BARTH® Elektronik GmbH

Mini-PLC STG-115
Art. No. 0850-0115

MANUAL

TABLE OF CONTENT

1   SAFETY INSTRUCTIONS

This manual contains notices which you should observe to ensure your own personal safety, as well as to protect the product and the connected equipment. These notices are highlighted in the manual by a warning symbol and are marked as follows according to the level of danger:

> **Only qualified personnel should be allowed to install and work on this equipment. Qualified persons are defined as persons who are authorized to commission, to ground and to tag circuits, equipment and systems in accordance with established safety practices and standards.**
>
> **Turn off the power supply before performing any wiring operations! Short circuits can be harmful, critical and can cause explosions and serious burns!**
>
> **Please read this manual carefully and observe all safety instructions!**

2   DESTINATED USE

The Mini-PLC is designed for universal measuring, controlling and regulating applications.
It must not be used for life critical, medical or fail safe applications.

3   DISCLAIMER

BARTH Elektronik GmbH assumes no liability for usage and functionality of the Mini-PLC in case of disregarding this manual. The strict accordance of this manual is important since the installation methods, peripheral connections, usage and maintenance can not be controlled by BARTH Elektronik GmbH. Therefore BARTH Elektronik GmbH assumes no liability for any claim.

4   PRODUCT DESCRIPTION

The picture below shows the BARTH® Mini-PLC STG-115 with it´s panel mount housing (front and backside).

4.1   Features

- Compact Panel Mount Mini-PLC
- Splashproof Front Panel
- 8 analog Inputs 0 to 30 VDC
- 2 analog Inputs 0 to 10 VDC / 4 to 20 mA
- 8 Power Outputs up to 1.5 A
- 1 Relay Output 1A/30V
- Backlid LCD 2x16 Characters
- Intuitive graphical Programming Capability
- Freely programmable LCD
- Programmable Keypad (4 Keys)
- USB Interface
- Plugable Spring Terminal Connectors
- Wide Operating Temp. Range -20..+55°C
- Engineered and manufactured in Germany

4.2   Applications

- Industrial Automation
- Building Automation
- Metering and Dispensing Technology
- Environmental Technology
- Light and Show Technology

4.3   General description

The BARTH® STG-115 extends the established Mini-PLC series with graphical programming capability featuring a rugged panel mount housing with backlid LCD and four programmable enter keys.

The splashproof front panel housing in combination with the freely programmable LCD open up a variety of application fields in industrial applications.

The STG-115 does not need any peripheral components to operate. Both inputs and outputs features highly integrated and rugged protection circuits to operate the Mini-PLC in really harsh environment.

The BARTH® Mini-PLC STG-115 is also available as customer-tailored OEM version.

4.4 Programming with miCon-L

Without learning a difficult programming language the BARTH® Mini-PLC can be easily programmed using simple and vivid graphical function blocks. This block design meets graphical standards of the latest graphical programming languages.

The miCon-L software suite features programming, simulation and test in one unique software design tool. The flexible programming option offers a variety of possibilities in industrial, automotive and maritime applications.
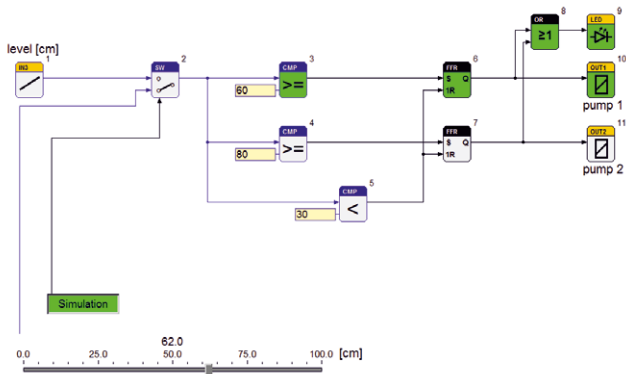
Programming the STG-115 follows using the USB port of your PC with installed miCon-L software suite.

miCon-L also supports full simulation and visualisation operation modes.

The software provides a variety of visualisation blocks and interactive elements to control and debug the Mini-PLC.
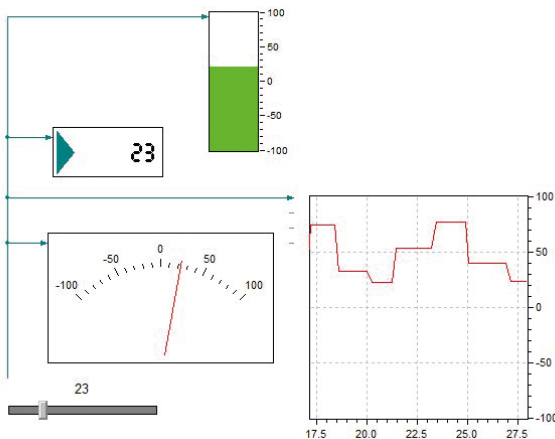
For detailed information please read the BARTH® miCon-L manual and the BARTH® Application Notes on: www.barth-elektronik.de

4.5 Delivery content

- BARTH® Mini-PLC STG-115
- Spring terminal connectors (for supply, input, output)

5 INSTALLATION

5.1 Mounting

⚠ **The STG-115 must be installed and wired by a trained technician who knows and complies with both the universally applicable engineering rules and the regulations and standards that apply in specific cases.**

The STG-115 is intended for panel mount using four M4 screws to fix the PLC.

Before mounting create a cut-out for the Mini-PLC with the dimensions 68 x 92 mm.

To fix the PLC place four holes diameter 4.5 mm with the distances 100 x 80 mm.

⚠ **To ensure the IP65 protection grade of the front panel an additional sealing is mandatory. The sealing has to be applied between the front panel and the housing.**
The 3M type 5915 is suitable for most applications.
Please verify the sealing for your application! Otherwise the degree of protection may be insufficient!
Take care to meet the environmental conditions of the STG-115.
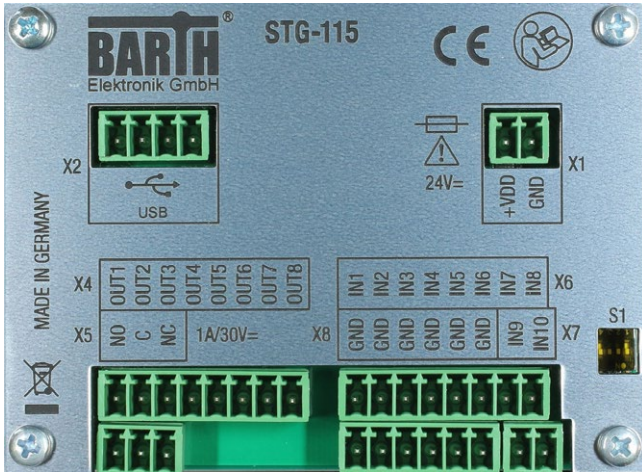
After creating the cut-out, place the Mini-PLC properly and fix it using four M4 screws.

⚠ **Only use M4 cylinder head type screws fastening the Mini-PLC, applying a maximum torque of 0.5 Nm !**
Otherwise damage of the front panel may occur !

5.2 Wiring

5.3 Overview

Connectors
- X1: Power supply (fused)
- X2: USB connection (PC interface for miCon-L)
- X4: Common output ports OUT1-OUT8
- X5: Relay output OUT9
- X6: Common input ports IN1-IN8
- X7: Special input ports IN9-IN10 (0-10V/4-20mA)
- X8: Common ground (bridged parallel)
- S1: DIP switch to configure X7 ports IN9 and IN10

5.3.1 Connecting the power supply

The STG-115 features an outstanding wide supply voltage range from 16 to 32 VDC at lowest current consumption.
So the Mini-PLC can be integrated within battery supplied 24V DC systems (cars, trucks, battery powered cars, forklifts and digger, for example).

> **Turn off the power supply before performing any wiring operations!**

> **False electrical connection, voltage reversal or disregarding the electrical specifications may cause irreversible damage of the Mini-PLC!**

Connect the supply voltage of 16 to 32 VDC to the X1 terminal named ‚+VDD' and ‚GND' of the STG-115.
Wire the positive supply to the ‚+VDD' marked terminal. The negative (ground) will be wired to the ‚GND' terminal.
All connectors are carried out as plugable spring terminal connectors for a wire gauge of 0.25 to 1.5mm².

> **Ensure correct power supply voltage range and polarisation! External fusing of 8A max. is mandatory!**
> **Disregard may cause irreversible damage of the Mini-PLC!**

5.3.2 Connecting the inputs

You can connect sensors, switches or buttons to the inputs. The sensors may be temperature, flow, pressure, photoelectric sensors or proximity switches, for example.
The STG-115 is well suitable for any sensor featuring a voltage or current loop output, 0 to 10 VDC or 4 to 20 mA, for example.

Common features of the inputs IN1-IN10 (X6, X7)
- IN1 to IN8 are selectable analog/digital inputs
- IN9 and IN10 are switchable inputs 0-10VDC or 4-20mA
- Wide input voltage range 0 to 32VDC
- Comprehensive integrated protection circuits
- Outstanding electromagnetic compatibility (EMC)
- Electrostatic discharge protection (ESD)

Due to the pull-down resistors integrated in the STG-115, any switch (NO/NC) can simply be connected between the positive supply (+VDD) of the STG-115 and the desired input.

> **The voltage at any input must not exceed 32VDC referred to ground (GND).**
> **Higher voltages or reverse voltage lower than -32VDC may cause irreversible damage of the Mini-PLC!**
> **At both IN9 and IN10 the applied signal must not exceed 12VDC or 25mA!**

The 8-pole X6 connector named ‚IN1' to ‚IN8' contains all common 0-30VDC inputs of the Mini-PLC.
The 2-pole X7 connector contains two special inputs named ‚IN9' and ‚IN10' which are DIP-switchable from 0-10VDC to 4-20mA. The default value of both inputs is 4-20mA.
To change the input IN9 from 4-20mA to 0-10V please set the switch 1 of the S1 DIP switch from ON to OFF.
To change the input IN10 from 4-20mA to 0-10V please set the switch 2 of the S1 DIP switch from ON to OFF.
Switches 3 and 4 of S1 are not related to any function.

Using the inputs IN9 and IN10 as current loop 4-20mA type a pull-down resistor of 470 Ohm is used within the STG-115 to receive a voltage from a current signal.

Using the miCon-L software suite you have to know wether or not the inputs IN9 and IN10 are configured as current loop type to recalculate the current from the received voltage value within miCon-L.

5.3.3 Connecting the outputs

Depending on load type and current the STG-115 is able to directly drive electric loads without any additional driver or protection circuit. The Mini-PLC provides 8 digital solid-state highside outputs and one isolated relay output.

Common features of outputs OUT1 to OUT8 (X6)
• Rugged solid-state higside switch up to 1.5A
• Paralleling permissible up to 6A
• Short circuit protection and current limitation
• Fast demagnetization of inductive loads
• Stable behaviour at undervoltage
• Comprehensive integrated protection circuits
• Outstanding electromagnetic compatibility (EMC)
• Electrostatic discharge protection (ESD)

Features of output OUT9 (X5)
• Relay NO/NC changeover output type 1A/30VDC
• Electrically isolated
• Outstanding electromagnetic compatibility (EMC)
• Electrostatic discharge protection (ESD)

The 9-pole connector X4 named ‚OUT1' to ‚OUT8' contains all digital outputs of the Mini-PLC. While OUT1 to OUT8 are overload-protected highside switches, OUT9 (X5) is carried out as electrically isolated relay changeover NO/NC switch. A logical HIGH within miConL will switch the Mini-PLS´s supply voltage at OUT1 to OUT8, while the isolated contact of OUT9 changes over (NC/NO-NO/NC).
Aviod a current exceeding 1A/30VDC at OUT9 because this outputs is not protected against short-circuiting or overload current !

⚠️ **The total current sourced by OUT1 to OUT8 must not exceed 6A!**
Avoid reverse voltage at any output higher than the Mini-PLC´s supply voltage!
OUT9 provides NO short circuit protection. Take care the contact current not exceeds 1A! Negligence may cause irreversible damage of the Mini-PLC!

6 OPERATION AND PROGRAMMING

To operate the STG-115 first establish proper power supply connection at both +VDD and GND terminals.
For programming and PC connection the connection cable VK-12 (Art. No. 0091-0012) and a PC with installed Windows operating system are mandatory.


Before you connect the Mini-PLC to the PC you have to install the USB-/COM-port driver (folder ‚USBdriver') from the software download package:
www.barth-elektronik.de/download/9045-0008-A.zip

Now install the miConL software suite from the ‚miCon-L' folder. Follow the setup instructions of miConL. Afterwards establish the PC connection using the VK-12 connection cable and run miConL.
For choosing the correct COM-Port please click the right button (configure serial interface) located on the main menu page and confirm the added COM-Port used by the STG-115.
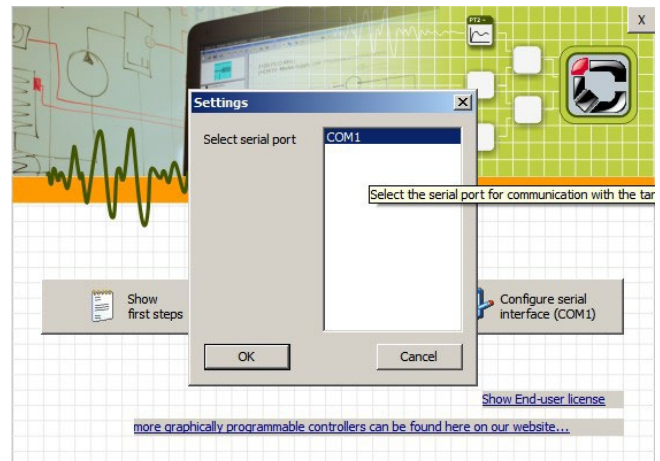
Now start miConL with creating a new project (Project->New) or open a miCon-L sample application (Project->Open).

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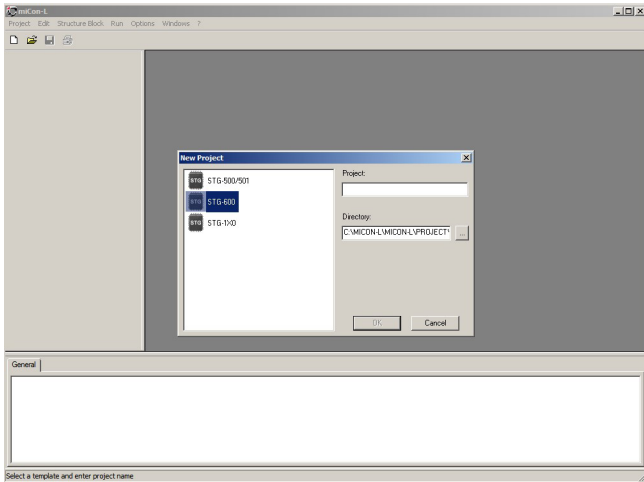
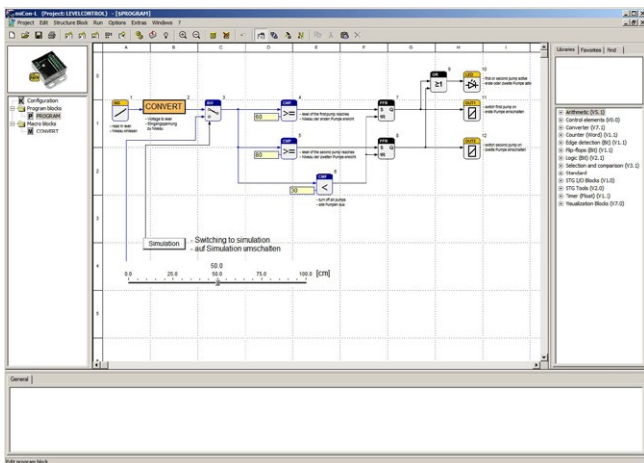Creating a new project the desired Mini-PLC model and the project name have to be defined.

After opening or creating a project the workspace of miConL with it´s libraries (right) is shown.

Additional help and a detailed user manual is provided within the miCon-L help and the miConL context menu (right mouse button).

7 APPENDIX

7.1 Specifications

7.1.1 General

Hardware design	BARTH® Mini-PLC, splashproof panel mount version, super-flat and rugged housing with plugable spring terminal connectors
Programming	miCon-L Software, graphical (function block style), simulation, programming and visualisation, free license model
Interfaces	USB reserved for miCon-L software communication only

7.1.2 Power supply

Operating voltage	16 to 32 VDC
Current consumption	< 7 mA at 32 VDC LCD backlight switched off in miCon-L application
Fusing	8 A max. (external) mandatory for voltage reversal protection
Voltage reversal protection	yes (combined with external fuse)
ESD/TVS protection	yes
Heat dissipation (at full load)	normally < 4 W

7.1.3 Inputs

Number analog	8+2
Analog input IN1 - IN8	U_{IN} = 0..30 VDC R_{IN} > 11 kOhm f_{IN} <= 100Hz t_{IN} >= 10 ms
Analog input IN9 - IN10	U_{IN} = 0 to 10 VDC R_I = 470 Ohm I_{IN} = 4 to 20 mA (DIP switchable)
Accuracy ADC IN1 - IN8	± 3% (0.5 VDC)
ADC resolution (internal)	10 Bit
Potential isolation	no (common GND)
ESD/TVS protection	yes
Permissible cable lenght (per input)	normally 40 m

7.1.4 Outputs

Number digital	8+1
Output OUT1 - OUT8	Output type: solid state $I_{OUT} <= 1{,}5$ A (resistive load) @ $f_{OUT} = 0..100$ Hz $U_{OUT} >= U_{IN}-0{,}45$ V $I_{TOT} <= 6$ A (paralleling permissible) Maximal allowable load inductance for a single switch off (one output): $V_{DD}=12VDC$, $I_L=1.5A$, $Z_L<=70mH$ $V_{DD}=12VDC$, $I_L=1A$, $Z_L<=200mH$ On-state resistance V_{DD} to OUT: $R_{ON}<=180mOhm$ Turn-on time: $t_{ON}<=250\mu s$ Turn-off time: $t_{OFF}<=270\mu s$
Relay output OUT9	Output type: NO/NC changeover $I_{NO/NC} <= 1$ A (resistive load) @ $f_{OUT} = 0..5$ Hz $U_{NC/NO} <= 30$ VDC
Potential isolation	yes

7.1.5 Display

Display Type	STN blue transmissive negative mode
Backlight	LED, lightguide, white
Display contents	16 x 2 characters
Character pitch	3.55 x 5.95 mm
Character size	2.95 x 5.55 mm
Character font	5 x 8 dots
Dot size	0.55 x 0.65 mm
Operating Temperature	-20 to +70°C

7.1.6 Electrical connection

Electrical Connection	plugable spring terminal connectors 0.25 to 1.5 mm²

7.1.7 Electromagnetic compatibility (EMC)

Electrostatic discharge (ESD) on IN1 to IN10	20 kV air discharge 30 kV contact discharge (IEC/EN 61 000-4-2, level 3)
Electrostatic discharge (ESD) on OUT1 to OUT9	8 kV (human body model) (MIL-STD883D)
Electromagnetic fields	Field strength 10 V/m (IEC/EN 61000-4-3)

7.1.8 Security features

Security Features	Watchdog (WD) Brown out detection (BOD) Power up timer (PUT)

7.1.9 Program and data memory

Flash program memory	64 k cell endurance: 10.000 min characteristic retention: 40 yrs
EEPROM data memory	1024 byte byte endurance 100.000 min. characteristic retention: 40 yrs

7.1.10 Environmental conditions

Operation temperature	-20..+60 °C (IEC 60068-2-1/2)
Storage temperature	-40..+70 °C (IEC 60068-2-1/2)
Relative humidity	5 to 95% non-condensing (IEC 60068-2-30)
Air pressure (in operation)	500 to 1500 hPa
Shock resistance	min. 50 m/s² (IEC 60068-2-27)
Vibration resistance	min. 25 m/s² @ 10..100 Hz (IEC 60068-2-6)
Degree of protection	IP 65 (EN 50178, IEC 60529) (front panel with applied sealing)
Drop	Drop height: 50mm (IEC 60068-2-31)
Free fall (packaged)	500 mm (IEC 60068-2-32)

7.1.11 Weight and dimensions

Weight	165 g (without connectors)
Dimensions	PLC: 110 x 90 x 36 mm (LxWxH) Cut-out: 68 x 92 mm (LxW) Hole distance: 100 x 80 mm Hole diameter: 4.2 mm
Mounting	via four M4 screws (only cylinder head type)

7.1.12 Ordering information

Ordering information Mini-PLC	Mini-PLC STG-115 Art. No. 0850-0115
Ordering information accessory	USB connection cable VK-12 Art. No. 0091-0012

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BARTH® Elektronik GmbH

7.2 Disposal

If you wish to finally dispose of the product, ask your local recycling centre or dealer for details about how to do this in accordance with the applicable disposal regulations.

7.3 Conformity declaration

For the following designated product it is hereby confirmed, that the construction in that technical design brought by us in traffic corresponds to the standards specified below. In the event of any alternation which has not been approved by us being made to any device as designated below, this statement shall thereby be made invalid.

Description	Mini-PLC
Type	STG-115
Art. No.	0850-0115
Directive 2004/108/EG relating to electromagnetic compatibility (EMC) CE	Applied norms: EN55022:2006+A1:2007 EN55024:1998+A1:2001 +A2:2003 EN61000-3-2:2006 +A1:2009+A2:2009 EN61000-3-3:2008 EN61000-6-2:2005
RoHS Directive 2011/65EU	We herby declare that our product is compilant to the RoHS Directive on restriction of the use of certain hazardous substances in electrical and electronic appliances.

BARTH® Elektronik GmbH

Lengerich, 10.10.2013

Dipl.-Ing. (FH) D. Barth
Managing Director

7.4 Documents, videos and software

Detailed information, additional documents, application notes and videos relating to this product are downloadable from www.barth-elektronik.de and www.micon-l.de