

**CAN Touch Display DMA-20
Art. No. 0044-0020**

MANUAL

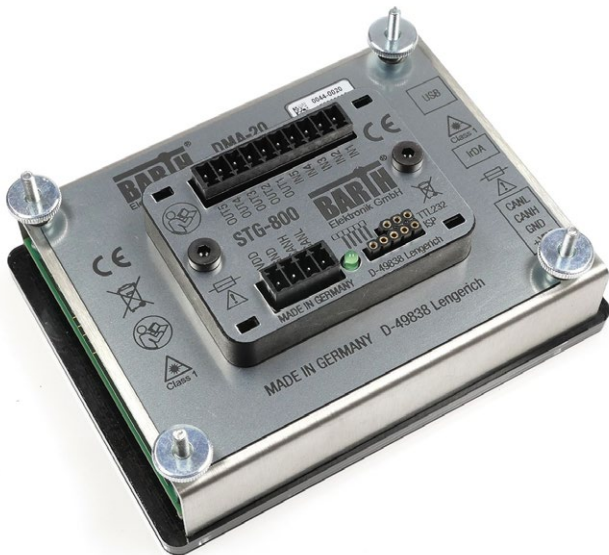


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SAFETY INSTRUCTIONS

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!

DESTINATED USE

The DMA-20 is designed for universal measuring, controlling and regulating applications. It must not be used for life critical, medical or fail safe applications.

DISCLAIMER

BARTH Elektronik GmbH assumes no liability for usage and functionality of the DMA-20 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.

1 Product description

The picture below shows the BARTH® CAN Touch Display DMA-20 (Art. No. 0044-0020).



1.1 Features

- Universal CAN Display
- Color Touch TFT 2.4" 240x320p
- LED Backlight
- Design Template Selection via CAN
- No Programming necessary
- Open Source Programming Option
- Customized Templates via USB
- Compatible with all CAN Mini-PLCs
- Backside Mini-PLC Mounting Plate
- Front IP65 Protection Grade
- Panel-Mount without visible Screws
- Panel Cut-Out (LxW): 106 x 78 mm
- Dimensions (LxW): 115 x 85 mm
- Operating Voltage 7 to 32 VDC
- Engineered and manufactured in Germany

1.2 Applications

- Industrial / Building Automation
- Automotive and Maritime Technology
- Technical Education / University
- Test Systems

1.3 General description

The splashproof 2.4" CAN Display DMA-20 allows connection to any Mini-PLC which supports a CAN interface. It's bright 240 x 320 pixel TFT display integrates resistive touch technology. Both display design and menu can be selected out of a variety of templates with one single CAN message. This feature ensures that no display programming is necessary.

The DMA-20 can be fully integrated within the graphical miCon-L Software Suite supporting any BARTH® Mini-PLC with CAN interface.

With the Open Source Programming option the DMA-20 can be easily user-customized within the powerful KEIL® µVision® Software Suite. Several Open Source, C programing templates are available for free download.

The DMA-20 is also available as customer-tailored OEM version within 8 weeks.

1.4 Programming options

The CAN Display DMA-20 can be directly connected to any BARTH® Mini-PLC providing a CAN interface. In case you use miCon-L as your favourite graphical programming tool, BARTH® provides free templates to control a DMA-20 by a STG-800 or STG-570. In the second programming option the DMA-20 is controlled by a BARTH® Open Source Mini-PLC (e.g. STG-800) which provides fully Open Source design using the powerful KEIL® µVision® Software Suite.

1.5 Delivery content

- BARTH® CAN Display DMA-20
- 1x Connector for Supply and CAN
- miCon-L Software Samples (Download)
- Open Source ,C' Templates (Download)

2 Installation

2.1 Mounting



The DMA-20 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.

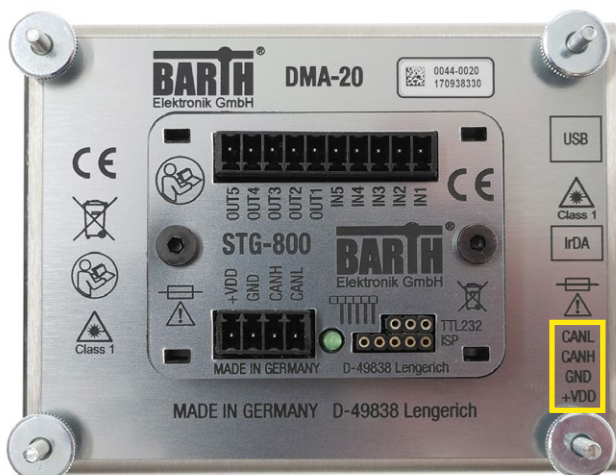
The DMA-20 is designed for panel mount use only. Please use an additional gasket (SEA-23 BARTH® Art. No. 0522-0023) to meet IP65 protection class. The measurements and dimensions are shown in the Appendix. On the backside of the DMA-20 a CAN Mini-PLC can be placed (e.g. STG-800, see picture below).

Take care to meet the environmental conditions!

2.2 Wiring

2.2.1 Overview

The graphic below shows the backside connection layout of the DMA-20 (Mini-PLC STG-800 not included).



Connector (marked yellow):

Power supply and CAN terminals

1	+VDD	positive supply (+7 to 32 VDC)
2	GND	ground terminal (GND)
3	CANH	CAN high terminal
4	CANL	CAN low terminal

2.2.2 Connecting the power supply

The DMA-20 features an outstanding wide supply voltage range from 7 to 32 VDC at lowest current consumption. So the DMA-20 can be integrated within battery supplied 12V or 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 DMA-20!

Connect the supply voltage of 7 to 32 VDC to the 4-pole terminal of the DMA-20. Wire the positive supply to the ,+VDD' marked connection. The negative (ground) will be wired to the ,GND' connection. All terminals are carried out as pluggable spring terminal connectors for a wire gauge of 0.25 to 1.5mm².



Ensure correct power supply voltage range and polarisation! External fusing of 1A max. is mandatory! Disregarding may cause irreversible damage of the DMA-20!

2.2.3 Connecting the CAN interface

The 4-pole connector of the DMA-20 also contains the CAN-specific pins ,CANH' and ,CANL'.



The voltage at CANH or CANL must not exceed -32 or +32 VDC referred to ground (GND). Higher voltages may cause irreversible damage of the Mini-PLC!

There is a 1k termination resistor integrated in the DMA-20 to ensure proper operation in direct connection to a backside-mounted BARTH® Mini-PLC.

Please refer to the appendix for detailed electrical specification of the CAN interface.

3 CAN Communication

3.1 Overview

The communication between the Mini-PLC and the DMA-20 ensures via a CAN bus setting a baud rate of 250 kBit/s. The internally filter will not process CAN messages that do not have the ID 0x7FD. Pressing a displayed button causes a CAN message to be sent on ID 0x7FC.

3.2 CAN Message Format

ID: 0x7FD
DLC: 8 Byte
Format: Intel (Byte 0 = LSB)

Byte 0	1	2	3	4	5	6	7
0x01	U8 Parameter number	I32 Value				U8 Unit	U8 Visibility of the controls masked with one bit per control
						0	0 = Parameter Number
						1 = %	1 = Value
						2 = °C	2 = Unit
						3 = °K	3 = ---
						4 = l	4 = Button ESC
						5 = ml	5 = Button UP
						6 = m	6 = Bt. DOWN
						7 = mm	7 = Button OK
						8 = kg	
						9 = g	
						10 = kN	
						11 = N	
						12 = V	
						13 = mV	
						14 = A	
						15 = mA	
						16 = kΩ	
						17 = Ω	
						18 = kW	
						19 = W	
						20 = h	
						21 = min	
						22 = s	
						23 = ms	
						24 = kHz	
						25 = Hz	

3.3 Button Functionality

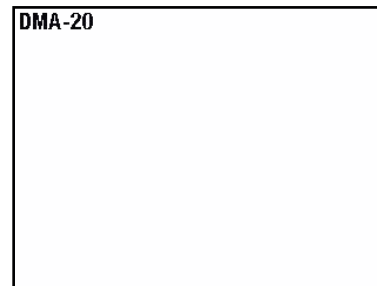
Whenever a displayed button is pressed, a CAN message is sent on the ID 0x7FC with the following content:

ID: 0x7FC
DLC: 8 Byte
Format: Intel (Byte 0 = LSB)

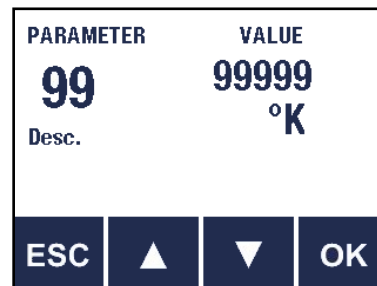
Byte 0	1	2	3	4	5	6	7
0x0001		Pressed Button: 4 = ESC 5 = UP 6 = DOWN 7 = OK				0x00	0x00

3.4 Templates

Template 0 (intro screen):



Template 1 (operation screen):



Example:

CAN message (hex)	Description
0x7FD: 01 63 9F 86 01 00 03 FF	Template: 1 Parameter: 99 (63) Value: 99999 (9F 86 01 00) Unit: °K (03) show all buttons (ESC, UP, DOWN and OK) (FF)

4 Operation with miCon-L

4.1 Software download

If you use miCon-L as your favourite graphical programming tool, BARTH® provides free templates to control a DMA-20 by the Mini-PLC STG-800 or STG-570.

The BARTH® template package is downloadable from:

<http://www.barth-elektronik.de/download/9045-0017-A.zip>

To get your free password to unzip the software package please write the following filled mail template to:

office@barth-elektronik.de

First Name:
Surname:
Company:
City:
State:
Country:
DMA-20 Serial Number:
Email Address:

Within 24h you will receive your individual password to unzip the the BARTH® software package.

Please refer to the Mini-PLC manual for miCon-L software installation and setup.

4.2 Connecting the Mini-PLC

To operate the DMA-20 with a CAN Bus Mini-PLC, first establish proper power and CAN connection between both devices. If you place the Mini-PLC on the backside of the DMA-20, a short CAN connection cable without a terminal resistor is sufficient. Please wire the ‚CANH‘ terminal of the Mini-PLC to the ‚CANH‘ terminal of the DMA-20 (see yellow marked area at the picture below). Then wire the ‚CANL‘ terminal of the Mini-PLC to the ‚CANL‘ terminal of the DMA-20. Finally establish the power supply connection to both Mini-PLC and DMA-20. The positive voltage is wired to the ‚+VDD‘ terminal, ground is connected to the ‚GND‘ terminal.



For programming and PC connection the USB connection

cable VK-16 (BARTH® Art. No. 0091-0016) and a PC with installed Windows operating system are mandatory.

For Mini-PLC connection please use the 3-way ‚TTL232‘ terminal to establish communication with the miCon-L software suite (see red marked area at the previous picture).

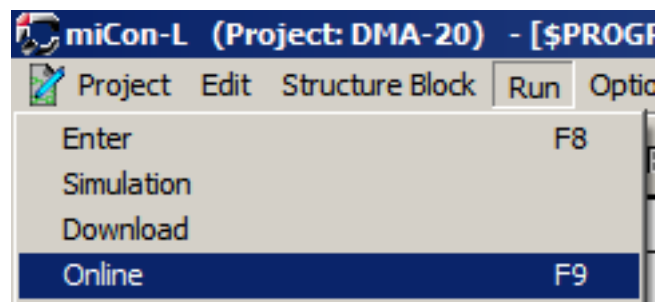
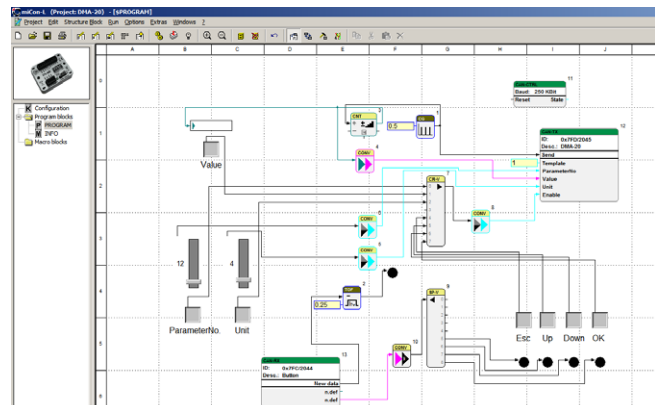
4.3 Operation

After launching the miCon-L software suite, please select the used COM port (by VK-16) first.



Now open the desired sample project from the ‚9045-0017-A.zip‘ package by selecting your favourite Mini-PLC model (STG-570 or STG-800).

The following package describes how to interface a STG-800 with a DMA-20 using a simple 2-wired CAN connection.



Now go online with your project and play with the interactive control elements at your worksheet with the DMA-20 connected. You can also modify this project.

5 Operation with KEIL® µVision®

5.1 Software download

If you have chosen 'C' as your favourite programming language, you can easily control the DMA-20 by a BARTH® Open Source Mini-PLC (e.g. STG-800) which provides fully Open Source design using the powerful KEIL® µVision® Software Suite.

Please download the KEIL® µVision® Software Suite from:

<http://www2.keil.com/stmicroelectronics-stm32/mdk>

The BARTH® template package is available from:

<http://www.barth-elektronik.de/download/9045-0014-A.zip>

The package includes free and ready-to-use sample programming templates. Each template refers to the STG-800's hardware design and contains all required port connections. To create your own project simply modify or extend one of the following programming templates.

To get your free password to unzip the software package please write the following filled mail template to:

office@barth-elektronik.de

First Name:
Surname:
Company:
City:
State:
Country:
DMA-20 Serial Number:
Email Address:

Within 24h you will receive your individual password to unzip the the BARTH® software package.

Please refer to the Mini-PLC manual for KEIL® µVision® software installation and setup.

5.2 Connecting the Mini-PLC

To operate the DMA-20 with a CAN Bus Mini-PLC, first establish proper power CAN connection between the devices. If you place the Mini-PLC on the backside of the DMA-20, a short CAN connection cable without a terminal resistor is sufficient. Please wire the 'CANH' terminal of the Mini-PLC to the 'CANH' terminal of the DMA-20 (see yellow marked area at the picture below). Then wire the 'CANL' terminal of the Mini-PLC to the 'CANL' terminal of the DMA-20.

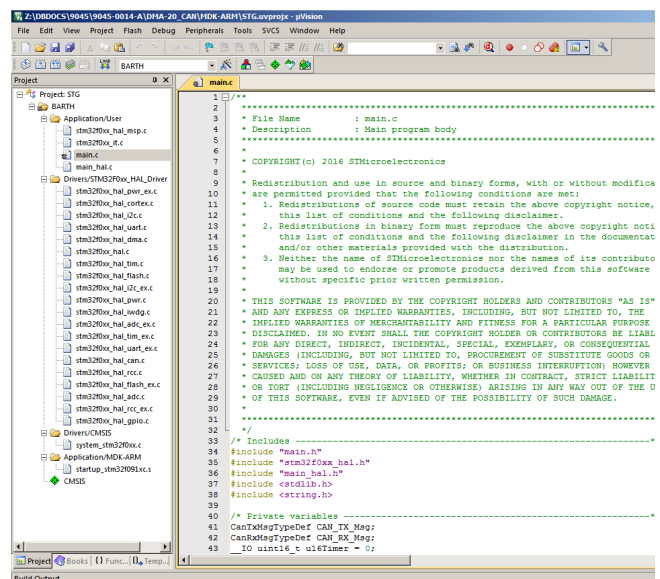
Finally establish the power supply connection to both Mini-PLC and DMA-20. The positive voltage is wired to the '+VDD' terminal, ground is connected to the 'GND' terminal. For programming connection the Open Source connection cable VK-35 (BARTH® Art. No. 0091-0035) and a Programmer (e.g. ST-Link/V2 ISOL, BARTH® Art. No. 0017-0066) are mandatory. Please use the red marked connector at the picture below to connect the programmer to the Mini-PLC.)

Please refer to the Mini-PLC manual for KEIL® µVision® programmer software installation and setup.



5.3 Operation

After launching the KEIL® µVision® Software Suite please open the Mini-PLC specific template for DMA-20 communication (e.g. 'DMA-20_CAN' from the software package ,9045-0014-A.zip).



```

1 1
2 /**
3  * File Name      : main.c
4  * Description    : Main program body
5  *
6  *
7  * COPYRIGHT(c) 2016 STMicroelectronics
8  *
9  * Redistribution and use in source and binary forms, with or without modifica
10 * are permitted provided that the following conditions are met:
11 * 1. Redistributions of source code must retain the above copyright notice,
12 *    this list of conditions and the following disclaimer.
13 * 2. Redistributions in binary form must reproduce the above copyright noti
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21 * AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE
22 * IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE
23 * ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT HOLDER OR CONTRIBUTORS BE LIAB
24 * FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL
25 * DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR
26 * SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER
27 * CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY
28 * OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE U
29 * OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.
30 *
31 *
32 */
33 /* Includes -----
34 #include "main.h"
35 #include "stm32f10x_hal.h"
36 #include "main_hal.h"
37 #include <stdlib.h>
38 #include <string.h>
39
40 /* Private variables -----
41 CanMsgTypeDef CAN_TX_Msg;
42 CanMsgTypeDef CAN_RX_Msg;
43 _IO uint16_t usTimer = 0;

```

Please refer to the Mini-PLC manual for KEIL® µVision® software installation, setup and operation.

6 Appendix

6.1 Specifications

6.1.1 General

Hardware design	BARTH® Mini CAN Touch Display, panel mount with plugable spring terminal connectors
Programming options	miCon-L Software control via CAN ,graphical (function block style), simulation, CAN programming and visualisation, free license Open Source, C-Programming control using the powerful KEIL® µVision® Software, free license
Interfaces	USB (for factory use only) CAN 2.0A/B IrDA/SIR (for factory use only)

6.1.2 Power supply

Operating voltage	7 to 32 VDC
Current consumption	100 mA @ 12 VDC 55 mA @ 24 VDC 45 mA @ 32 VDC
Fusing	1A max. (external) mandatory for voltage reversal protection
Voltage reversal protection	yes (combined with external fuse)
ESD/TVS protection	yes, integrated
Heat dissipation air (at full load)	normally < 1 W

6.1.3 Display

Technology	TFT (Thin-Film Transistor) Liquid Crystal Display Module
Size	2.4" Diagonal
Resolution	240 x 320 Pixels / 262K colors
Touch	4-wire Resistive Touch Panel
Backlight	LED white

6.1.4 Interfaces

CAN	CAN 2.0A/B: 11/29 bit ID, base frame format Baud rates: 50, 100, 125, 250, 500 kbit, 1Mbit Internal termination resistor: 1k (for direct connection to one Mini-PLC), meets or exceeds the requirements of applications ISO 11898-2, loss of ground protection from -32 V to +32 V, thermal shutdown protection
USB	1.0/2.0/3.0 (for factory use only)
IrDA	SIR (9.6 kbit/s to 115.2 kbit/s) IrPHY (for factory use only)

6.1.5 Security features

Security Features	System and independent watchdog Fail safe oscillator Power on/down reset Supply voltage supervisor
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6.1.6 Program and data memory

Memory	5Mb Flash, 196k RAM
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6.1.7 Timebase (oscillator)

Primary Oscillator	Crystal quartz MEMS unit (precise ,micro-electro-mechanical system')
Nominal Frequency	16.000 MHz
Frequency tolerance	$\pm 50 \times 10^{-6}$
Frequency aging	$\pm 5 \times 10^{-6}$ / year max.

6.1.8 Electrical connection

Electrical Connection	plugable spring terminal connectors 0.25 to 1.5 mm ² Manufacturer: Phoenix Contact Series: COMBICON Type: FMC1,5/4-ST-3,5(-BK)
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6.1.9 Electromagnetic compatibility (EMC)

Electrostatic discharge (ESD) at supply terminals	20 kV air discharge 30 kV contact discharge (IEC/EN 61 000-4-2, level 3)
Electromagnetic fields	Field strength 10 V/m (IEC/EN 61000-4-3)
CAN bus terminals (CANH, CANL to GND)	IEC 61000-4-2: Unpowered Contact Discharge ± 15000 V IEC 61000-4-2: Powered Contact Discharge ± 8000 V

6.1.10 Environmental conditions

Operation temperature	-20 to +60 °C (IEC 60068-2-1/2)
Storage temperature	-30 to 70 °C (IEC 60068-2-1/2)
Relative humidity	5 to 80% non-condensing (IEC 60068-2-30)
Air pressure (in operation)	500 to 1500 hPa
Shock resistance	min. 50 m/s ² (IEC 60068-2-27)
Vibration resistance	min. 10 m/s ² @ 10..100 Hz (IEC 60068-2-6)
Degree of protection	IP 40 (without additional gasket) IP65 (with Gasket SEA-23) (EN 50178, IEC 60529)
Free fall (packaged)	1000 mm (IEC 60068-2-32)

6.1.11 Weight and dimensions

Weight	200 g (without connectors)
Dimensions	115 x 85 x 41 mm (LxWxH)
Panel cut-out	106 x 78 mm (LxW)

6.1.12 Ordering information

Ordering information	CAN Touch Display DMA-20 Art. No. 0044-0020 GTIN 4251329401290
Ordering information accessory	Connection Cable VK-35 for Open Source programming Art. No. 0091-0035 GTIN 4251329401276
	Programmer ST-Link/V2 ISOL for Open Source programming Art. No. 0017-0066 GTIN 4251329401269
	Gasket SEA-23 for DMA-20 Art. No. 0522-0023 GTIN 4251329401344
	Mini-PLC STG-800 Art. No. 0850-0800 GTIN 4251329401207

6.2 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

6.3 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.

6.4 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	CAN Touch Display
Type	DMA-20
Art. No.	0044-0020
Directive 2004/108/EG relating to electromagnetic compatibility (EMC)	Applied norms: 2004/108/EG 2004/108/EC 2014/30/EU
CE	
RoHS Directive 2011/65EU	We hereby declare that our product is compliant to the RoHS Directive on restriction of the use of certain hazardous substances in electrical and electronic appliances.

BARTH® Elektronik GmbH
Lengerich, 17.01.2017

D. Barth

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