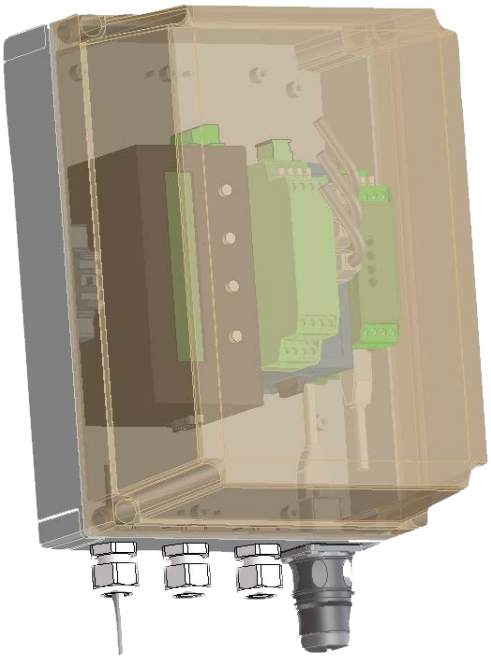
Special Documentation
GM32

TCP-Modbus Converter



Endress+Hauser
People for Process Automation

Described Product
Product name: GM32 TCP-Modbus Converter

Manufacturer
Endress+Hauser SICK GmbH+Co. KG
Bergener Ring 27
01458 Ottendorf-Okrilla
Germany

Legal Information

Original document
This document is an original document of Endress+Hauser SICK GmbH+Co. KG.

CE

Warning Symbols

Hazard (general)

Hazard by voltage

Warning Levels / Signal Words

DANGER
Risk or hazardous situation which *will* result in severe personal injury or death.

WARNING
Risk or hazardous situation which *could* result in severe personal injury or death.

CAUTION
Hazard or unsafe practice which *could* result in personal injury or property damage.

NOTICE
Hazard which *could* result in property damage.

Information Symbols

Important technical information for this product

Important information on electric or electronic functions

Nice to know

Supplementary information

Link to information at another place

TCP-Modbus Converter

1 Important Information

General information
Main safety information
Responsibility of user
Additional documentation
Product description

1.1 General information

These Operating Instructions describe installation and configuration of the interface module TCP-Modbus as an optional supplement of the GM32 communication options for application in Korea.
They supplement the GM32 Operating Instructions.

For detailed information concerning communication via Modbus, see the “Modbus Organization” (www.modbus.org) documents, for example:
- MODBUS Messaging on TCP/IP Implementation Guide
- MODBUS APPLICATION PROTOCOL SPECIFICATION
- MODBUS over serial line specification and implementation guide

Version 1.0 of this document has been exclusively created for application in Korea. A further version describes the use of interface module TCP-Modbus with CE compliance.

NOTICE:
- Always read the instructions before starting any work!
- Be sure to observe all safety and warning information!

1.2 Main safety information

Hazards through electrical equipment
The GM32 is electrical equipment for use in industrial high-voltage plants.

WARNING: Danger through power voltage
- ► Disconnect power supply lines before working on power connections or parts carrying power voltage.
- ► Refit any contact protection removed before switching the power voltage back on again.

1.3 Responsibility of user

- ► Only put the GM32 in operation when you have read the Operating Instructions for GM32 and this Addendum to the Operating Instructions.
- ► Observe all safety information.
- ► If there is something you do not understand: Contact Endress+Hauser Customer Service.

Designated users

- ► All operators of the GM32 should be specifically trained on this device, knowledgable of relevant regulations, and able to assess potential hazards related to its operation.

Retention of documents

This Addendum to the Operating Instructions must be kept available for reference.
- ► Pass on to new owners.

1.4 Additional documentation/information

► Observe the supplied documents.

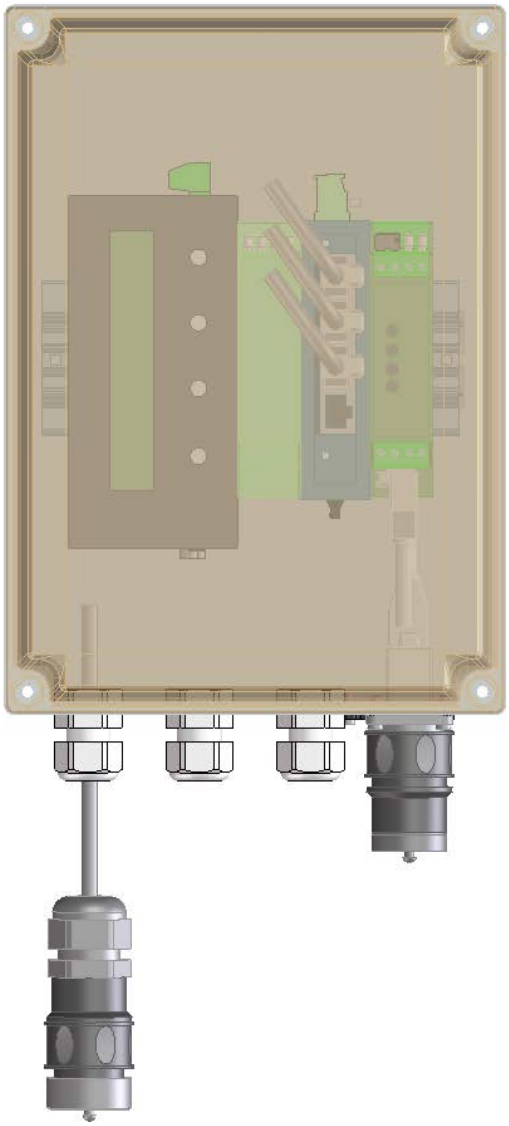
Additional instructions

The following documents are applicable in addition to this Addendum to the Operating Instructions:

- Operating Instructions GM32
- TI GM32
- Operating Instructions Power Supply Unit: MINI-PS-100-240AC/24DC/1.3
- Operating Instructions Switch SPIDER 4 TX/IFX

1.5 Product description

TCP-Modbus Converter



For a description of the components and interfaces, see → p. 10, Fig 1

TCP-Modbus Converter

2 Installation

Installing the configuration program
Setting the IP address
Configuration of Modbus interface
GM32 activation of Korea mode for password change via Modbus
Configuration without Lantronix DeviceInstaller
PCB console / Linux CPU

2.1 Installation information

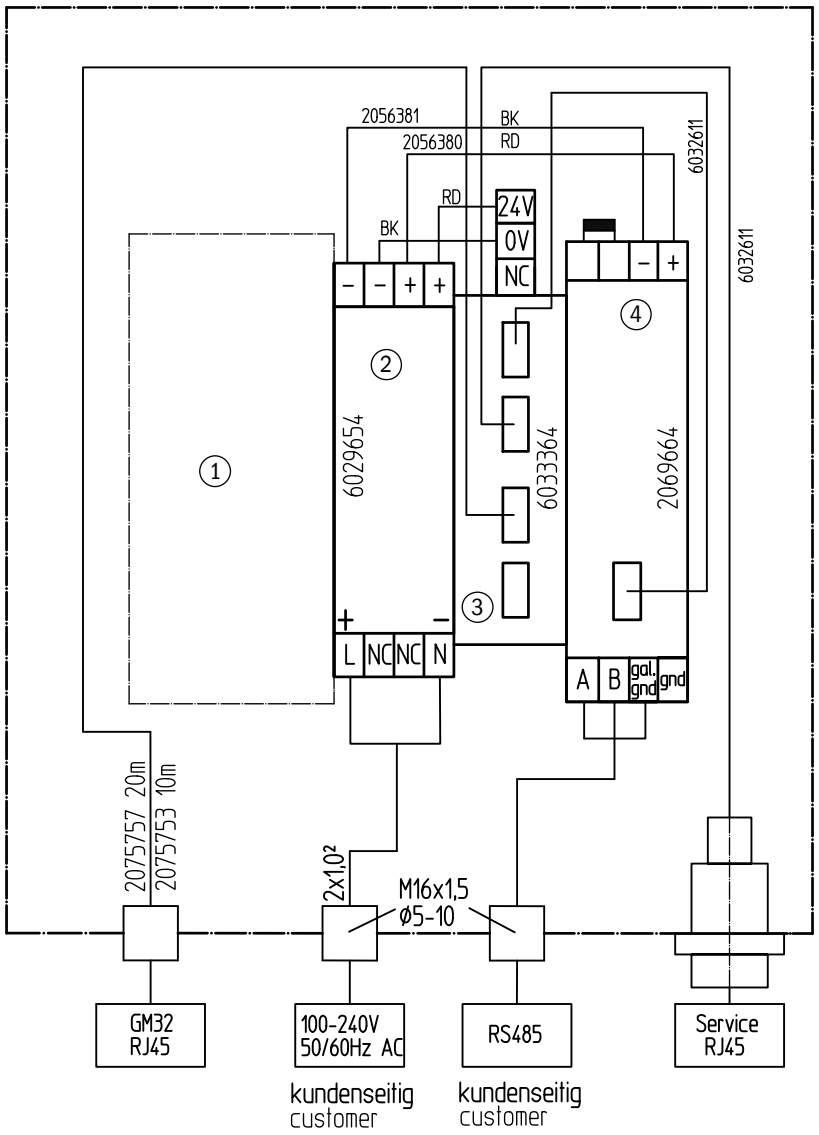
NOTICE: **To prevent failures caused by temperature, always install the TCP-Modbus Converter with the connections pointing downwards.**

WARNING: Danger through power voltage

► Read the Operating Instructions of the power supply unit before starting installation.

2.2 Electrical installation

Fig 1 Terminal connection diagram TCP-Modbus Converter



1 Space for installing the converter.
2 Power supply unit 100-240 V 24 V 1A
3 Ethernet rail switch, 4x Cu connection: max. 80 m, 1x fibre optic cable connection (T, R): max. 5000 m
4 INTERFACE MODULE MODBUS TCP (XPORT) with Ethernet connection

2.3 GM32 requirements

2.3.1 Hardware

Linux CPU:

- On devices as from SN 13278000: Linux CPU is implemented.
- On devices older than SN 13278000: Retrofitting to Linux CPU required. (→ p. 20, 2.9)

2.3.2 Firmware

- Later or equal XO76
- Install new firmware if firmware is older. Reload parameter reset and parameter backup.

2.4 Installing the configuration program

Administrator rights are required to install software.

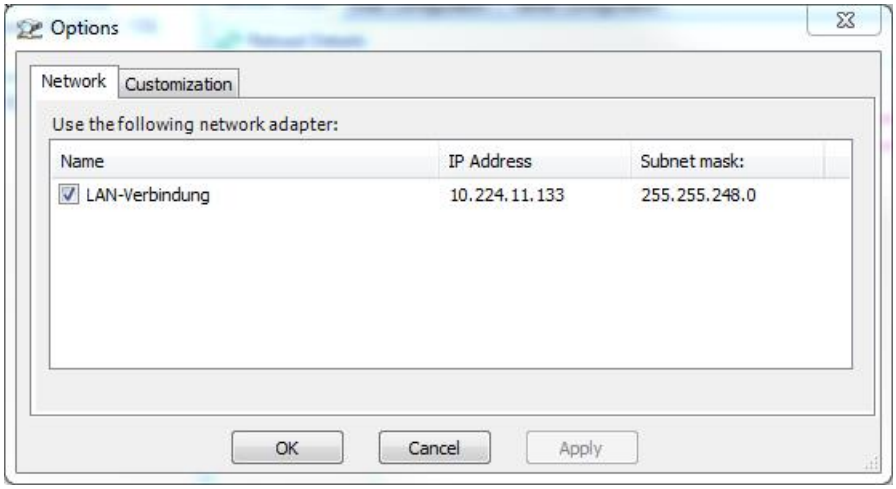
PC system requirements

- Operating system: MS-Windows XP or higher
- Program NET Framework 4.0
- Program Windows Installer 3.1

2.4.1 Requirements

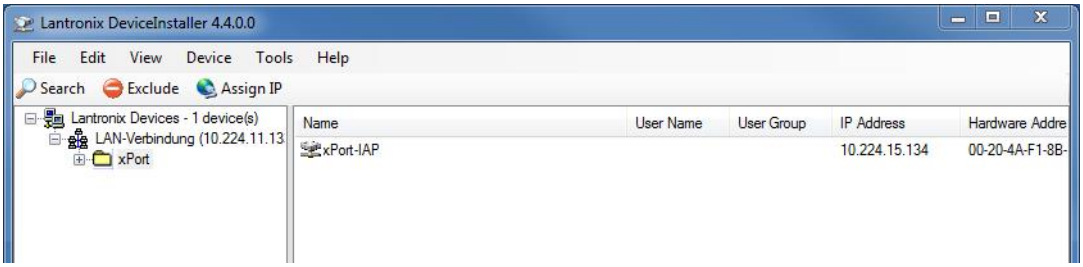
1. Install configuration program Lantronix DeviceInstaller.
2. Download the latest configuration program from:
   http://www.lantronix.com/device-networking/utilities-tools/device-installer.html
   (release: 27.03.2014).
3. Connect the interface module to the PC via the network. If connection via the network is not possible, the interface module can be connected with the PC via a peer-to-peer connection.
4. When several network cards are in the PC, select the correct configuration via *Tools -> Options*

Fig 2 Selecting the LAN connection



2.4.2 Starting the Lantronix DeviceInstaller

Fig 3 DeviceInstaller start window

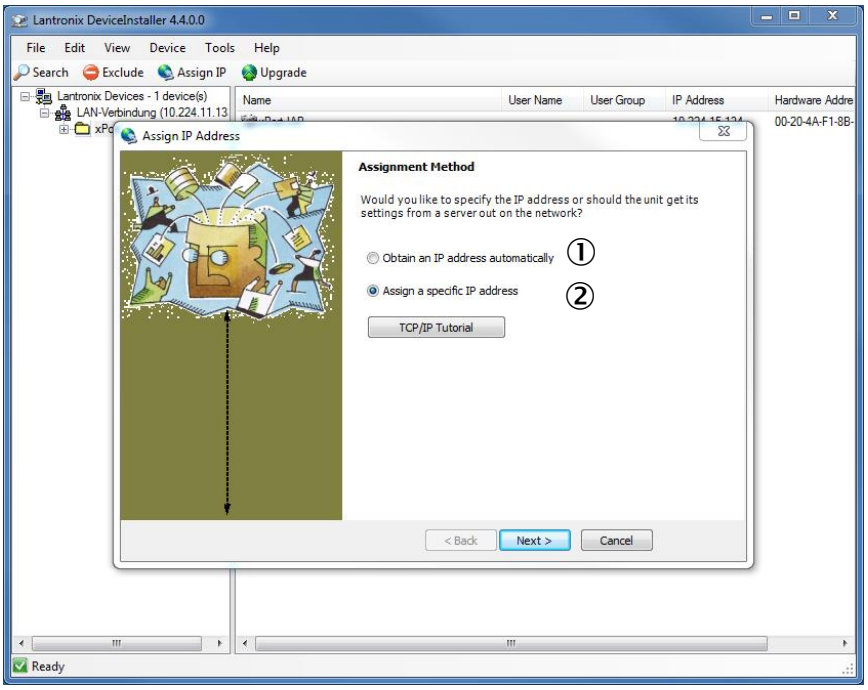


► Start the Lantronix DeviceInstaller. A network scan is performed to create a connection with the connected x port.

2.5 Setting the IP address of the interface module

1 Highlight the interface module.
2 Click *Assign IP*. The IP menu opens.
3 Select the IP address assignment

Fig 4 IP menu

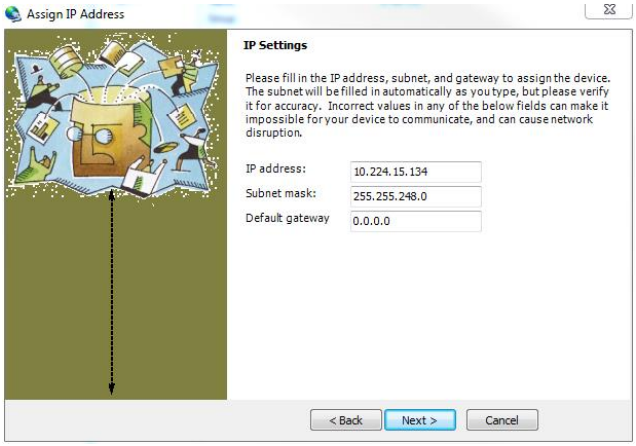


1 The IP address is automatically assigned to the interface module.
2 A specific IP address can be assigned to the interface module.

2.5.1 Entering a specific IP address

1 Select the *Assign a specific IP address* option.
2 Next > The next window opens.
3 Enter the IP address and subnet mask.
4 Next > The next window opens.
5 Assign The IP address is sent to the interface module.
6 Finish The process is now finished.

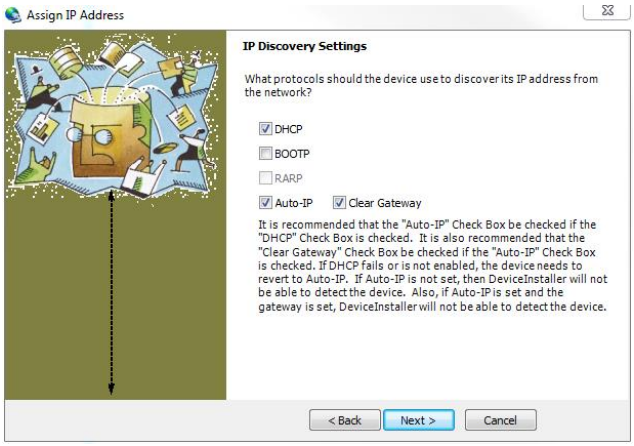
Fig 5 Assign IP address



2.5.1.1 Automatic assignment of an IP address

1 Select the *Obtain an IP address automatically* option.
2 Next > The next window opens.
3 Select the desired protocol.

Fig 6 Selecting the protocol

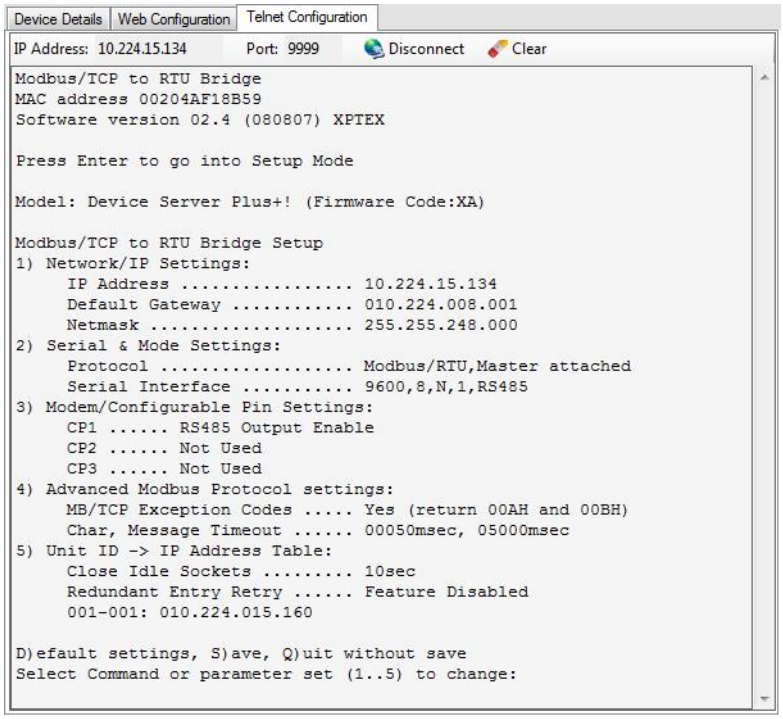


4 Next > The settings are taken over. The next window opens.
5 Assign The IP address is transferred to the interface module.
6 Finish The process is now finished.

2.6 Configuring the Modbus interface

1 Open the start window of the DeviceInstallers.
2 Double-click the desired device. The *Device Details* menu window opens. Displayed error messages can be ignored.
3 Select the *Telnet Configuration* menu tab. The Configuration menu opens
4 Connect + Enter The *Setup Mode* is now displayed

Fig 7 *Telnet Configuration* tab



You can change the network settings here, if you want to.

2.6.1 Country-specific settings

2.6.1.1 Serial & mode settings

1 Press key 2 in the *Telnet Configuration* sub-menu tab.
The setting dialog window opens.
2 Enter the following settings:
- Attached Device: 2
- Serial Protocol: 1
- Interface Type: 3
- Serial Parameters: 9600,8,N,1

Fig 8 Country-specific settings *Serial & Mode Settings*

```
Attached Device (1=Slave 2=Master) (2) 2
Serial Protocol (1=Modbus/RTU 2=Modbus/ASCII) (1) 1
Interface Type (1=RS232 2=RS422/RS485+4-wire 3=RS485+2-wire) (3) 3
Enter serial parameters (9600,8,N,1) 9600,8,N,1
```

3 Enter Confirm inputs.

2.6.1.2 Modem/configurable pin settings

1 Press key 3 in the *Telnet Configuration* sub-menu tab. The setting dialog window opens.
2 Enter the following settings:
- CP1 Function: 4
- Invert: N
- CP2 Function: 1
- CP3 Function: 1

Fig 9 Country-specific settings *Modem/Configurable Pin Settings*

```
CP1 Function (1=Unused, 2=Status LED Output, 3=RTS Output, 4=RS485 Enable) (4) 4
    Invert RS485 Output Enable (active low) (N) N

CP2 Function (1=Unused, 2=DTR Output, 3=RS485 Output Enable) (1)
CP3 Function (1=Unused, 2=Diagnostic LED Output) (1)
```

3 Enter Confirm inputs.

2.6.1.3 Advanced Modbus Settings

1 Press key 4 in the *Telnet Configuration* sub-menu tab.
The setting dialog window opens.

2 Enter the following settings:
- Use MB/TCP...: 2
- Disable Modbus...: 1
- Character Timeout: 50
- Message Timeout: 5000
- Serial TX...: 0
- Swap 4x...: N

Fig 10 Country-specific settings *Advanced Modbus Settings*

```
Use MB/TCP 00BH/00AH Exception Responses (1=No 2=Yes) (2)
Disable Modbus/TCP pipeline (1=No 2=Yes) (1)
Character Timeout (0 for auto, or 10-6950 msec) (50)
Message Timeout (200-65000 msec) (5000)
Serial TX delay after RX (0-1275 msec) (0)
Swap 4x/0H to get 3x/1x (N) N
```

3 Enter Confirm inputs.

2.6.1.4 Unit ID, IP Address Table

1 Press key 5 in the *Telnet Configuration* sub-menu tab. The setting dialog window opens.

2 Enter the following settings:
- Close Idle TCP Sockets:10
- Redundant entry...: 0
- A new IP address is added with A:
  - Modbus addr from: 1
  - Modbus addr to: 1
  - Slave IP address: Specify the four elements of the IP address of the sensor and confirm each time with Enter. In the example: 10.224.15.160

Fig 11 Country-specific setting *Unit ID, IP Address Table*

```
Close Idle TCP sockets after (3-60 sec, 0=leave open) (10)
Redundant entry retries after (15-60 sec, 0=disable feature) (0)
(Set 4th octet to 0 to use Slave Address as part of IP)


A)dd, D)elete, E)xit - select function
        Modbus addr from  (1) 1
        Modbus addr   to  (1) 1
        Slave IP address (010) 10.(224) 224.(015) 15.(000) 160

    1):      001-001: 010.224.015.160

A)dd, D)elete, E)xit - select function
```

2.6.2 Accepting changes of the country-specific settings

1 Return to *Telnet Configuration* Setup Mode.
2 Press key S.
3 Restart the interface module.

> ***NOTICE:*** **Check whether the new values were accepted.**
> Connect with the interface module after restart (via *Connect*) to check whether the data transfer was correct.

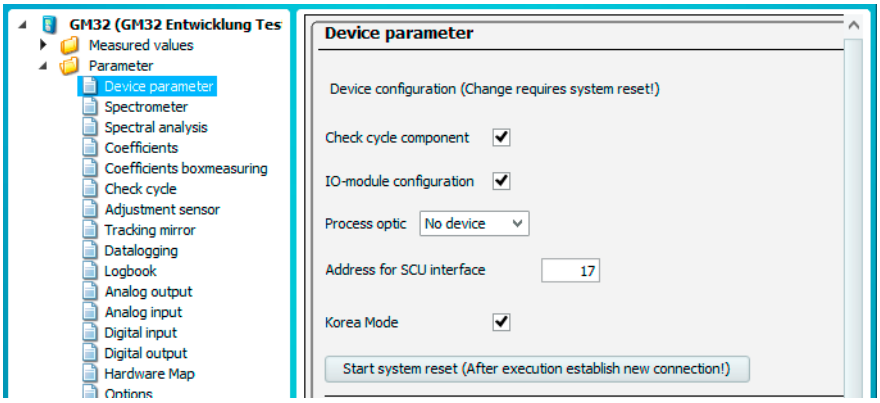
2.7 GM32 activation of Korea mode for password change via Modbus

2.7.1 Requirement

- For GM32 firmware > X076: Linux CPU
- For GM32 Firmware < X076: Install firmware, reload parameter reset and parameter backup.

2.7.2 Activating Korea mode

Fig 12 Activating Korea mode in the SOPAS Engineering Tool



A system restart must be made after activating the checkbox. The Reset button is highlighted in → p. 19, Fig 12.

***NOTICE:* Observe the effect of a device restart on the validity of the password!**

The previous passwords for all access levels are not longer valid after the device restart. Password 'NotSet' is then valid for all levels. This password can only be changed via the Modbus.

Korea mode can be disabled again at Service level. The default passwords of the device are then valid again.

2.8 Configuration without Lantronix DeviceInstaller

The configuration can also be performed without the Lantronix DeviceInstaller.
A Telnet connection must be performed manually for this purpose.

1. The *telnet IP-Adresse 9999* command must be entered in a command line and executed
2. Setup mode is opened. (The current IP address of the interface module is entered as IP address).
3. The menu navigation is identical to that of the Lantronix DeviceInstaller.

2.9 PCB console / Linux CPU

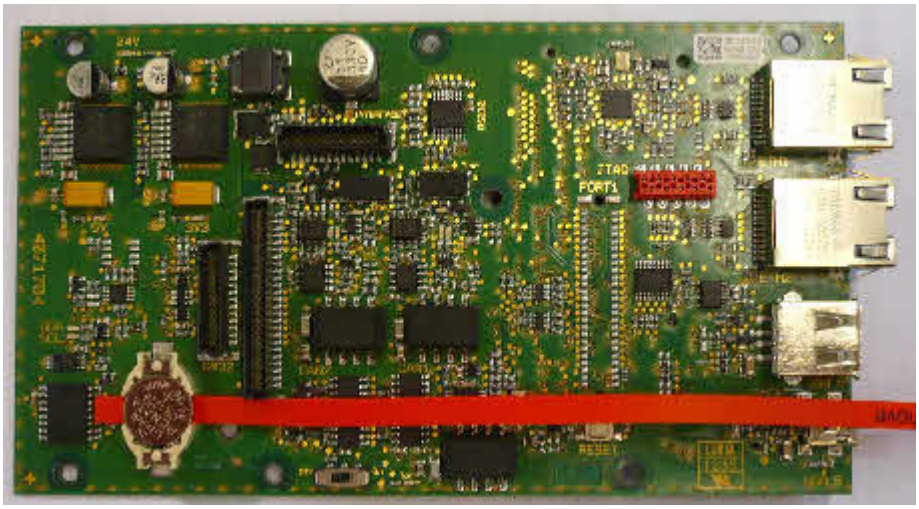
This Chapter describes the exchange of the PCB console against the Linux CPU.
See Service News from June 2013!

Part number	Description
2066624	Spare parts set modules Linux-CPU
2066625	Spare parts set PCB heating control (as required)

Auxiliary means

Auxiliary means required	Required for
EEPROM data (SMF file)	Restoring the configuration (device-specific)
Firmware (SMF file)	9172060 Firmware GM32 Linux CPU
Calibration data (SMC file)	Restoring the calibration (device-specific)
Device data (SVD file)	Restoring the device parameters (customer-specific)

Fig 13 Linux-CPU



1 Backup the SDV file
2 Make an external backup of file eeprom.dat and make it available to the manufacturer
3 Switch the GM32 off or disconnect it from the mains
4 Remove the housing (six 5 mm hexagon socket screws)
5 Remove the connections on the lamp control PCB
6 Remove retaining plate using a 3.5 mm hexagon socket
7 Disconnect PCB console from lamp control PCB
8 Remove intermediate plate (no longer required!)
9 Install Linux CPU and lamp control PCB in reverse sequence.
10 Connect Ethernet cable with upper connection
11 Remove battery fuse
12 Set the GM32/-Ex to an operational state
13 Apply voltage to the SR-unit
14 Connect the computer with SOPAS with the GM32 (basic sensor)
15 Login as Service in SOPAS.

16 Load the suitable firmware (SMF file) to GM32.

> GM32 then restarts automatically.

17 Load a suitable EEPROM file (available as SMF file) to the GM32.

> The EEPROM file is created in the factory!

18 SOPAS project tree *Maintenance / Load EPROM.*
19 SOPAS project tree *Maintenance / Reset parameter.*
20 Click “Reset parameter”.

> All parameters are reset to the factory settings!

21 SOPAS project tree *Maintenance / Operating mode switch.*
22 Click “Start system reset”.
23 Load device data into the device (SDV file).
24 Load suitable calibration data (SMC file) to the GM32.
25 Check the current data and time with SOPAS and set if required.
26 After exchanging, check the ignition protection function (only GM32-Ex).

TCP-Modbus Converter

3 Annex

Modbus register mapping

3.1 Modbus register mapping

3.1.1 Mapping of GM32 measuring components

- Modbus register for 16 components

- Address, address start and address end of further components (component 4, component 5, ...) are each incremented with 17, the sequence of the items remains the same.
- The sequence of the components depends on the GM32 configuration.

Table 1 Modbus component register (for the first 3 components)

Name	Item	Address		Data type	Register type	Comment
		Start	Width			
Component 1	Measured Value	5000	2	32 Bit float	Input register	Measuring value
	Status	5002	1	16 Bit integer	Input register	Status [0)]
	Zero Point Value	5003	2	32 Bit float	Input register	Zero point
	Span Point Value	5005	2	32 Bit float	Input register	Span point
	Start of measuring range	5007	2	32 Bit float	Input register	min of range
	End of measuring range	5009	2	32 Bit float	Input register	max of range
	Regression coefficient C0	5011	2	32 Bit float	Input register	Offset
	Regression coefficient C1	5013	2	32 Bit float	Input register	Slope
	Regression coefficient C2	5015	2	32 Bit float	Input register	Correction factor
Component 2	Measured Value	5017	2	32 Bit float	Input register	Measuring value
	Status	5019	1	16 Bit integer	Input register	Status [0)]
	Zero Point Value	5020	2	32 Bit float	Input register	Zero point
	Span Point Value	5022	2	32 Bit float	Input register	Span point
	Start of measuring range	5024	2	32 Bit float	Input register	min of range
	End of measuring range	5026	2	32 Bit float	Input register	max of range
	Regression coefficient C0	5028	2	32 Bit float	Input register	Offset
	Regression coefficient C1	5030	2	32 Bit float	Input register	Slope
	Regression coefficient C2	5032	2	32 Bit float	Input register	Correction factor
Component 3	Measured Value	5034	2	32 Bit float	Input register	Measuring value
	Status	5036	1	16 Bit integer	Input register	Status [0)]
	Zero Point Value	5037	2	32 Bit float	Input register	Zero point
	Span Point Value	5039	2	32 Bit float	Input register	Span point
	Start of measuring range	5041	2	32 Bit float	Input register	min of range
	End of measuring range	5043	2	32 Bit float	Input register	max of range
	Regression coefficient C0	5045	2	32 Bit float	Input register	Offset
	Regression coefficient C1	5047	2	32 Bit float	Input register	Slope
	Regression coefficient C2	5049	2	32 Bit float	Input register	Correction factor

3.1.2 Mapping for GM32 in general

- Modbus register for output signals, valid for all measured components

Table 2 Modbus “Common Out” register

Item	Address		Data type	Register type	Comment
	Start	Width			
Year of current time	5272	1	16 Bit integer	Input register	> 2000 1)
Month of current date	5273	1	16 Bit integer	Input register	1 – 12 1)
Day of current month	5274	1	16 Bit integer	Input register	1 – 31 1)
Hour of current time	5275	1	16 Bit integer	Input register	0 – 23 1)
Minute of current time	5276	1	16 Bit integer	Input register	0 – 59 1)
Second of current time	5277	1	16 Bit integer	Input register	0 – 59 1)
Failure [collective]	5278	2	32 Bit integer	Input register	Bit Field 2)
Maintenance required [collective]	5280	2	32 Bit integer	Input register	Bit Field 3)
Check [collective]	5282	2	32 Bit integer	Input register	Bit Field 4)
Out of Spec. [collective]	5284	2	32 Bit integer	Input register	Bit Field 5)
Extended [collective]	5286	2	32 Bit integer	Input register	Bit Field 6)
Pressure	5288	2	32 Bit float	Input register	
Temperature	5290	2	32 Bit float	Input register	
Humidity	5292	2	32 Bit float	Input register	
Lamp Current	5294	2	32 Bit float	Input register	Lamp pulse (mA)
Lamp Integration	5296	2	32 Bit float	Input register	Exposure (ms)
Temperature Optic Housing	5298	2	32 Bit float	Input register	
Temperature Spectrom-eter	5300	2	32 Bit float	Input register	
Lamp performance	5302	2	32 Bit float	Input register	
Operating state	5304	1	16 Bit integer	Input register	8).
Year of last Check cycle	5305	1	16 Bit integer	Input register	> 2000 9)
Month of last Check cycle	5306	1	16 Bit integer	Input register	1 – 12 9)
Day of last Check cycle	5307	1	16 Bit integer	Input register	1 – 31 9)
Hour of last Check cycle	5308	1	16 Bit integer	Input register	0 – 23 9)
Minute of last Check cycle	5309	1	16 Bit integer	Input register	0 – 59 9)
Second of last Check cycle	5310	1	16 Bit integer	Input register	0 – 59 9)

3.1.3 Mapping of Modbus input values

- Modbus register for input signals, valid for all measured components

Table 3 Modbus input register

Item	Address		Data type	Register type	Comment
	Start	Width			
Pressure	6000	2	32 Bit float	Holding register	
Temperature	6002	2	32 Bit float	Holding register	
Humidity	6006	2	32 Bit float	Holding register	
Password	6900	3	string	Holding register	
Pressure valid flag	6000	1	1 Bit	Coil	sticky 10)
Temperature valid flag	6001	1	1 Bit	Coil	sticky 10)
Humidity valid flag	6002	1	1 Bit	Coil	sticky 10)
Maintenance switch	6003	1	1 Bit	Coil	sticky 10)
Trigger control cycle	6004	1	1 Bit	Coil	momentary 11)
Supress control cycle	6005	1	1 Bit	Coil	sticky 10)

0) Bit field, please see Table "Status" for details. → p. 26, Table 4

1) Current date and time of the device in ISO8601 format

2) Bit field, please see Table "Failure" for details, → p. 27, Table 5

3) Bit field, please see Table "Maintenance request" for details, → p. 27, Table 6

4) Bit field, please see Table "Function check" for details, → p. 27, Table 7.

5) Bit field, please see Table "Out of Spec" for details.→ p. 27, Table 7

6) Bit field, please see Table "Extended" for details, → p. 28, Table 8

8) For Table of operating states please see Table "Operating states" for details, → p. 28, Table 9

9) Date and time of last Control check cycle for all components of the GM32

10) Sticky: functions like a switch

11) Momentary: functions like a push button

3.1.4 Table Bitmap “Status“

Table 4 Bitmap “Status“

Bit No.	Name	Comment
0	Failure	Bit=1: active
1	Maintenance request	Bit=1: active
2	Function Check	Bit=1: active
3	Out of Spec	Bit=1: active
4	Extended	Bit=1: active
5	Under range	Bit=1: active
6	Over range	Bit=1: active
7	Maintenance	Bit=1: active

Bit No.	Name	Comment
8	Check cycle	Bit=1: active
9	Reserved	Bit=1: active
10	Reserved	Bit=1: active
11	Reserved	Bit=1: active
12	Reserved	Bit=1: active
13	Reserved	Bit=1: active
14	Reserved	Bit=1: active
15	Reserved	Bit=1: active

3.1.5 Bitmap Table “Failure“

Table 5 Bitmap “Failure“

Bit No.	Name	Comment
0	EEPROM	Bit=1: active
1	Spectro com.	Bit=1: active
2	Zero com.	Bit=1: active
3	Extinction calc	Bit=1: active
4	Reference calc	Bit=1: active
5	IIR Filter	Bit=1: active
6	Interpolation	Bit=1: active
7	Filter com.	Bit=1: active
8	Mirror com.	Bit=1: active
9	Visor fault	Bit=1: active
10	Visor values	Bit=1: active
11	Zero adj. mc adj.	Bit=1: active
12	Lamp fault	Bit=1: active
13	Visor no signal	Bit=1: active
14	Mirror adj. End	Bit=1: active
15	File measval	Bit=1: active

Bit No.	Name	Comment
16	File config	Bit=1: active
17	File conditions	Bit=1: active
18	File espec	Bit=1: active
19	File cact	Bit=1: active
20	Visor com.	Bit=1: active
21	Lamp com.	Bit=1: active
22	Spectro para.	Bit=1: active
23	Eval modul com.	Bit=1: active
24	Purge air signal	Bit=1: active
25	Temp control com.	Bit=1: active
26	Temp control out of range	Bit=1: active
27	Failure eval module	Bit=1: active
28	MV failure activ	Bit=1: active
29	Reserved	Bit=1: active
30	Reserved	Bit=1: active
31	Reserved	Bit=1: active

3.1.6 Bitmap Table “Maintenance Request“

Table 6 Bitmap “Maintenance Request“

Bit No.	Name	Comment
0	Lamp performance	Bit=1: active
1	Lamp minimum parameter	Bit=1: active
2	Lamp 4Q max parameter	Bit=1: active
3	Data logging: writing data	Bit=1: active
4	Data logging: open file	Bit=1: active
5	Temp. Extern	Bit=1: active
6	Flashcard missing	Bit=1: active
7	Logbook error	Bit=1: active
8	IO com.	Bit=1: active
9	IO error	Bit=1: active
10	Spectro no answer	Bit=1: active
11	Check Cycle span drift	Bit=1: active
12	Check Cycle zero drift	Bit=1: active
13	Check Cycle wavelength drift	Bit=1: active
14	Check Cycle peak position	Bit=1: active
15	Check Cycle peak width	Bit=1: active

Bit No.	Name	Comment
16	Check Cycle cell empty	Bit=1: active
17	Temp control voltage low	Bit=1: active
18	Temp control lamp fan	Bit=1: active
19	Temp control optic fan	Bit=1: active
20	Temp control spectro fan	Bit=1: active
21	Temp control electronic temp	Bit=1: active
22	Temp control spectro temp	Bit=1: active
23	Lamp performance limit	Bit=1: active
24	Probe message	Bit=1: active
25	Reserved	Bit=1: active
26	Reserved	Bit=1: active
27	Reserved	Bit=1: active
28	Reserved	Bit=1: active
29	Reserved	Bit=1: active
30	Reserved	Bit=1: active
31	Reserved	Bit=1: active

3.1.7 Bitmap Table Function “Check“ and “Out of Specification“

The “Function Check“ and “Out of Specification“ is currently not defined

Table 7 Bitmap table for “Function Check“ and “Out of Specification“

Bit No.	Name	Comment
0 -31	not specified	Bit=1: active

3.1.8 Bitmap Table “Extended“

Additional functions, such as Alarm functions are listed in Bitmap table .

Table 8 Bitmap table for extended Functions

Bit No.	Name	Comment
0	Alarm purge air	Bit=1: active
1	Alarm optic housing temperature	Bit=1: active;
2	Alarm lamp current	Bit=1: active;
3	Alarm lamp integration	Bit=1: active;
4	Alarm pressure (pressure < 800 hPa or pressure > 1300 hPa)	Bit=1: active
5-31	Reserved	

3.1.9 Table “Operating States“

Table 9 Table “Operating states“

Value	Operating state
0	not defined
1	Initialisation
2	Measuring
3	Maintenance
4	RCycle
5	Check cycle
6	ZeroAdjust
7	Alignment
8	Boxmeasuring
9	Restart
10	Reserved
11	Reserved
12	Reserved
13	Reserved
14	Reserved
15	Reserved
16	Reserved
17	Reserved
18	Reserved
19	Reserved
20	Reserved

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