

# User guide

## 1. General Information

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### Elektronikon Mk5 Gateway Module

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<b>Document Edition</b>	:	15
<b>Concerning</b>	:	Units with Elektronikon Mk5 gateway module
<b>Preliminary Operations</b>	:	–
<b>Safety Instructions</b>	:	General
<b>Persons Required</b>	:	1
<b>Special Tools</b>	:	–
<b>Consumables</b>	:	–

## 2. Document Overview

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### 3. Safety first

## ***SAFETY = THINK BEFORE YOU ACT***



**1. STOP**

**EVALUATE RISKS**



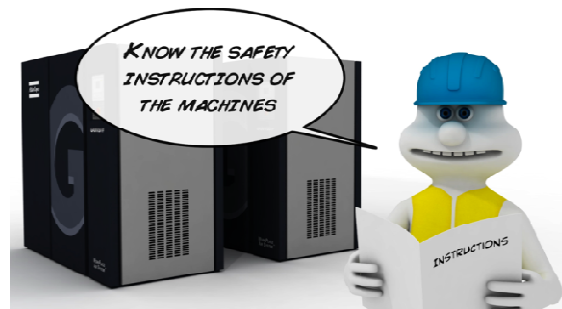
**2. THINK**

**SEEK PROPER SOLUTION**



**3. ACT**

**CARRY OUT SOLUTION**



**PERSONAL PROTECTION KEEPS YOU SAFE**



**LOCK OUT / TAG OUT  
TAKE AWAY THE RISKS**

## 4. Copyright Notice

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Any unauthorized use or copying of the contents or any part thereof is prohibited.

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

## 5. Document Information and History

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<b>Edition</b>	<b>Date</b>	<b>Description</b>	<b>Author</b>
00	29/11/2010	First Edition	CTE-KD
01	22/03/2011	Text update by Tine Lefebvre	CTE-KD
02	10/05/2011	Renamed ES devices to CRC ES	CTE-KD
03	23/08/2011	Customer Password / Access Codes	CTE-KD
04	23/08/2011	Update according to remarks from Guido Willems	CTE-KD
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12	01/02/2013	- Serial Line Connection - Profibus Protocol Specification - Update chapter "The physical set-up"	CTE-KD
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14	13/08/2013	Update reference to CAN cabling instruction	CTE-KD
15	13/08/2013	Update according to remarks from VTF-GW	CTE-KD

## 6. Safety Precautions

### 6.1. Safety icons

	Danger for life
	Warning
	Important note

### 6.2. 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.**

#### 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 authorised, trained, specialised personnel.
4. Before carrying out any maintenance, repair work, adjustment or any other non-routine checks, stop the device. In addition, the power isolating switch must be opened and locked.

#### Precautions during installation

1. Place the device where the ambient air is as cool and clean as possible.
2. During installation or any other intervention on one of the connected machines, the machine must be stopped, de-energized and the isolating switch opened and locked before any maintenance or repair. As a further safeguard, 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 start equipment.
3. The electrical connections must correspond to the local 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.
4. For machines controlled by a central control system, a sign stating "This machine may start without warning" must be affixed near the instrument panel.
5. In multiple compressor systems, manual valves must be installed to isolate each compressor. Non return valves (check valves) must not be relied upon for isolating pressure systems.
6. Never remove or tamper with the safety devices.



*Also consult following safety precautions: Safety precautions during operation and Safety precautions during maintenance or repair.  
These precautions apply to electrical devices.*

*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.*

### 6.3. Safety precautions during operation

#### General precautions

1. The operator must employ safe working practices and observe all related local work safety requirements and regulations.
2. If any of the following statements does not comply with local 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. Before carrying out any maintenance, repair work, adjustment or any other non-routine checks, stop the device. In addition, the power isolating switch must be opened and locked.

#### Precautions during operation

1. 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.
2. Never operate the device in the presence of flammable or toxic fumes, vapors or particles.
3. Never operate the machine below or in excess of its limit ratings.
4. Keep all bodywork doors and panels closed 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 if applicable.
5. People staying in environments or rooms where the sound pressure level reaches or exceeds 90 dB(A) shall wear ear protectors.
6. 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
7. Never remove or tamper with the safety devices.



*Also consult following safety precautions: Safety precautions during installation and Safety precautions during maintenance or repair.*

*These precautions apply to electrical devices.*

*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.*

## 6.4. Safety precautions during maintenance or repair

### General precautions

1. The operator must employ safe working practices and observe all related local work safety requirements and regulations.
2. If any of the following statements does not comply with local 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. Before carrying out any maintenance, repair work, adjustment or any other non-routine checks, stop the device. In addition, the power isolating switch must be opened and locked.

### Precautions during maintenance or repair

1. Use only the correct tools for maintenance and repair work.
2. Use only genuine spare parts.
3. A warning sign bearing a legend such as "work in progress; do not start" shall be attached to the starting equipment, including all remote start equipment.
4. 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.
5. Never use flammable solvents or carbon tetrachloride for cleaning parts. Take safety precautions against toxic vapors of cleaning liquids.
6. Scrupulously observe cleanliness during maintenance and repair. Keep dirt away by covering the parts and exposed openings with a clean cloth, paper or tape.
7. Never use a light source with open flame for inspecting the interior of the device.
8. 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.
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. Never use caustic solvents which can damage materials of the air net.



*Also consult following safety precautions: Safety precautions during installation and Safety precautions during operation.*

*These precautions apply to electrical devices.*

*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.*



*Units and/or used parts should be disposed of in an environmentally friendly and safe manner and in line with the local recommendations and legislation.*

## 7. Preface

This document describes how to implement a Modbus and/or Profibus connection to the Elektronikon MkIV and/or Elektronikon Mk5 compressor controller network.

## 8. Physical Set-up

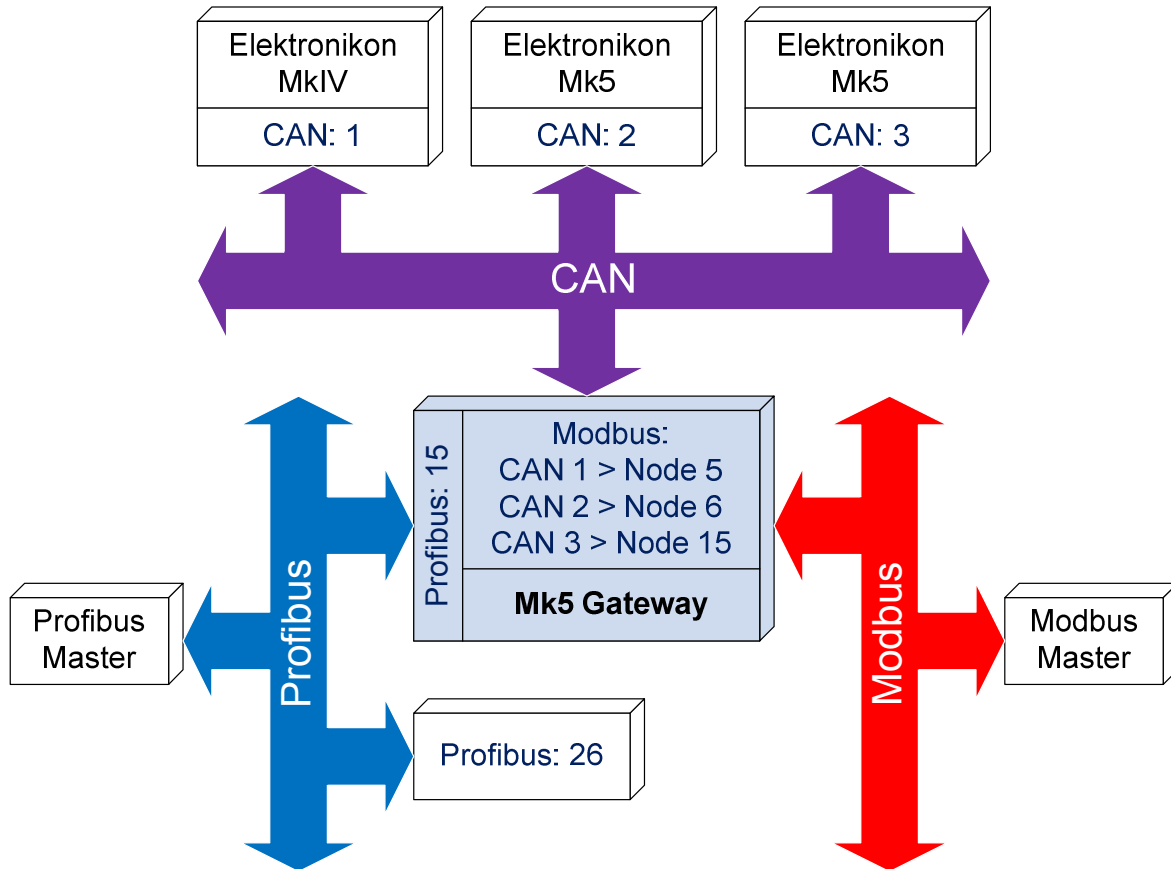
### 8.1. Modbus and/or Profibus in the network

In the Elektronikon system, all compressors in an installation can be connected by a data and/or control network. This is done according to the Compressor Network Cabling instruction (LN: 9820 3582 00, GBP: 2946 1361 00). This instruction explains what connectors and cables should be used to interconnect the different compressors/controllers in the network. Basically this is a CAN-based network.

In order to set up a Modbus and/or Profibus connection to one or several of the compressors in this network, a special module has to be inserted in this network.

This will behave as a Modbus/Profibus proxy that allows access to all compressors in the network, whereby each compressor has its own Modbus address (proxy concept).

The module will as well behave as a bridge to access the data stored in the CAN node's Object Dictionary. In order to work correctly, this bridge module has to be assigned a slave node ID. From the master's point of view, this bridge acts as a way to access information of the CANBUS network.



**NOTE:** the profibus manufacturer of the module must create a so named "Electronic Datasheet" or GSD file that declares the dimensions and the type of the exchanged datas. This file is public information necessary for Profibus users to interface with the bridge module.



## 8.2. Gateway module

For the Modbus and/or Profibus connection a so-called Gateway module has to be used. This is a general purpose serial communication module. By downloading the correct software, it will perform the proxy and/or bridge function.

The following connections will be used:

- 6x36 : to connect a 24Vac power supply
- 6x20 : to connect to the compressor network (CAN)
- 6x25 : to connect to a PC for downloading the application into the module
- 6x22 : to connect the RS485 Modbus line
- 6x37: to connect the Profibus line

The other 6x38 connector is not used in this application.

## 8.3. Gateway module

For the Modbus and/or Profibus connection, the Gateway module supports RS485A, with the following pin-layout as specified.

9 pin Female Sub-D Connector	
Pin	Function
1	GND
2	Reserved
3	B-signal
4	Reserved
5	GND (galvanic isolated)
6	+5V (galvanic isolated)
7	Reserved
8	A-signal
9	Reserved

## 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	<b>19200 bps</b>
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	<b>Even</b>
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	<b>1 data record</b>
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/alterd here.

### EtherNet Network Mask

The EtherNet Network Mask can be set/alterd here.

### EtherNet Gateway

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

Every item can be set to one of below values:

Display value	Priority
0	Off
1	Normal
1	High
2	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

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### 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:



### 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
06	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#05 16#03 16#03 16#20 16#00 16#01 16#84 16#00
- Answer : 16#05 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 Speci5, 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#05 16#03 16#00 16#00 16#00 16#02 16#C5 16#8F
- Answer : 16#05 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 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, value 16#00 16#02 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 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.*

- 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
- 
- 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

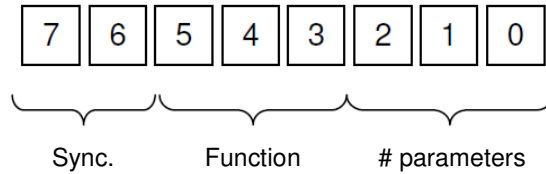
**NOTE:** Not all functions allow more than 1 data record to be transferred. Basically read operations can be handled for several data records in 1 cycle, while write operations are only valid for a single data record at a time.

#### 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><b>NOTE:</b> only one parameter can be written in a cycle, # parameters must be 1</i> <i><b>NOTE:</b> 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

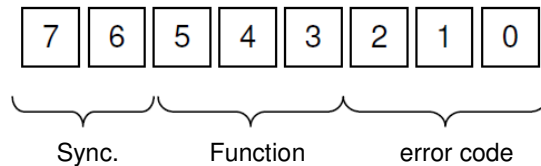
- **# parameters:**

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

Value	Binary
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 - GA30P\_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