

100BASE-T1 Media Converter

User Manual



CHANGES

Date	Description	Created By	Review By
9.11.2020	Initial Release	VB	MM

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1 About

This document describes the use of the **100BASE-T1 Media Converter**.

P/N: 100BASE-T1-MC-ETH

Web: <https://www.machsystems.cz/en/products/embedded-networking/gateways-and-bus-converters/100base-t1-media-converter>

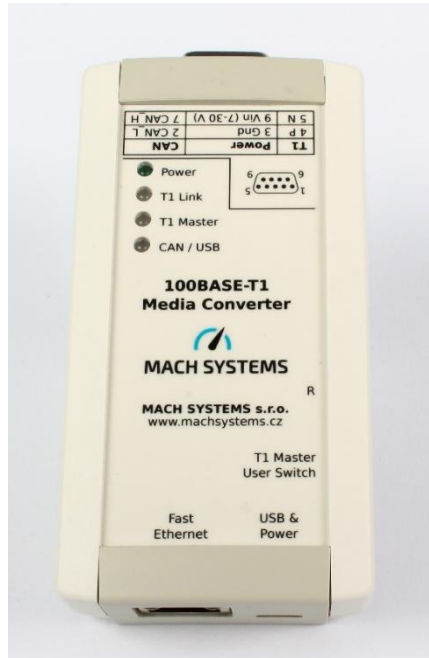


Figure 1 100BASE-T1 Media Converter

2 Introduction

The Media Converter realizes a bi-directional network connection between **100BASE-T1 (BroadR-Reach)** and **100BASE-TX (Fast Ethernet)** physical layer. The converter easily connects devices with a standard OPEN Alliance BroadR-Reach (OABR) port, such as automotive cameras or ECUs, to a standard computer network.

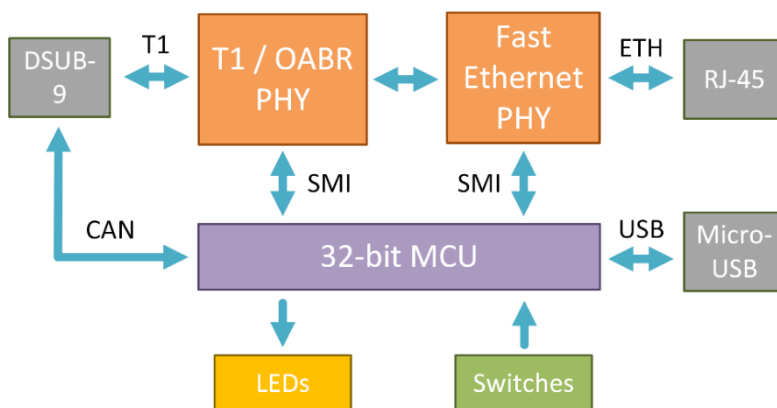


Figure 2 Block Diagram

The device establishes a point-to-point link between an unshielded twisted-pair OABR port and a Fast Ethernet port. The converter features one DSUB9 (BroadR-Reach, CAN bus), one Fast Ethernet

port with RJ-45 connector, and a Micro-USB connector (Chapter 4.1). The OABR channel is configurable as either Master or Slave by a switch button or programmatically, and the device can be powered either via DSUB connector or via USB. (Chapter 4.2)

The converter offers a possibility to access SMI registers of both transceivers (PHYs) via a CAN bus or a USB's virtual serial port. (Chapter 4.3) This enables the user to evaluate signal strength, detect polarity of the T1 port, carry out a BroadR-Reach media test to diagnose cable errors, fine-tune the PHYs parameters, and generally to read and write the registers.

2.1 Features

- Physical Layer conversion between 100BASE-T1 and 100BASE-TX
- Master / Slave configuration for OABR
- Automatic polarity detection for Slave
- 6 Status LEDs
- Powered via DSUB9 or Micro-USB connector
- PHY SMI registers accessible via CAN bus or USB virtual serial port
- Table or DIN-rail mount

3 Technical Specification

Electrical	
Ports	1x 100BASE-T1 (BroadR-Reach / OABR) 1x 100BASE-TX (Fast Ethernet) 1x CAN bus 1x Virtual COM Port (USB CDC)
Power	9 - 30 V DC with polarity protection either via DSUB or Micro-USB
Consumption	150mA @ 12 V approx. 2 W
LEDs	5x Status Indicator 1x Power
Button and Switches	2x DIP switch (Master/Slave, User) 1x Tactile switch (Reset factory defaults)
Transreceivers	100BASE-T1: TJA1102 100BASE-TX: KSZ8041
Firmware	Upgradable via USB
Microcontroller	32-bit
Mechanical	
Connectors	1x D-SUB9M 1x RJ-45 1x Micro-USB
Dimensions (L x W x H)	108 x 54 x 30 mm
Weight	83 g
Operating Temperature	0 to 70 °C
Protection	IP20
Placement	Table (adhesive pads included) DIN-rail mount (clip sold separately)

Table 1 Technical Specification

4 Device Description

4.1 Overview

The converter has three connectors, six LEDs (4 on top, 2 on RJ-45 connector), two DIP switches and a reset button.

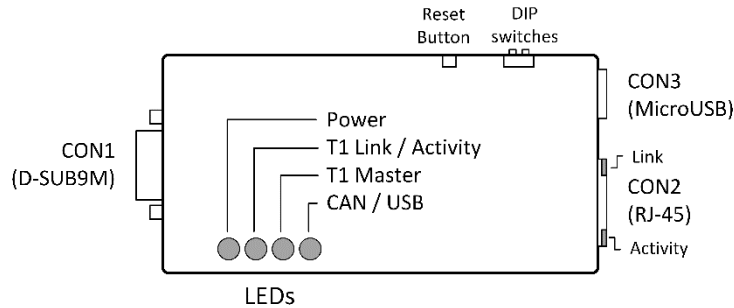


Figure 3 Top View

4.2 Power

The device can be powered over CON 1: pins 3 and 9 or over CON 2: USB Type – B. See Chapter 4.8 for information on galvanic isolation.

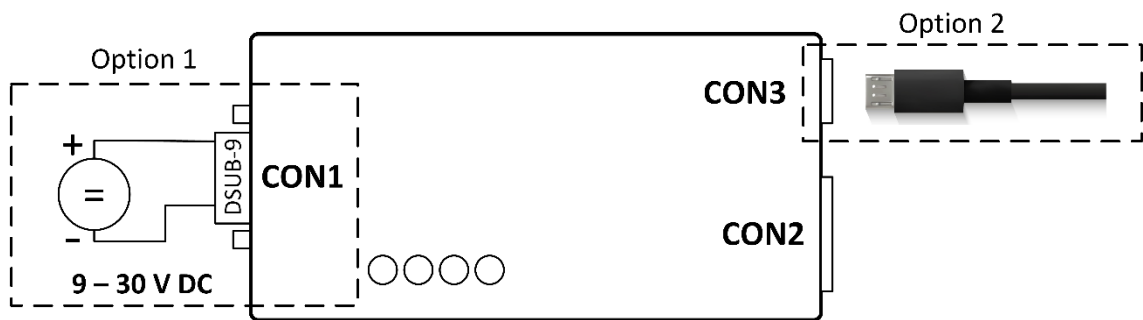


Figure 4 Power Options

4.3 Media Conversion

Connect 100BASE-T1 network over CON1 (DSUB9M) pins 4 (BP - Positive) and 5 (BM - Negative). Connect 100BASE-TX (Fast Ethernet) network over CON2 (RJ-45). Do not forget to select the select T1 Master/Slave configuration depending on your use case (Chapter 4.4.2), and to power the device (Chapter 4.2).

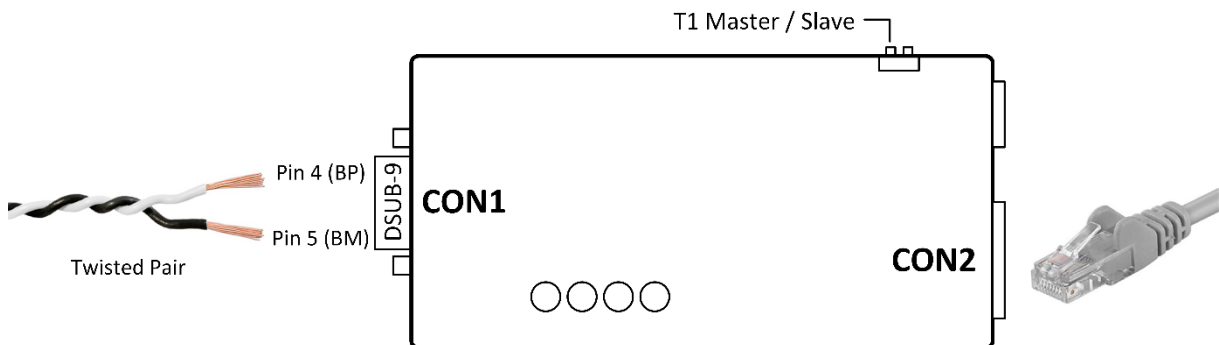


Figure 5 Power Options

4.4 Pinout

4.4.1 CON 1

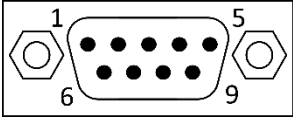
DSUB 9 Male	Pin	Name
 <p>Front view</p>	1	
	2	CAN_L
	3	GND / Power-
	4	T1-BP (OABR)
	5	T1-BM (OABR)
	6	
	7	CAN_H
	8	
	9	Power+ (or via Micro-USB)

Table 2 Connector 1 - Pin Assignment

4.4.2 DIP Switches

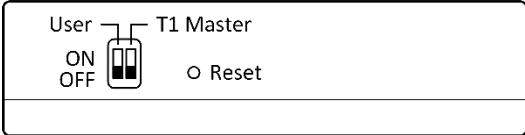
DIP switches	Pin	Name
	T1 Master	Master/Slave configuration
	User	N/A; Currently unused

Table 3 DIP Switch - Pin Assignment

Note: To set the T1 mode to Master, switch T1 Master dip switch to „ON“ (up) position.

4.4.3 CON 2 & 3

Both RJ-45 and Micro-USB connectors use the standard pinouts. From left on RJ-45 port is yellow and green LED. RJ-45 connector is galvanically isolated (Chapter 4.8). USB can be used for diagnostic purposes (Chapter 5.2). The 100BASE-T1 Media Converter forwards Ethernet communication packets between 100BASE-T1 and 100BASE-TX ports only.

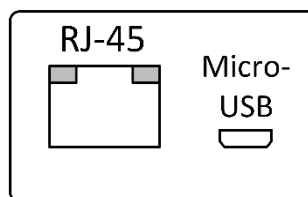


Figure 6 Connector 2 and 3 - Pin Assignment

4.5 LED Status Information

The six LEDs provide the following status information:

LED	Colour	State	Meaning
Power	Green	Off	The device is not powered
		On	The device is powered
T1 Link / Act	Green	Off	Link is not established
		On	Link is established
		Blinking	Link activity
T1 Master	Green	Off	Slave
		On	Master
Communication CAN/USB	Green	Flash	Request received
		On	USB enumerated
		Off	USB connection is not active
Communication RJ-45	Yellow	Blinking	Communication packet received
		Off	Data transfer is not active
	Green	On	Transmission is active
		Off	Transmission is not active

Table 4 LED Function Description

4.6 CAN Bus Termination

Status information of the 100BASE-T1 Media Converter can be obtained over USB or CAN bus. In case of a CAN bus connection, there is no internal termination resistor inside the device. Therefore, a proper termination of the CAN bus is needed. The user needs to make sure the CAN bus is properly terminated at both ends.

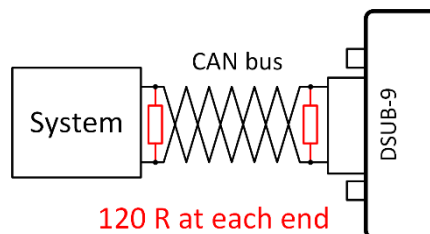


Figure 7 CAN Bus Termination

4.7 Factory Reset

The reset button is located on the side of the device (see Figure 3). For resetting to factory defaults, power the device, wait a few seconds and then press and hold the button for 10 seconds. The button can be pressed by tweezers or a pencil.

4.8 Galvanic Isolation

The Fast Ethernet (RJ-45) port is the only port of the device with galvanic isolation. Please be ware that if you for example connect the device to a PC over USB, the ground signal of T1 link will be connected to the USB port's ground.

5 Usage

The Media Converter offers a plug&play bi-directional connection between 100BASE-T1 and 100BASE-TX port. USB and CAN bus can be used for diagnostic purposes.

5.1 100BASE-T1 to 100BASE-TX Conversion

Purpose of the device is to inter-connect 100BASE-T1 (BroadR – Reach) and 100BASE-TX (Fast Ethernet) physical layers.

Power up the Media Converter as described in Chapter 4.2. The green Power LED will light up.

Select T1 Master/Slave mode as desired - either by hardware (set the Master/Slave DIP switch to ON or OFF) or by software (Chapter 5.2).

Connect your Fast Ethernet network to the RJ-45 connector. Yellow and green LED on RJ-45 is now in state “On”. Yellow LED on RJ-45 port and green LED on T1 Link Act flashes, when is a communication packet received.

When USB is connected to the computer, the Green LED on CAN/USB is enabled.

5.2 Diagnostic over USB

When connect the media converter to PC over USB, it will be enumerated as a virtual COM port. Windows 10 operating system and newer is supported.

The 100BASE-T1 Media Converter Utility PC application allows to read the status of the device. The utility can be downloaded from www.machsystems.cz/en/support .

Run “100BASE-T1 Media Converter.exe”. Now you see window of Windows application as shown below. To start monitoring, click once on button „Connect”.

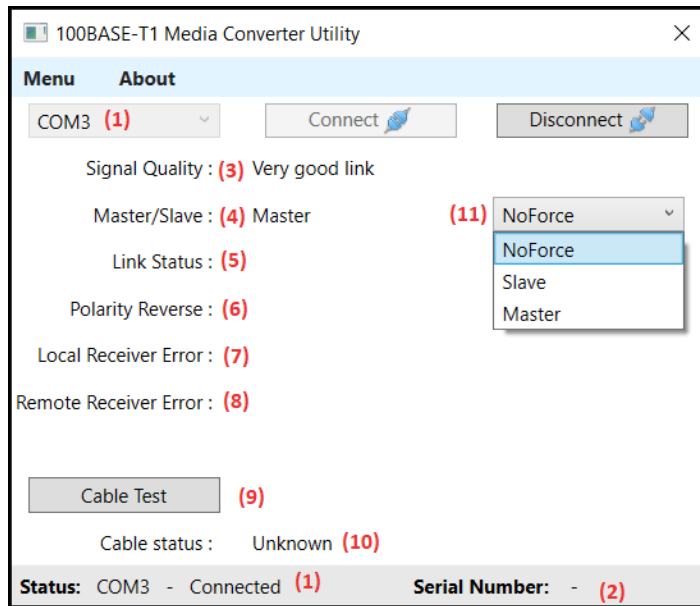


Figure 8 Media Converter Utility

- (1) COM port number of the device
- (2) Device's serial number
- (3) T1 signal quality
- (4) current T1 mode
- (5) T1 link status
- (6), (7), (8) T1 link errors
- (9), (10) T1 port cable test
- (11) T1 Master / Slave forcing

Note: Mode of the Media Converter can be changed by software (11) or by hardware (set DIP switch T1 Master to position „ON“ for User mode „Master“).

6 Firmware Update

For updating the device's firmware, you will need a .MSF firmware file, MsFirmwareUpdater application, a Micro-USB cable, and a PC.

6.1 Preparations

The device's firmware can be updated over USB. To do so, connect your Media Converter to the PC over USB. If you are connecting your product to the computer for the first time, it takes a little bit more time than usual. Please download the MsFirmwareUpdater application and the MSF firmware file from our support page www.machsystems.cz/en/support and extract all files into a new folder.

Run "MsFirmwareUpdater.exe". Now you can see window of the Windows application. Click on button "Load from File" and select the .msf file which you downloaded previously. Details of the .msf file will be shown. Make sure both "Variant Id check" and "New Protocol" checkboxes are checked.

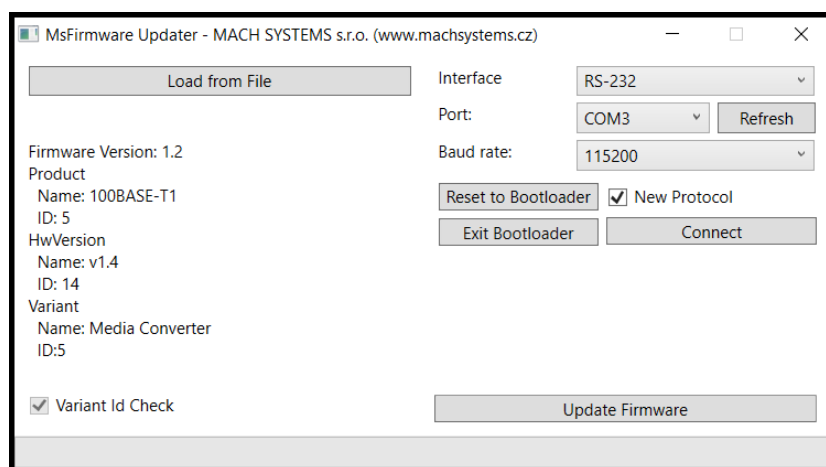


Figure 9 MsFirmwareUpdater - Main Window

Select RS-232 interface and the correct COM port. It is recommended to use baud rate of 115200.

6.2 Updating Process

Steps:

1. Make sure "New Protocol" checkbox is checked.
2. Click "Reset to Bootloader".
Wait until the device is enumerated (usually 5 - 15 seconds).
3. The device will switch into bootloader mode and a new COM port will be added.
4. Click on "Refresh" button so that the new port is available in drop-down.
5. Select a different COM port than you found in default settings from the dropdown.
6. Click "Connect".
7. Click "Update Firmware" and wait until the flashing is finished.
Progress bar in the bottom shows flashing progress.
8. Once finished, a pop-up windows will be shown. Click "OK".

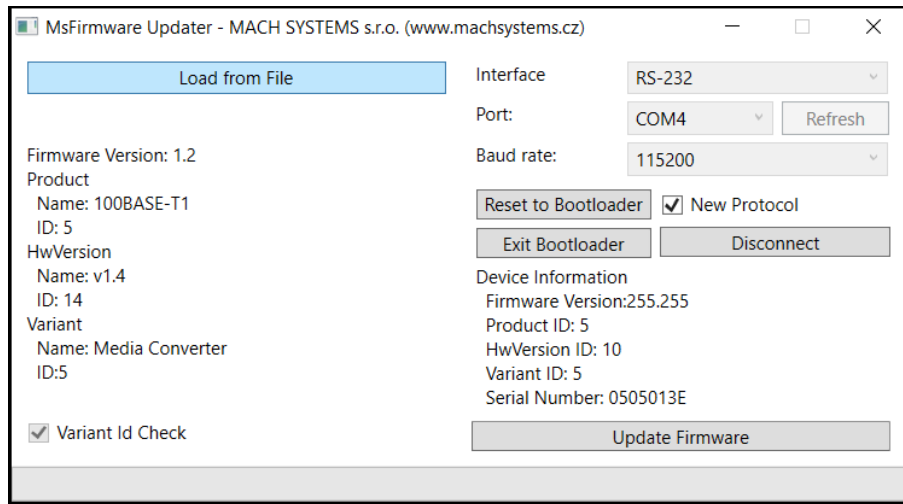


Figure 11 MsFirmwareUpdater - Device Connected

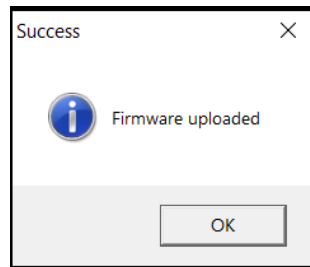


Figure 10 MsFirmwareUpdater - Firmware Update Succeeded

7 Legal Information

7.1 Usage Warning

WARNING FOR ALL USERS

WARNING! - YOUR USE OF THIS DEVICE MUST BE DONE WITH CAUTION AND A FULL UNDERSTANDING OF THE RISKS!

THIS WARNING IS PRESENTED TO INFORM YOU THAT THE OPERATION OF THIS DEVICE MAY BE DANGEROUS. YOUR ACTIONS CAN INFLUENCE THE BEHAVIOR OF A DISTRIBUTED EMBEDDED SYSTEM, AND DEPENDING ON THE APPLICATION, THE CONSEQUENCES OF YOUR IMPROPER ACTIONS COULD CAUSE SERIOUS OPERATIONAL MALFUNCTION, LOSS OF INFORMATION, DAMAGE TO EQUIPMENT, AND PHYSICAL INJURY TO YOURSELF AND OTHERS. A POTENTIALLY HAZARDOUS OPERATING CONDITION IS PRESENT WHEN THE FOLLOWING TWO CONDITIONS ARE CONCURRENTLY TRUE: THE PRODUCT IS PHYSICALLY INTERCONNECTED TO A REAL DISTRIBUTED EMBEDDED SYSTEM; AND THE FUNCTIONS AND OPERATIONS OF THE REAL DISTRIBUTED EMBEDDED SYSTEM ARE CONTROLLABLE OR INFLUENCED BY THE USE OF THE CAN NETWORK. A POTENTIALLY HAZARDOUS OPERATING CONDITION MAY RESULT FROM THE ACTIVITY OR NON-ACTIVITY OF SOME DISTRIBUTED EMBEDDED SYSTEM FUNCTIONS AND OPERATIONS, WHICH MAY RESULT IN SERIOUS PHYSICAL HARM OR DEATH OR CAUSE DAMAGE TO EQUIPMENT, DEVICES, OR THE SURROUNDING ENVIRONMENT.

WITH THIS DEVICE, YOU MAY POTENTIALLY:

- CAUSE A CHANGE IN THE OPERATION OF THE SYSTEM, MODULE, DEVICE, CIRCUIT, OR OUTPUT.
- TURN ON OR ACTIVATE A MODULE, DEVICE, CIRCUIT, OUTPUT, OR FUNCTION.
- TURN OFF OR DEACTIVATE A MODULE, DEVICE, CIRCUIT, OUTPUT, OR FUNCTION.
- INHIBIT, TURN OFF, OR DEACTIVATE NORMAL OPERATION.
- MODIFY THE BEHAVIOR OF A DISTRIBUTED PRODUCT.
- ACTIVATE AN UNINTENDED OPERATION.
- PLACE THE SYSTEM, MODULE, DEVICE, CIRCUIT, OR OUTPUT INTO AN UNINTENDED MODE.

ONLY THOSE PERSONS WHO:

(A) ARE PROPERLY TRAINED AND QUALIFIED WITH RESPECT TO THE USE OF THE DEVICE,

(B) UNDERSTAND THE WARNINGS ABOVE, AND

(C) UNDERSTAND HOW THIS DEVICE INTERACTS WITH AND IMPACTS THE FUNCTION

AND SAFETY OF OTHER PRODUCTS IN A DISTRIBUTED SYSTEM AND THE APPLICATION FOR WHICH THIS DEVICE WILL BE APPLIED, MAY USE THE DEVICE.


PLEASE NOTE THAT YOU CAN INTEGRATE THIS PRODUCT AS A SUBSYSTEM INTO HIGHER-LEVEL SYSTEMS. IN CASE YOU DO SO, MACH SYSTEMS s.r.o. HEREBY DECLARES THAT MACH SYSTEMS s.r.o.'s WARRANTY SHALL BE LIMITED TO THE CORRECTION OF DEFECTS, AND MACH SYSTEMS s.r.o. HEREBY EXPRESSLY DISCLAIMS ANY LIABILITY OVER AND ABOVE THE REFUNDING OF THE PRICE PAID FOR THIS DEVICE, SINCE MACH SYSTEMS s.r.o. DOES NOT HAVE ANY INFLUENCE ON THE IMPLEMENTATIONS OF THE HIGHER-LEVEL SYSTEM, WHICH MAY BE DEFECTIVE.

7.2 Disposal and Recycling Information



When this product reaches its end of life, please dispose of it according to your local environmental laws and guidelines.

7.3 Declaration of Conformity


MACH SYSTEMS

EU Declaration of Conformity (DoC)

We

Company Name	MACH SYSTEMS s.r.o.	City	Prague
Postal Address	Pocernicka 272/96	Country	Czech Republic
Postcode	108 00		

declare that the DoC is issued under our sole responsibility and belongs to the following products:

100BASE-T1 Media Converter
100BASE-T1 USB Interface

Objects of the declaration:

Product	Product Number
100BASE-T1 Media Converter	100BASET1-MC-ETH
100BASE-T1 USB Interface	100BASET1-USB-IF

The objects of the declaration described above is in conformity with the relevant Union harmonisation legislation:

2014/30/EU - EMC Directive
2011/65/EU - RoHS (recast)


The following harmonised standards and technical specifications have been applied:

EN 55032	EN 61000-4-2
EN 63000	EN 61000-4-4

Signed for and on behalf of: MACH SYSTEMS s.r.o.

Place of issue: Prague, Czech Republic

Date of issue: November 20th 2020

Signature: 

Name, function: Miroslav Machacek, Managing Director

MACH SYSTEMS s.r.o.
www.machsystems.cz

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Kvaser is a registered trademark of Kvaser AB in Sweden and other countries.

8 Ordering Information

Product Number	Description
100BASET1-MC-ETH	Media Converter
DIN-CLIP	Clip for mounting on a DIN rail

Table 5 Ordering numbers

9 Contact

MACH SYSTEMS s.r.o.

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info@machsystems.cz

Czech Republic



Company registration: 29413893

EU VAT number: CZ29413893