exhaust piping should be installed in such a manner as to not create additional back pressure on the vacuum pump. Also, the exhaust piping should be installed sloping away from the vacuum pump.

A drip leg with drain point provision is foreseen available inside the vacuum pump, to prevent condensate from running back into the fluid reservoir.

Care must be taken to avoid assembling the piping in a strain with the vacuum pump.

It is very important to use adequate pipe diameter for the vacuum network. The combination of restrictive pipe diameter and long pipe runs can create significant pressure drop. A rule of thumb on single vacuum pump installations: maintain the diameter of the vacuum pump inlet as far into the process as possible.

It is recommended to install an isolation valve at the inlet of the vacuum pump, to isolate the pump from vacuum distribution and piping system before performing maintenance.

The discharge air can run up to 120 °C (248 °F), piping should be suitable to handle this temperature.

The vacuum pump is equipped with an inlet filter, however depending on the application it may be required to add additional inlet filtration upfront the vacuum pump.

3) Ventilation:

The inlet grid(s) and ventilation fan should be installed in such a way that any recirculation of cooling air to the inlet grating of the vacuum pump is avoided. The air velocity to the grid(s) has to be limited to 5m/s.

The maximum air temperature at intake opening for 3 ph is 46 °C (115 °F) and for 1 ph is 32 °C (90 °F), (minimum 0 °C / 32 °F) Ventilation alternative 1 and 3: The required ventilation to limit vacuum pump room temperature can be calculated from:

$Qv = 1.06\ N / T$

Where, Qv = required cooling air flow (m^3/s)

N = Nominal motor power of vacuum pump (kW)

T = Temperature increase in vacuum pump room. (°C)

Ventilation alternative 2 and 4: The fan capacity should match the vacuum pump fan capacity at a pressure head equal to the pressure drop caused by cooling air ducts.

Max. allowable pressure drop in ducting before or after the vacuum pump = 10 Pa

Safety

	Apply all relevant safety precautions, including those mentioned in this book.

Refer to instruction 9820726229 for inlet and outlet related options.

Outdoor/altitude operation

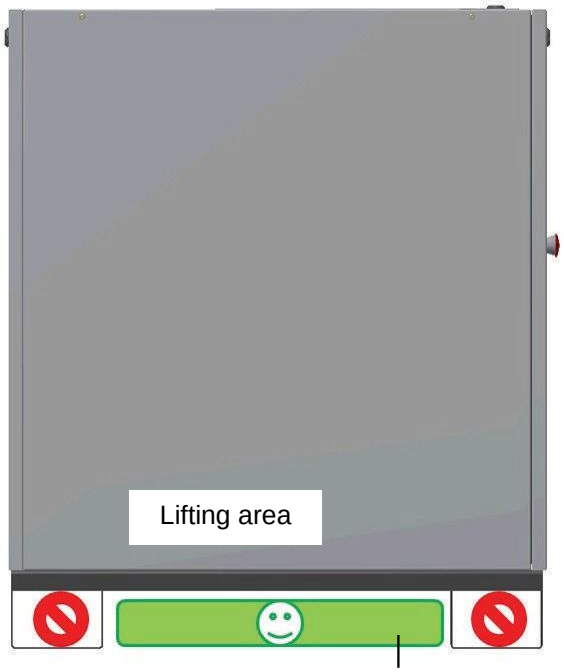
The vacuum pumps are designed according to IP2X classification. The electrical cabinet and motor are designed according to *IP54* classification. If the unit is installed outdoors, special precautions must be taken; consult Atlas Copco.

The vacuum pumps can only be used in temperatures above 0 °C (+32 °F). If frost might occur, the appropriate measures should be taken to avoid damage to the machine and its ancillary equipment. In this case, consult Atlas Copco.

Also, if operating above 1000 m (3300 ft), consult Atlas Copco.

Moving/lifting

The vacuum pumps can be moved by a lift truck using the slots in the frame. Take care not to damage the bodywork during lifting or transport.



Lifting slots

Before lifting, reinstall the transport securing bolts. Make sure that the forks protrude from the other side of the frame. The vacuum pumps 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 Vacuum pump. The lifting equipment must be placed in such a way that the vacuum pump is lifted perpendicularly. Lift gently and avoid twisting.

	It is not allowed to lift the Vacuum pump if the canopy parts or lifting supports are not completely installed. When the vacuum pump is being lifted, it is also forbidden to come under the load or to perform maintenance activities to it.

Acclimatization

	When moving the vacuum pump into an installation room, condensation can occur on some components. To avoid the dew from harming the electrical components, ensure at least 2 hours of acclimatization before switching on the vacuum pump.

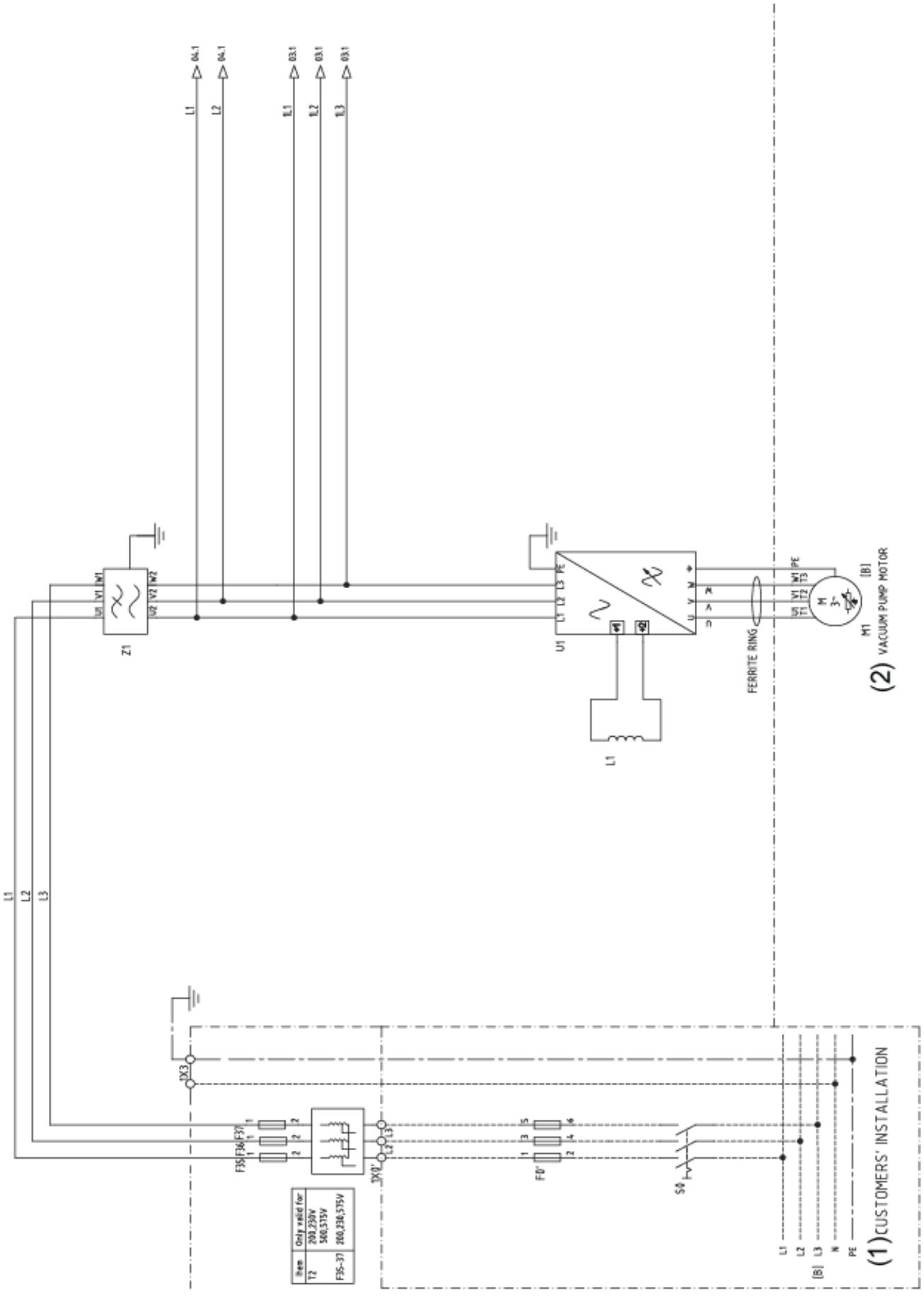
4.3 Electrical connections

	Working with machinery controlled by a frequency converter requires special safety precautions. These safety precautions depend on the kind of network used (TN, TT, IT system). Consult Atlas Copco.

	Most vacuum pump are designed for use in TT/TN networks and are intended for industrial environments where the electrical supply is separated from the residential/commercial supply network. To use the machine in light industrial, commercial or residential environments with a shared supply network or in an IT network, extra measures can be required: contact Atlas Copco.

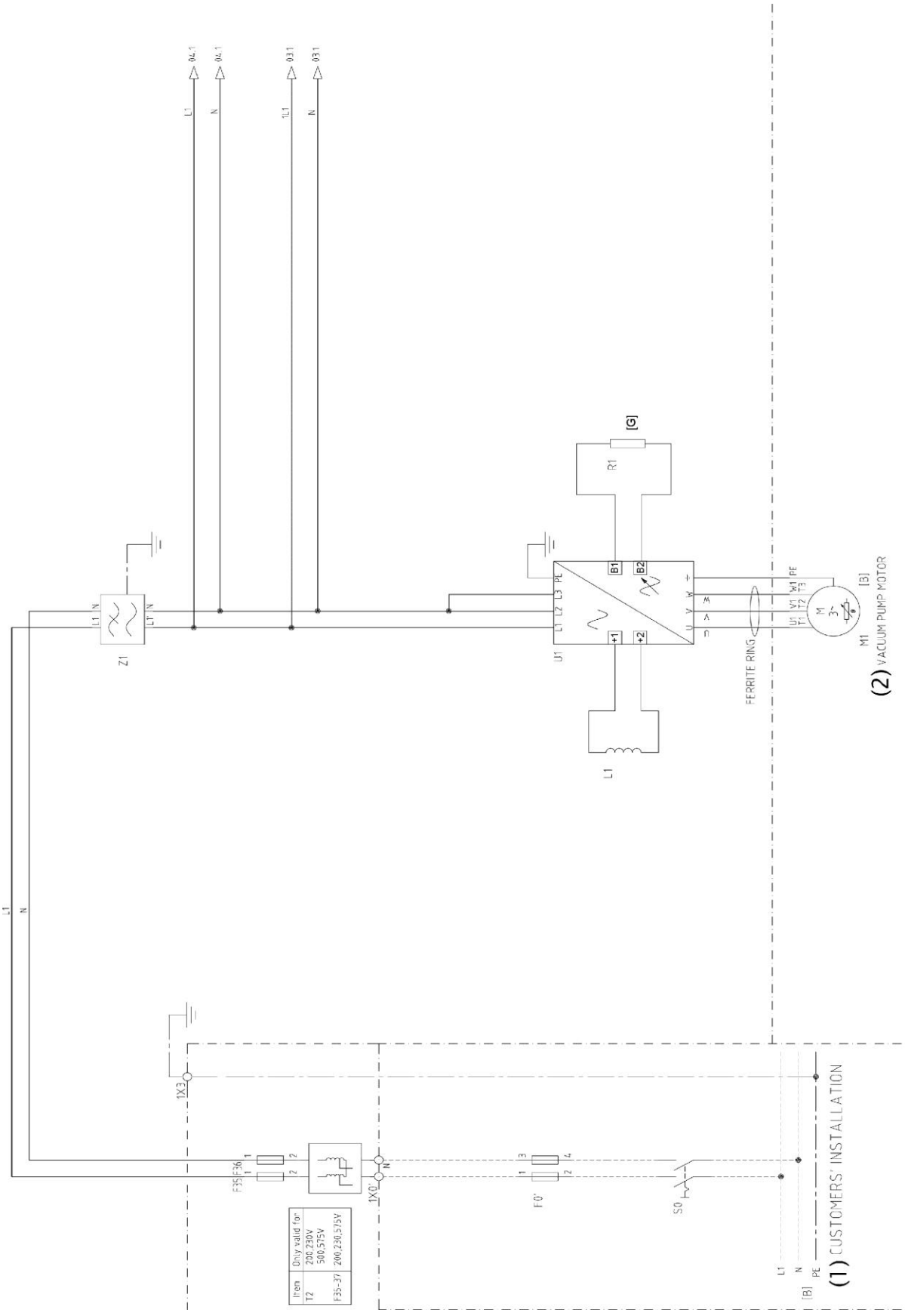
Electrical connections for GHS 350 VSD+ up to GHS 900 VSD+

Service diagram



Electrical connections 1 ph GHS 350 VSD+ up to GHS 730 VSD+

Service diagram



Reference	Designation
1	Customer's installation
2	Vacuum pump motor

Note

The complete electrical diagram can be found in the electrical cubicle.

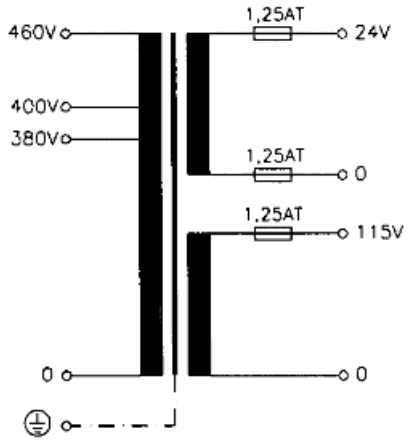
Description

	You find the correct position for the electrical connection on the Dimension drawings.

1. Provide an isolating switch.
2. Check that the motor cables and wires inside the electric cabinet are clamped tight to their terminals.
3. Check the fuses. See section Electric cable size and fuses.
4. Connect the power supply cables to terminals (1, 3 and 5).
5. Connect the earth conductor to the earth bolt (PE).

	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 vacuum pump.

380V or 460V supply:



Mount the transformer bridge on the primary winding side of the transformer, mounted inside the electrical cubicle, according to the scheme indicated on the transformer (also shown here) for the applicable supply voltage. GHS pumps leave the factory with 400V supply voltage setting.

Vacuum pump control modes

See also section Control mode selection.

The following control modes can be selected:

- Local control: The vacuum pump will react to commands entered by means of the buttons on the control panel. Vacuum pump start/stop commands via Clock function are active, if programmed.

- Remote control: The vacuum pump will react to commands from external switches. Emergency stop remains active. Vacuum pump start/stop commands via Clock function are still possible.

	Have the modifications checked by Atlas Copco. Stop the vacuum pump and switch off the voltage before connecting external equipment. Only potential-free contacts are allowed.

- LAN control: The vacuum pump is controlled via a local network. Consult Atlas Copco.

Vacuum pump status indication

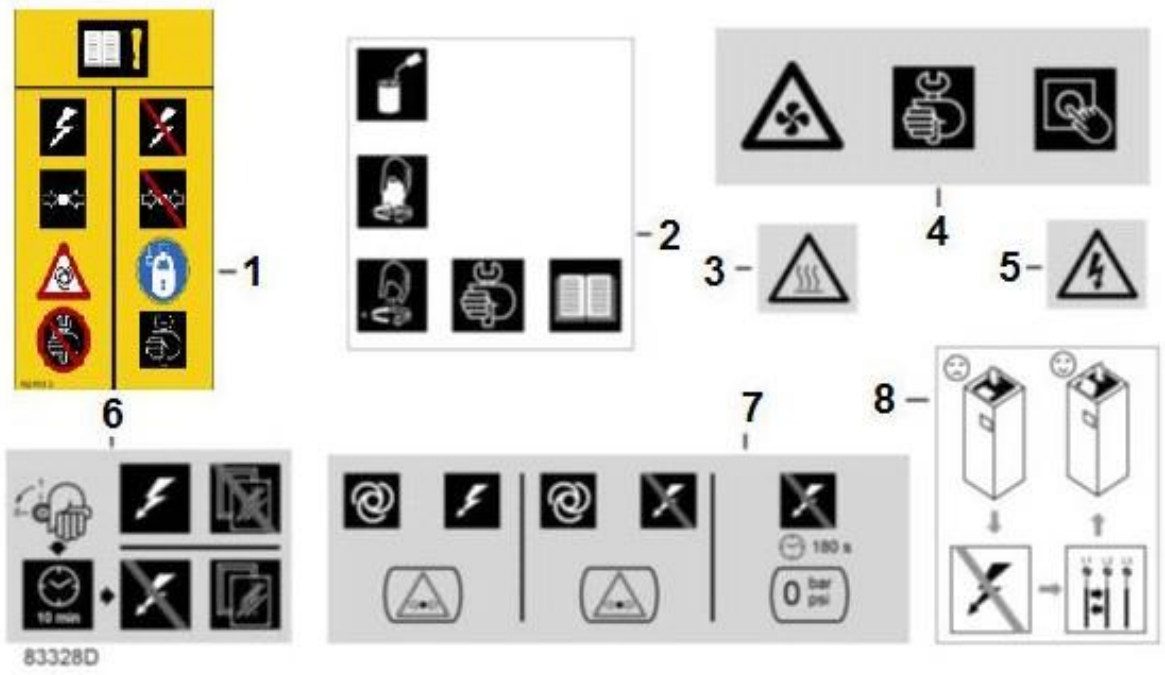
The Elektronikon controller is provided with potential-free auxiliary NO contacts (NO = normally open) (K07, K08 and K09) for remote indication of:

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

Maximum contact load: 10 A / 250 V AC.

Stop the vacuum pump and switch off the voltage before connecting external equipment. Consult Atlas Copco.

4.4 Pictographs



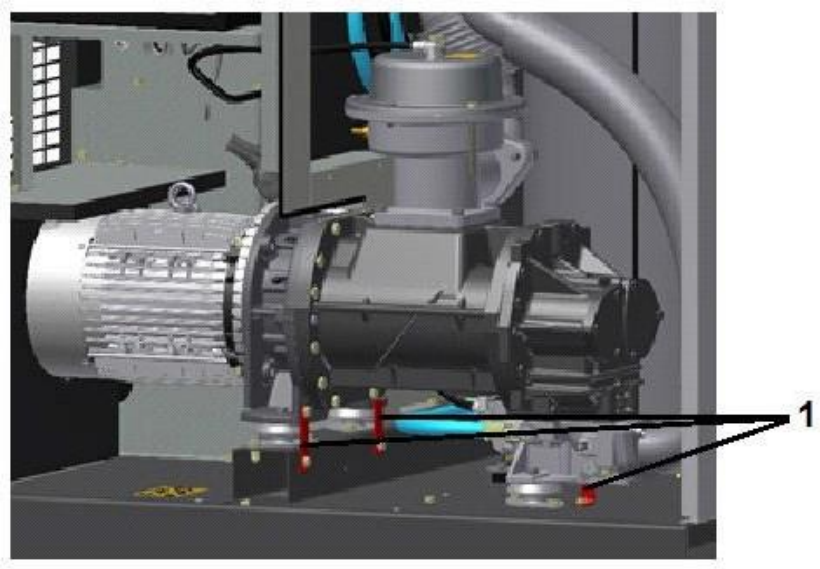
Pictographs

Reference	Designation
1	Switch off the voltage and depressurize the vacuum pump before starting maintenance or Repairs
2	Lightly oil the gasket of the oil filter, screw it on and tighten by hand (approx. half a turn)
3	Warning, hot surface
4	Stop the vacuum pump before cleaning the coolers
5	Warning, voltage
6	Switch off the voltage and wait at least 10 minutes before maintenance
7	Vacuum pump remains pressurized for 180 seconds after switching off the voltage
8	If the rotation direction is wrong, open the isolating switch in the voltage supply line and reverse two incoming electric lines

5 Operating instructions

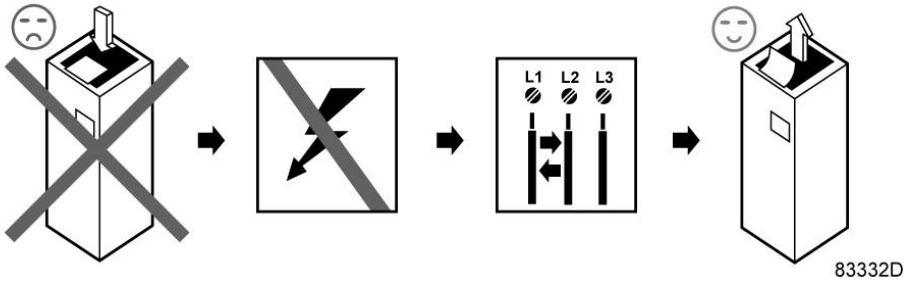
5.1 Initial start-up

⚠	The operator must apply all relevant Safety precautions. Also consult section Problem solving.



- Remove the canopy panel(s) in order to get access to the internal components.
- Remove the red transport spacers and the related bolts under element (1) and oil separator tank.
- Check that the electrical connections correspond to the local codes and that all wires are clamped tight to their terminals.
- The installation must be earthed and protected against short circuits by fuses of the inert type in all phases. It is advised to install an isolating switch near the vacuum pump.
- Check the process lines for the correct size to prevent high pressure drop and for cleanliness to protect the vacuum pump. Also check for leaks.
- Make sure the pump outlet is not obstructed.
- Fit inlet isolation valve (IV); see section Installation proposal for the position of the valve.
- Close the valve.
- Connect the inlet pipework to the valve.
- Check the oil level, the oil level should reach the top of the oil sight glass (GI).
- If needed, top up the oil via the oil filler plug (FC).
- Take care that no dirt drops into the oil system.
- Provide labels, warning the operator that:
- The vacuum pump may automatically restart after voltage failure (if activated, consult Atlas Copco).
- The vacuum pump is automatically controlled and may be restarted automatically.

- The vacuum pump may be remotely controlled.



- Check the programmed settings. Consult section Programmable settings.
- Close the isolation valve.
- Start and run the vacuum pump for a few minutes. Check that the vacuum pump operates normally.
- Open the inlet isolation valve (IV)

5.2 Starting

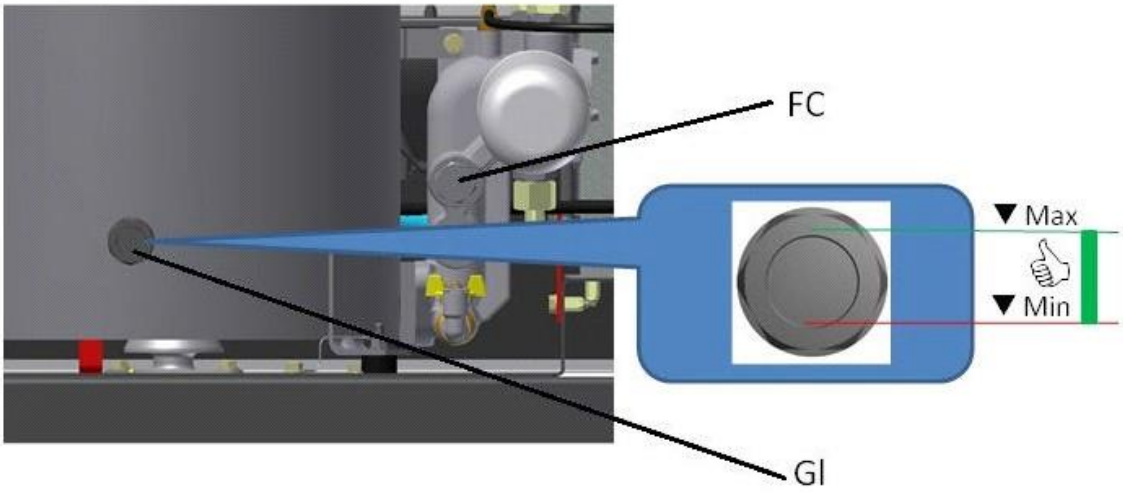
Control panel Elektronikon® Graphic

Step	Action
1	Switch on the voltage. Check that voltage on LED (6) lights up.
2	Press start button (1) on the control panel. The vacuum pump starts running and the automatic operation LED (8) lights up.
3	Open the inlet isolation valve (IV).

5.3 During operation

	Keep the panels closed during operation
	When the motors are stopped and LED (8) (automatic operation) is alight, the motors may start automatically.
	When the automatic operation LED (8) is lit, the regulator is automatically controlling the vacuum pump, i.e. loading, purging, stopping of the motors and restarting!

Regularly check the oil level during operation.



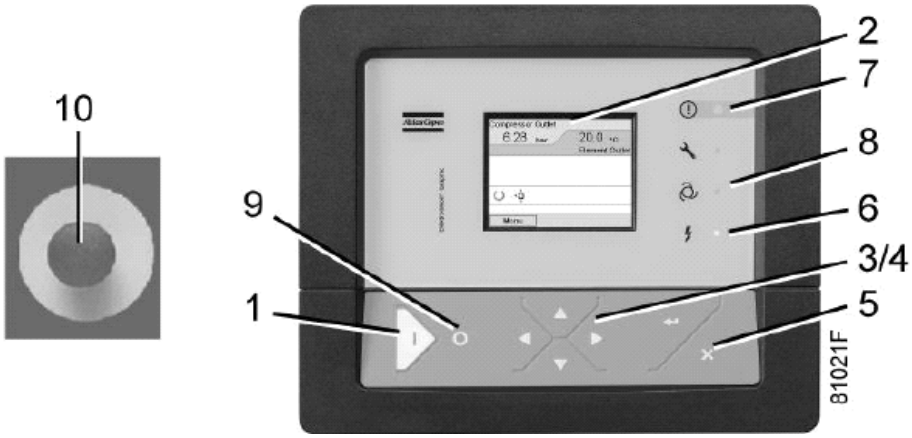
A few minutes after stopping, the oil level should reach the top of the oil sight glass (GI).

If the oil level is too low, wait until the vacuum pump has vented. Push the emergency stop button (10) to avoid the vacuum pump to start unexpectedly. Next, close the inlet isolation valve (IV).

Remove the oil filler plug (FC) and add oil until the level reaches the top of the oil sight glass. Fit and tighten the plug (FC).

On vacuum pump with an Elektronikon® Graphic controller, unlock the emergency stop button (10), select the STOP icon on the display and press reset before restarting.

Checking the display



Control panel Elektronikon® Graphic

Check the display (2) regularly for readings and messages. The display normally shows the vacuum pump vacuum pressure, while the status of the vacuum pump is indicated by means of a number of icons. Remedy the trouble if alarm LED (7) is lit or flashes, see section Icons used. The display (2) 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, see section Service menu.

5.4 Taking out of operation

- Disconnect the vacuum pump from the mains.
- Shut off and vent the part of the system which is connected to the vacuum pump by opening the plug located on the lit of the air inlet filter. Isolate the vacuum pump from the vacuum system.
- Drain the oil.

5.5 Stopping

- Press stop button (9). Automatic operation LED (8) goes out and the vacuum pump stops.
- To stop the vacuum pump in the event of an emergency, press emergency stop button (10). Alarm LED flashes (7).
- Remedy the problem cause, unlock the button by pulling it out.
- Navigate to the Stop icon on the display by means of the navigation keys (3/4) or scroll keys and press the Select key.

Press Reset.

Do not use emergency stop button (10) for normal stopping!

- Close the air inlet valve.
- Switch off the voltage.

6 Maintenance

6.1 Preventive maintenance schedule

Control panel

Warning

	Before carrying out any maintenance, repair work or adjustments, proceed as follows: • Stop the vacuum pump. • Close the air inlet valve. • Press the emergency stop button (10). • Switch off the voltage. • Vent the vacuum pump by opening the plug located on the cover of the air inlet filter. For detailed instructions, see section Problem solving. The operator must apply all relevant Safety precautions.

Warranty - Product Liability

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

Service kits

For overhauling or carrying out preventive maintenance, service kits are available (see section Service kits).

Service contracts

Atlas Copco offers several types of service contracts, relieving you of all preventive maintenance work. Consult your Atlas Copco Customer Center**.**

General

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

Intervals

The local Atlas Copco Customer Center may overrule the maintenance schedule, especially the service intervals, depending on the environmental and working conditions of the vacuum pump.

The longer interval checks must also include the shorter interval checks. Service plans for vacuum pump with an Elektronikon® Graphic controller.

Besides the daily and 3-monthly checks, preventive service operations are specified in the schedule below. Each plan has a programmed time interval at which all service actions belonging to that plan are to be carried out. When reaching the interval, a message will appear on the screen indicating which service plans are to be carried out. After servicing, the intervals must be reset, see section Service menu.

Preventive maintenance schedule

Daily and 3-monthly check list for normal applications

Period	Operation
Daily	Check oil level and condition. (see section Operations instructions / During operation) Check readings on display.
Monthly (1)	Remove the air filter elements and inspect. Replace damaged or heavily contaminated elements. Check for possible air and oil leakages.
3-monthly (1)	Check coolers, clean if necessary. Check the filter elements of the electric cabinet. Replace if necessary Check the silencer of the vacuum control valve, clean if necessary.

(1) Depending on type of application (normal, medium, harsh) this needs to be done more frequently. Consult your Atlas Copco Customer Center.

Preventive Maintenance schedule programmed in the Elektronikon for normal applications

	Type of application		
Action	**Normal**	**Medium**	**Harsh**
Check oil level and condition	Daily	Daily	Daily
Check readings on display			
Remove the air filter elements and inspect Replace damaged or heavily contaminated elements	Monthly	Monthly	Weekly
Check for possible air and oil leakages			
Check coolers, clean if necessary	3-Monthly	3-Monthly	Monthly
Check the filter elements of the electric cabinet. Replace if necessary			
Check the silencer of the vacuum control valve, clean if necessary			
Change oil *	4000 hrs (1) (4)	2000 hrs (1) (4)	1000 hrs (1) (4)
Change oil filter			
Replace the air filter elements			
Clean the scavange line and blow out the restriction nozzle			
Replace the oil seperator elements	4000 hrs (1)	4000 hrs (1)	2000 hrs (1)
Check pressure and temperature readings			
Check operation of cooling fans of converter and clean heatsink			
Check vacuum control valve solenoid and gasballast solenoid valve			
Clean coolers			
Check and clean cooling fan assembly			
Regreasing of motor bearings			
Replace the filter element of electric cabinet	8000 hrs (2)	6000 hrs (2)	4000 hrs (2)
Replace the thermostatic valve			
Test pressure switch			
Replace membrane of vacuum control valve (3)			
Motor overhaul	24000 hrs	24000 hrs	24000 hrs
Change lipseal assembly	24000 hrs	24000 hrs	24000 hrs

	Type of application		
Action	**Normal**	**Medium**	**Harsh**
Replacement of tubes	24000 hrs	24000 hrs	24000 hrs
Element overhaul	48000 hrs	36000 hrs	24000 hrs

(1):or yearly, whichever comes first

(2):or every 2 years, whichever comes first

(3):For turbo pumps; for non-turbo application every 48k hrs

(4):When using sythentic oil the indicated number of running hours can be doubled

* In medium and harsh applications an optional 500 hrs oil sample is recommended.

HWHcap option always use sythentic oil and harsh service intervals

The indicated service exchange intervals are valid for standard operating conditions (see section Reference conditions and limitations) and nominal operating pressure (see section Vacuum pump data). Exposure of the vacuum pump to external pollutants, operation at high humidity combined with low duty cycles or operation at higher temperatures may require a shorter service exchange interval. Contact Atlas Copco if in doubt.

Vacuum pumps with optional high water handling capability (humid version) are recommended for use with Atlas Copco vacuum Synthetic fluid only.

Atlas Copco vacuum Mineral fluid

Ambient temperature	**Element outlet temperature**	**Exchange interval ***	**Maximum time interval ***
up to 25 °C	up to 90 °C	4000 hours	1 year
from 25 °C up to 35 °C	from 90 °C up to 100 °C	3000 hours	1 year
more than 35 °C	more than 100 °C	2000 hours	1 year

Atlas Copco vacuum Synthetic fluid

Ambient temperature	**Element outlet temperature**	**Exchange interval ***	**Maximum time interval ***
up to 40 °C	up to 110 °C	8000 hours	2 year
more than 40°C	more than 110 °C	6000 hours	2 year

Atlas Copco vacuum Foodgrade Fluid

Ambient temperature	Element outlet temperature	Exchange interval *	Maximum time interval *
up to 25 °C	up to 90 °C	4000 hours	1 year
from 25 °C up to 35 °C	from 90 °C up to 100 °C	3000 hours	1 year
more than 35 °C	more than 100 °C	2000 hours	1 year

* Whichever comes first

Important

- Always consult Atlas Copco if a timer setting has to be changed.
- For the change interval of oil and oil filter in extreme conditions of temperature, humidity or cooling air, consult your Atlas Copco Customer Center.
- Any leakage should be attended to immediately. Damaged hoses or flexible joints must be replaced.

6.2 Oil specifications

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

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

Atlas Copco vacuum mineral fluid

Atlas Copco's vacuum mineral Fluid is a specially developed lubricant for use in single stage oil-sealed screw vacuum pumps. Its specific composition keeps the vacuum pump in excellent condition. The vacuum mineral Fluid can be used for vacuum pumps operating at ambient temperatures between 0 °C (32 °F) and 40 °C (104 °F). If the vacuum pump is regularly operating in ambient temperatures above 35 °C (95 °F), oil lifetime is reduced significantly. In such case, use Atlas Copco's vacuum synthetic Fluid for a longer interval for oil exchange.

If the vacuum pump is regularly operating in ambient temperatures above 35 °C (95 °F), oil lifetime is reduced (see table oil lifetime Preventive maintenance schedule).

Atlas Copco vacuum synthetic fluid

Atlas Copco's vacuum synthetic Fluid is a high quality synthetic lubricant for oil-sealed screw vacuum pumps which keeps the vacuum pump in excellent condition. Because of its excellent oxidation stability, vacuum synthetic Fluid can be used for vacuum pumps operating at ambient temperatures between 0 °C (32 °F) and 46 °C (115 °F).

If the vacuum pump is regularly operating in ambient temperatures above 40 °C (104 °F), oil lifetime is reduced (see table oil lifetime Preventive maintenance schedule).

Atlas Copco vacuum foodgrade Fluid

Special oil, delivered as an option.

Atlas Copco's vacuum Foodgrade Fluid is a unique high quality synthetic lubricant, specially created for oil sealed screw vacuum pumps that provide vacuum for the food industry. This lubricant keeps the vacuum pump in excellent condition. Vacuum Foodgrade Fluid can be used for vacuum pump operating at ambient temperatures between 0 °C (32 °F) and 40 °C (104 °F).

If the vacuum pump is regularly operating in ambient temperatures above 35 °C (95 °F), oil lifetime is reduced (see table oil lifetime Preventive maintenance schedule).

6.3 Drive motor

Bearing maintenance

Attention

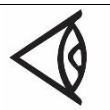
	Never mix greases of different brands or types.

Recommended grease:

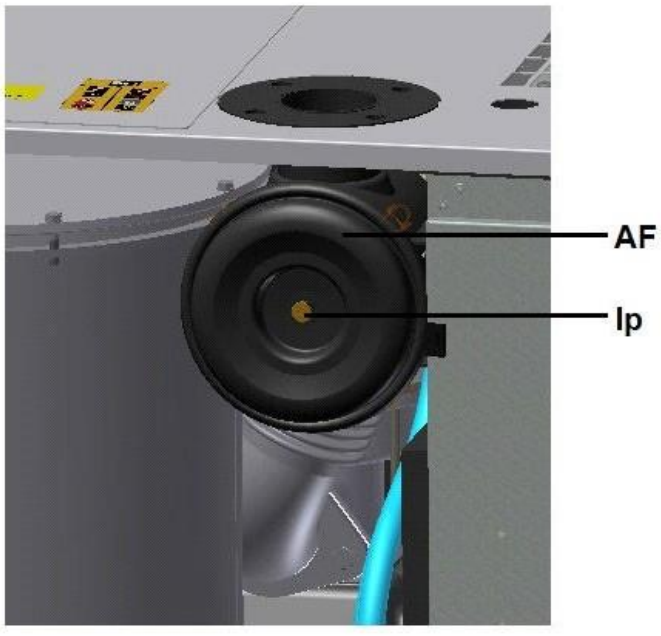
Use 2901 0338.3 Amber

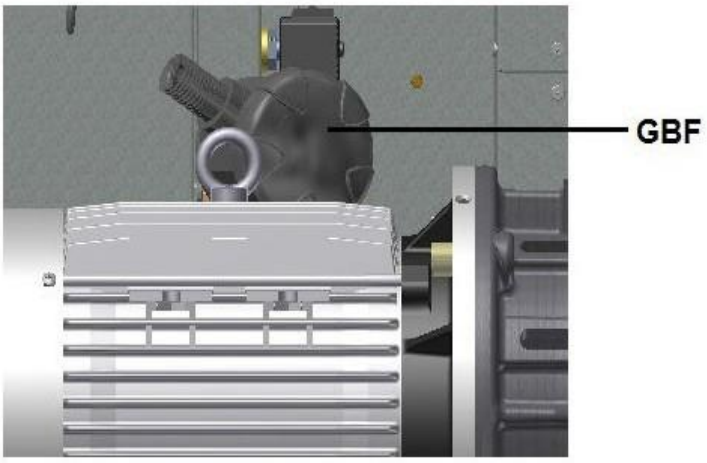
Quantity:

GHS 350VSD+ GHS 350VSD+ Turbo GHS 585VSD+	6.9 g (0.24 oz) per bearing
GHS 585VSD+ Turbo GHS 730VSD+ GHS 730VSD+ Turbo GHS 900VSD+	7.2 g (0.25 oz) per bearing

	Do not use more grease than prescribed!

6.4 Air filter





Procedure

1. Stop the vacuum pump. Switch off the voltage.
2. Vent the vacuum pump by opening the plug (Ip) on the lit of the air inlet filter.
3. Remove the cover of the air filter (AF and GBF). Remove the filter element.
4. Fit the new element and the cover.
5. Reset the air filter service warning.

For vacuum pumps equipped with an Elektronikon® Graphic regulator, see section Service menu.

⚠	When placing the air filter element, verify that the seal is present and in good condition.

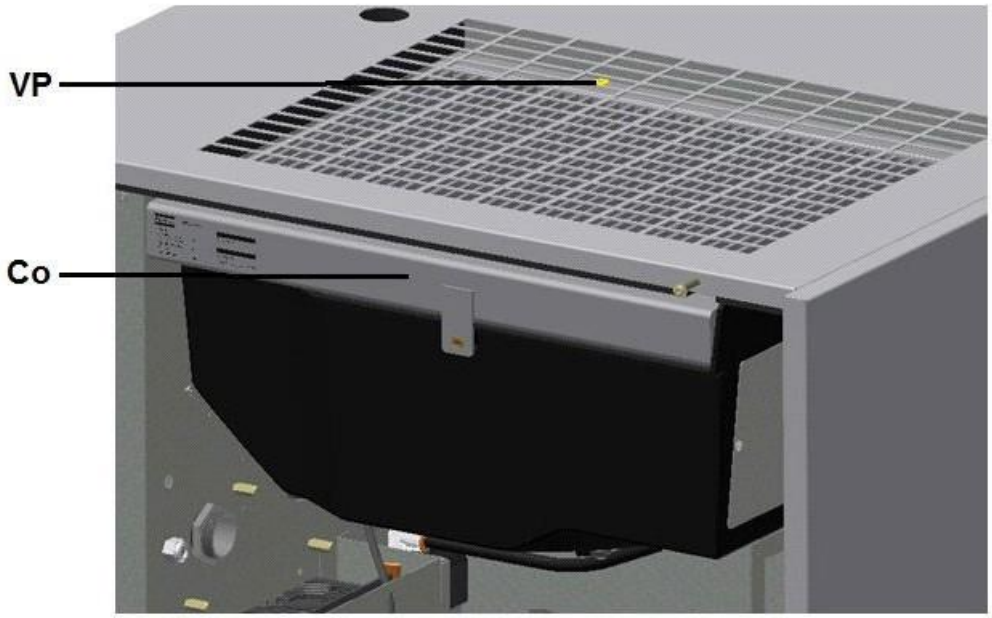
6.5 Oil and oil filter change

Warning

⚠	The operator must apply all relevant Safety precautions. Always drain the vacuum pump oil at all drain points. Used oil left in the vacuum pump can contaminate the oil system and can shorten the lifetime of the new oil. Never mix lubricants of different brands or types as they may not be compatible and the oil mix will have inferior properties. A label, indicating the type of oil filled ex-factory, is stuck on the air receiver/oil tank.

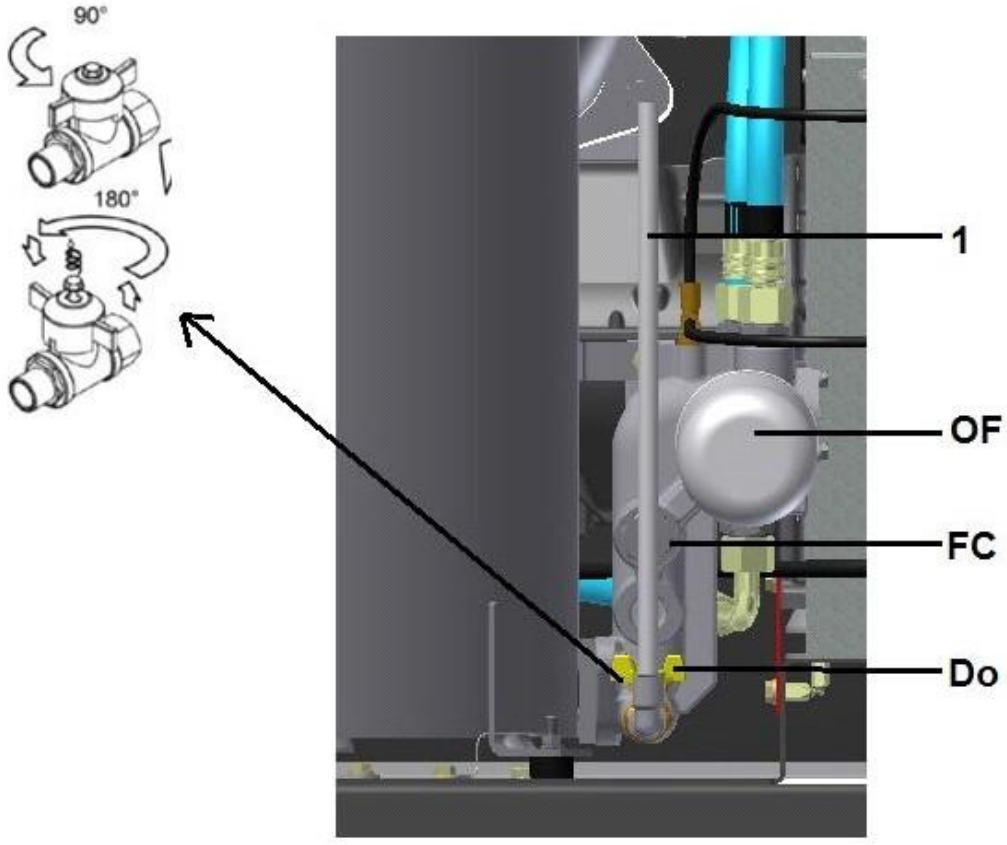
Procedure

1. Run the vacuum pump until warm and stop the vacuum pump.
   - Close the air inlet valve and switch off the voltage.
   - Vent the vacuum pump by opening the plug (Ip) on the cover of the air inlet filter.
2. Remove the vent plug (VP) of the oil cooler.

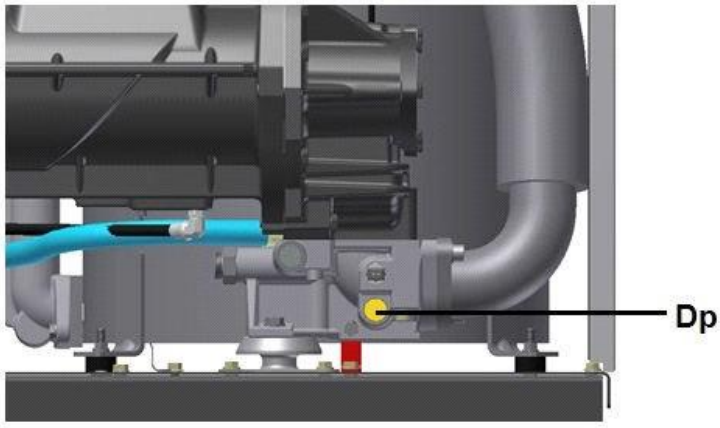


3. Open the oil drain valve (Do).

Hold the oil drain hose (1) downward to drain the oil.



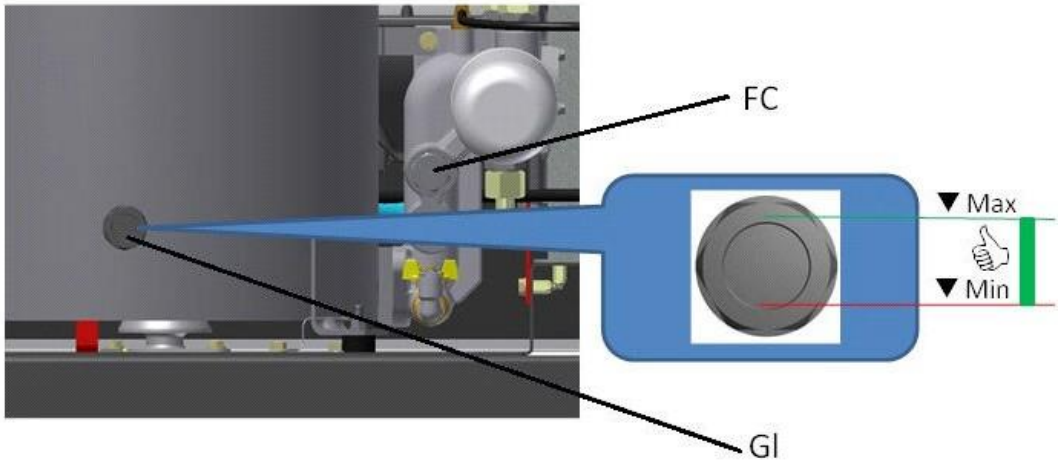
4. Collect the oil in a collector and deliver it to the local collection service. Refit the vent plugs after draining.
5. Close the oil drain valve (Do).
6. Clean the seat on the manifold. Lubricate the gasket of the new oil filter and screw it into place. Tighten firmly by hand**.**



- Unscrew the plug (Dp) in the outlet element housing and drain the oil Collect the oil in a collector and deliver it to the local collection service. Refit the vent plugs after draining.

7. Remove filler plug (FC).

   Fill the oil seperator vessel with oil until the level reaches the top of the oil sight glass.



Take care that no dirt drops into the system. Refit and tighten filler plug (FC).

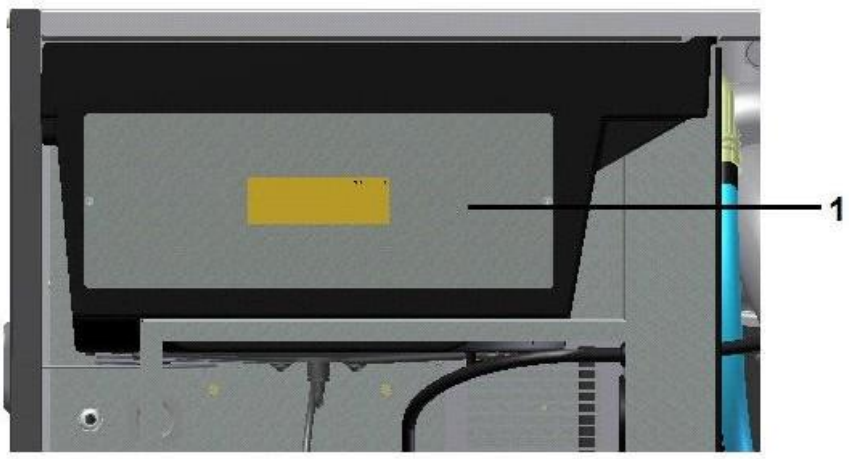
8. Run the vacuum pump loaded for a few minutes. Stop the vacuum pump.
9. Close the air inlet valve and switch off the voltage.
   - Wait a few moments for the Vacuum pump to vent the vessel.
   - Unscrew the oil filler plug (FC) just one turn to permit any remaining pressure in the system to escape.
10. Fill the air receiver (AR) with oil until the level reaches the top of the oil sight glass. (see Operating instructions /During operation)
    - Refit and tighten filler plug (FC).
    - When the oil level is too low, go back to step 7.

6.6 Coolers

General
Keep the coolers clean to maintain their efficiency.

Procedure

- Stop the vacuum pump, close the air inlet valve and switch off the voltage.
- Cover all parts under the coolers.
- Remove the service plate (1) at the fan compartment.



Remove dirt from the coolers with a fibre brush. Brush in the direction of the cooling fins.

- Clean with an air jet in the reverse direction to normal flow.
- If it is necessary to wash the coolers with a cleaning agent, consult Atlas Copco.

	After maintenance on the fan and on the coolers: Remove the loose parts that are used as cover.

- Mount the service plate (1) at the fan compartment.

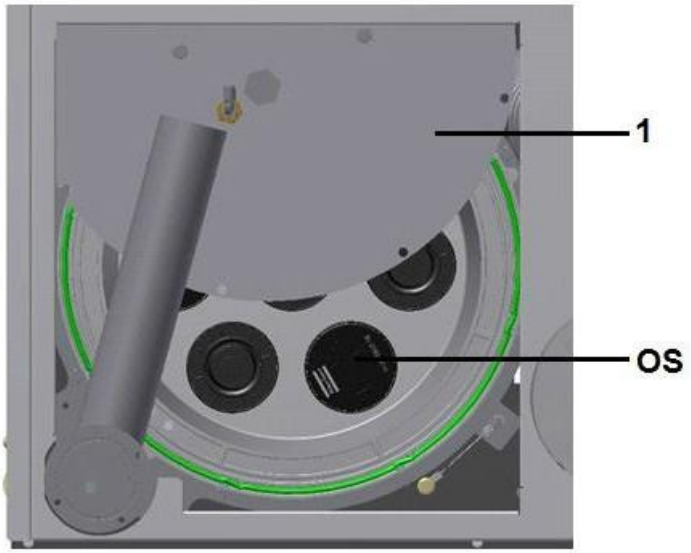
6.7 Oil separator change

Warning

	The operator must apply all relevant Safety precautions.

Procedure

- Stop the vacuum pump, close the air inlet valve and switch off the voltage.
- Wait a few moments for the vacuum pump to vent the vessel.
- Open the service panel in the roof.
- Unscrew the bolts of the cover (1) of the oil separator tank.



- Slide the cover (1) of the oil separator tank backwards
- Remove the oil separator elements (OS) by turning one quarter counter-clockwise
- Clean the seat on the shield. Lubricate the gasket of the new oil separator using vacuum pump oil and screw it into place. Tighten by hand.

	Make sure all separator elements are assembled in the correct position. An arrow is printed on the cover of the separator elements and the bottom of the shield; all arrows should be pointing in the same direction after assembly.

- Slide the cover (1) of the oil separator tank back in position. Caution not to squeeze the O-ring.
- Tighten bolts.

6.8 Pressure switch

Testing

	The pressure switch test can only be performed by authorized personnel.

If the pressure switch does not open at the set pressure of 1500 mbar(a), it needs to be replaced.

Warning

	No adjustments are allowed. Never run the vacuum pump without pressure switch.

6.9 Service kits

Service kits

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

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

Consult the Spare Parts List for part numbers**.**

6.10 Storage after installation

Procedure

Run the vacuum pump regularly, e.g. twice a week, until warm.

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

6.11 Disposal of used material

Used filters or any other used material (e.g., 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.

7 Problem solving

Warning

	Before carrying out any maintenance, repair work or adjustment, stop vacuum pump, close the air inlet valve and wait 3 minutes. Press the emergency stop button and switch off the voltage. Vent the vacuum pump by opening the plug on the cover of the air inlet filter. For location of components, see sections: • Introduction. • Operation instructions • Maintenance. Open and lock the isolating switch. Lock the air inlet valve during maintenance or repair. The operator must apply all relevant Safety precautions.

Before electrical maintenance

	Wait for at least 10 minutes before starting any electrical repairs as dangerous high voltage remains on the capacitors of the start and speed regulation unit during some minutes after switching off the voltage.

Faults and remedies, vacuum pump

If the alarm LED is lit or flashes, consult sections Event history menu or Service menu.

Condition	Fault	Remedy
The pump cannot reach ultimate pressure	Air leakage in the inlet piping connections	Check for leakages in the inlet filter assembly and piping. Check sealing between components
	Low oil level	Top-up oil
	Oil contaminated	Replace oil
	Solenoid-valve malfunctioning	Replace valve
	Membrane of vacuum control valve defect	Replace membrane
	Vacuum pump element out of order	Consult Atlas Copco
The pump cannot reach stated vacuum	Air consumption exceeds air delivery of vacuum pump	Check equipment connected
	Clogged air filter element	Replace the filter
	Too high pressure drop between process and pump inlet	Check the process lines for correct size and for leakage. Correct if necessary
	Low oil level	Top up oil
	Oil contaminated	Replace oil
	Solenoid valve malfunctioning	Replace valve
	Membrane of vacuum control valve defect	Replace membrane
	Vacuum pump element out of order	Consult Atlas Copco
	Air leakage	Check the process lines for leakage

Condition	Fault	Remedy
Pressure switch trips	Oil separator elements clogged	Have elements replaced
	Oil filter clogged	Have oil filter replaced
	Discharge clogged	Check couplings and outlet
	Bypass valve or oil injection system clogged	Have bypass valve cleaned or replaced. Clean oil injection system
	Pressure switch out of order	Replace pressure switch
Vacuum pump element outlet temperature above normal	Oil level too low	Check and correct, see Operation instructions / During operation
	Insufficient cooling air or cooling air temperature or relative humidity is too high	Check for cooling air restriction or improve ventilation of the vacuum pump room. Avoid recirculating of cooling air. If installed, check capacity of vacuum pump room fan
	Oil cooler clogged	Clean cooler
	Oil filter clogged	Replace oil filter
	Scavenge line clogged	Clean scavenge line
	By-pass valve malfunctioning	Have valve tested
	Degraded oil	Check service intervals, see Preventive maintenance schedule
	Temperature of pressure air too high	Check process air temperature
	Vacuum pump element out of order	Consult Atlas Copco

Converter fault codes

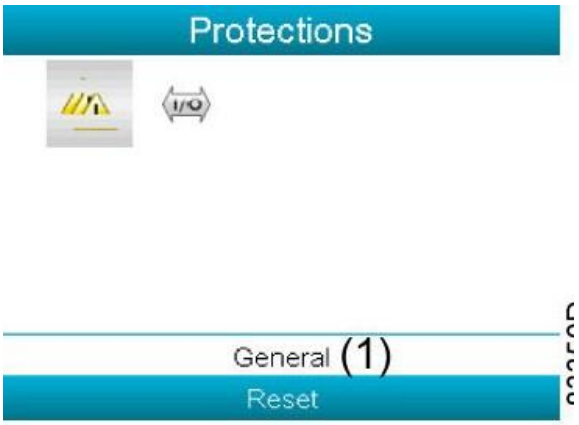
If a problem is detected by the converter, a specific code (Main motor converter alarm) will appear on the Elektronikon display, together with a fault code. Below table lists the most important error codes. If another code appears, please contact Atlas Copco.

Typical display when the vacuum pump is stopped by a shutdown

(1)	Shutdown

Navigate to the Stop icon or to the Protections icon and press Enter.

(1)	Protections



(1)	General

The display shows the problem (Main Motor Converter Alarm) and a fault code (31 in this case).

(1)	Main Motor Converter Alarm
(2)	Fault

Fault code	Fault	Remedy
2 (or 60000)	DC Bus Under voltage (Uv1)	Check supply voltage Check input wiring Check EMC filter
3 (or 60000)	Control Power Supply Voltage Fault (Uv2)	Check supply voltage Check input wiring Check EMC filter
4 (or 60000)	Under voltage 3 (Uv3)	Check supply voltage Check input wiring Check EMC filter
5	Output Short-Circuit or IGBT Fault (SC)	Check wiring to motor Check for short-circuits Check inlet valve Check back pressure oil separator vessel Check oil injection
6	Ground Fault (GF)	Check wiring to motor Check for short-circuits Check inlet valve Check back pressure oil separator vessel Check oil injection
7	Overcurrent (oC)	Check wiring to motor Check for short-circuits Check inlet valve Check back pressure oil separator vessel Check oil injection
8	Drive Overheat Warning (ov)	Check ambient temperatures Check cooling unit/inverter Check heatsink inverter
9	Heat sink Overheat (oH)	Check ambient temperatures Check cooling unit/inverter Check heatsink inverter
10	Overheat 1 (oH1)	Check ambient temperatures Check cooling unit/inverter Check heatsink inverter
11	Motor Overload (oL1)	Check inlet valve Check back pressure oil separator vessel Check drive train Check oil injection
12	Drive Overload (oL2)	Check inlet valve Check back pressure oil separator vessel Check drive train Check oil injection
13	Over torque Detection 1 (oL3)	Check inlet valve Check back pressure oil separator vessel Check drive train Check oil injection

Fault code	Fault	Remedy
14	Overtorque Detection 2 (oL4)	Check inlet valve Check back pressure oil separator vessel Check drive train Check oil injection
15	Dynamic Braking Transistor (rr)	Contact Atlas Copco
16	Braking Resistor Overheat (rH)	Contact Atlas Copco
17	External Fault at Input Terminal S3 (EF3)	Check control wiring
18	External Fault at Input Terminal S4 (EF4)	Check control wiring
19	External Fault at Input Terminal S5 (EF5)	Check control wiring
20	External Fault at Input Terminal S6 (EF6)	Check control wiring
21	External Fault at Input Terminal S7 (EF7)	Check control wiring
22	External Fault at Input Terminal S8 (EF8)	Check control wiring
23	Internal Fan Fault (FAn)	Check cooling inverter
24	Overspeed (oS)	Contact Atlas Copco
25	Speed Deviation (dEv)	Contact Atlas Copco
26	PG Disconnect (PGo)	Contact Atlas Copco
27	Input Phase Loss (PF)	Check supply voltage Check input wiring Check EMC filter
28	Output Phase Loss (LF)	Check wiring to motor
29	Motor Overheat (PTC input) (oH3)	Check wiring to motor Check ambient temperatures Check cooling unit Check inlet valve Check back pressure oil separator vessel
30	Digital Operator Connection (oPr)	Contact Atlas Copco
31	EEPROM Write Error (Err)	Contact Atlas Copco
32	Motor Overheat (PTC input) (oH4)	Check wiring to motor Check ambient temperatures Check cooling unit Check inlet valve Check back pressure oil separator vessel
33	MEMOBUS/Modbus Communication Error (CE)	Check communication wiring
34	Option Communication Error (bUS)	Contact Atlas Copco
37	Control Fault (CF)	Contact Atlas Copco
38	Zero-Servo Fault (SvE)	Contact Atlas Copco
39	Option External Fault (EF0)	Contact Atlas Copco
40	PID Feedback Loss (FbL)	Contact Atlas Copco
41	Undertorque Detection 1 (UL3)	Contact Atlas Copco
42	Undertorque Detection 2 (UL4)	Contact Atlas Copco
43	High Slip Braking Overload (oL7)	Contact Atlas Copco
48	Hardware Fault (including oFx)	Contact Atlas Copco
50	Z Pulse Fault (dv1)	Contact Atlas Copco
51	Z Pulse Noise Fault Detection (dv2)	Contact Atlas Copco
52	Inversion Detection (dv3)	Contact Atlas Copco
53	Inversion Prevention Detection (dv4)	Contact Atlas Copco
54	Output Current Imbalance (LF2)	Check wiring to motor

Fault code	Fault	Remedy
55	Pullout Detection (Sto)	Contact Atlas Copco
56	PG Hardware Fault (PGoH)	Contact Atlas Copco
57	MECHATROLINK Watchdog Timer Error (E5)	Contact Atlas Copco
59	Safe Torque Off	Check emergency stop Check pressure switch Check temperature switch and their wiring
65	PID Feedback Loss (FbH)	Contact Atlas Copco
66	External Fault 1, Input Terminal S1 (EF1)	Contact Atlas Copco
67	External Fault 2, Input Terminal S2 (EF2)	Contact Atlas Copco
68	Mechanical Weakening Detection 1 (oL5)	Contact Atlas Copco
69	Mechanical Weakening Detection 2 (UL5)	Contact Atlas Copco
70	Current Offset Fault (CoF)	Contact Atlas Copco
71	PLC Detection Error 1 (PE1)	Contact Atlas Copco
72	PLC Detection Error 2 (PE2)	Contact Atlas Copco
73	DriveWorksEZ Fault (dWFL)	Contact Atlas Copco
74	EEPROM Memory DriveWorksEZ Data Er (dWF1)	Contact Atlas Copco
77	Output Voltage Detection Fault (voF)	Contact Atlas Copco
78	Braking Resistor Transistor Fault (rF)	Contact Atlas Copco
79	Braking Transistor Overload Fault (boL)	Contact Atlas Copco
80	Motor Overheat (NTC Input) (oH5)	Contact Atlas Copco
81	LSo Fault (LSo)	Contact Atlas Copco
82	Node Setup Fault (nSE)	Contact Atlas Copco
83	Thermistor Disconnect (THo)	Contact Atlas Copco
91	Initial Polarity Estimation Timeout (dv7)	Contact Atlas Copco
95	Power Unit Output Phase Loss 3 (LF3)	Contact Atlas Copco
96	Current Unbalance (UnbC)	Check wiring to motor
97	Power Supply Module Undervoltage (Uv4)	Contact Atlas Copco
131	A/D Conversion Error (CPF02)	Contact Atlas Copco
132	PWM Data Fault (CPF03)	Contact Atlas Copco
135	EEPROM Memory Data Error (CPF06)	Contact Atlas Copco
136	Terminal Board Connection Error (CPF07)	Contact Atlas Copco
137	EEPROM Serial Communication Fault (CPF08)	Contact Atlas Copco
140	RAM Fault (CPF11)	Contact Atlas Copco
141	Flash Memory Circuit Exception (CPF12)	Contact Atlas Copco
142	Watchdog Circuit Exception (CPF13)	Contact Atlas Copco
143	Control Circuit Fault (CPF14)	Contact Atlas Copco
145	Clock Fault (CPF16)	Contact Atlas Copco
146	Timing Fault (CPF17)	Contact Atlas Copco
147	Control Circuit Fault (CPF18)	Contact Atlas Copco
148	Control Circuit Fault (CPF19)	Contact Atlas Copco
149	Hardware Fault at Power Up (CPF20)	Contact Atlas Copco
150	Hardware Fault at Communication Start Up (CPF21)	Contact Atlas Copco
151	A/D Conversion Fault (CPF22)	Contact Atlas Copco

Fault code	Fault	Remedy
152	PWM Feedback Fault (CPF23)	Contact Atlas Copco
153	Drive Unit Signal Fault (CPF24)	Contact Atlas Copco
154	Terminal Board is Not Properly Connected. (CPF25)	Contact Atlas Copco
155	ASIC BB Circuit Error (CPF26)	Contact Atlas Copco
156	ASIC PWM Setting Register Error (CPF27)	Contact Atlas Copco
157	ASIC PWM Pattern Error (CPF28)	Contact Atlas Copco
158	ASIC On-delay Error (CPF29)	Contact Atlas Copco
159	ASIC BBON Error (CPF30)	Contact Atlas Copco
160	ASIC Code Error (CPF31)	Contact Atlas Copco
161	ASIC Start-up Error (CPF32)	Contact Atlas Copco
162	Watch-dog Error (CPF33)	Contact Atlas Copco
163	ASIC Power/Clock Error (CPF34)	Contact Atlas Copco
164	External A/D Converter Error (CPF35)	Contact Atlas Copco
169	Control Circuit Error (CPF40)	Contact Atlas Copco
170	Control Circuit Error (CPF41)	Contact Atlas Copco
171	Control Circuit Error (CPF42)	Contact Atlas Copco
172	Control Circuit Error (CPF43)	Contact Atlas Copco
173	Control Circuit Error (CPF44)	Contact Atlas Copco
174	Control Circuit Error (CPF45)	Contact Atlas Copco
257	Option Compatibility Error (oFA00)	Contact Atlas Copco
258	Option Not Properly Connected (oFA01)	Contact Atlas Copco
259	Same Type of Option Card Already Connected (oFA02)	Contact Atlas Copco
262	A/D Conversion Error (oFA05)	Contact Atlas Copco
263	Option Response Error (oFA06)	Contact Atlas Copco
273	Option RAM Fault (oFA10)	Contact Atlas Copco
274	Option Operation Mode Fault (SLMOD) (oFA11)	Contact Atlas Copco
275	Drive Receive CRC Error (oFA12)	Contact Atlas Copco
276	Drive Receive Frame Error (oFA13)	Contact Atlas Copco
277	Drive Receive Abort Error (oFA14)	Contact Atlas Copco
278	Option Receive CRC Error (oFA15)	Contact Atlas Copco
279	Option Receive Frame Error (oFA16)	Contact Atlas Copco
280	Option Receive Abort Error (oFA17)	Contact Atlas Copco
305	Comm. ID Error (oFA30)	Contact Atlas Copco
306	Model Code Error (oFA31)	Contact Atlas Copco
307	Sumcheck Error (oFA32)	Contact Atlas Copco
308	Comm. Option Timeout Waiting for Response (oFA33)	Contact Atlas Copco
309	MEMOBUS Timeout (oFA34)	Contact Atlas Copco
310	Drive Timeout Waiting for Response (oFA35)	Contact Atlas Copco
311	CI Check Error (oFA36)	Contact Atlas Copco
312	Drive Timeout Waiting for Response (oFA37)	Contact Atlas Copco
313	Control Command Selection Error (oFA38)	Contact Atlas Copco
314	Drive Timeout Waiting for Response (oFA39)	Contact Atlas Copco

Fault code	Fault	Remedy
315	Control Response Selection 1 Error (oFA40)	Contact Atlas Copco
316	Drive Timeout Waiting for Response (oFA41)	Contact Atlas Copco
317	Control Response Selection 2 Error (oFA42)	Contact Atlas Copco
318	Control Response Selection Error (oFA43)	Contact Atlas Copco
513	Option Compatibility Error (oFB00)	Contact Atlas Copco
514	Option Connection Error (oFb01)	Contact Atlas Copco
515	Same Type of Option Card Already Connected (oFb02)	Contact Atlas Copco
518	A/D Conversion Error (oFb05)	Contact Atlas Copco
519	Option Response Error (oFb06)	Contact Atlas Copco
529	Option RAM Fault (oFb10)	Contact Atlas Copco
530	Option Operation Mode Fault (SLMOD) (oFb11)	Contact Atlas Copco
531	Drive Receive CRC Error (oFb12)	Contact Atlas Copco
532	Drive Receive Frame Error (oFb13)	Contact Atlas Copco
533	Drive Receive Abort Error (oFb14)	Contact Atlas Copco
534	Option Receive CRC Error (oFb15)	Contact Atlas Copco
535	Option Receive Frame Error (oFb16)	Contact Atlas Copco
536	Option Receive Abort Error (oFb17)	Contact Atlas Copco
561	Comm. ID Error (oFb30)	Contact Atlas Copco
562	Model Code Error (oFb31)	Contact Atlas Copco
563	Sumcheck Error (oFb32)	Contact Atlas Copco
564	Comm. option Timeout Waiting for Response (oFb33)	Contact Atlas Copco
565	MEMOBUS Timeout (oFb34)	Contact Atlas Copco
566	Drive Timeout Waiting for Response (oFb35)	Contact Atlas Copco
567	CI Check Error (oFb36)	Contact Atlas Copco
568	Drive Timeout Waiting for Response (oFb37)	Contact Atlas Copco
569	Control Command Selection Error (oFb38)	Contact Atlas Copco
570	Drive Timeout Waiting for Response (oFb39)	Contact Atlas Copco
571	Control Response Selection 1 Error (oFb40)	Contact Atlas Copco
572	Drive Timeout Waiting for Response (oFb41)	Contact Atlas Copco
573	Control Response Selection 2 Error (oFb42)	Contact Atlas Copco
574	Control Response Selection Error (oFb43)	Contact Atlas Copco
769	Option Compatibility Error (oFC00)	Contact Atlas Copco
771	Option Not Properly Connected (oFC01)	Contact Atlas Copco
772	Same Type of Option Card Already Connected (oFC02)	Contact Atlas Copco
774	A/D Conversion Error (oFC05)	Contact Atlas Copco
775	Option Response Error (oFC06)	Contact Atlas Copco
785	Option RAM Fault (oFC10)	Contact Atlas Copco
786	Option Operation Mode Fault (SLMOD) (oFC11)	Contact Atlas Copco
787	Drive Receive CRC Error (oFC12)	Contact Atlas Copco
788	Drive Receive Frame Error (oFC13)	Contact Atlas Copco
789	Drive Receive Abort Error (oFC14)	Contact Atlas Copco

Fault code	Fault	Remedy
790	Option Receive CRC Error (oFC15)	Contact Atlas Copco
791	Option Receive Frame Error (oFC16)	Contact Atlas Copco
792	Option Receive Abort Error (oFC17)	Contact Atlas Copco
849	Encoder Option AD Conversion Error (oFC50)	Contact Atlas Copco
850	Encoder Option Analog Circuit Error (oFC51)	Contact Atlas Copco
851	Encoder Communication Timeout (oFC52)	Contact Atlas Copco
852	Encoder Communication Data Error (oFC53)	Contact Atlas Copco
853	Encoder Error (oFC54)	Contact Atlas Copco
854	Resolver Error (oFC55)	Contact Atlas Copco

8 Technical data

8.1 Reading on display

Elektronikon® Graphic controller

Important

	The readings mentioned below are valid under the reference conditions (see section Reference conditions and limitations).

Reference	Reading
Vacuum pressure	Depends on the setpoint (desired net pressure).
element outlet temperature	Approx. 83°C (181°F) (ambient temperature 20 °C + 63°C)
Discharge pressure	Approx. 1020 mbar(a)

8.2 Electrical cable size and fuses

Important

The voltage on the vacuum pump terminals (3 ph) must not deviate more than 10% of the nominal voltage. The voltage on the vacuum pump terminals (1 ph) must not deviate more than 5% of the nominal voltage.

It is however highly recommended to keep the voltage drop over the supply cables at nominal current below 5% of the nominal voltage (IEC 60204-1).

- If cables are grouped together with other power cables, it may be necessary to use cables of a larger size than those calculated for the standard operating conditions.
- Use the original cable entry. See section Dimension drawings.

  To preserve the IP 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 Vacuum pump.
- Local regulations remain applicable if they are stricter than the values proposed below.

Caution:

- Always double-check the fuse size versus the calculated cable size. If required, reduce fuse size or enlarge cable size.
- Cable length should not exceed the maximum length according to IEC60204 table 10

Leakage breaker (optional)

If the installation requires a leakage breaker, always use an all current sensitive leakage breaker, RCM or RCD Type B (according to IEC/EN 60755) with a sufficient trip level.

Currents and fuses

IEC and UL/cUL approval

Vacuum pump specification					**Itot**		**Imax undervoltage**	
					Primary	Secondary	Primary	Secondary
Pump	Voltage	Freq.	Secondary voltage autotransform	Approval	Itot	Itot	Itot	Itot
	V	Hz		IEC/CSA/ UL	A	A	A	A
GHS 350-585 VSD+	380	60			18,4		20,4	
GHS 350-585 VSD+	400	50			17,4		19,4	
GHS 350-585 VSD+	460	60			15,2		16,9	
GHS 350-585 VSD+ 1 ph	460	60			31.6		35.2	
GHS 350-585 VSD+	200	50	400		34,9	17,4	38,8	19,4
GHS 350-585 VSD+	230	60	460		30,3	15,2	33,7	16,9
GHS 350-585 VSD+	500	50	400		14,0	17,4	15,5	19,4
GHS 350-585 VSD+	575	60	460		12,1	15,2	13,5	16,9
GHS 350 VSD+ Turbo	380	60			18,4		20,4	
GHS 350 VSD+ Turbo	400	50			17,4		19,4	

Vacuum pump specification					Itot		Imax undervoltage	
					Primary	Secondary	Primary	Secondary
Pump	Voltage	Freq.	Secondary voltage autotransform	Approval	Itot	Itot	Itot	Itot
GHS 350 VSD+ Turbo	460	60		IEC/CSA/ UL	15,2		16,9	
GHS 350 VSD+ Turbo	200	50	400		34,9	17,4	38,8	19,4
GHS 350 VSD+ Turbo	230	60	460		30,3	15,2	33,7	16,9
GHS 350 VSD+ Turbo	500	50	400		14,0	17,4	15,5	19,4
GHS 350 VSD+ Turbo	575	60	460		12,1	15,2	13,5	16,9
GHS 730 VSD+	380	60			25,2		28,0	
GHS 730 VSD+	400	50			23,9		26,6	
GHS 730 VSD+	460	60			20,8		23,1	
GHS 730 VSD+ 1 ph	460	60			43.5		48.3	
GHS 730 VSD+	200	50	400		47,8	23,9	53,2	26,6
GHS 730 VSD+	230	60	460		41,6	20,8	46,2	23,1
GHS 730 VSD+	500	50	400		19,1	23,9	21,3	26,6
GHS 730 VSD+	575	60	460		16,6	20,8	18,5	23,1
GHS 585 VSD+ Turbo	380	60			25,2		28,0	
GHS 585 VSD+ Turbo	400	50			23,9		26,6	
GHS 585 VSD+ Turbo	460	60			20,8		23,1	
GHS 585 VSD+ Turbo	200	50	400		47,8	23,9	53,2	26,6
GHS 585 VSD+ Turbo	230	60	460		41,6	20,8	46,2	23,1
GHS 585 VSD+ Turbo	500	50	400		19,1	23,9	21,3	26,6
GHS 585 VSD+ Turbo	575	60	460		16,6	20,8	18,5	23,1
GHS 900 VSD+	380	60			35,8		39,8	
GHS 900 VSD+	400	50			34,0		37,8	
GHS 900 VSD+	460	60			29,6		32,9	
GHS 900 VSD+	200	50	400		64,7	32,3	71,8	35,9
GHS 900 VSD+	230	60	460		56,2	28,1	62,5	31,2
GHS 900 VSD+	500	50	400		25,9	32,3	28,7	35,9
GHS 900 VSD+	575	60	460		22,5	28,1	25,0	31,2
GHS 730 VSD+ Turbo	380	60			35,8		39,8	
GHS 730 VSD+ Turbo	400	50			34,0		37,8	
GHS 730 VSD+ Turbo	460	60			29,6		32,9	
GHS 730 VSD+ Turbo	200	50	400		64,7	32,3	71,8	35,9
GHS 730 VSD+ Turbo	230	60	460		56,2	28,1	62,5	31,2
GHS 730 VSD+ Turbo	500	50	400		25,9	32,3	28,7	35,9

Vacuum pump specification					Itot		Imax undervoltage	
					Primary	Secondary	Primary	Secondary
Pump	Voltage	Freq.	Secondary voltage autotransform	Approval	Itot	Itot	Itot	Itot
GHS 730 VSD+ Turbo	575	60	460	IEC/CSA/ UL	22,5	28,1	25,0	31,2

			max. fuse pack		Supply cables	
Pump	Voltage	Freq.	IEC class gL/gC	UL class K5 CSA HRC from ii	Wire ends	Recommended cable size
	V	Hz	A	A		mm^2 (P/FF)
GHS 350-585 VSD+	380	60	20	20	end sockets	4
GHS 350-585 VSD+	400	50	20	20	end sockets	4
GHS 350-585 VSD+	460	60	20	20	end sockets	4
GHS 350-585 VSD+ 1 ph	460	60	40	40	end sockets	10
GHS 350-585 VSD+	200	50	40	40	end sockets	16
GHS 350-585 VSD+	230	60	35	35	end sockets	10
GHS 350-585 VSD+	500	50	15	15	end sockets	2,5
GHS 350-585 VSD+	575	60	15	15	end sockets	2,5
GHS 350 VSD+ Turbo	380	60	20	20	end sockets	4
GHS 350 VSD+ Turbo	400	50	20	20	end sockets	4
GHS 350 VSD+ Turbo	460	60	20	20	end sockets	4
GHS 350 VSD+ Turbo	200	50	40	40	end sockets	16
GHS 350 VSD+ Turbo	230	60	35	35	end sockets	10
GHS 350 VSD+ Turbo	500	50	15	15	end sockets	2,5
GHS 350 VSD+ Turbo	575	60	15	15	end sockets	2,5
GHS 730 VSD+	380	60	32	30	end sockets	6
GHS 730 VSD+	400	50	32	30	end sockets	6
GHS 730 VSD+	460	60	25	25	end sockets	6
GHS 730 VSD+ 1 ph	460	60	50	50	end sockets	10
GHS 730 VSD+	200	50	63	60	end sockets	25
GHS 730 VSD+	230	60	50	50	end sockets	16
GHS 730 VSD+	500	50	25	25	end sockets	4
GHS 730 VSD+	575	60	20	20	end sockets	4
GHS 585 VSD+ Turbo	380	60	32	30	end sockets	6
GHS 585 VSD+ Turbo	400	50	32	30	end sockets	6
GHS 585 VSD+ Turbo	460	60	25	25	end sockets	6
GHS 585 VSD+ Turbo	200	50	63	60	end sockets	25
GHS 585 VSD+ Turbo	230	60	50	50	end sockets	16
GHS 585 VSD+ Turbo	500	50	25	25	end sockets	4
GHS 585 VSD+ Turbo	575	60	20	20	end sockets	4
GHS 900 VSD+	380	60	40	40	end sockets	10

			max. fuse pack		Supply cables	
Pump	Voltage	Freq.	IEC class gL/gC	UL class K5 CSA HRC from ii	Wire ends	Recommended cable size
	V	Hz	A	A		mm^2 (P/FF)
GHS 900 VSD+	400	50	40	40	end sockets	10
GHS 900 VSD+	460	60	35	35	end sockets	10
GHS 900 VSD+	200	50	80	80	end sockets	35
GHS 900 VSD+	230	60	80	70	end sockets	25
GHS 900 VSD+	500	50	32	30	end sockets	10
GHS 900 VSD+	575	60	32	30	end sockets	6
GHS 730 VSD+ Turbo	380	60	40	40	end sockets	10
GHS 730 VSD+ Turbo	400	50	40	40	end sockets	10
GHS 730 VSD+ Turbo	460	60	35	35	end sockets	10
GHS 730 VSD+ Turbo	200	50	80	80	end sockets	35
GHS 730 VSD+ Turbo	230	60	80	70	end sockets	25
GHS 730 VSD+ Turbo	500	50	32	30	end sockets	10
GHS 730 VSD+ Turbo	575	60	32	30	end sockets	6

I: current in the supply lines at maximum load and nominal voltage

Setting for circuit breakers

Q1	1 A
Q15 (as fuse)	0.6 A

Fuse calculations for IEC are done according to 60364-4-43 electrical installations of buildings, part 4: protection for safety- section 43: protection against over current. Fuse sizes are calculated in order to protect the cable against short circuit.

Fuse calculations for cUL and UL: The indicated fuse size is the maximum fuse size in order to protect the motor against short circuit. For cUL fuse HRC form II, for UL fuse class K5

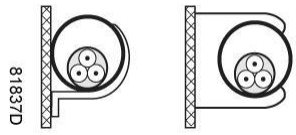
Earthing

The earthing cable connected to the vacuum pump (PE) should be minimum 10 mm^2 (according to EN 60204-1 section 828).

Cable sizing according IEC

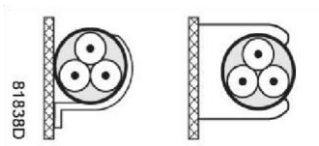
The tables below indicate the current carrying capacities of cables for 3 commonly used installation methods, calculated according to standard 60364-5-52 - electrical installations of buildings part 5 - selection and erection equipment and section 52 - current carrying capacities in wiring systems.

The allowed currents are valid for PVC insulated cables with three loaded copper conductors (maximum conductor temperature 70 °C).

	Installation method B2 according to table B.52.1. Multi-core cable in conduit on a wooden wall.

Maximum allowed current in function of the ambient temperature for installation method B2

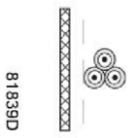
	Ambient temperature				
Cable section	**30 °C**	**40 °C**	**45 °C**	**50 °C**	**55 °C**
4 mm²	< 27 A	< 23 A	< 21 A	< 19 A	< 16 A
6 mm²	< 34 A	< 30 A	< 27 A	< 24 A	< 21 A
10 mm²	< 46 A	< 40 A	< 36 A	< 33 A	< 28 A
16 mm²	< 62 A	< 54 A	< 49 A	< 44 A	< 38 A
25 mm²	< 80 A	< 70 A	< 63 A	< 57 A	< 49 A
35 mm²	< 99 A	< 86 A	< 78 A	< 70 A	< 60 A
50 mm²	< 118 A	< 103 A	< 93 A	< 84 A	< 72 A
70 mm²	< 149 A	< 130 A	< 118 A	< 106 A	< 91 A
95 mm²	< 179 A	< 156 A	< 141 A	< 127 A	< 109 A
120 mm²	< 206 A	< 179 A	< 163 A	< 146 A	< 126 A



Installation method C according to table B.52.1.
Single-core or multi-core cable on a wooden wall.

Maximum allowed current in function of the ambient temperature for installation method C.

	Ambient temperature				
Cable section	**30 °C**	**40 °C**	**45 °C**	**50 °C**	**55 °C**
4 mm²	< 32 A	< 28 A	< 25 A	< 23 A	< 20 A
6 mm²	< 41 A	< 36 A	< 32 A	< 29 A	< 25 A
10 mm²	< 57 A	< 50 A	< 45 A	< 40 A	< 35 A
16 mm²	< 76 A	< 66 A	< 60 A	< 54 A	< 46 A
25 mm²	< 96 A	< 84 A	< 76 A	< 68 A	< 59 A
35 mm²	< 119 A	< 104 A	< 94 A	< 84 A	< 73 A
50 mm²	< 144 A	< 125 A	< 114 A	< 102 A	< 88 A
70 mm²	< 184 A	< 160 A	< 145 A	< 131 A	< 112 A
95 mm²	< 223 A	< 194 A	< 176 A	< 158 A	< 136 A
120 mm²	< 259 A	< 225 A	< 205 A	< 184 A	< 158 A



Installation method F according table B.52.1. Single-core cables, touching in free air Clearance to wall not less than one cable diameter

Maximum allowed current in function of the ambient temperature for installation method F

	Ambient temperature				
Cable section	**30 °C**	**40 °C**	**45 °C**	**50 °C**	**55 °C**
25 mm²	< 110 A	< 96 A	< 87 A	< 78 A	< 67 A
35 mm²	< 137 A	< 119 A	< 108 A	< 97 A	< 84 A
50 mm²	< 167 A	< 145 A	< 132 A	< 119 A	< 102 A
70 mm²	< 216 A	< 188 A	< 171 A	< 153 A	< 132 A
95 mm²	< 264 A	< 230 A	< 209 A	< 187 A	< 161 A
120 mm²	< 308 A	< 268 A	< 243 A	< 219 A	< 188 A

Calculation method for IEC:

- Single supply cables (3 phases + PE - configuration (1)):
- Add 10% to the total vacuum pump current (Itot from the tables)
- Install the prescribed fuse on each cable
- Parallel supply cable (2 x 3 phases + PE - configuration (2)):
- Add 10% to the total vacuum pump current (Itot from the tables) and divide by 2
- Multiply the ampacity of the cables with 0.8 (see table A.52.17 (52-E1))
- Install fuses of half the size of the recommended maximum fuse size on each cable.
- When using 2 x 3 phases + PE as in (3):
- Add 10% to the total vacuum pump current (Itot from the tables) and divide by √3
- Multiply the ampacity of the cables with 0.8 (see table A.52.17 (52-E1))
- Fuse size: the recommended maximum fuse size divided by √3 on each cable.
- Size of the PE cable:
- For supply cables up to 35 mm²: same size as supply cables
- 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: Itot= 89 A, maximum ambient temperature is 45 °C, recommended fuse = 100 A

- Single supply cables (3 phases + PE - configuration (1)):
- I = 89 A + 10% = 89 x 1.1 = 97.9 A
- The table for B2 and ambient temperature = 45 ° C allows a maximum current of 93 A for a 50 mm² cable. For a cable of 70 mm², the maximum allowed current is 118 A, which is sufficient. Therefore, use a 3 x 70 mm² + 35 mm² cable.

  If method C is used, 50 mm² is sufficient. (35 mm² for method F) =>cable 3 x 50 mm² + 25 mm².
- Parallel supply cable (2 x 3 phases + PE - configuration (2)):
- I = (89 A + 10%)/2 = (89 x 1.1)/2 = 49 A
- For a cable of 25 mm², B2 at 45 °C, the maximum current is 63 A x 0.8 = 50.4 A. So 2 parallel cables of 3 x 25 mm² + 25 mm² are sufficient.
- Install 50 A fuses on each cable instead of 100 A.

Cable sizing according UL/cUL

Calculation method according UL 508A, table 28.1 column 5: allowable ampacities of insulated copper conductors (75°C (167°F)).

Maximum allowed current in function of the wire size

AWG or kcmil	Maximum current
10	< 30 A
8	< 50 A
6	< 65 A
4	< 85 A
3	< 100 A
2	< 115 A
1	< 130 A
1/0	< 150 A
2/0	< 175 A
3/0	< 200 A

Calculation method for UL:

- Single supply cables (3 phases + 1 PE - configuration (1)):
- Add 25% to the total current from the tables (see UL 508A 28.3.2: “Capacity shall have 125% of the full load current”)
- Install the prescribed maximum fuse on each cable
- Parallel supply cable (2 x 3 phases + 2 PE - configuration (2)):
- Add 25% to the total current from the tables and divide by 2
- Multiply the capacity of the cables with 0.8 (see UL 508A table 28.1 continued)
- Install fuses of half the size of the recommended maximum fuse size on each cable.
- When using 2 x 3 phase + 2 PE as in (3):
- Add 25% to the total current from the tables and divide by √3
- Multiply the capacity of the cables with 0.8 (see UL 508A table 28.1 continued)
- Fuse size: the recommended maximum fuse size divided by √3 on each cable.
- Size PE cable:
- For supply cables up to AWG8: same size as the supply cables
- For supply cables larger than AWG8: use maximum allowed capacity.

< 100 A: use AWG8
< 200 A: use AWG6
< 300 A: use AWG4

Always check the voltage drop over the cable (less than 5 % of the nominal voltage is recommended).Example of supply cable calculation: Itot= 128 A, maximum ambient temperature is 45 °C, recommended fuse = 150 A.

- Single supply cables (3 phases + 1 PE - configuration (1)):
- I = 128 A + 25 % = 128 x 1.25 = 160 A
- For AWG2/0, the maximum current is 175 A, which is sufficient => use AWG2/0
- Install the prescribed maximum fuse (150 A) on each cable
- Parallel supply cable (2 x 3 phases + 2 PE - configuration (2)):
- I = (128 A + 25%)/2 = (128 x 1.25)/2 = 80 A
- For an AWG4, the maximum current is 85 A x 0.8 = 68 A, which is insufficient. For an AWG3, the maximum current is 100 x 0.8 = 80 A. So 2 parallel cables of 3 x AWG3 + 2 x AWG8 are sufficient.
- Install 80 A fuses on each cable.

8.3 Reference condition and limitations

Reference conditions

Relative humidity	%	0
Air inlet temperature	°C	20
	°F	68
Exhaust back pressure	mbar(g)	0
	psi	0
Ambient barometric pressure	mbar(a)	1013
	psi	14.7

Limitations

Minimum ambient temperature	ºC	0
	ºF	32
Maximum ambient temperature (3 ph)	°C	46
	°F	115
Maximum ambient temperature (1 ph)	°C	32
	°F	90
Minimum allowable inlet temperature	°C	-10
	°F	14
Maximum allowable inlet temperature	°C	70
	°F	158
Maximum inlet pressure	mbar(a)	1050
	Psi	0.73
Maximum vessel pressure	mbar(a)	1500
	psi	7.3

8.4 Vacuum pump data

Reference condition

	All data specified below apply under reference conditions, see section Reference conditions and limitations.

Common vacuum pump data

	Unit	
Number of compression stages		1
Ultimate pressure	mbar(a)	0.35
	Torr	0.4
Maximum exhaust back pressure	mbar(g)	100
	mbar(g)	0

GHS 350 VSD+

Nominal motor power	kW	7.5
	HP	10
Maximum motor shaft speed	Rpm	3500
Minimum motor shaft speed	Rpm	600
Oil capacity	L	16
	US GAL	4.2
Oil capacity	Imp. GAL	3.5
	cu. ft.	0.57
Sound pressure level (according to ISO 2151 (2004))	dB(A)	65 (+/-3)
Temperature of the air leaving the discharge (approx.)	°C	80
	°F	176

GHS 350 VSD+ Turbo

Nominal motor power	kW	7.5
	HP	10
Maximum motor shaft speed	Rpm	4500
Minimum motor shaft speed	Rpm	2250
Oil capacity	L	16
	US GAL	4.2
Oil capacity	Imp. GAL	3.5
	cu. ft.	0.57
Sound pressure level (according to ISO 2151 (2004))	dB(A)	68 (+/-3)
Temperature of the air leaving the discharge (approx.)	°C	80
	°F	176

GHS 350 VSD+ (option high water handling capacity)

Nominal motor power	kW	7.5
	HP	10
Maximum motor shaft speed	Rpm	3500
Minimum motor shaft speed	Rpm	600
Oil capacity	L	16
	US GAL	4.2
Oil capacity	Imp. GAL	3.5
	cu. ft.	0.57
Sound pressure level (according to ISO 2151 (2004))	dB(A)	65 (+/-3)
Temperature of the air leaving the discharge (approx.)	°C	87
	°F	188.6

GHS 350 VSD+ Turbo (option high water handling capacity)

Nominal motor power	kW	7.5
	HP	10
Maximum motor shaft speed	Rpm	4500
Minimum motor shaft speed	Rpm	2250
Oil capacity	L	16
	US GAL	4.2
Oil capacity	Imp. GAL	3.5
	cu. ft.	0.57
Sound pressure level (according to ISO 2151 (2004))	dB(A)	68 (+/-3)
Temperature of the air leaving the discharge (approx.)	°C	87
	°F	188.6

GHS 585 VSD+

Nominal motor power	kW	7.5
	HP	10
Maximum motor shaft speed	Rpm	4500
Minimum motor shaft speed	Rpm	600
Oil capacity	L	16
	US GAL	4.2
Oil capacity	Imp. GAL	3.5
	cu. ft.	0.57
Sound pressure level (according to ISO 2151 (2004))	dB(A)	68 (+/-3)
Temperature of the air leaving the discharge (approx.)	°C	80
	°F	176

GHS 585 VSD+ Turbo

Nominal motor power	kW	11
	HP	15
Maximum motor shaft speed	Rpm	6000
Minimum motor shaft speed	Rpm	3000
Oil capacity	L	16
	US GAL	4.2
Oil capacity	Imp. GAL	3.5
	cu. ft.	0.57
Sound pressure level (according to ISO 2151 (2004))	dB(A)	73 (+/-3)
Temperature of the air leaving the discharge (approx.)	°C	80
	°F	176

GHS 585 VSD+ (option high water handling capacity)

Nominal motor power	kW	7.5
	HP	10
Maximum motor shaft speed	Rpm	4500
Minimum motor shaft speed	Rpm	600
Oil capacity	L	16
	US GAL	4.2
Oil capacity	Imp. GAL	3.5
	cu. ft.	0.57
Sound pressure level (according to ISO 2151 (2004))	dB(A)	68 (+/-3)
Temperature of the air leaving the discharge (approx.)	°C	87
	°F	188.6

GHS 585 VSD+ Turbo (option high water handling capacity)

Nominal motor power	kW	11
	HP	15
Maximum motor shaft speed	Rpm	6000
Minimum motor shaft speed	Rpm	3000
Oil capacity	L	16
	US GAL	4.2
Oil capacity	Imp. GAL	3.5
	cu. ft.	0.57
Sound pressure level (according to ISO 2151 (2004))	dB(A)	73 (+/-3)
Temperature of the air leaving the discharge (approx.)	°C	87
	°F	188.6

GHS 730 VSD+

Nominal motor power	kW	11
	HP	15
Maximum motor shaft speed	Rpm	6000
Minimum motor shaft speed	Rpm	600
Oil capacity	L	16
	US GAL	4.2
Oil capacity	Imp. GAL	3.5
	cu. ft.	0.57
Sound pressure level (according to ISO 2151 (2004))	dB(A)	73 (+/-3)
Temperature of the air leaving the discharge (approx.)	°C	80
	°F	176

GHS 730 VSD+ Turbo

Nominal motor power	kW	15
	HP	20
Maximum motor shaft speed	Rpm	7000
Minimum motor shaft speed	Rpm	4000
Oil capacity	L	16
	US GAL	4.2
Oil capacity	Imp. GAL	3.5
	cu. ft.	0.57
Sound pressure level (according to ISO 2151 (2004))	dB(A)	76 (+/-3)
Temperature of the air leaving the discharge (approx.)	°C	80
	°F	176

GHS 730 VSD+ (option high water handling capacity)

Nominal motor power	kW	11
	HP	15
Maximum motor shaft speed	Rpm	6000
Minimum motor shaft speed	Rpm	600
Oil capacity	L	16
	US GAL	4.2
Oil capacity	Imp. GAL	3.5
	cu. ft.	0.57
Sound pressure level (according to ISO 2151 (2004))	dB(A)	73 (+/-3)
Temperature of the air leaving the discharge (approx.)	°C	87
	°F	188.6

GHS 730 VSD+ Turbo (option high water handling capacity)

Nominal motor power	kW	15
	HP	20
Maximum motor shaft speed	Rpm	7000
Minimum motor shaft speed	Rpm	4000
Oil capacity	L	16
	US GAL	4.2
Oil capacity	Imp. GAL	3.5
	cu. ft.	0.57
Sound pressure level (according to ISO 2151 (2004))	dB(A)	76 (+/-3)
Temperature of the air leaving the discharge (approx.)	°C	87
	°F	188.6

GHS 900 VSD+

Nominal motor power	kW	15
	HP	20
Maximum motor shaft speed	Rpm	7000
Minimum motor shaft speed	Rpm	600
Oil capacity	L	16
	US GAL	4.2
Oil capacity	Imp. GAL	3.5
	cu. ft.	0.57
Sound pressure level (according to ISO 2151 (2004))	dB(A)	76 (+/-3)
Temperature of the air leaving the discharge (approx.)	°C	80
	°F	176

GHS 900 VSD+ (option high water handling capacity)

Nominal motor power	kW	15
	HP	20
Maximum motor shaft speed	Rpm	7000
Minimum motor shaft speed	Rpm	600
Oil capacity	L	16
	US GAL	4.2
Oil capacity	Imp. GAL	3.5
	cu. ft.	0.57
Sound pressure level (according to ISO 2151 (2004))	dB(A)	76 (+/-3)
Temperature of the air leaving the discharge (approx.)	°C	87
	°F	188.6

8.5 Technical data Elektronikon® controller

General

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

Digital outputs

Number of outputs	9 (Elektronikon® Graphic controller - p.n. 1900 5200 10.....1900 5200 19)
Type	Relay (voltage free contacts)
Related voltage AC	250 V AC/10 A Max.
Related voltage AC	30 V DC/10 A Max.

Digital inputs

Number of inputs	10 (Elektronikon® Graphic controller - p.n. 1900 5200 10.....1900 5200 19)
Supply by controller	24 V DC
Supply protection	Short circuit protected to ground
Input protection	Not isolated

Analog inputs

Number of pressure inputs	2 (Elektronikon® Graphic controller - p.n. 1900 5200 10.....1900 5200 19)
Number of temperature inputs	5 (Elektronikon® Graphic controller - p.n. 1900 5200 10.....1900 5200 19)

9 Instructions for use

Air/oil separator vessel

-	This vessel can contain pressurised air; this can be potentially dangerous if the equipment is misused.
-	This vessel must only be used as a air/oil separator and must be operated below 0.5 bar(g).
-	No alterations must be made to this vessel by welding, drilling or any other mechanical methods without the written permission of the manufacturer.
-	Use only oil as specified by the manufacturer.
-	This vessel has been designed and built to guarantee an operational lifetime in excess of 20 years. The vessel needs a yearly visual inspection.

10 Guidelines for inspection

Guidelines

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

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

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

11 Declaration of conformity

EC DECLARATION OF CONFORMITY

We, Atlas Copco Airpower n.v., declare under our sole responsibility, that the product
Machine name *vacuum pump*
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
Machinery safety	2006/42/EC	EN ISO 12100 EN 1012 – 2	
Electromagnetic compatibility	2004/108/EC	EN 61000-6-2 EN 61000-6-4	
Low voltage equipment	2006/95/EC	EN 60034 EN 60204-1 EN 60439	
Ecodesign, energy-using products Ecodesign, energy-related products	2005/32/EC 2009/125/EC		X

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

Atlas Copco Airpower n.v. 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		

form 6009 #### ##
ed .xx, xxxx-xx-xx

Atlas Copco Airpower n.v. — Part of the Atlas Copco Group

Postal address: P.O. Box 100, B-2610 Wilrijk-Antwerp, Belgium
Visitors address: Boomsesteenweg 957, B-2610 Wilrijk-Antwerp, Belgium
Phone: +0032 (0)3 - 870 2111
Fax: +0032 (0)3 - 870 2443
Email: info@atlascopco.com
Registration n°: BE0403.992.231
www.atlascopco.com
For info, please contact your local Atlas Copco representative

Typical example of a Declaration of Conformity document

(1): Contact address:

Atlas Copco Airpower n.v.

P.O. Box 100

B-2610 Wilrijk (Antwerp)

Belgium

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

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

Sustainable Productivity

We stand by our responsibilities towards our customers,
towards the environment and the people around us.
We make performance stand the test of time.

This is what we call - Sustainable Productivity

Atlas Copco AB
(publ) SE-105 23 Stockholm, Sweden Phone: +46 8 743 80 00
Reg. no: 556014-2720 www.atlascopco.com