

9. Software installation and configuration

Before the module can be used for a Modbus and/or Profibus connection, the correct software application and settings must be downloaded. This can be done by AC Service personnel using AC Speci5.

Once the software has been installed, configuration can also be performed by qualified Atlas Copco personnel using AC Modi5.

Please refer to the Address Mapping document, available for each individual machine to be attached, to get the supported registers and their meanings.

9.1. Display menu folder structure

Once the module is downloaded, the default settings are found on the module. It is now important to set up the module correctly at your personal wishes.

The display menu structure is built up as follows:

Mainscreen	[]	
+ General Settings	[	GE]
+ Compressors	[	CP]

Each folder has one or more subfolders which can be accessed using the **Enter** key on the keyboard. Exiting a folder can be performed using the **Cancel** key. Browsing through the different folders is done by pressing the **Left** and **Right** button.

Once a setting is reached in a specific folder, the current settings value will be displayed. By pressing **Cancel** the current menu will be exited. Pressing **Enter** however will allow the user to alter the settings (the value will start blinking) by clicking the **Up** or **Down** button. At this point the user will be able to undo the current settings change by clicking **Cancel**. In this case the current settings value will be shown again. However, by clicking **Enter** the settings value will be stored and the module will behave accordingly.

9.1.1. Mainscreen folder []

The Mainscreen folder has no subfolders and is only used to display general information. The module will always return to this folder in case no button is pressed over a certain period.

9.1.2. General Settings folder [GE]

The General Settings folder consists of 4 subfolders which will be explained in the next paragraphs.

Mainscreen	[]	
- General Settings	[	GE]
+ Communication	[	CO]
+ CAN	[	CA]
+ Password settings	[	PW]
+ Program information	[	PI]
+ Compressors	[	CP]

Communication Folder [Co]

The Communication folder basically offers the possibility to edit the parameters that are used to properly communicate over the CAN channel (with the attached Elektronikon modules on the CAN network), the RS485 Modbus channel and the Profibus channel.

It also offers the possibility to set/alter the EtherNet settings.

Mainscreen	[GE]
- General Settings	[CO]
- Communication	[MbEN]
Modbus Engine	[MbbR]
Modbus Baudrate	[MbPa]
Modbus Parity	[Mbsb]
Modbus Stopbits	[PbEN]
Profibus Engine	[PbSA]
Profibus SlaveAddress	[PbdR]
Profibus DataRecords	[EtEN]
EtherNet Engine	[EtIP]
EtherNet IP Address	[EtNM]
EtherNet Network Mask	[EtGW]
EtherNet Gateway	[CAEN]
CAN Engine	[CACH]
CAN Channel	[CA]
+ CAN	[PW]
+ Password settings	[PI]
+ Program information	[CP]
+ Compressors	

Modbus Engine

The Modbus Engine can be started/stopped here.

NOTE: In case the Modbus Engine is active, the settings for Modbus Baudrate, Modbus Parity and Modbus Stopbits are not accessible.

Modbus Baudrate

Below table lists the possible Modbus baudrates, indicated as follows:

Display value	Baudrate
0	9600 bps
1	19200 bps
2	38400 bps
3	57600 bps
4	115200 bps
5	230400 bps
6	460800 bps

Modbus Parity

Below table lists the possible Modbus parities, indicated as follows:

Display value	Parity
0	None
1	Even
2	Odd

Modbus Stopbits

Select the number of used stopbits (1 or 2).

Profibus Engine

The Profibus Engine can be started/stopped here.

NOTE: In case the Profibus Engine is active, the settings for Profibus SlaveAddress and Profibus DataRecords are not accessible.

Profibus SlaveAddress

The Profibus SlaveAddress can be adjusted here.

Display value
1 .. 255

Profibus DataRecords

There are 4 possible settings, indicated as follows:

Display value	#
1	1 data record
2	2 data records
4	4 data records
8	8 data records

EtherNet Engine

The EtherNet Engine can be started/stopped here.

EtherNet IP Address

The EtherNet IP Address can be set/alterred here.

EtherNet Network Mask

The EtherNet Network Mask can be set/alterred here.

EtherNet Gateway

The EtherNet Gateway can be set/alterred here.

CAN Engine

The CAN Engine can be started/stopped here.

NOTE: In case the CAN Engine is active, the setting for CAN Channel is not accessible.

CAN Channel

Below table lists the possible CAN channels, indicated as follows:

Display value	Channel
1	Primary
2	Secondary

CAN folder [CA]

The CAN folder contains the settings that are used by the internal CAN Engine and contains the following subfolders:

Mainscreen	[	GE]
- General Settings	[	Co]
+ Communication	[	CA]
- CAN	[	CA01]
- General Status	[	CA02]
- Analog Inputs	[	CA03]
- SPM Inputs	[	CA04]
- Calculated Analog Inputs	[	CA05]
- Digital Inputs	[	CA06]
- Counters	[	CA07]
- ES Counters	[	CA08]
- ES System Data	[	CA10]
- Special Alarms	[	CA11]
- Motor Speeds	[	CA12]
- ES8 Analog Inputs	[	CA13]
- ES8 Digital Inputs	[	CA14]
- ES8 Digital Outputs	[	CA15]
- ES8 System Data	[	CA16]
- CRE ES Analog Inputs	[	CA17]
- CRC ES Digital Inputs	[	CA18]
- CRC ES Digital Outputs	[	CA19]
- CRC ES System Data	[	CA20]
- CRC ES SPS	[	CA22]
- Analog outputs	[	CA23]
- Digital Outputs	[	CA24]
- Pressure Band	[	CA25]
- VSD Setpoint	[	CA26]
- Remote Setpoint	[	CA27]
- ES Pressure Band	[	CA28]
- PET regulation Band	[	CA29]
- Turbo Setpoint and Band	[	PI]
+ Program information	[	CP]
+ Compressors	[]

Every item can be set to one of below values:

Display value	Priority
0	Off
1	Normal
2	High
3	Request

Password Settings [PW]

The different password folders offer the possibility to enable/disable and alter the customer password.

Mainscreen	[]
- General Settings	[	GE]
+ Communication	[	CO]
+ CAN	[	CA]
- Password settings	[	PW]
- Enable	[	PWEN]
- Password 1	[	PW 1]
+ Program information	[	PI]
+ Compressors	[	CP]

Program Information [PI]

The Program Information folder shows information that is associated with the current application.

Mainscreen	[]
- General Settings	[	GE]
+ Communication	[	CO]
+ CAN	[	CA]
+ Password settings	[	PW]
- Program information	[	PI]
- Program Number	[	PN]
- Program Revision	[	PR]
- Operating System	[	OS]
- Boot Software	[	BS]
+ Compressors	[	CP]

Program Number

The Program Number folder shows the program number that is associated with the current application.

Program Revision

The Program Revision folder shows the program revision number that is associated with the current application.

Operating System

The Operating System folder shows the operating system number that is associated with the current application.

Boot Software

The Boot Software folder shows the boot software number that is associated with the current application.

9.1.3. Compressors folder [CP]

The Compressors folder contains 31 subfolders ([CP01] to [CP31]) each containing 2 subfolders, describing the compressor parameters.

Information about the icons that are shown in these folders can be found in paragraph 10.1.

Mainscreen	[GE]	
+ General Settings	[CP]	
- Compressors	[CP01] .. [CP31]	
- Compressor	[MA01]	
CAN Status	[MA02]	
Modbus Address	[Info]	
Information		

CAN Status folder [MA01]

This parameter defines whether the controller is read-out over CAN.

NOTE: In case the CAN Status is set to disabled for a certain controller, no data will be retrieved and hence the respective registers will be 0 in the Modbus and/or Profibus communication.

Modbus Node folder [MA02]

This parameter defines the controller in the Modbus communication.






Information folder [Info]

In this folder, respectively, the cycle time of the CAN Normal, the cycle time of the CAN High and the Modbus answering speed can be visualized..


NOTE: Use the Up/Down keys to select the correct item.

10. Gateway Display Description

10.1. Icons

Icon	Description
	Blinking: Compressor related menu : machine is in CAN Error
	On: CAN engine stopped Running: CAN engine running
	Off: Modbus engine stopped On: Modbus engine running
	Off: Profibus engine stopped On: Profibus engine running
	On: machine is defined/enabled and is able to request data Blinking: machine is defined/enabled and is able to request settings

10.2. Leds

Led	Description
	On: Gateway module is powered on

NOTE: No other LEDs are used during the operation of the application.

10.3. Keyboard

Key	Description
Up Down	Edit settings parameters
Left Right	Browse through the different menus

10.4. Passwords / Access Codes

Please consult the table below to know the type of password that has to be entered in a given menu.

Customer Passwords and/or Access Codes can be identified by their appearance on the display.

Blinking key(s)	Non blinking key(s)	Description
1 digit	3 dashes	Enter the Customer Password
3 dashes	1 digit	Enter the applicable Access Code
1 digit	3 digits	Enter the new Customer Password
3 digits	1 digit	Confirm the new Customer Password

Access codes are to be requested from Atlas Copco.

11. Modbus Protocol Implementation

11.1. Supported Modbus specification

The Gateway module supports the following Modbus-variant:

- Mode of transmission : RTU
- Coding system : binary
- Mode : RS485
- Number of start bits: 1
- Number of data bits: 8
- Baudrate: 9600, 19200, 38400, 57600, 115200, 230400, 460800
- Parity control: even, odd, none
- Number of stop bits: 1, 2
- Error checking: CRC16

Frame synchronization in the RTU mode is done by simulating a synchronous message. The slave device monitors the elapsed time between receipts of characters. If three character time elapsed without a new character, then the device assumes that the message is completed and the next byte will be the address.

The message frame format is as follows:

T1 T2 T3	Address	Message Body	CRC	T1 T2 T3
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11.2. Supported Modbus functions

The Elektronikon Mk5 Modbus supports the following message type, depending on the type of data involved (see details below).

- Function 01 : read coil register
- Function 03 : read holding register
- Function 06 : preset single register

NOTE: for Elektronikon Mk5 controllers, it is not possible to change parameters. Consult the address mapping to check which parameters can be adjusted.

11.3. Function code - data field

In a normal response, the slave echoes the function code of the original query.

In an exception response, 0x80 is added to the original function code.
At the same time, an exception code is added in the Data Field.

11.4. Exception codes

Code	Name	Description
01	Illegal function	The function code received in the query is not an allowable action for the slave
02	Illegal Data Address	The data address received in the query is not an allowable address for the slave
03	Illegal Data Value	A value contained in the query data field is not an allowable value for the slave
05	Reprogramming Refused	Command refused because previous command was not yet executed
07	Command Refused	Command refused because previous command was not yet executed
08	Data Not Available	Check Communication cable between Elektronikon and the Gateway module
09	Illegal Command	An unknown command is being sent
0A	Invalid CRC Checksum	The CRC16 checksum received is incorrect
0B	Write Refused	Parameter change refused

11.5. Examples

The examples below use the following parameters:

- Attached module : Mk5 – LU – GA30P_08
- Node ID : 5

11.5.1. Illegal Data Address

If the slave device is asked for a parameter that it is not able to process, the slave device answers with the error code Illegal Data Address.

In this case f.i. the Required Motor Speed is requested.

- Request : 16#C5 16#03 16#03 16#20 16#00 16#01 16#84 16#00
- Answer : 16#C5 16#83 16#02 16#81 16#30

11.5.2. Outlet Pressure and Outlet Pressure Status

Please refer to the Address Mapping document, created by Specif5, to get the correct Register for the Outlet Pressure and its meaning.

In this case f.i. the Outlet Pressure Status can be found in the first Analog Input Register and the Outlet Pressure Value can be found in the second Analog Input Register.

- Request : 16#C5 16#03 16#00 16#00 16#00 16#02 16#C5 16#8F
- Answer : 16#C5 16#03 16#04 16#00 16#80 16#19 16#64 16#B4 16#60

11.5.3. Change the active pressure band

Please refer to the Address Mapping document, created by Spec5, to get the correct Register and Value for adjusting the Pressure Band Selection.

In this case f.i. the correct Register is 16#03 16#5C. To switch from Pressure Band 1 to Pressure Band 2, value 16#00 16#C2 will have to be used.

NOTE: Make sure that Pressure Band 1 is used before actually sending the request.

- Request : 16#05 16#06 16#03 16#5C 16#00 16#02 16#C9 16#D9
- Answer : 16#05 16#06 16#03 16#5C 16#00 16#02 16#C9 16#D9

11.5.4. Start the machine

Please refer to the Address Mapping document, created by Spec5, to get the correct Register and Value to start the machine.

In this case f.i. the correct register is 16#07 16#D0 and the correct value is 16#00 16#01.

NOTE: Make sure the machine is in LAN Control before actually sending the request.

- Request : 16#05 16#06 16#07 16#D0 16#00 16#01 16#49 16#03
- Answer : 16#05 16#06 16#07 16#D0 16#00 16#01 16#49 16#03

12. Profibus Protocol Implementation

12.1. Protocol Specification

The protocol is based on the standard Profibus-DP V0 protocol, with the following basic specifications:

- Mode : RS485
 - Baudrate : 9.6k, 19.2k, 45.45k, 93.75k, 187.5k, 500k, 1.5M, 3M, 6M, 12M
 - Autobaud : Supported
 - Freeze Mode : Not Supported
 - Sync Mode : Not Supported
 - Slave Node Address Change : Not Supported
 - Diagnostics : Not Supported
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- No PTO or PNO certification available (Not mandatory for Profibus DP)

12.2. Master-slave concept

The profile is based upon the master-slave principle. This means that all communication is initiated by the master and a reply is generated by the slave.

All buffers should be full length consistent.

12.3. Buffer structure

The profile can be used for buffers with differs length: 8, 16, 32 and 64 bytes. This buffer is split into 2 parts:

- Header (B0) : 1 byte
- data section : n * data record (7bytes)

The buffer length is thus defined as follows:

Number of data records (n)	Total buffer length	Total used buffer length
1	8	8
2	16	15
4	32	29
8	64	57

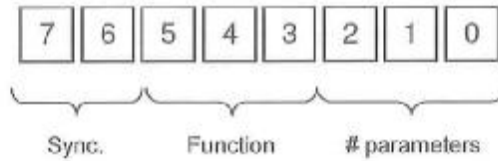
NOTE: Not all functions allow more than 1 data record to be transferred. Basically read operations can be handled for several data records in 1 cycle, while write operations are only valid for a single data record at a time.

12.2.1. Header

The header is a bit encoded 1 byte value. The interpretation is different for Master > Slave and Slave > Master communication.

Master > Slave

The header is split into 3 areas:



- **Sync**
The synchronization bits are used to synchronize master requests and slave answers. The slave will always reflect the same bit sequence in its answer. This way an 'old' answer can be distinguished from a new one.

- **Functions:**

Value	Function
0	No task
1	Request parameter value (read)
3	Alter parameter value (write) <i>NOTE: only one parameter can be written in a cycle, # parameters must be 1</i> <i>NOTE: for Elektronikon Mk5 controllers, it is not possible to change parameters. Consult the address mapping to check which parameters can be adjusted!</i>
2,4,5,6,7	Reserved

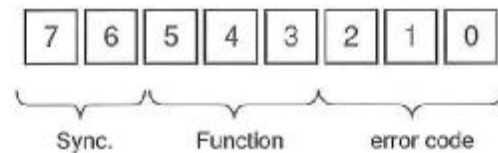
- **# parameters:**

The number of parameters needs to be lower or equal to the number of data records.

Value	
1	001
2	010
3	011
4	100
5	101
6	110
7	111
8	000

Slave > Master

The header is split into 3 areas:



- **Sync**
The synchronization bits will be set identical to the bits from the master > slave.

- **Functions:**

Value	Function
0	No task, or no data yet
2	Transmit parameter value(s)
7	Task not possible
1,3,4,5,6	Reserved

- **Error code**

Value	Explanation
0	No error
1	Incorrect number of data records
2	Incorrect function
3	Incorrect number of data records for writing

12.2.2. Data record

Each data record is 7 bytes long and contains the following info:

- Node Address (B1) : 1 byte, CAN Address of slave to connect to.
- Parameter ID (B2B3) : 2 bytes, ID of the parameter to read/write
- Data (B4B5B6B7) : 4 bytes

12.2.3. Node Address

This is the Elektronikon MkIV or Mk5 CAN Address.

NOTE: In case of an error, bit 7 will be set.

12.4. Exception codes

When the highest bit of the Node Address is set, there is an error in the request. The type of error can be found in the lowest byte of the Slave answer.

Error Code	Description
01	Node Address not found
02	Profibus parameter not found
05	Invalid compressor data
06	Command Not Executed
07	Command Refused
08	Write Refused

12.5. Examples

The following examples use the following parameters:

- Attached module : Mk5 - LU - GA3CP_08
- Node ID : 5
- Profibus Slave Address : 1
- Profibus DataRecords : 1

12.4.1. Illegal Data Address

In case the slave device is asked for a parameter that it is not able to process, the slave device answers with the error code Illegal Data Address.

In this case f.i. the Required Motor Speed is requested.

- | | B0 | B1 | B2 | B3 | B4 | B5 | B6 | B7 |
|-------------|-------|-------|-------|-------|-------|-------|-------|-------|
| • Request : | 16#09 | 16#05 | 16#03 | 16#20 | 16#00 | 16#00 | 16#00 | 16#00 |
| • Answer : | 16#10 | 16#85 | 16#03 | 16#20 | 16#00 | 16#00 | 16#00 | 16#02 |

12.4.2. Outlet Pressure and Outlet Pressure Status

Please refer to the Address Mapping document, created by Speci5, to get the correct Register for the Outlet Pressure and its meaning.

In this case f.i. the Outlet Pressure Status and Value can be found in the first Analog Input Register.

- | | B0 | B1 | B2 | B3 | B4 | B5 | B6 | B7 |
|-------------|-------|-------|-------|-------|-------|-------|-------|-------|
| • Request : | 16#49 | 16#05 | 16#00 | 16#00 | 16#00 | 16#00 | 16#00 | 16#00 |
| • Answer : | 16#50 | 16#05 | 16#00 | 16#00 | 16#19 | 16#64 | 16#00 | 16#80 |

12.4.3. Change the active pressure band

Please refer to the Address Mapping document, created by Speci5, to get the correct Register and Value for adjusting the Pressure Band Selection.

In this case f.i. the correct Register is 16#03 16#5C. To switch from Pressure Band 1 to Pressure Band 2, the value 16#00 16#02 will have to be used.

NOTE: Make sure that Pressure Band 1 is used before actually sending the request.

- | | B0 | B1 | B2 | B3 | B4 | B5 | B6 | B7 |
|-------------|-------|-------|-------|-------|-------|-------|-------|-------|
| • Request : | 16#D9 | 16#05 | 16#03 | 16#5C | 16#00 | 16#00 | 16#00 | 16#02 |
| • Answer : | 16#D0 | 16#05 | 16#03 | 16#5C | 16#00 | 16#00 | 16#00 | 16#02 |

12.4.4. Start the machine

Please refer to the Address Mapping document, created by Speci5, to get the correct Register and Value to start the machine.

In this case f.i. the correct register is 16#07 16#D0 and the correct value is 16#00 16#01.

NOTE: Make sure the machine is in LAN Control before actually sending the request.

- | | B0 | B1 | B2 | B3 | B4 | B5 | B6 | B7 |
|-------------|-------|-------|-------|-------|-------|-------|-------|-------|
| • Request : | 16#99 | 16#05 | 16#07 | 16#D0 | 16#00 | 16#00 | 16#00 | 16#01 |
| • Answer : | 16#90 | 16#05 | 16#07 | 16#D0 | 16#00 | 16#00 | 16#00 | 16#01 |

ANYBUS COMMUNICATOR

Anybus Communicators are protocol converters that connect non-networked devices to all major industrial networks. The Communicator is capable of converting almost any standard or user specific proprietary protocol without the need for any hardware or software changes to your device.



Key Features

- Easy setup – no programming required
- Connects non-networked devices via a serial RS232/422/485 cable
- Supports Modbus RTU, DF1, ASCII and proprietary serial and CAN based protocols
- Connects devices to all major fieldbus and industrial Ethernet networks

AVAILABLE MODELS:

Part Number	Model	Description
AB7007	ABC-EIP	Anybus Communicator Serial Gateway EtherNet/IP & MODBUS TCP (10/100Mb)