

HEX@GRID Central Control System

INSTALLATION GUIDE

300992066_A1 Original instructions

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You must use this product as described in this manual. Read the manual before you install, operate, or maintain the product.

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1. Safety and compliance

For safe operation from the start, read these instructions carefully before you install or commission the equipment and keep them safe for future use. Read all the safety instructions in this section and the rest of this manual carefully and make sure that you obey these instructions.

The instruction manual is an important safety document that we often deliver digitally. It is your responsibility to keep the instruction manual available and visible while working with the equipment. Please download the digital version of the instruction manual for use on your device or print it if a device will not be available.

1.1. Definition of Warnings and Cautions

Important safety information is highlighted as warning and caution instructions which are defined as follows. Different symbols are used according to the type of hazard.

WARNING:

If you do not obey a warning, there is a risk of injury or death.

CAUTION:

If you do not obey a caution, there is a risk of minor injury, damage to equipment, related equipment or process.

NOTICE:

Information about properties or instructions for an action which, if ignored, will cause damage to the equipment.

We reserve the right to change the design and the stated data. The illustrations are not binding.

1.2. Trained personnel

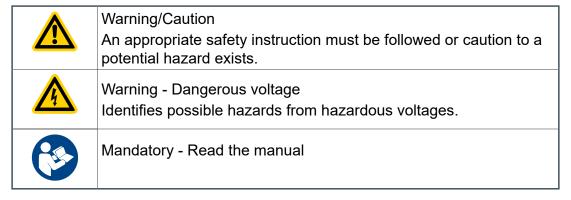
For the operation of this equipment "trained personnel" are:

- skilled workers with knowledge in the fields of mechanics, electrical engineering, pollution abatement and vacuum technology and
- personnel specially trained for the operation of vacuum pumps

1.3. Safety symbols

The safety symbols on the products show the areas where care and attention is necessary.

The safety symbols that we use on the product or in the product documentation have the following meanings:



2. Important safety information

2.1. Safety precautions during installation

- 1. Place the device where the ambient air is cool and as clean as possible.
- 2. During installation or any other intervention on one of the connected machines, make sure that
 - the machine is stopped and de-energised
 - the isolating switch is open and locked before any maintenance or repair
- For remotely controlled machines, make sure that there is no one checking or working on the machine before you start the machine. You can paste a safety label to the start equipment.
- 4. Install the machine in an area free of flammable fumes, vapour and particles (for example paint solvents) that can lead to internal fire or explosion.
- 5. The electrical connections must be according to the applicable codes. The device must be earthed and protected against short circuits by fuses in all phases. A lockable power isolating switch must be installed near the device.
- 6. For machines controlled by a central control system, a sign stating "This machine may start without warning" must be affixed near the instrument panel.
- In multiple vacuum pump systems, manual valves must be installed to isolate each vacuum pump. Non-return valves (check valve) must not be relied upon for isolating pressure systems.
- 8. Do not remove or tamper with the safety devices.

Note:

For precautions applying to the connected equipment consult the relevant instruction book. Some precautions are general and cover several machine types and equipment; hence some statements may not apply to your device.

2.2. Safety precautions during operation

- For remotely controlled machines, make sure that there is no one checking or working on the machine before you start the machine. You can paste a safety label to the start equipment.
- Do not operate the device in the presence of flammable or toxic fumes, vapours or particles.
- 3. Do not operate the device below or in excess of its limit ratings.
- 4. Do not operate the device when there are flammable or toxic fumes, vapours or particles.
- 5. Keep all bodywork doors and panels closed during operation. The doors may be opened for short periods only, for example, to do routine checks.
- 6. People staying in environments or rooms where the sound pressure level reaches or exceeds 90 dB(A) must wear ear protectors.
- 7. Periodically check that:

- All guards and fasteners are in place and tight
- All hoses and/or pipes are in good condition, secure and not rubbing
- There are no leaks
- All electrical leads are secure and in good order
- 8. Do not remove or tamper with the safety devices.

2.3. Safety precautions during maintenance or repair

- 1. Use only the correct tools for maintenance and repair work.
- 2. Use only genuine spare parts.
- A warning sign bearing a legend such as "Work in progress do not start" must be attached to the starting equipment, including all remote start equipment.
- 4. For remotely controlled machines, make sure that there is no one checking or working on the machine before you start the machine. You can paste a safety label to the start equipment.
- 5. Do not use flammable solvents or carbon tetrachloride for cleaning parts. Take safety precautions against toxic vapours of cleaning liquids.
- 6. Observe cleanliness during maintenance and repair. Keep dirt away by covering the parts and exposed openings with a clean cloth, paper or tape.
- 7. Do not use a light source with an open flame for inspecting the interior of the device.
- 8. All regulating and safety devices must be maintained with due care to ensure that they function properly. They may not be put out of action.
- 9. Before clearing the device for use after maintenance or repair, 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.
- 10. Make sure that no tools, loose parts or rags are left in or on the device.
- 11. Do not use caustic solvents which can damage the materials of the device.

3. Description

3.1. Introduction

The MPC is a stand-alone central control system that regulates the net pressure within programmable limits by starting and stopping or controlling the speed of the connected vacuum pumps according to a programmed algorithm.

If you use the control system, note that:

- Competitor vacuum pumps can only be started and stopped by the control system via digital contacts.
- The status of each vacuum pump can be checked on the display. Operating parameters are accessible via the menu.

3.2. Controller types

Figure 1 3002615020 HEX@GRID



Figure 2 3002615021 HEX@GRID with screen



3.3. Single point pressure measurement

The control system measures the net pressure by means of a pressure sensor (P), connected to the control system cubicle. The system then controls the vacuum pumps in the network to keep the pressure within the limits of the programmed pressure band.

For more information, refer to the User Interface Instruction manual and Service diagram.

Figure 3 Single point pressure measurement



4. Technical data

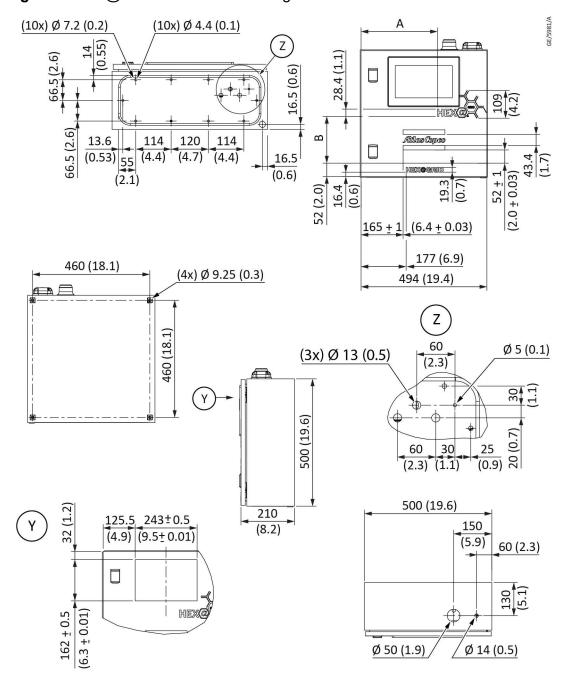
Table 1 Technical data

Parameter	Value	Unit
Power supply	100 - 240	V
Frequency	50/60	Hz
Maximum ambient temperature	45	°C
Protection type	IP54	-
Maximum power	620	VA

5. Installation

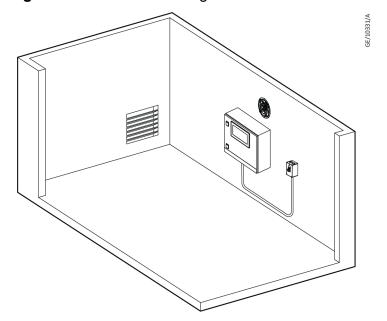
5.1. Dimension drawing

Figure 4 HEX@GRID dimension drawing



5.2. Installation instructions

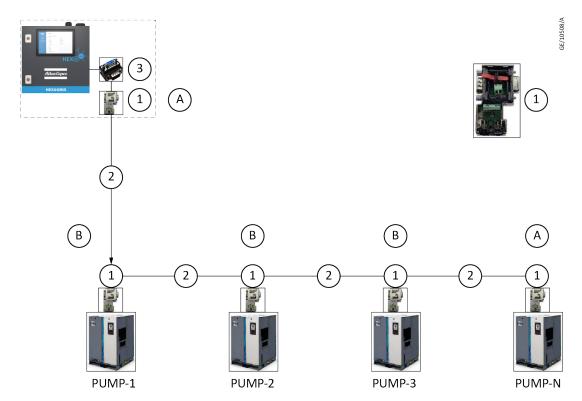
Figure 5 Installation drawing



- 1. Fix the control system to a wall (for example, in the vacuum pump room), taking into account the following maximum cable lengths:
 - 250 m (820 ft) for a CAN network
 - 500 m (1640 ft) if a repeater is installed
 - 970 m (3180 ft) if two repeaters and one CAN bridge are installed
 - 3280 ft/1000 m (for 4-20 mA) sensors between the pressure transmitter and the control system.
- Connect the control system to the Mains circuit breaker. We do not provide the circuit breaker for the control system. Refer to the manufacturer's instructions to choose the correct circuit breaker.
- 3. The pressure transmitter must be connected to an air receiver to avoid pressure pulsations and vibrations.
- 4. It is recommended to connect the pressure transmitter via valves, which will help to replace it after it is isolated and depressurised. The pressure transmitter must be installed in an upright position to avoid the accumulation of condensate in the device.
- 5. Isolate and depressurise the part of the air net to which the pressure transmitter will be connected.
- 6. Provide a threaded hole (G 1/4) in the depressurised part of the air net.
- 7. Tighten the pressure transmitter into place.
- 8. Connect the pressure transmitter cable to the module of the central control system.
- 9. Respect the pin numbers as indicated on the electrical diagram, which is delivered with the device.

5.3. Connection methods

Figure 6 CANBUS network schematic diagram



A. Turn ON termination resistor

B. Turn OFF termination resistor

For details of accessories refer to Table: CANBUS network accessories.

■ Note:

Pump - 1 and Pump - N must be connected to A1,B1 and C1 of the connector

Table 2 Wiring connection - MPC C4.0 to the connector

	MPC C4.0	Connector
CAN L	PIN 2	A1
CAN GND	PIN 3	B1
CAN H	PIN 7	C1

Table 3 Wiring connection - Pump to pump

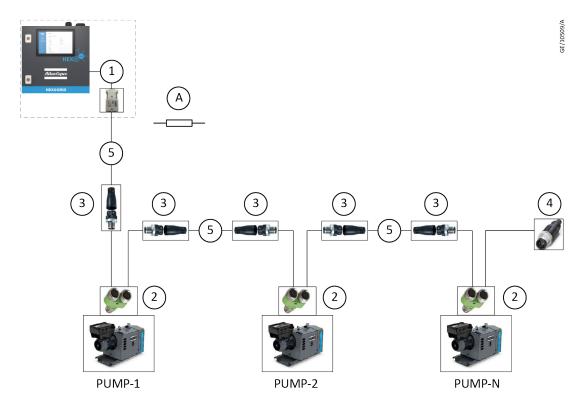
	Incoming cable	Outgoing cable
CAN L	A1	A2
CAN GND	B1	B2
CAN H	C1	C2

Table 4 CANBUS network accessories

Reference	Part number	Description
1	3002615166	CANBUS D-SUB Socket with screw connector, 9-Pole 90°
	3002615173	UNITRONIC DeviceNet FD 1x22xAWG24 + 1x22xAWG22, 10 meter
	3002615192	UNITRONIC DeviceNet FD 1x22xAWG24 + 1x22xAWG22, 20 meter
2*	3002615193	UNITRONIC DeviceNet FD 1x22xAWG24 + 1x22xAWG22, 30 meter
	3002615194	UNITRONIC DeviceNet FD 1x22xAWG24 + 1x22xAWG22, 40 meter
	3002615195	UNITRONIC DeviceNet FD 1x22xAWG24 + 1x22xAWG22, 50 meter
3	3002615407	D-SUB angled connector

^{*} Order cable as per required length

Figure 7 MODBUS network schematic diagram



A. Connect resistor between PIN-4 and PIN-8 of SUB-9 connector

For details of accessories refer to Table: MODBUS network accessories.

■ Note:

Use D-SUB 9-PIN angled 90° extension adapter with D-SUB 9-PIN male connector + resistor

Table 5 Pin assignment

Pin	Assignment	Kostal socket	Assignment	Controller X17 Pins
4	RS485-B		RS485n	8
3	GND	1. 2	GND	6
2	RS485-A		RS485p	4
Housing	Shielding		-	-

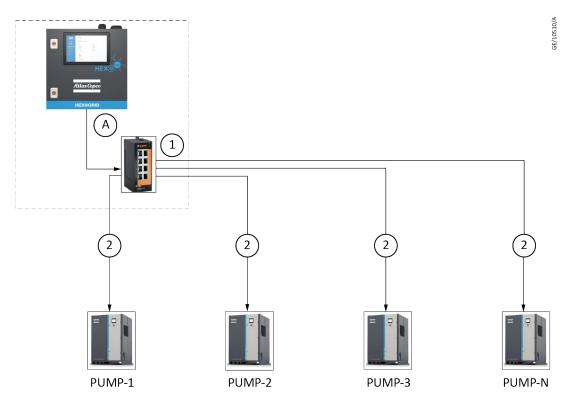
Table 6 MODBUS network accessories

Reference	Part number	Description	
1	1 3002615400 D-SUB 9-PIN male connector + Resistor		
		T-SPLITTER, 4-Pole, unshielded, plug straight M12, coding: A, on socket straight M12, coding: A and socket straight M12, coding: A	
3	3002615402	RECEPTACLE, M12. male. straight, 4-Pole, back wall-mounting, wire contact	
4	3002615403	CC-link termination resistor, 4-Pole, M12 plug	

Reference	Part number	Description
	3002615152	MODBUS communication cable, 10 meter
	3002615196	MODBUS communication cable, 20 meter
5*	3002615197	MODBUS communication cable, 30 meter
	3002615198	MODBUS communication cable, 40 meter
	3002615199	MODBUS communication cable, 50 meter

^{*} Order cable as per required length

Figure 8 LAN network schematic diagram



A. Connect the LAN cable to X11

For details of accessories refer to Table: LAN network accessories.

Table 7 LAN network accessories

Reference	Part number	Description
1	3002615053	ETHERLINE® ACCESS UF08T

	3002615151	ETHERLINE® Cat.7 Y 4X2X2 AWG22/1,
		5 meter
	3002615186	ETHERLINE® Cat.7 Y 4X2X2 AWG22/1,
	3002015180	10 meter
2*	3002615187	ETHERLINE® Cat.7 Y 4X2X2 AWG22/1,
		15 meter
	3002615188	ETHERLINE® Cat.7 Y 4X2X2 AWG22/1,
		20 meter
		ETHERLINE® Cat.7 Y 4X2X2 AWG22/1,
		50 meter

^{*} Order cable as per required length

6. Connect and configure MPC

The Multi Pump Controller (MPC) is an intelligent control box that can fully control and monitor the multiple vacuum pumps with its multiprocessors. You can also collect data and analyse pump performance to improve processes and lower your operating costs.

The MPC can be connected to the cloud, data virtualization, and execute complex algorithms to provide a rich interface for the user on HMI. It also provides support for inputs and outputs to connect multiple sensors for data acquisition and has customizable industrial Ethernet Fieldbus connections such as EtherCAT, Ethernet/IP, Modbus-TCP, and Profinet.

6.1. List of abbreviations

Table 8 Abbreviations

HEX@	HEX@AtlasCopco controller
MPC	Multi Pump Controller
UI	User Interface
HMI	Human Machine Interface
IP address	Internet Protocol address
DNS	Domain Name System
DHCP	Dynamic Host Configuration Protocol
mDNS	Multicast DNS
M2M	Machine to Machine
MQTT	Message Queuing Telemetry Transport
VSD	Variable Speed Drive
I/O	Input/Output

6.2. Configuring the controller

Configure the controller for your situation and usage.

6.2.1. Accessing User Interface

You can access the controller from any device connected to the same network (Windows PC, smartphone, tablet, laptop,...)

To access the controller

■ Note:

Your computer must not be connected to another network when you access the controller.

- 1. Click the browser's address bar.
- 2. Type the IP address, 192.168.202.10 and press Enter.

■ Note:

When you access the user interface, you may get a message "Your connection is not private". Click on **Advanced** and **Proceed to (IP address)** 192.168.202.10.



Your connection is not private

Attackers might be trying to steal your information from **192.168.202.10** (for example, passwords, messages, or credit cards). <u>Learn more</u>

NET::ERR_CERT_AUTHORITY_INVALID

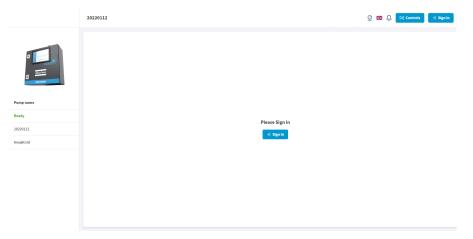
0

To get Chrome's highest level of security, turn on enhanced protection

Advanced

Back to safety

You will land on the following default page when you have an access to the user interface.



- 3. To change the units
 - a. Click on the **Unit** icon.
 - b. Select the unit of your choice.
- 4. To change the display language
 - a. Click on the Flag icon.
 - b. Select the language of your choice.

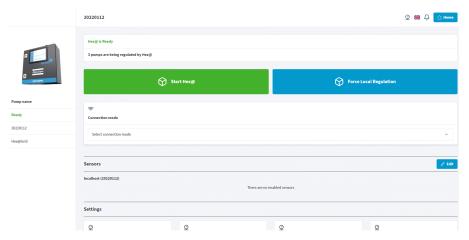
The notifications are displayed along with the **Bell** icon.

- 5. To access some Controls without login on the Touch HMI
 - a. Click on Controls button.
 - b. Select the controls

Modify the values as per requirements.

■ Note:

You can see the controls such as Start Pump, Reset Alerts, Setting Pressure Set points, Pump Modes, Connection Modes, Team Viewer & Docker. The descriptions of these controls are defined in the below chapters.



6. To Sign-in

- a. Click on Sign in button
- b. Type Username and Password.
- c. Click Sign in.
- d. Use your login credentials or the credentials available on the label on the controller.



Troubleshooting Windows connection problems

If you cannot access the IP address, 192.168.202.10 in your web browser,

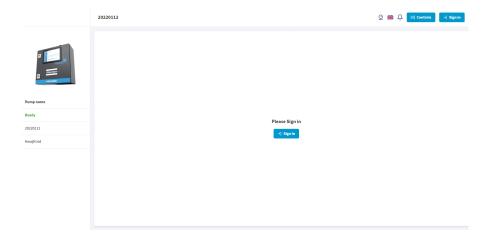
- 1. Press the "Windows" button on the keyboard.
- 2. Search "View network connections".
- 3. Right click on **Ethernet** or **Adapter** (depending on the ethernet connection).
- Click Properties > Internet protocol version 4 (TCP/IPv4) > Properties >
 Use following IP address.
- Enter IP address as 192.168.202.XX.

■ Note:

The IP address placed in IPv4 needs to be different from the IP entered in the web browser, for example enter IP address as 192.168.202.11.

- 6. Click on **Subnet mask** and 255.255.255.0 number must appear.
- 7. Click OK.

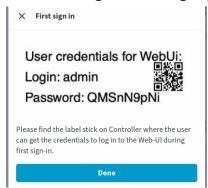
Try to connect through your web browser again.



Entering login credentials

If you signing in first time or forgot the password, please follow the below procedures:

1. Click First sign-in or Forgot password on the sign in page.

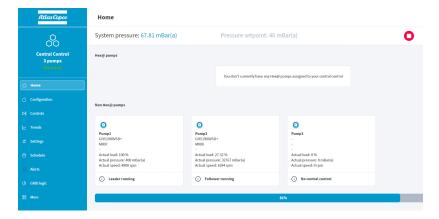


- 2. Make a note of the login credentials.
- 3. Click Done.
- 4. Type Username and Password.
- 5. Click Sign in.

You can change login credentials after your login, refer to *Creating and updating the user profile* on page 28.

Viewing controller home page

The default home page displays after the first login.



The home page is divided into four segments

Section	Functions
Navigation bar	You can navigate to 9 different primary pages through the navigator bar. Home Configuration Controls Trends Settings Settings GRID logic More
General status bar	The general status bar shows the net pressure, pressure setpoint, and state of the MPC (running, ready, initialization).
Overview of follower pumps	You can find the information about the follower pumps, the pump model, serial number, IP address / node name (for follower pump), actual motor speed, inlet pressure by the pump, user-defined priority.
Notification bar	Active warning or failure notification is shown on the bottom of the page.

6.2.2. Connecting the pump to the local LAN network

■ Note:

Connect the controllers directly to the company network through the X11 port on the rear of the controller with Ethernet cables.

To connect to the controller

- 1. Navigate to the IP address in a web browser. If you do not have the IP address, use X10 access (OP0020).
- 2. Click Sign in.
- 3. Enter login credentials to access the home page.
- 4. Click More > Preferences > Connectivity > LAN.

- 5. Check and confirm with the IT department, if the DHCP has been set automatically.
- If the DHCP is set automatically, the connection is complete.
- If the DHCP is not set automatically, connect the ethernet manually

■ Note:

If the DHCP is enabled, the connection details will be selected automatically. If it is not displayed, enter the details manually.

- a. Click Edit.
- b. Deactivate **DHCP**.
- c. Enter the connection details manually.
- d. Click Save.
- e. Activate **Proxy** if you have to add the Proxy IP address.

6.2.3. Setting the WiFi bolt

Connecting WiFi to the company network

■ Note:

The controllers can be connected directly to the company network through the X11 port using the Client mode of the WiFi bolt.

To connect the controller to the WiFi connection

- 1. Connect to the controller. Refer to Accessing User Interface on page 20.
- 2. The default home screen displays after sign in.
- 3. Click More > Preferences > Accessories > WiFi bolt.
- 4. Configure the WiFi bolt
 - a. Enable the WiFi bolt.
 - b. Make sure that the WiFi bolt is connected.
 - Press the **Refresh** button (visible only when the WiFi bolt is not connected).
 - d. Select Client mode.
 - e. Click Scan to see the access points.
 - f. Select the **WiFi access point** to connect.
 - g. Select the Authentication mode.
 - h. Enter Password.
 - i. Click Connect.
- 5. Repeat the process for all the devices that you want to connect to the customer network through WiFi.

Creating a separate local network with WiFi bolts

■ Note:

If you do not want a direct connection between the controller and your network, create a separate local network by an access point.

The controllers can connect directly to the customer network through the X11 port using the Client mode of the WiFi bolt.

To create a separate local network with WiFi bolts

- 1. Connect the WiFi bolt to the pump.
- 2. Connect to the controller. Refer to Accessing User Interface on page 20.
- 3. The default home screen displays after sign in.
- 4. Click More > Preferences > Accessories > WiFi bolt.
- 5. Configure the WiFi bolt
 - Enable the WiFi bolt.
 - b. Check that the WiFi bolt is connected.
 - c. Press the **Refresh** button (visible only when the WiFi bolt is not connected).
 - d. Change connection mode to Access Point.
 - e. Create the access point by typing the name (SSID).
 - f. Set **Password** if required.
 - g. Set the Authentication mode to WPA2.
- 6. Connect the laptop to this WiFi. Check the IP address and Subnet mask from the Network adaptor settings.
- 7. Change the WiFi details in UI:
 - a. Click More > Preferences > Connectivity > LAN
 - b. Change the Subnet mask value received from above step.

Connecting to a local network with WiFi bolts

To connect to a separate local network with WiFi bolts

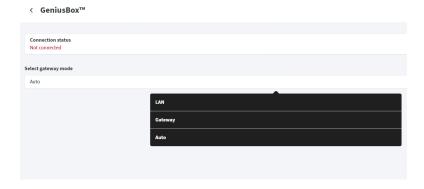
- 1. Connect to the controller. Refer to Accessing User Interface on page 20.
- The default home screen displays after sign in.
- 3. Click More > Preferences > Accessories > WiFi bolt.
- 4. Configure the WiFi bolt
 - a. Enable the WiFi bolt.
 - b. Make sure that the WiFi bolt is connected. If not, press the Refresh button (visible only when the WiFi bolt is not connected).
 - c. Change connection mode to Client.
 - d. Click Scan to see the access points.
 - e. Select the WiFi access point to connect.
 - f. Select the Authentication mode.
 - g. Enter Password.

- h. Click Connect.
- 5. Repeat the process for all the devices that you want to connect to the customer network through WiFi.

6.2.4. Connecting the genius box

To connect the genius box to the controller

- Connect the genius box to the LAN switch and connect the LAN switch to the X10 port on the controller.
- 2. Configure the genius box on the controller interface as follows:
 - a. Click More > Preference > Accessories > GeniusBox.
 - b. Select Gateway mode > Gateway.
 - c. Click Yes to set.



6.2.5. Setting the preferred language

To set your desired language

- 1. Click More.
- 2. Navigate to **Preferences > General > Language**.
- 3. Select the preferred language.

6.2.6. Setting the physical units

To set the physical parameters units

- 1. Click More.
- 2. Navigate to Preferences > General > Units.
- 3. Modify the units for different parameters as per your requirement

6.2.7. Setting the date and time

To set the date and time

- 1. Click More.
- 2. Navigate to **Preferences > General > Date and time**.
- 3. Modify the time zone, date and time, format of date and time as per requirement.

6.2.8. Creating and updating the user profile

■ Note:

You must create an admin profile for the user (tier level 1). The admin can use his access to create different user profiles for their use.

To create the user profile

- 1. Click More > Manage users > Add user.
- 2. Enter the user details.
- 3. Click Save user.

To edit or delete the user profile

- 1. Click More > Manage users.
- Click the dots on the top right corner of user card.
- 3. Select Edit or Delete.

6.2.9. Changing display settings

To change the display settings

- 1. Click More.
- 2. Navigate to **Preferences > Accessories > HMI menu**.
- Modify the brightness, zoom and colour palette of the HMI as per your requirement.

6.2.10. Backup and restore parameter setting

This feature enables the user to backup and restore the parameters saved in the settings.

To backup the parameter values:

- 1. Navigate to **Settings**.
- 2. Click top right icon.
- 3. Click Backup locally.

To restore the parameter settings:

- 1. Navigate to **Settings**.
- 2. Click top right icon.
- 3. Click restore parameters from file.
- 4. Upload the backup file from your location and upload.

6.2.11. Updating the software

To update the software online:

Update the software online by updating automatically from the controller.

■ Note:

Make sure to stop the pump before you do the software update.

1. Click **Download update file** which has been received from the cloud.

2. Click Install update > Done.

Set connection mode after Software update:

After the software updates or during commissioning, the user needs to choose the one of the below options:

- 1. If the user has Touch HMI then select touch panel as the connection mode.
- 2. If the user wants to connect through laptop or phone then select remote network access as the connection mode.

Troubleshooting software update failure

There is a chance of failure when updating the software. To fix the failure issue

- 1. Click View log.
- 2. Click Failed updates.
- 3. Check more information on failed updates.
- Click Download log.
- 5. Restart the controller.
- 6. Repeat the software update.
- 7. If the problem persists
 - Click on Download log.
 - Send the log file and the software update file (if available) through TechConnect to the second level support.

6.2.12. Allowing remote assistance (optional)

■ Note:

If you need any urgent support, we can help you in accessing the controller with your allowance through TeamViewer.

To access the TeamViewer support for remote assistance

- 1. Click More.
- 2. Navigate to Support.
- 3. Click TeamViewer.

6.2.13. Checking the trend mechanism

To check the trend mechanism

- 1. Navigate to Trends.
- 2. Navigate to the required function (Central controller load, Net pressure, Flow demand, Total power) tab.

To add the variables as favourites

- 1. Click on the top right corner of the card.
- 2. Select Add to favourites.

■ Note:

Click on a variable to view the Variable Range.

The flexibility to add trends based on the preference and save the settings. Charts are grouped into types of measurements that can contain multiple charts.

Using trend actions

To access the options in variable tab click the dots at the top right corner.

- add/remove from favourites
- details of function of respective variables

6.2.14. Configuring follower pumps

Configuring follower pumps equipped with a controller

In the Configuration menu, click on the **Add pump** button to add a follower pump with controller.

You can choose to add the pump automatically or manually.

A. Automatic addition of pump

You will see a list of available pumps with a controller in the same network after you click on the **Add pump** button. The following items are shown automatically for each of the pump

- a. Pump name
- b. IP address
- c. Model name
- d. Serial number

Click in the **check box > Done** to add the pump as a follower.

- B. Manual addition of pump
 - 1. Click Add Manually.
 - 2. Enter the IP address and the serial number.
 - 3. Click Go to confirm.

■ Note:

To add a pump with a controller successfully, you also need to do an acknowledge at the follower's user interface. You will get a notification card on the Alerts page of the follower asking you to acknowledge the connecting requirement of the MPC. Click on the acknowledge button to establish the m2m communication between MPC and the follower pump with controller.

Configuring follower pumps equipped with a Electronikon

To add a follower pump equipped with a Electronikon.

- 1. Navigate to Configuration menu.
- 2. Click Add pump button.

You will see up to 16 nodes (node1 to node16) for follower pump equipped with a Electronikon.

- 3. Click in the check box to activate one or more nodes for Electronikon. You can do it once for up to 16 Electronikon nodes.
- 4. Click Done.

After you add the necessary number of Electronikon nodes, go inside each node page to configure the follower pump

Click on the node tab to navigate to the detailed configuration page. There you need to insert the following items

- User-defined priority
- Motor starts per day limitation
- Serial number
- Follower (CAN) address (of Electronikon)
- Model number
- User-defined availability

Configuring follower pumps equipped with a VSD4ALL

To add a follower pump equipped with a VSD4ALL.

- 1. Navigate to Configuration menu.
- 2. Click Add pump button.

You will see up to 4 nodes (node1 to node4) for follower pump equipped with a VSD4ALL.

- 3. Click in the check box to activate one or more nodes for VSD4ALL. You can do it once for up to 4 VSD4ALL nodes.
- 4. Click Done.

After you add the necessary number of VSD4ALL nodes, go inside each node page to configure the follower pump

Click on the node tab to navigate to the detailed configuration page. There you need to insert the following items

- User-defined priority
- Motor starts per day limitation
- Serial number
- Follower (CAN) address (of Electronikon)
- Model number
- User-defined availability

6.2.15. Optimising the system

You can optimise the multi-pump controller system by:

- 1. Clicking on the GRID logic.
- 2. Clicking on the **OPTIMIZER Energy consumption focus**.

Flow demand is fixed, it will control each individual follower pumps to meet the flow demand and find the best combination of having the least power consumption.

3. Clicking on the **Maintenance focus.**

Care is taken to ensure that all pumps in a system have similar running hours. Priority is given to pumps with the lowest number of hours.

4. Clicking on the Consider priority.

The pumps run according to set priority. Different pumps can be set with the same priority so that they belong to the same 'priority group'. These pumps will start first. Inside the group, **OPTIMIZER Energy consumption focus** or **Maintenance** focus is still considered depending on the option selected.

7. Operating MPC

7.1. Verifying main operating conditions

The main operating conditions of the pump can be checked from the any menu by having a look at the general status bar. It includes

- 1. MPC running status
 - Running MPC central control system is manually started by the user. 0
 to max number of follower pumps (the under central control ones) are
 possibly running, based on the current flow demand (can be viewed on
 the Trends page)
 - Ready MPC central control system is manually stopped by the user. All the under central control follower pumps are manually stopped.
 - Initialization MPC is in an initialization phase that no other actions/ commands can be accepted.
- 2. Net pressure
- 3. Pressure setpoint
- 4. Start/Stop button

7.2. Starting and Stopping the MPC pump

You can start or stop the MPC central control system from the pump Control screen, or top of the other screens.

- A green button indicates that the MPC central control system is ready and can be started.
- A red button indicates that the MPC central control system is in operation and can be stopped.

Click on the blue 'Force Local Regulation' button, to force each follower pump to enter in the local control mode. The blue button will change to 'Stop force local regulation'.

Click on 'Stop force local regulation' to force the follower pumps to be controlled by MPC central control system. When the blue button is in 'Stop force local regulation' mode, the start/stop button is grey, which means start/stop from MPC central control system is prohibited.

■ Note:

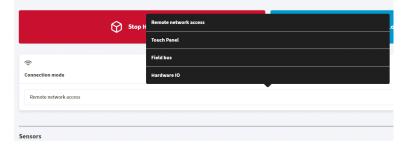
If the MPC was running or ready (stopped) before the 'Force Local Regulation' then after the 'Stop force local regulation' the MPC will be in the same state.

7.3. Changing the connection mode

You can change the pump connection mode from the **Controls** screen. No other source than the one selected can start or stop the pump.

The most common connection modes are:

- Remote network access It is used when the interface is accessed from external devices like laptop or phones.
- Touch panel -It is used when the HMI installed on the pump.
- Fieldbus It is used when external PLC controls the pump over ethernet.
- Hardware IO the hard-wired connections (if installed).



7.4. Changing the user sensors and pressure setpoint

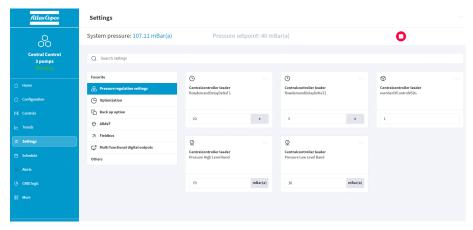
To change the pressure setpoint.

- 1. Navigate to Controls > Sensors.
- 2. Click Edit.
- 3. Select the pressure sensors to be used.
- 4. Click in the checking box of each available pressure sensors and fill in the pressure setpoint values.

These sensors are either installed on MPC itself or on the follower pumps. You are able to select multiple pressure sensors and fill in different pressure setpoint. The minimum of all the pressure setpoint values will be used as the effective pressure setpoint value. The maximum of all the actual pressure values will be used as the effective actual net pressure value

7.5. Control VSD

Number of ControlVSD option defines the number of pumps that will perform fine regulation around the pressure setpoint.



7.6. Controlled demand option

To set a custom digital output

- Navigate to Settings > Multi functional digital outputs.
- 2. Change the **Active function code**.

Each multi functional digital output has four settings:

- Active function code When set to a value different than 0, a specific function is activated to control this digital output. Refer to *Table: Function* codes for a list of function code.
- Inverted Inverts the logic of the chosen function.
- **Start delay** To add a delay and enable the digital output after the specific function become true.
- Delay falling edge To add a delay and disable the digital output after the specific function become false.

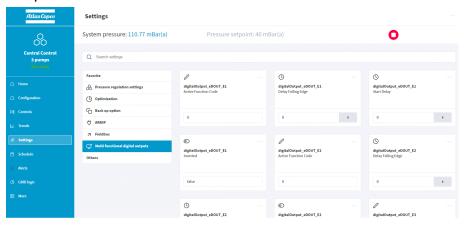


Table 9 Function codes

Function code	Function
1	Controlled demand option
2	Inlet pressure 1 sensor error

7.7. Responding to an alert

An alert can be recognised by a failure or warning message on the bottom of the home page.

- A failure can be from MPC itself or from one or more of the follower pump.
 - A failure that comes from one or more of the follower pumps requires a manual reset at the follower pump side. It is displayed in red alert there too.
 - A failure that is from MPC itself can be caused by the lost of communication with one of the follower pumps, or caused by one of the sensor error. These failures will not stop MPC running
- A warning will not stop the pump and does not require a reset. It is displayed in orange on the user interface.

To investigate the alert, failure or warning

- 1. Navigate to **Alerts**. You can see a list of all current alerts.
- 2. Select the specific alert to get more information about the possible root cause and the solutions.

■ Note:

MPC will not stop if any alert comes. Alert will automatically disappear if the condition of the same will be false. You can also see the previously solved alerts by clicking on the history button.

8. Fieldbus protocol

Fieldbus is a two way communication device. It connects with I/O devices to exchange the data between the system without connecting each individual device to the controller.

8.1. Setup reading and writing of data from fieldbus

The fieldbus functionality is an optional functionality which gives the possibility to connect to the machine over ModbusTCP, Profinet, EtherCAT or Ethernet/IP. Over ethernet, the user can readout machine data and/or control the machine remotely.

8.1.1. Configuration of fieldbus

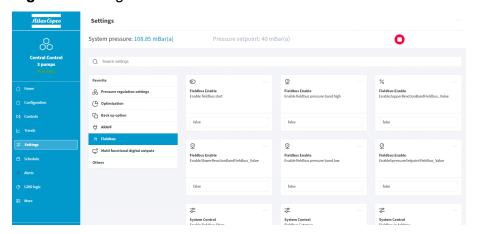
- Connect an external PLC over ethernet to fieldbus in X4 connector on rear of the controller.
- 2. If multiple controllers are present, they can be interlinked by connecting controller 1 Out (X3) to controller 2 In (X4).



To setup desired IP address:

- 1. Navigate to the **Settings > Fieldbus** menu.
- 2. Setup the IP address, gateway, and netmask as required.

Figure 9 Configuration of fieldbus



The Profinet setup requires a GSDML file for the PLC, which can be delivered by the nearest service representative.

8.1.2. Reading

Reading one of the output registers from the mapping can be done without necessary to set any other settings besides the IP address, gateway and Netmask.

There is an Offset of +30001 for Modbus.

The below table shows what information is available in the register.

Register	Component	Parameter	Туре	Unit	Notes	PLC side Modbus RTU/TCP Address (30001+Register no.)
0	netPressure	FieldbusStart	WORD	mbar	To readout the system pressure of the whole central control system	30001
1	flowDemand	Value	WORD	m ³ /h	To readout the estimated flow demand (excluding the fine tuning VSD pump) of the whole central control system	
2	totalPower	Value	DWORD	W	To readout the total power of the whole central control system	30003
4	state	Value	WORD		To readout the state of the central control system StateUnknown = 1 Idle = 2 Initializing = 3 Ready = 4 Stopping = 5 Running = 6 Failure = 7 ForceLocal = 8	30005

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8.1.3. Writing

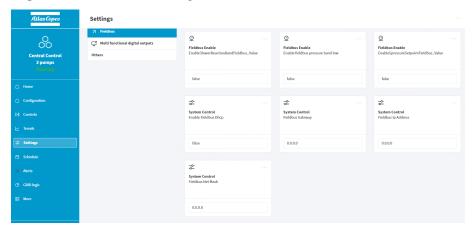
Writing a setting defined in the mapping below requires an extra setting from the user.

There is an Offset of +40001 for Modbus.

To write any of the inputs,

- 1. Enable the linked 'enablefieldbus' setting in the Settings > Fieldbus menu.
- For example, if the user wants to start/stop the pump over fieldbus, the enablefieldbustart should be set to true. Only then it will get overwritten by the fieldbus.
- The others will use the local setting.

Figure 10 Fieldbus setting



In order to write registers 0, the connection mode must be set to fieldbus.

Register	Component	Parameter	Туре	Unit	Notes	PLC side Modbus RTU/TCP Address (40001+Register no.)
0	systemControl	Fieldbus- Start	BOOL		Start/stop command to start the system. 1 = start, 0 = stop	40001 (bit 0)*
1	pressureBandHigh- Fieldbus	Value	WORD	mbar	The low level and high level pressure band define the normal operating zone of the central controller. Outisde this band, the central controller will more rapdily increase or decrease the required flowrate than inside this band.	40002
2	upperReaction- BandFieldbus	Value	WORD		The low level and high level pressure band define the normal operating zone of the central controller. Within this pressure band 3 zones are defined based on the lower and upper reaction band percentages. Zone 1 is between the pressurelowlevelband and the pressure defined by the lowerreactionband percentage times the pressure band.	40003
					Zone 3 is between the pressurehighlevel-band and the pressure defined by the upper-reactionband percentage times the pressure band. Zone 2 is between zone 1 and zone 3. In zone 2 only the control VSD's are allowed to change their speed. In Zone 1 and 3, also non-controlVSD's will decrease or increase their flows respectively.	

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Register	Component	Parameter	Туре	Unit	Notes	PLC side Modbus RTU/TCP Address (40001+Register no.)
3	lowerReaction- BandFieldbus	Value	WORD		The low level and high level pressure band define the normal operating zone of the central controller. Within this pressure band 3 zones are defined based on the lower and upper reaction band percentages.	40004
					Zone 1 is between the pressurelowlevelband and the pressure defined by the lowerreactionband percentage times the pressure band.	
					Zone 3 is between the pressurehighlevel- band and the pressure defined by the upper- reactionband percentage times the pressure band.	
					Zone 2 is between zone 1 and zone 3. In zone 2 only the control VSD's are allowed to change their speed. In Zone 1 and 3, also non-controlVSD's will decrease or increase their flows respectively.	
4	pressureBandLow- Fieldbus.	Value	WORD	mbar	The low level and high level pressure band define the normal operating zone of the central controller. Outisde this band, the central controller will more rapdily increase or decrease the required flowrate than inside this band.	40005
5	pressureSetpoint- Fieldbus	Value	WORD	mbar	Sets the Pressure Setpoint.	40006

^{*} The register type of our controller side is BOOL, but the type read and written by our PLC side is WORD.

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8.1.4. Direct communication with Modbus TCP - Customer side PLC expert

Defined the address mapping in the Modbus network according to the Register address of the controller. You can query the register address of the controller, then it read and write according to Modbus function code.

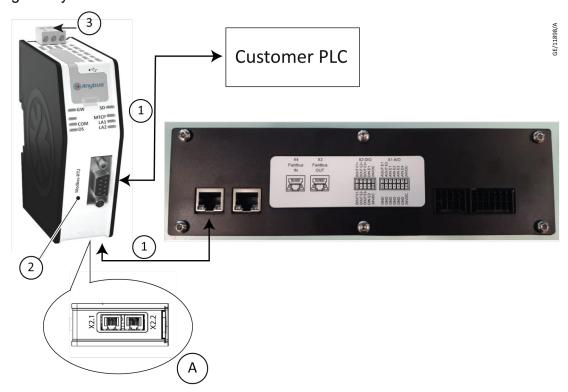
8.2. Fieldbus gateway

Fieldbus gateway allows you to seamlessly inter-connect PLC control systems and their connected devices between Modbus-TCP and other networks such as Modbus-RTU, Profibus and CANOpen.

The primary function of the gateway is the fast transfer of cyclic I/O data between the two networks. This offloads your PLC from working with additional calculations. The gateway acts as a follower on the PLC side network and as a full Master/Client on the Modbus-TCP Controller.

8.2.1. Anybus X-Gateway Modbus-TCP to Modbus-RTU with the Controller

- 1. Get the pre-configured gateway.
- 2. Connect the 24V power supply to the power port in gateway.
- 3. Connect Ethernet Cable in any Modbus TCP Port (there are two ports) in gateway. The other end to the Controller Fieldbus X4 IN.



- 1. Ethernet cable
- 3. Ethernet cable

- 2. Modbus-RTU port
- 4. Power supply

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Status LEDs

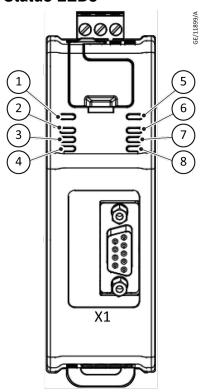


Table 10 LEDs: X-gateway and Modbus-TCP Network

No	Name	Indication	Meaning	
1	Gateway Status	Off	Power off	
	(GW)	Alternating red/green	Missing configuration	
		Flashing green	Idle	
		Green	Running	
		Flashing red	Invalid configuration	
		Red	Fatal error	
5	SD Card Status	Green	Accessing SD card	
	(SD)	Flashing red	Failure	
6	Modbus-TCP Status (MTCP)	Off	No Modbus-TCP network communication	
		Green	Communicating with Mod- bus-TCP network	
		Flashing red	Transaction error or timeout	
		Red	Fatal error	
7	Ethernet Link 1	Off	No link	
	and 2 (LA1, LA2)	Flashing green	Receiving/transmitting Ethernet packets at 100 Mbit	
8		Flashing yellow	Receiving/transmitting Ethernet packets at 100 Mbit	

Table 11 LEDs: Modbus-RTU Network

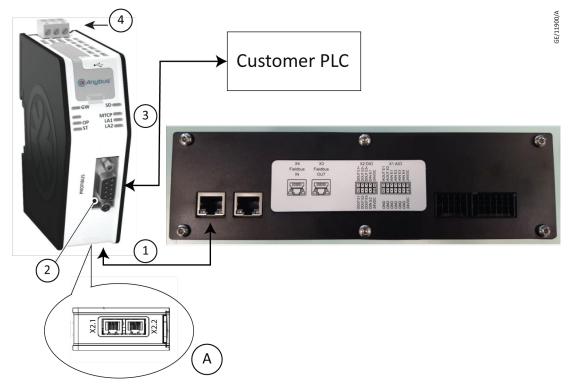
No	Name	Indication	Meaning	
2	Not used	-	-	
3	Modbus-RTU	Off	No traffic	
	Communication (COM)	Yellow	Frame reception or transmission	
		Red	Fatal error	
4	Device Status (DS)	Off	Initializing	
		Green	Module initialized, no error	
		Red	Fatal error	
		Red, one flash	Communication error or configuration error	

■ Note:

Output data will be in Big Endian format. For example, if the pressure value in the pump is 700 mbar. Then in Hex, the value will be 02 BC, but in the output you will get BC 02.

8.2.2. Anybus X-Gateway Modbus-TCP to Profibus with the Controller

- 1. Get the pre-configured gateway.
- 2. Connect the 24V power supply to the power port in gateway.
- 3. Connect Ethernet Cable in any Modbus TCP Port (there are two ports) in gateway. The other end to the Controller Fieldbus X4 IN.



- 1. Ethernet cable
- 3. Profibus connector

- 2. Profibus port
- 4. Power supply

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Status LEDs

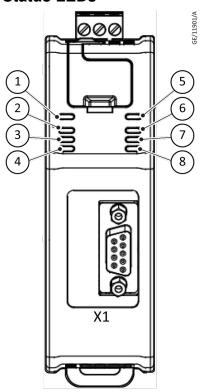


Table 12 LEDs: X-gateway and Modbus-TCP Network

No	Name	Indication	Meaning	
1	Gateway Status	Off	Power off	
	(GW)	Alternating red/green	Missing configuration	
		Flashing green	Idle	
		Green	Running	
		Flashing red	Invalid configuration	
		Red	Fatal error	
5	SD Card Status	Green	Accessing SD card	
	(SD)	Flashing red	Failure	
6	Modbus-TCP Status (MTCP)	Off	No Modbus-TCP network communication	
		Green	Communicating with Mod- bus-TCP network	
		Flashing red	Transaction error or timeout	
		Red	Fatal error	
7	Ethernet Link 1	Off	No link	
	and 2 (LA1, LA2)	Flashing green	Receiving/transmitting Ethernet packets at 100 Mbit	
8		Flashing yellow	Receiving/transmitting Ethernet packets at 100 Mbit	

Table 13 LEDs: Profibus Network

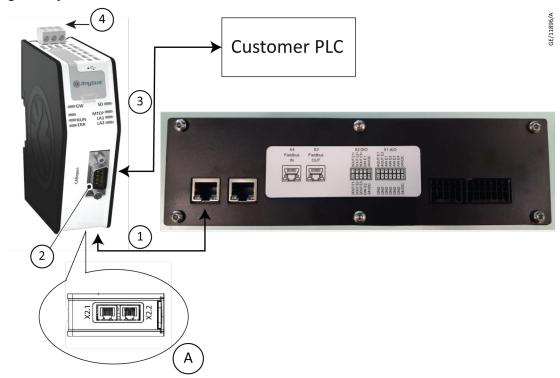
No	Name	Indication	Meaning	
2	Not used	-	-	
3	Network Status	Off	Not online	
	(OP)	Flashing green	Online, clear	
		Green	Online, data exchange	
		Flashing red (1 flash)	Parameterization error	
		Flashing red (2 flashes)	Configuration error	
4	Module Status	Off	Not Initialized	
	(ST)	Green	Initialized	
		Red	Fatal error	

■ Note:

Output data will be in Big Endian format. For example, if the pressure value in the pump is 700 mbar. Then in Hex, the value will be 02 BC, but in the output you will get BC 02.

8.2.3. Anybus X-Gateway Modbus-TCP to CANOpen with the Controller

- 1. Get the pre-configured gateway.
- 2. Connect the 24V power supply to the power port in gateway.
- 3. Connect Ethernet Cable in any Modbus TCP Port (there are two ports) in gateway. The other end to the Controller Fieldbus X4 IN.



- 1. Ethernet cable
- 3. Profibus connector

- 2. CANOpen port
- 4. Power supply

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Status LEDs

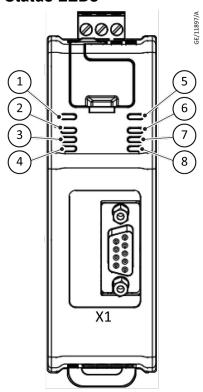


Table 14 LEDs: X-gateway and Modbus-TCP Network

No	Name	Indication	Meaning	
1	Gateway Status	Off	Power off	
	(GW)	Alternating red/green	Missing configuration	
		Flashing green	Idle	
		Green	Running	
		Flashing red	Invalid configuration	
		Red	Fatal error	
5	SD Card Status	Green	Accessing SD card	
	(SD)	Flashing red	Failure	
6	Modbus-TCP Status (MTCP)	Off	No Modbus-TCP network communication	
		Green	Communicating with Mod- bus-TCP network	
		Flashing red	Transaction error or timeout	
		Red	Fatal error	
7	Ethernet Link 1	Off	No link	
	and 2 (LA1, LA2)	Flashing green	Receiving/transmitting Ethernet packets at 100 Mbit	
8		Flashing yellow	Receiving/transmitting Ethernet packets at 100 Mbit	

Table 15 LEDs: CANOpen Network

No	Name	Indication	Meaning	
2	Not used	-	-	
3	(RUN)	Off	Power off	
		Green	I/O data exchanged, normal operation	
		Flashing green	No I/O data exchanged	
		Green, single flash	No I/O data exchanged	
		Flickering green	Baud rate detection in progress	
		Red	Fatal error	
4	(ERR)	Off	Module in working condition	
		Red, single flash	A bus error counter reached or exceeded its warning leve	
		Flickering red	LSS services in progress	
		Red, double flash	An error control event has oc- curred	
		Red	Fatal error, or bus off	

■ Note:

Output data will be in Big Endian format. For example, if the pressure value in the pump is 700 mbar. Then in Hex, the value will be 02 BC, but in the output you will get BC 02.



EU Declaration of Conformity

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Atlas Copco Vacuum Belgium n.v.

Industrielaan 40 B-3730 Hoeselt Belgium **Documentation Officer**

Jana Sigmunda 300 Lutín , 78349 Czech Republic T: +42(0) 580 582 728

documentation@vt.atlascopco.com

The product specified and listed below

• Product: Multi Pump Controller

• Models: HEX@GRID / HEX@GRID with screen / HMI kit

Pump family codes: 3002615020 / 3002615021 / 3002615050

Is in conformity with the relevant requirements of European CE legislation:

2014/35/EU Low voltage directive (LVD)

2014/30/EU Electromagnetic compatibility (EMC) directive

Class A Emissions, Industrial Immunity

2011/65/EU Restriction of certain hazardous substances (RoHS) directive

as amended by Delegated Directive (EU) 2015/863

Based on the relevant requirements of harmonised standards:

EN 60204-1: Safety of machinery. Electrical equipment of machines. General requirements

2018/A1:2009/AC:2010

EN 61000-6-2:2005 Electromagnetic Compatibility (EMC) - Part 6-2: Generic Industrial Immunity Standard

EN 61000-6-4:2007

Electromagnetic Compatibility (EMC) - Part 6-4: Generic Industrial Emission Standard

A1:2011

EN IEC 63000:2018 Technical documentation for the assessment of electrical and electronic products with

respect to the restriction of hazardous substances

This declaration, based on the requirements of the listed Directives and EN ISO/IEC 17050-1, covers all product serial numbers from this date on: 2022-10-03

You must retain the signed legal declaration for future reference

This declaration becomes invalid if modifications are made to the product without prior agreement.

Andries de Bock - VP Engineering Industrial Vacuum Division

Cologne

Bram Claes – VP Operations Industrial Vacuum Division

Cologne





Declaration of Conformity

Atlas Copco Vacuum Belgium n.v. Industrielaan 40 B-3730 Hoeselt Belgium Documentation Officer
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Burgess Hill
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RH15 9TW
documentation@vt.atlascopco.com

This declaration of conformity is issued under the sole responsibility of the manufacturer.

- Product: Multi Pump Controller
- Models: HEX@GRID / HEX@GRID with screen / HMI kit
- Pump family codes: 3002615020 / 3002615021 / 3002615050

The object of the declaration described above is in conformity with relevant statutory requirements:

Electrical Equipment (Safety) Regulations 2016

Electromagnetic Compatibility Regulations 2016

Class A Emissions, Industrial Immunity

Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

Relevant designated standards or technical specifications are as follows:

EN 60204-1: Safety of machinery. Electrical equipment of machines. General requirements
2018/A1:2009/AC:2010

EN 61000-6-2:2005 Electromagnetic Compatibility (EMC) - Part 6-2: Generic Industrial Immunity Standard
EN 61000-6-4:2007 Electromagnetic Compatibility (EMC) - Part 6-4: Generic Industrial Emission Standard
A1:2011

EN IEC 63000:2018 Technical documentation for the assessment of electrical and electronic products with

respect to the restriction of hazardous substances

This declaration, based on the requirements of the listed Statutory Instruments and EN ISO/IEC 17050-1, covers all product serial numbers from this date on: 2022-10-03

You must retain the signed legal declaration for future reference
This declaration becomes invalid if modifications are made to the product without prior agreement.

Signed for and on behalf of Atlas Copco Vacuum Belgium

Andries de Bock - VP Engineering Industrial Vacuum Division

Cologne

Bram Claes – VP Operations Industrial Vacuum Division

Cologne

ADDITIONAL LEGISLATION AND COMPLIANCE INFORMATION

EMC (EU, UK): Industrial equipment

Caution: This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.

RoHS (EU, UK): Material Exemption Information

This product is compliant with the following Exemptions

Annex III:

• 6(a) **Lead** as an alloying element in steel for machining purposes and in galvanised steel containing up to 0.35 % lead by weight

REACH (EU, UK)

This product is a complex article which is not designed for intentional substance release. To the best of our knowledge the materials used comply with the requirements of REACH. The product manual provides information and instruction to ensure the safe storage, use, maintenance and disposal of the product including any substance based requirements.

Article 33.1 Declaration (EU, UK)

This product contains Candidate List Substances of Very High Concern above 0.1%ww by article as clarified under the 2015 European Court of Justice ruling in case C-106/14.

Lead (Pb)

This substance is present in certain electrical or electronic components.

TSCA PBTs (US)

Regulation of Persistent, Bioaccumulative, and Toxic Chemicals Under TSCA Section 6(h)

The product does not knowingly or intentionally contain substances in contravention with the above requirements.

Additional Applicable Requirements

The product is in scope for and complies with the requirements of the following:

2012/19/EU

Directive on waste electrical and electronic equipment (WEEE)

材料成分声明

China Material Content Declaration

	有害物质					
			Haz	zardous Substa	ances	
部件名称 Part name	铅 Lead (Pb)	汞 Mercury (Hg)	镉 Cadmium (Cd)	六价铬 Hexavalent Chromium (Cr VI)	多溴联苯 Polybrominated biphenyls (PBB)	多溴二苯醚 Polybrominated diphenyl ethers (PBDE)
电子元件和控件 Electronics and Controls	х	0	0	0	0	0

O: 表示该有害物质在该部件的所有均质材料中的含量低于 GB/T 26572 标准规定的限量要求。

O: Indicates that the hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in GB/T 26572.

X: 表示该有害物质在该部件的至少一种均质材料中的含量超出 GB/T26572 标准规定的限量要求。

X: Indicates that the hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement of GB/T26572.

