

**CAN Display DMA-20 lococube®**  
**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 lococube® 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
- Compatible with all lococube® 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 Connection an operation

The CAN Display DMA-20 can be directly connected to any BARTH® mini-PLC providing a CAN interface.

In case you use the miCon-L Software as you favourite graphical programming tool, BARTH® provides a free template to control the DMA-20 by a STG-8xx mini-PLC.

In the second programming option the DMA-20 is controlled by a BARTH® Open Source mini-PLC (STG-8xx) which provides fully Open Source design using the powerful KEIL® µVision® Software Suite.

Customer-tailored screens can be easily created using the EMG Embedded Menu Generator (free software tool from BARTH® Download Center).

## 1.5 Delivery content

- BARTH® CAN Display DMA-20
- Connectors for Supply and CAN Terminals

## 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.**

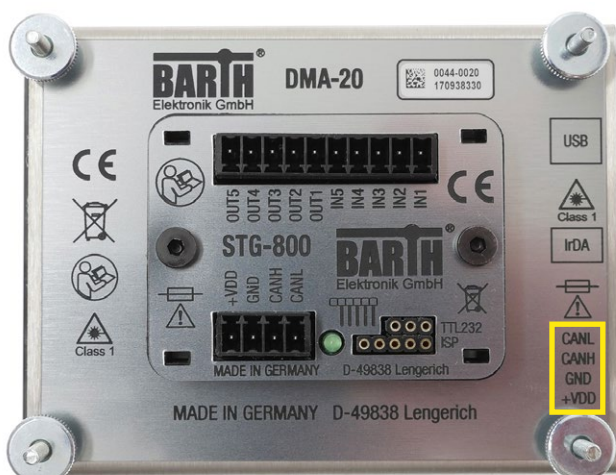
The DMA-20 is designed for panel mount use only. Please use an additional gasket (SEA-23 BARTH® Art. No. 0522-0023) to meet IP65 protection class. The measurements and dimensions are shown in the Appendix. On the backside of the DMA-20 an CAN Mini-PLC can be placed (e.g. STG-800, see picture below).

**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 plugable spring terminal connectors for a wire gauge of 0.25 to 1.5mm<sup>2</sup>.



**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 Software and operation

The communication between the mini-PLC and the DMA-20 ensures via CAN bus, setting a fixed baud rate of 250 kBit/s.



<https://www.barth-elektronik.com/en/download.html>  
 Please login and download the DMA-20 Software Package 9045-0023. Product related documents can also be found within this package.

The package includes free and ready-to-use sample programming templates. To create your own project simply modify or extend one of the following programming templates. Please login or register for free Downloadcenter access.

### 4 Operation with miCon-L

#### 4.1 Connecting the mini-PLC

To operate the DMA-20 with a CAN Bus equipped mini-PLC, first establish proper power and CAN connection between both devices. Please wire the ,CANH' terminal of the mini-PLC to the ,CANH' terminal of the DMA-20. Then wire the ,CANL' terminal of the Mini-PLC to the ,CANL' terminal of the DMA-20. Finally establish the power supply connection for both devices. The positive voltage is wired to the '+VDD' terminal, ground is connected to the 'GND' terminal. For mini-PLC 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. Please use the mini-PLC's 3-way ,TTL232' terminal to establish communication with the miCon-L software suite.

#### 4.2 Operation

After launching the miCon-L software suite, please select the used COM port (by VK-16) first. Now open the miCon-L sample project from the 9045-0023 software package. This template 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>

All product-related software packages are available from:

<https://www.barth-elektronik.com/en/download.html>

The software package 9045-0023 includes free and ready-to-use sample programming templates. To create your own project simply modify or extend one of the following programming templates. Please login or register for free Downloadcenter access.

**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 equipped mini-PLC, first establish proper power CAN connection for both devices.

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.

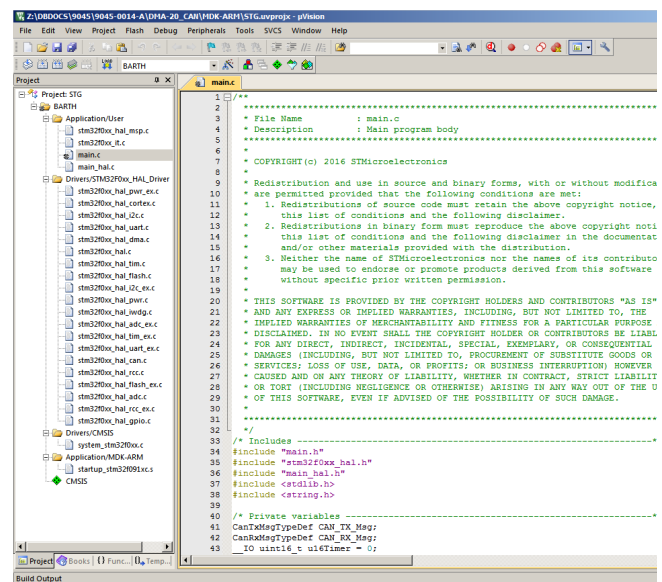
Finally establish the power supply connection for both devices. The positive voltage is wired to the '+VDD' terminal, ground is connected to the 'GND' terminal.

For programming connection a Programmer (PG-30, BARTH® Art. No. 0017-0030) is mandatory.

**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). DMA-15 and DMA-20 are compatible.



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

## 6 DMA-20 customization

The DMA-20 can also be programmed with a user-defined screen layout, selectable and controllable via one CAN message by any BARTH® Open Source mini-PLC which supports CAN bus. You only need a Open Source Programmer (PG-30, BARTH® Art. No. 0017-0030).

### 6.1 Software Download

To create a customized screen layout you have to download the **EMG Software Tool** from the BARTH Downloadcenter.

<https://www.barth-elektronik.com/en/download.html>

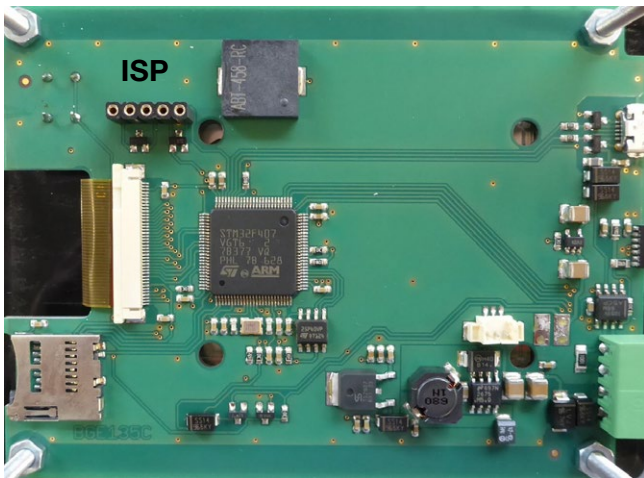
You can find the **EMG Software Tool** within the software package **9045-0023**. For programming support please read the EMG related documents within the related folder.

### 6.2 Connecting the DMA-20

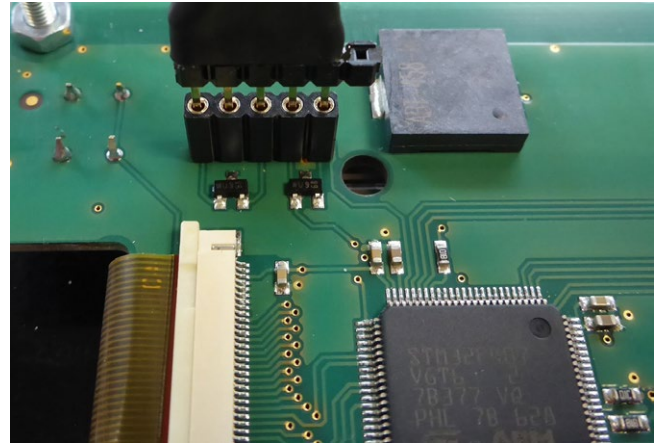
To connect the DMA-20 programming a user-defined screen layout you need the following parts:

- Power supply 7 to 32 VDC for DMA-20
- PG-30 Programmer (BARTH® Art. No. 0017-0030)
- EMG Software Tool (free Download, 9045-0023)

In the first step please locate the PG-30 programming terminal (marked: ISP).



In the second step please connect the PG-30 programmer to the DMA-20 PCB. Take care to ensure the correct pin assignment (see picture below).



Now you have to establish a power supply connection (7 to 32VDC/max.100mA).

**For EMG programming support please refer to the related documents in the software package folder.**

## 7 Appendix

### 7.1 Specifications

#### 7.1.1 General

<b>Hardware design</b>	BARTH® Mini CAN Touch Display, panel mount with plugable spring terminal connectors
<b>Programming options</b>	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
<b>Interfaces</b>	USB (for factory use only) CAN 2.0A/B IrDA/SIR (for factory use only)

#### 7.1.2 Power supply

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

#### 7.1.3 Display

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

#### 7.1.4 Interfaces

<b>CAN</b>	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
<b>USB</b>	1.0/2.0/3.0 (for factory use only)
<b>IrDA</b>	SIR (9.6 kbit/s to 115.2 kbit/s) IrPHY (for factory use only)

#### 7.1.5 Security features

<b>Security Features</b>	System and independent watchdog Fail safe oscillator Power on/down reset Supply voltage supervisor
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#### 7.1.6 Program and data memory

<b>Memory</b>	5Mb Flash, 196k RAM
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#### 7.1.7 Timebase (oscillator)

<b>Primary Oscillator</b>	Crystal quartz MEMS unit (precise ,micro-electro-mechanical system')
<b>Nominal Frequency</b>	16.000 MHz
<b>Frequency tolerance</b>	±50 × 10 <sup>-6</sup>
<b>Frequency aging</b>	±5 × 10 <sup>-6</sup> / year max.

#### 7.1.8 Electrical connection

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

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

#### 7.1.10 Environmental conditions

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

### 7.1.11 Weight and dimensions

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

### 7.1.12 Ordering information

<b>Ordering information</b>	CAN Touch Display DMA-20 Art. No. 0044-0020 GTIN 4251329401290
<b>Ordering information accessory</b>	Programmer PG-30 for Open Source programming Art. No. 0017-0030 GTIN 4251329401481
	Gasket SEA-23 for DMA-20 Art. No. 0522-0023 GTIN 4251329401344
	Mini-PLC STG-800 Art. No. 0850-0800 GTIN 4251329401207

### 7.2 Documents, videos and software

Detailed information, additional documents, application notes and videos relating to this product are downloadable from [www.barth-elektronik.com](http://www.barth-elektronik.com) and [www.micon-l.de](http://www.micon-l.de)

### 7.3 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.**

### 7.4 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.

<b>Description</b>	CAN Touch Display
<b>Type</b>	DMA-20
<b>Art. No.</b>	0044-0020
<b>Directive 2004/108/EG relating to electromagnetic compatibility (EMC)</b>	Applied norms: 2004/108/EG 2004/108/EC 2014/30/EU
<b>CE</b>	
<b>RoHS Directive 2011/65EU</b>	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



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