Instruction handbook

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BAUMÜLLER

**Control system
PLC mc 40**

C E

Read the Instruction handbook before starting any work!

Preliminary information

Warning Insofar as this document is identified as being preliminary information, the following applies:

this version is regarded as providing advance technical information to users of the described devices and their functions at an early enough time in order to adapt to any possible changes or expanded functionality.

This information must be regarded as being preliminary, as it has not yet passed through Baumüller's internal review process. In particular, this information is still subject to changes, thus no legal liability can be derived from this preliminary information. Baumüller assumes no liability for damages that might arise from this possibly faulty or incomplete version.

If you detect or suspect any content errors and/or major form errors in this preliminary information, we request that you notify the Baumüller support specialist responsible for you. Please provide us, via this employee, with your insights and comments so that we can take them into account and include them when transitioning from the preliminary information to the final information (as reviewed by Baumüller).

The conditions stipulated in the following section under „Obligatory" are invalid in case of preliminary information.

Obligatory

This Instruction handbook are a part of the equipment/machine. This Instruction handbook must be available to the operator at all times and must be in legible condition. If the equipment/machine is sold or moved another location, this Instruction handbook must be passed on by the owner together with the equipment/machine.

After any sale of the equipment/machine, this original and all copies must be handed over to the buyer. After disposal or any other end use, this original and all copies must be destroyed.

When the present Instruction handbook is handed over, corresponding sets of Instruction handbooks of a previous version are automatically invalidated.

Please note that the specifications/data/information **are current values according to the printing date**. These statements are **not legally binding** with regard to measurements, computation or calculations.

Baumüller Nürnberg GmbH reserves the right, in developing its products further, to change the technical specifications and handling of it products concerned without prior notice.

No liability can be accepted concerning the correctness of this Instruction handbook unless otherwise specified in the General Conditions of Sale and Delivery.

Table of Contents

GENERAL

1.1 Information on this Instruction handbook

This Instruction handbook provides important information on handling the device. A prerequisite for safe work is compliance with all specified safety notes and procedural instructions.

Additionally, the valid accident prevention regulations and general safety regulations applicable to the scope of application the device must be complied with.

Read this Instruction handbook, particularly the safety notes chapter, completely before beginning any work on the device. This Instruction handbook is part of the product and must be kept accessible to personnel at all times in the immediate vicinity of the device.

1.2 Key to symbols

Warning notes

Warning notes are identified by symbols in this Instruction handbook. The notes are introduced by signal words that express the extent of the danger.

It is imperative that these notes be complied with and are conscientiously regarded in order to prevent accidents, personal injury and material damage.

DANGER!

....this indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING!

....this indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION!

....this indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE!

....indicates a hazardous situation which, if not avoided, may cause material damage.

**Recommen-
dations**

NOTE!

....highlights useful hints and recommendations, as well as information for the efficient and trouble-free use.

1.3 Limitation of liability

All specifications and notes in this Instruction handbook were compiled taking into account the applicable standards and regulations, the state of the art and our knowledge and experience of many years.

The manufacturer assumes no liability for damages due to:

- noncompliance with the Instruction handbook
- usage for other than the intended purpose
- usage by untrained personnel

The actual scope of delivery can vary in case of optional equipment, laying claim to additional order options, or on account of the latest technical changes to the explanations and representations described herein.

The user bears the responsibility for performing service and commissioning in accordance with the safety regulations of the applicable standards and all other relevant governmental or local regulations referring to the dimensioning and protection of conductors, grounding, disconnectors, overcurrent protection, etc.

The person who carried out the mounting or installation is liable for any damage, which incurred when assembling or connecting the device.

1.4 Copyright protection

The Instruction handbook must be treated confidentially. It is to be used exclusively by personnel who work with the device. The consignment of the Instruction handbook to third persons without the written permission of the manufacturer is prohibited.

	NOTE!
	The specific contents, text, drawings, images and other representations are copyrighted and subject to industrial property rights. Any prohibited usage is punishable by law.

EnDat®	is a registered trademark of Dr. Johannes Heidenhain GmbH, 83301 Traunreut, Germany
EtherCAT®	is a registered trademark of Beckhoff Automation GmbH, 33415 Verl, Germany
Hiperface®	is a registered trademark of SICK STEGMANN GmbH, 78166 Donaueschingen, Germany
Intel®	is a registered trademark of Intel Corporation, Santa Clara, CA 95054-1549. USA
Intel Atom™ **Intel Core**™	is a registered trademark of Intel Corporation
HDMI	High Definition Multimedia Interface; Interface for digital image and sound transmission - is liable to license

	NOTE!
	Please note, that BAUMÜLLER is not responsible to examine whether any (industrial property) rights of third parties are infringed by the application-specific use of the BAUMÜLLER products/components or the execution.

1.5 Spare parts

	WARNING!
	False or flawed spare parts can lead to damage, malfunction or complete failure, thus endangering safety.
	Therefore:
	● Only use original spare parts of the manufacturer.

Procure spare parts through an authorized dealer or directly from the manufacturer.

See also ▷Accessories and Spare parts◁ from page 69.

1.6 Disposal

Insofar as no take-back or disposal agreement has been made, please disassemble units correctly and properly recycle the constituent parts.

1.7 Guarantee provisions

The guarantee provisions are stated in a separate document of the sales documents.

The devices described herein may only be operated in accordance with the stipulated methods, procedures and conditions. Anything else not presented here, including the operation of devices in mounted positions, is not permitted and must be cleared with the plant on a case-by-case basis. If the devices are operated in any other manner than as described within this Instruction handbook, then all guarantee and warranty rights are rendered null and void.

1.8 Customer service

Our customer service is available to provide you with technical information.

Info on the responsible contact persons is available at all times via telephone, fax, mail or the Internet.

1.9 Terms used

The term „device" is also used in this documentation for this Baumüller product „**Control system PLC mc 40**".

1.10 Applicable documents

Components of other manufacturers are integrated into the device. For these purchased parts, hazard assessments have been performed by the respective manufacturers. The compliance of the design construction with the applicable European and national regulations has been declared for the components by the respective manufacturers.

1.11 List of associated documentations

	Doc. No.	Part No. German	Part No. English
Application handbook Control system PCC-04	5.16008	462103	462104
Application handbook EtherCAT	5.10030	440084	440085

SAFETY

This section provides an overview of all of the important safety aspects for optimum protection of personnel as well as for the safe and problem-free operation.

2.1 Contents of the Instruction handbook

Each person who is tasked with performing work on or with the device must have read and understood the Instruction handbook before working with the device. This also applies if the person involved with this kind of device or a similar one, or has been trained by the manufacturer.

2.2 For your safety

Your new Baumüller product was developed and tested carefully to provide all features necessary to ensure its compliance with electrical safety requirements. It was also designed for a long fault-free life. However, the life expectancy of your product can be drastically reduced by improper treatment during unpacking and installation. Therefore, in the interest of your own safety and of the correct operation of your new Baumüller product, you are requested to conform with the following guidelines.

WARNING!

All operations on this product must be carried out by sufficiently skilled personnel only.

WARNING!

In case of non-compliance of the safety notes or use contrary to the intended purpose the integrated safety functions of the device can be inoperative.

2.3 Changes and modifications to the device

In order to prevent hazards and to ensure optimum performance, no changes, additions or modifications may be undertaken on the device that have not been explicitly approved by the manufacturer.

2.4 Appropriate Use

The device is conceived and constructed exclusively for usage compliant with its intended purpose described in this Instruction handbook.

> **WARNING!**
>
> **Danger arising from usage for an unintended purpose!**
>
> Any usage that goes beyond the intended purpose and/or any non-compliant use of the device can lead to dangerous situations.
>
> Therefore:
> - Only use the device compliant with its intended purpose.
> - Observe all specifications of this Instruction handbook.
> - Ensure that only qualified personnel work with/on this device.
> - Ensure that the power supply complies with the stipulated specifications.
> - The device may only be operated in a technically flawless condition.

2.5 Responsibility of the operating company

The device will be used in commercial areas. Thus, the proprietor of the device is subject to the legal work safety regulations.

Along with the notes on work safety in this Instruction handbook, the safety, accident prevention and environmental protection regulations valid for the area of application of this device must be complied with. Whereby:

- The operating company must inform himself about the applicable work health and safety regulations and ascertain, in a hazard assessment, any additional hazards that could arise from the special working conditions in the use area of the device. These must then be implemented in the form of operating instruction for operation of the device.
- This Instruction handbook must be kept accessible to personnel working with the device at all times in the immediate vicinity of the device.
- The specifications of the Instruction handbook must be adhered to completely and without exception.
- The device may only be operated in a technically faultless and operationally safe condition.

2.6   Protective equipment

Protection classification	
box	IP 20

2.7   Training of the personnel

⚠️	**WARNING!**
	Risk of injury due to insufficient qualifications!
	Improper handling can lead to significant personal injury and material damage.

In this Instruction handbook, the following qualifications are stipulated for various areas of activity:

- **Operating personnel**
  - The drive system may only be operated by persons who have been specially trained, instructed and authorized.
  - Troubleshooting, maintenance, cleaning, maintenance and replacement may only be performed by trained or instructed personnel. These persons must know the Instruction handbook and act accordingly.
  - Commissioning and training may only be performed by qualified personnel.

- **Qualified personnel**
  - Electrical engineers authorized by Baumüller Nürnberg GmbH, and qualified electricians of the customer or a third party who have learned to install and maintain Baumüller drive systems and are authorized to ground and identify electrical power circuits and devices in accordance with the safety engineering standards of the company.
  - Qualified personnel have had occupational training or instruction in accordance with the respective locally applicable safety engineering standards for the service and use of appropriate safety equipment.

2.8 Fire fighting

	DANGER!
⚠️	**Risk of fatal injury from electrical current!**
	There is a risk of electric shock if an electrically-conductive, fire-extinguishing agent is used.
	Therefore:
	• Use the following fire-extinguishing agent:
	🧯 ABC powder / CO_2

2.9 Safety equipment

	WARNING!
⚠️	**Risk of fatal injury due to non-functioning safety equipment!**
	Safety equipment provides for the highest level of safety in a facility. Even if safety equipment makes work processes more awkward, under no circumstances may they be circumvented. Safety can only be ensured by intact safety equipment.
	Therefore:
	• Before starting to work, check whether the safety equipment in good working order and properly installed.

2.10 Behavior in hazardous situations or at accidents

Preventive measures
- Always be prepared for accidents or fire!
- Keep first-aid equipment (e.g. first-aid kits, blankets, etc.) and fire extinguishers readily accessible.
- Train personnel so that they can handle the accident signalling systems, first aid equipment and life saving equipment.

And if something does happen: respond properly
- Stop operation of the device immediately with an EMERGENCY Stop.
- Initiate first aid measures.
- Evacuate persons from the danger zone.
- Notify the responsible persons of the site.
- Alarm medical personnel and/or the fire department.
- Keep access routes clear for rescue vehicles.

2.11 Signs and labels

The following symbols and information signs are located in the working area. They refer to the adjacencies, where they were affixed.

> **WARNING!**
>
> **Risk of injury due to illegible symbols!**
>
> Over the course of time, stickers and symbols on the device can become dirty or otherwise unrecognizable.
>
> Therefore:
>
> • Maintain all safety, warning and operating labels on the device in easily readable condition.

Electrical voltage

Only qualified personnel may work in work areas that identified with this.

Unauthorized persons may not touch working materials marked correspondingly.

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Baumüller Nürnberg GmbH

TECHNICAL DATA

3.1 Dimensions / Weight

The following table shows the main device dimensions. In order to make the required cut-outs use the drawings in ▷Mounting◁ from page 27.

	Dimension (Width x Height x Depth)	Weight
PLC mc 40	36.2 x 108 x 91 mm	385 g

3.2 Operating conditions

3.2.1 Power supply requirements

A power supply of 24 V_{DC} is required for the **PLC mc 40**. This may be either a standard power supply or not interruptible DC power supply.

Voltage	+24 V_{DC} ±20 %
Current	0.15 A - max. 1 A
Power	3.6 W - max. 24 W
Internal fuse	2 A fuse

Recommended power supply: Voltage/ output power: 24 V_{DC} / min. 30 W

> **NOTE!**
>
> The actual power consumption depends on the configuration and the type and No. of active interfaces (typical current consumption 0.5 A and typical power consumption 12 W).
>
> The fuse cannot be changed.
>
> USB devices connected to the USB 2.0 interface must not exceed 0.5 A per interface.

3.2.2   Required environmental conditions

Transportation temperature range	- 20°C to +70°C
Storage temperature range	- 20°C to +70°C
Operation temperature range	0°C to +55°C
Degree of pollution IEC 61010-1	2
Humidity (operation) EN 60721-3-3	Relative humidity: 5 % to 95 %, no condensation
Operation altitude	Max. 3000 m above MSL

> **WARNING!**
>
> This device is designed for operation in industrial environment. The device can cause interferences In residential environments. The operator is responsible for measurements in this case.

> **DANGER!**
>
> No use in potentially explosives atmospheres!

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DESIGN AND FUNCTION

The **Control system PLC mc 40** is an industrial PC.

4.1   Function description

Processor

The **PLC mc 40** is equipped with the following Intel® Atom™ processors:

Name	Cache	Clock fre-quency	No. of cores
Intel® Atom™processor E3845	2MB	1.91 GHz	4 (quad core)

BIOS

The BIOS controls the following functionalities among others:

- Phoenix Technologies SecureCore Technology for the E38xx platform
- UEFI BIOS for 32- and 64-Bit Operating systems
- UEFI/Legacy Boot Option
- Booting from USB, LAN, SD and eMMC
- Virtualization (Intel VT-x)
- Built-in UEFI Shell
- BIOS password
- Execute Disable (XD)
- USB Support
- Fast Boot

NOR-Flash The NOR flash memory installed on the **PLC mc 40** serves as BIOS memory. Its storage capacity is 64Mb.

DDR3L RAM DDR3L-RAM is used as working memory.

The CPU module provides a SO-DIMM-204 slot. The total memory capacity is minimum 1GB up to maximum 4GB for single-core processors and maximum 8GB for multi-core processors. The assembly is done in the factory.

MicroSD The microSD card slot X14 integrated on the base module allows the use of SD cards up to SDXC format. The 4-bit wide SDIO interface is routed directly from the processor to the microSD slot.

Supported UHS-I Modes: HS, DDR50, SDR12, SDR25

Modes: 1 bit, 4 bit

Maximum data rate: 400Mbit/s (in 4 bit mode)

The microSD card must be inserted with the contacts facing the heat sink.

NOTICE!

MicroSD cards available in consumer electronics stores are generally not designed or suitable for industrial applications. A lifetime in terms of write/erase cycles is often not specified for these cards and is in the range of a few hundred cycles.

When purchasing microSD cards, make sure that the card is suitable for the application and environmental conditions.

Unexpected data loss or device failure can result when using unsuitable microSD cards.

---

eMMC The bootable eMMC (JEDEC 5.0) built into the **PLC mc 40** serves as operating system and program memory. The storage capacity is 32GB.

SRAM / FRAM The **PLC mc 40** is be equipped at the factory with 128 kB FRAM. The FRAM is used for keeping control data in case of power supply failure because no extra power supply (e.g. battery) is necessary.

Under Windows operating system FRAM is not supported.

Thermal Management The internal processor temperature is used to throttle the clock rate and to shut down the operating system in case of overtemperature.

RTC   The RTC RX-8564LC from Seiko Epson is used as clock component. In combination with a backup battery, the time continues to run even in case of a power failure. The specified maximum deviation of the frequency corresponds approximately to the deviation of one minute per month. For correct operation, the appropriate driver from Kontron Electronics must be installed.

Watchdog   On the CPU module, the 32-bit binary counter DS1374 from Maxim is used as watchdog. For correct operation, the appropriate driver must be installed.

Ethernet   Two Gigabit Ethernet interfaces are controlled via the PCIe interface of the CPU module. The WGI210 from Intel is used as Ethernet controller.

4.2   Type plate

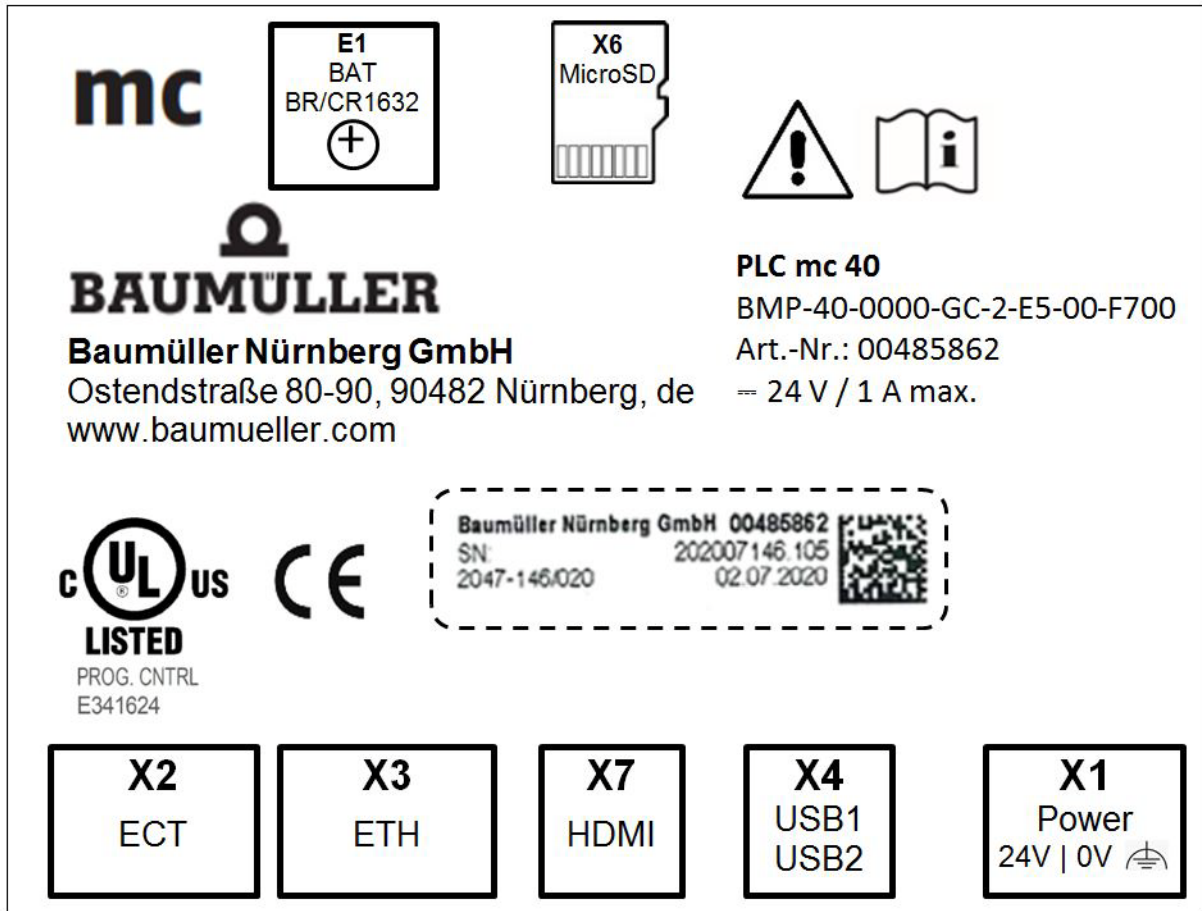On the type plate the type code of the device also can be found.

Figure 1:   Type plate

	NOTE!
🛈	At some mounting kinds it can happen, that the type plate covers the operating system. Take this information of the plates down before mounting. It is recommended to make an accordant note on the inside cover page of the Instruction handbook.

4.3 Type code

Type code format

BMP-XX-XXXX-XX-X-XX-XX-XXXX-XXXX-XX

In the following table the type code is explained:

BMP-XX-XXXX-XX-X-XX-XX-XXXX-XXXX-XX   Device series
Baumüller PC-based control

BMP-XX-XXXX-XX-X-XX-XX-XXXX-XXXX-XX   Basic device version

40:    PLC mc 40, industrial pc

BMP-XX-XXXX-XX-X-XX-XX-XXXX-XXXX-XX   Device type

0000: Box-PC

BMP-XX-XXXX-XX-X-XX-XX-XXXX-XXXX-XX   Hardware configuration mainboard

G: CUmini 5x   Control Unit

BMP-XX-XXXX-XX-X-XX-XX-XXXX-XXXX-XX   Hardware configuration processor

C: Intel Atom Quad Core E3845 with 4 x 1.9 GHz
G: Intel Atom Dual Core E3825 with 2 x 1.33 GHz

BMP-XX-XXXX-XX-X-XX-XX-XXXX-XXXX-XX   Hardware configuration RAM

2:    4 GB RAM

BMP-XX-XXXX-XX-X-XX-XX-XXXX-XXXX-XX   Hardware configuration Hard Disk 1

Ex: eMMC, with 2^x GB

BMP-XX-XXXX-XX-X-XX-XX-XXXX-XXXX-XX   Hardware configuration Hard Disk 2

00:    no

BMP-XX-XXXX-XX-X-XX-XX-XXXX-XXXX-XX   Hardware configuration option

Fx: FRAM, with 2^x kB

BMP-XX-XXXX-XX-X-XX-XX-XXXX-XXXX-XX   Optional equipment

00:    no

4.4   State LEDs

Abbildung 2:   State LEDs

LED	Display	Description
PWR	Green	Lights up in case of 24 V_{DC} supply is available and the device is not in state G2/S5
S1	Blue	Connected with processor GPIO. Can be activated by user software. Shows in delivery state an active system (state G0/S0)

4.5   Power button

The power button is beside the power connection X1 below PWR LED.

G/S state		Description
G0/S0	FULL ON	CPU is running.
G1/S3	Suspend-to-RAM (STR) Standby mode	Most of hardware is switched off, the operating state is saved in RAM. The system can be waked up.
G1/S4	Suspend-to-Disk (STD) Resting state	The operating state is saved in non-volatile memory (boot memory). The system can be waked up.
G2/S5	Soft off	System is switched off (except RTC), the power supply is available, the system can be reactivated with the power button.

Initial state	State after pressing the power button
G0/S0	G2/S5
G1/S3 oder G1/S4	G2/S5
G2/S5	G0/S0

The power button must be pressed for at least 0.5 s.

The function of the power button can be changed under Windows, System control (e.g. target state G1 instead of G2 from G0)

If the power button is hold longer than 4 s, the device changes to state G2/S5 independent of configuration or processor state.

NOTE

The setting of BIOS under Advanced -> Miscellaneous Configuration -> „State after G3" is without an effect. From state G3 (separated from power supply) the device starts automatically and changes to state G0/S0.

4.6   Ethernet-LEDS

LEDs display the interface state.

Figure 3:   Ethernet-LEDs

LED orange (activity)	LED green (link)
off: no activity, no link	off: no link
blink: activity, link	on: link

5

TRANSPORT AND PACKING

Safety notes for the transport

> **NOTICE!**
>
> **Damage due to unauthorized transport!**
>
> Transport handled by untrained personnel can lead to a substantial amount of material damage.
> - The unloading of the packages upon delivery as well as the in-house transport should only be done by trained personnel.
> - Contact Baumüller Nürnberg GmbH sales office if necessary.

> **WARNING!**
>
> **Danger of physical impact!**
>
> Secure devices against falling down.
>
> Therefore:
> - Use appropriate means of transport.

5.1 What to observe when transporting

For initial transport of a device, it is packed at the manufacturer's plant. If the device must be transported, ensure that the following conditions are met throughout the entire transport:
- Climate class, refer to ▷Required environmental conditions◁ auf Seite 16
- Temperature range, refer to ▷Required environmental conditions◁ auf Seite 16

5.2 Transport inspection

Upon receiving the delivered goods, immediately examine them for completeness and transport damage.

If there is visible transport damage on the outside, proceed as follows:

● Do not accept the delivery or conditionally accept it with reservations.

● Note the extent of the damage on the transport documents or on the delivery note of the shipping agent.

● Immediately file a complaint with the freight carrier. Have the complaint confirmed in writing and immediately contact the responsible representative of Baumüller Nürnberg GmbH.

NOTE!

The device may not be operated if there is visible transport damage!

5.3 Unpacking

After having received the packaged device:

◖ Avoid forceful transport agitation and hard jolts, e.g. when putting an item down.

If no transport damage is visible:

◖ Open the packaging of the device.

◖ Verify the delivery scope based on the delivery note.

File a claim with the responsible Baumüller representative if the delivery is incomplete.

NOTE!

Claim each individual deficiency as soon as it has been detected. Damage claims can only be validly asserted within the claim registration period.

5.4 Disposal of the packaging

The packaging consists of cardboard, plastic, metal parts, corrugated cardboard and/or wood.

◖ When disposing of the packaging, comply with the national regulations valid at the use area.

MOUNTING

	NOTE!
	Mounting shall only be performed by employees of the manufacturer or by other qualified personnel.

	WARNING!
	Danger as a result of mechanical effects!
	Secure devices against falling down.
	Therefore:
	• Use appropriate means of transport.

	NOTICE!
	Danger due to electrostatic discharge.
	The connecting terminals of the device are partially at risk due from ESD.
	Therefore:
	• Please heed the respective notes.

6.1   Preparing the mounting

At the installation of the **PLC mc 40** in a control cabinet the following general provisions must be observed:

○ Check the working clearance in the control cabinet. In general, keep at least 5 cm space on each side.

○ Drill and cut the holes, before starting with the installation.

○ Assure that components, which were installed, are protected against damages.

CAUTION!

Eye injury due to flung particles.

Metal particles are flung when making the drill holes and the cutout sections.

Therefore:

Wear safety goggles!

○ Load-bearing parts must be at least 1.63 mm thick, in order to provide a proper stability.

○ The space all-round the heatsink (on the rear of the **PLC mc 40**) must be adequate and the air inlets as well as the air outlets must provide adequate cooling.

NOTICE!

PLC mc 40 must be installed with an adequate space around the heatsink, so that the environmental temperature of the operating limit values are not exceeded (see ▷Operating conditions◁ from page 15). Fans can be installed in the control cabinet if required.

Possibly, an exceeding of the system temperature limits can cause a power reduction of the single or of all components. Therefore, the temperature in the environment of the installation must be within the system temperature limits of the **PLC mc 40**.
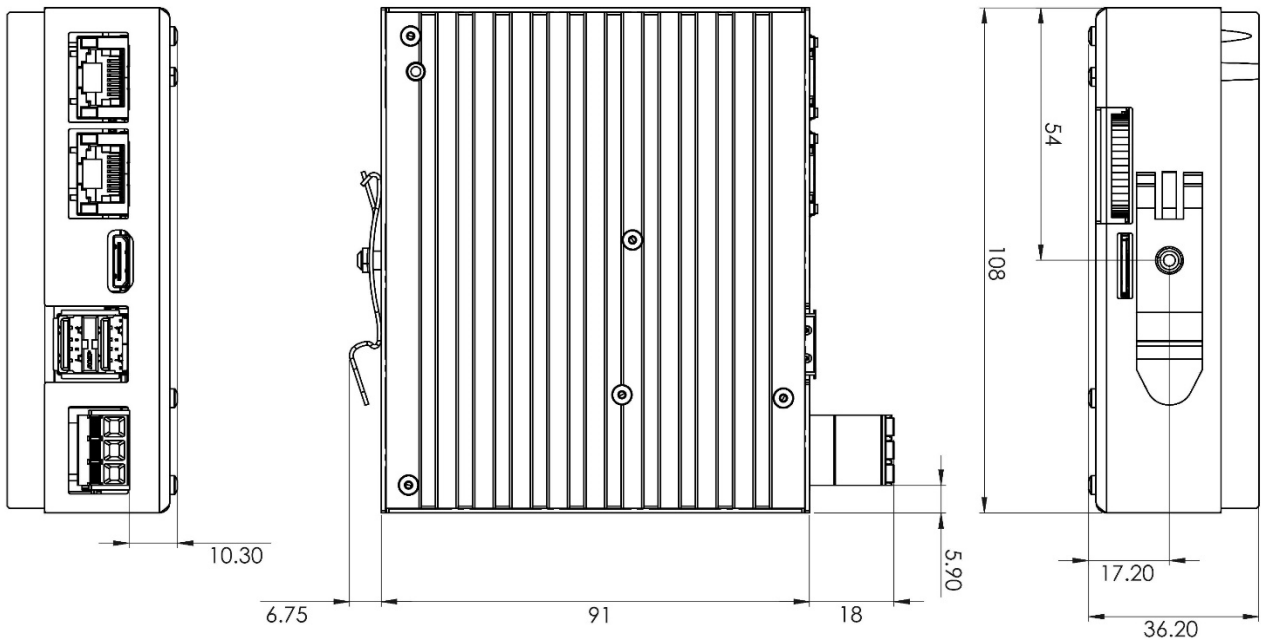

6.2 Dimensions

Figure 4:   Dimensions

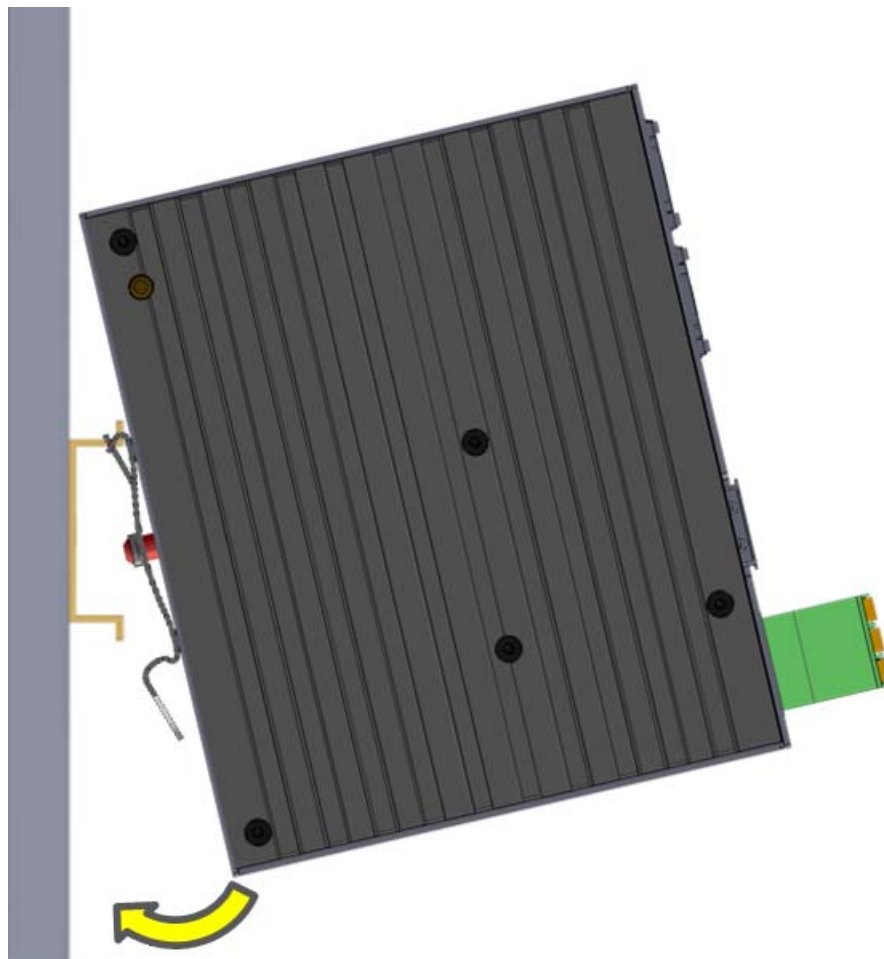## 6.3   Top hat rail mounting
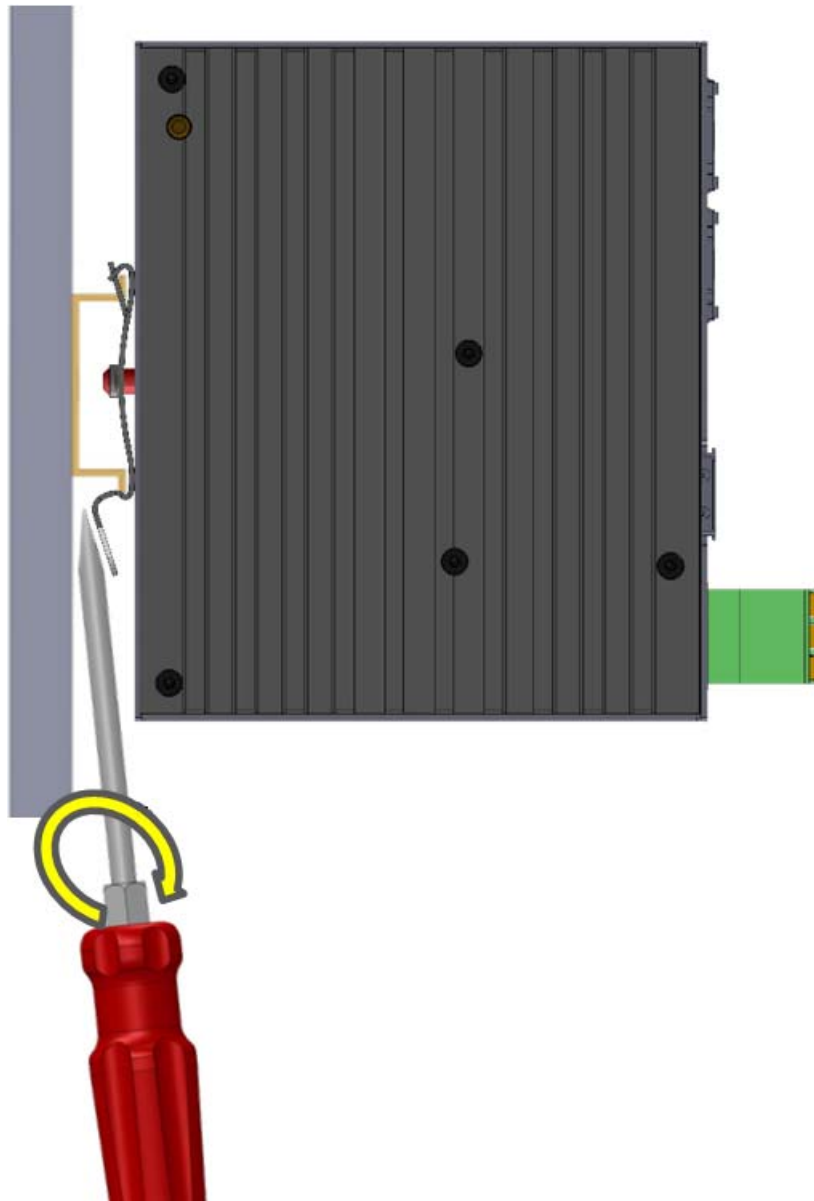

Figure 5:   Mounting on DIN top hat rail

Figure 6:   Demounting on DIN top hat rail

INSTALLATION

After mounting the **PLC mc 40** the required cable connection must be made.

Safety notes

	NOTE!
	The installation may be performed by employees of the manufacturer or by other qualified personnel only.

	CAUTION!
	The power cable must be rated for a temperature of +75 °C or higher.
	The cable can become damaged over time or potentially harmful plasticizers could be released in the surrounding air if cables with a lower temperature rating are being used.

7.1 Interfaces

Figure 7:   Interfaces front
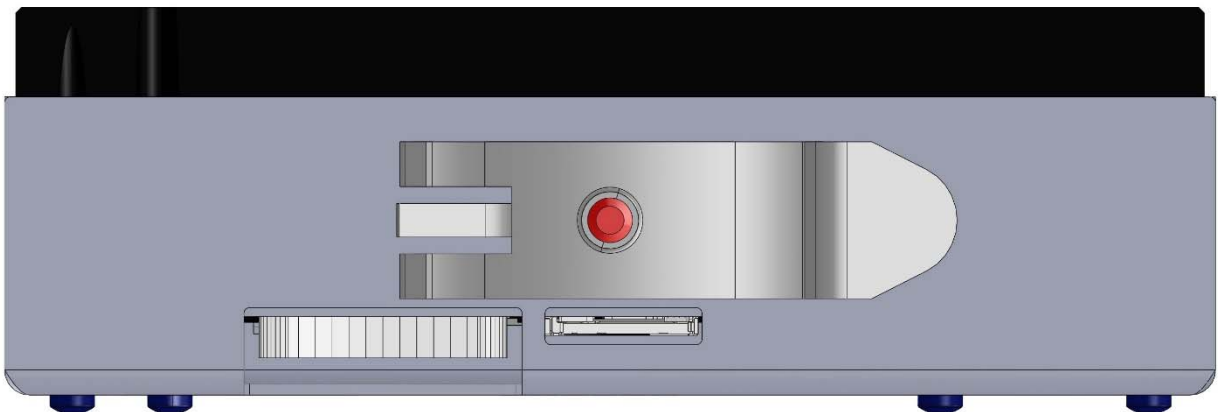
Figure 8:   Interfaces back

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7.2   Pin assignment

Connec-tor	Type	Use
X1	3-pin pluggable terminal pitch 5 mm for 24 VDC supply	Power
X2	RJ45 (8P8C) Connector for Ethernet	Ethernet
X3	RJ45 (8P8C) Connector for Ethernet	Ethernet
X4	2 port USB Host connector type A	USB 2.0
X6	microSD card slot	microSD
X7	HDMI, 19-pin for connector type C (mini)	HDMI

7.2.1   Power supply connector X1

Pin	Signal	Comment
1	FE	Functional earth
2	0V	Power supply 0 Volt DC
3	24V	Power supply +24 VDC ±20%

Cable: max. 3 m, unshielded

Connector type: Phoenix MSTBA 2,5/3-G - 1757488

Mating connector: Phoenix FKCN 2.5/ 3-ST-- 1732755 (included in delivery)

Associated permissible cable cross-sections:
- Rigid conductor cross-section: 0,2 mm² ... 1,5 mm²
- Flexible conductor cross-section: 0,2 mm² ... 2,5 mm²
- Conductor cross section AWG / kcmil: 24 … 16
- Conductor cross-section flexible with wire end ferrule: 0,25 mm² ... 1,5 mm²
- Stripping length: 10 mm

7.2.2 Ethernet connector X2 and X3

Pin	Signal	Comment
1	DA+	TX
2	DA-	TX
3	DB+	RX
4	DC+	BI
5	DC-	BI
6	DB-	RX
7	DD+	BI
8	DD-	BI

Cable: smaller 30 m, shielded, min. Cat-5e

7.2.3 HDMI connector X7

The device has a type C HDMI socket (HDMI mini). The DDC data bus is available, CEC is not available.

WARNING!

Use a high quality HDMI cable which is double shielded with a cable length of less than 3m.

Otherwise, compliance with the applicable EMC standards cannot be guaranteed.

Baumüller recommends the use of a certified "Premium High Speed HDMI" cable with the appropriate label from HDMI Licensing Administrator Inc.

NOTICE!

HDCP (High-bandwidth Digital Content Protection) is not supported.

7.2.4 USB 2.0 Host: Connector X4

The pin assignment corresponds to the USB 2.0 standard, connector type A. The connected USB cable must be shielded and have a cable length of less than 3 m.

OPERATION

General

⚠️	**WARNING!** **Risk of injury due to improper operation!** Improper operation can result in severe personal injuries or material damage. Therefore: • Carry out all operating steps as per the details in this Instruction handbook. • Before starting work assure that all covers and safety equipment is installed and operate properly. • The control cabinet, where the device was placed, shall protect against touching of the conductive parts. Keep all doors of the control cabinet shut during operation.

🛈	**NOTICE!** **The environmental conditions do not comply with the requirements.** Unspecified environmental conditions can cause material damage. Therefore: • The environmental conditions must be complied to during operation (see ▷Required environmental conditions◁ on page 16).

8.1 Power switching on

The voltage power supply can be switched on after all components are connected. The **PLC mc 40** starts automatically, see also ▷Power button◁ on page 22.

Figure 9:   Power button

NOTE!

It is recommended to connect an USB keyboard, mouse and a screen on the HDMI port to the **PLC mc 40** for commissioning.

8.2 First start

8.2.1 Software license and activation

Use of the Microsoft® operating system **Windows 10 IOT** is subject to the licensing limitations specified by the Microsoft Software License.

Baumüller Nürnberg GmbH is not responsible and cannot be held liable for proper use of the operating system or any other software installed on the computer.

EULA (End user License Agreement) is on the system partition and can be consulted there. Please, note that!

Additional details are included in the Microsoft Software License and are also available at www.microsoft.com. The Windows product key is on a sticker that is affixed to the **PLC mc 40**.

The standard version of PLC mc 40 is equipped with Windows 10 IOT Enterprise 2019 LTSC.

8.2.2 Firmware and software updates

It's possible that from time to time updates of firmware and software are provided in the **PLC mc 40** products.

From time to time, Baumüller Nürnberg GmbH may make updates available for the firmware and software utilities. Automatically updates are switched off and may not made by the user.

8.2.3 Start screen

The **PLC mc 40** boots after switching on the 24 V_{DC} power supply.

First of all the BIOS is displayed then 10 IOT Embedded is started from the system data storage.

BIOS start screen The BIOS-Start-Screen starts with „Phoenix Technologies" These issues are eliminated from the following hardware test:

◖ The break key normally is on the top right side of the keyboard. It interrupts a procedure and the BIOS-version can be checked. Continue with any key.

	NOTE!
	At the first booting up the BIOS starts at first, then Windows and then **automatically** Windows is started once more. This can last a few seconds.

See Application Manual **PLC mc 40** for further procedure.

8.3 Touchkit

PLC mc 40 computers equipped with a display include Touchkit, a software utility to configure the operation of the touch screen. This utility provides multiple touch screen calibration methods as well as modes for pointer (mouse) operation and audio touch acknowledgment.

1 To start Touchkit utility do one of the following:

- Double-click the "eGalaxTouch" icon ((see ▷Touchkit (eGalaxTouch) icon◁ on page 52).
- Click the "Start" key, navigate to the "All Programs, eGalaxTouch" folder and then click the "Configure Utility" icon

2 The dialog „Touchkit USB Controller ... general" is opened. All installed Touchscreen controller are displayed.

NOTE!

The default controller for the **PLC mc 40** is **USB Controller**.

---

3 If multiple controllers are installed, click the icon of the controller to be modified before clicking the required tab.

8.3.1 Touchkit setting

The "Setting" tab allows modification of the audio acknowledgment and mouse mode features..
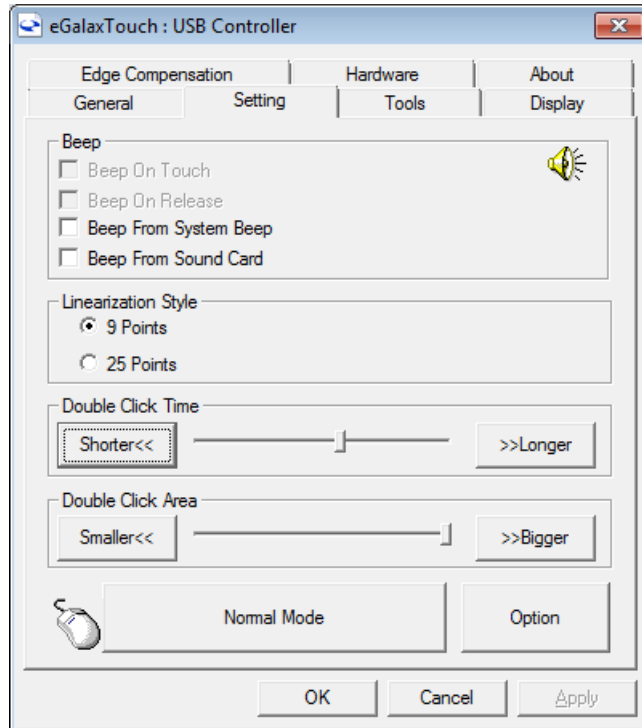
Figure 10:   Dialog „Settings Touchkit"

Audio acknowledgment

For a **PLC mc 40** with audio capability, four different modes are available when an audio acknowledgment to a screen touch is desired. Click the desired check box to activate the desired mode.

- Beep On Touch: A beep is sounded when the screen is touched.
- Beep On Release: A beep is sounded when the screen touch is released

NOTE!

If Beep on Touch and Beep on Release are checked, every touch will generate two beeps.

- Beep From System Beep: Sound is generated from internal speaker (not applicable to **PLC mc 40**).
- Beep From Sound Card: Sound is generated from an external speaker.

The frequency and duration of the beep can be modified using the two sliders.

- ○ Frequency: Move the slider to the left for a lower tone; to the right for a higher tone.
- ○ Duration: This adjusts the time between beeps when Beep On Touch and Beep On Release are both checked. Move the slider to the left for the beep occur immediately upon the release. Move the slider to the right for the beep to be delayed to a maximum of 1 second after the release.

Linearization Style

Normal calibration uses four touch points to calibrate the screen. A greater accuracy of the calibration can be achieved if more touch points are used in the calibration. Chose a linearization style of either 9 or 25 points.

To start the linearization function, click the "Tools" tab and then click the "Linearization" key.

Double Click Time

To adjust the time span that two touches are recognized as a double-click. This range is approximately 0.25 to 1 second.

Double Click Area

This adjusts the size of the area allowed for the second click relative to the first click.

Mouse modes

Mouse modes allow configuration of mouse (touch) behavior. One of five modes can be active (in ▷Figure 11◁ on page 43 shows the key with "Normal Mode" active). The available modes are:

- ● Normal Mode: emulates normal mouse key behavior
  - ○ A touch and release acts as a click and release.
  - ○ A touch, drag and release acts as a click, drag and release.
  - ○ A constant touch behaves like a mouse button held down. If the Enable Auto Right Click function is checked, it will act as a right-click.
- ● Click on Touch: emulates a left mouse button click when the screen is touched
- ● Click On Release: emulates a left mouse button click when the screen is touched and released.
- ● Click On Touch Without Moving cursor: moves the cursor to the touched position and acts as a normal left click but will not perform a drag to another screen position.
- ● Click On Release Without Moving cursor: emulates a left mouse button click when a screen touch is released, but the cursor doesn't move to the touched point until the touch is released.

Although the modes are predefined, each mode can be manually modified by clicking the "Option" key**.**
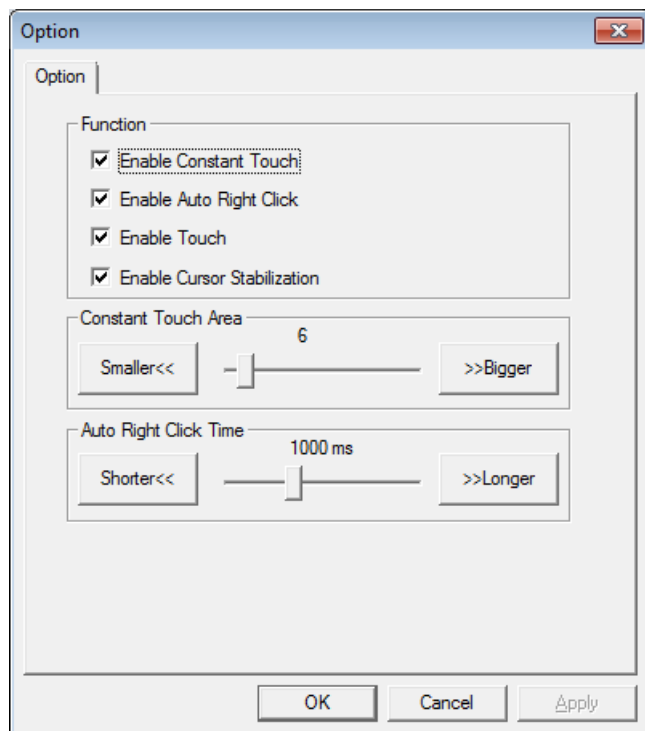

Figure 11: Mouse mode „Option dialog box"

Click the check box of the desired functionality.

- Enable **Constant Touch**: Enables the "Constant Touch Area" slider to increase/decrease movement granularity (values are displayed in pixels). Unchecked provides smooth movement while checked with the slider to the right provides the coarsest movement.
- Enable **Auto Right Click**: Enables the "Auto Right Click Time" slider to set the time required by which a touch is recognized as a right click. This requires the "Auto Right Click" option to be activated using Touchmon.
- Enable **Touch**: Enables or disables the touch feature of the touch screen.
- Enable **Cursor Stabilization**: When checked, this creates a slight lag in the cursor when following linear movement.
- **Constant Touch Area**: Sets the granularity of the Constant Touch function.
- Auto Right Click Time: Sets the required touch time span when using the Auto Right Click function is enabled.

8.3.2   Touchkit Tools

The "Tools" tab provides access to multiple tools for calibration and testing of the touch screen functionality.
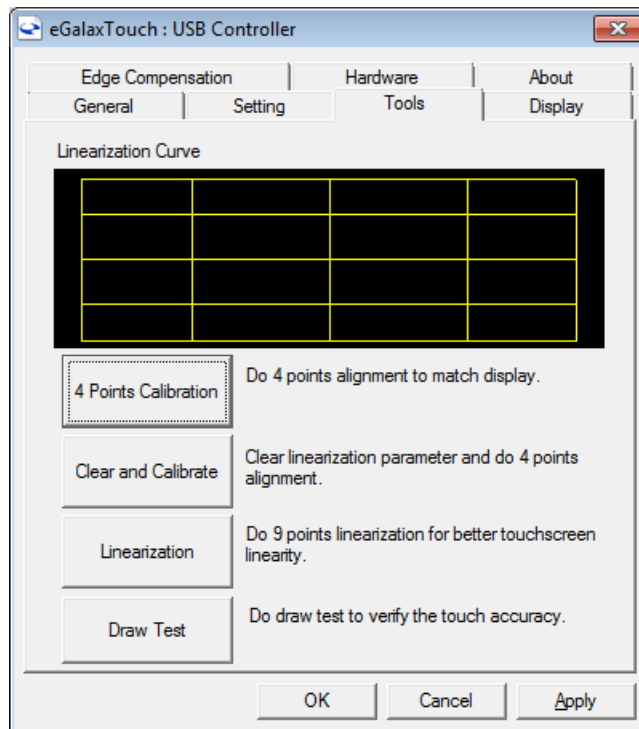
Figure 12:   „Touchkit Tools" dialog box

4 Points Calibration

Basic calibration can be completed using this utility. Click the "4 Points Calibration" key to start. The display will change to a white screen with four blinking touch points..

Please touch each blinking symbol until it stops blinking.
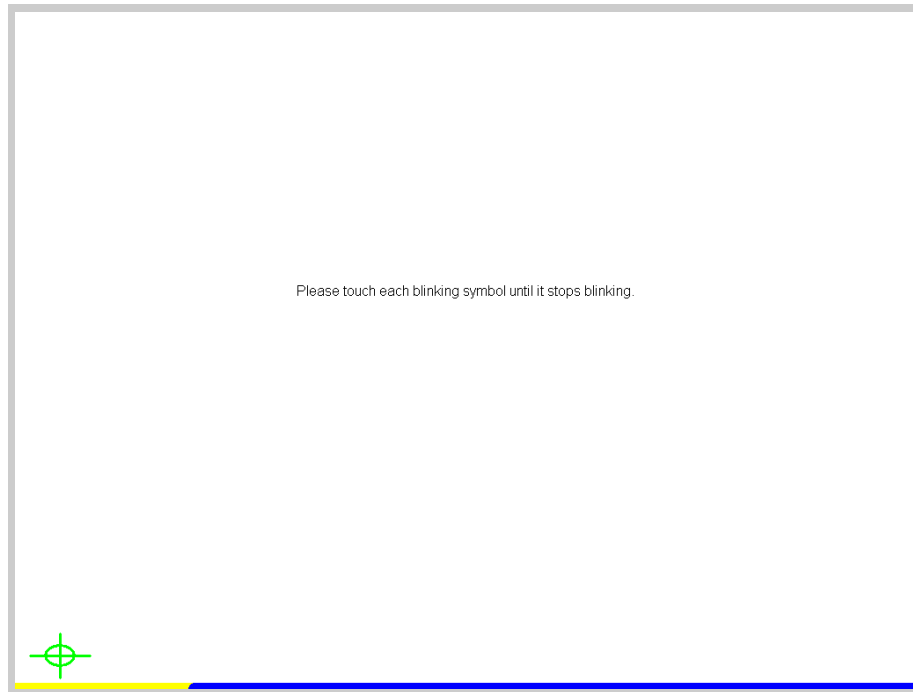
Figure 13:   4 Points Calibration screen

Touch and hold each point until the point stops blinking. If a touch point is not touched within 30 seconds, the utility is closed, returning to the "Touchkit… Tools" dialog box. A progress bar at the bottom of the screen indicates the time remaining.

Clear and Calibrate

Click the "Clear and Calibrate" key to erase a linearization. This also starts the "4 Points Calibration" utility. Always use this key if changing from a linearization to a calibration to ensure the linearization doesn't effect the calibration.

Linearization

Linearization is another method of calibrating a touch screen. It functions the same way as the 4 Points Calibration but uses more touch points for finer calibration.

Linearization can be performed using either 9 or 25 points. Select the number of points by clicking the "Setting" tab and clicking either the "9 Points" or "25 Points" radio key (see

Click the "Linearization" key to start the utility. The display will change to a white screen with either 9 or 25 blinking touch points.

Please touch each blinking symbol until it stops blinking.
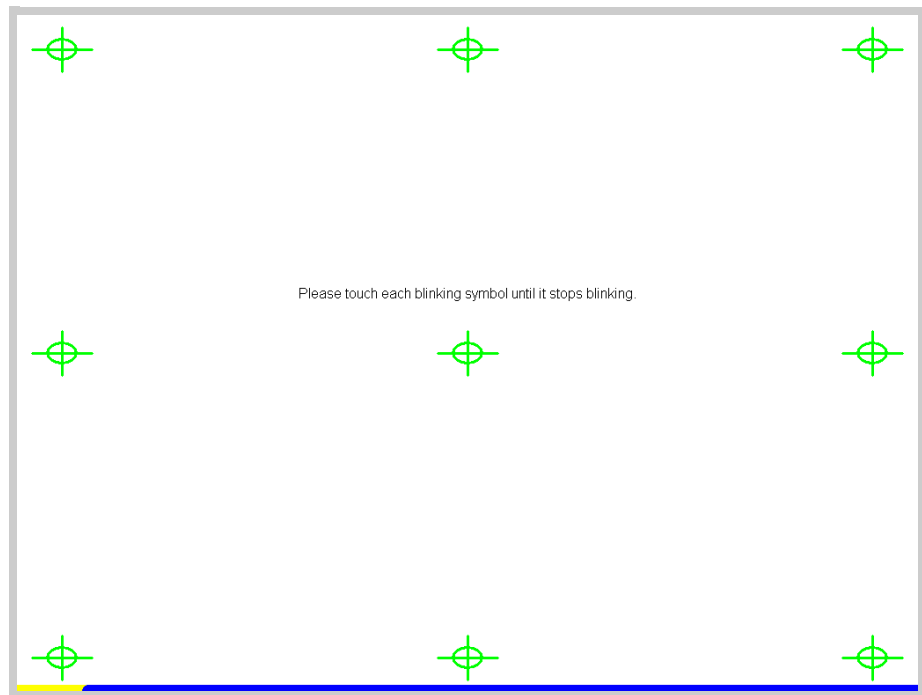
Figure 14:   9 Points Calibration screen

Touch and hold each point until the point stops blinking. If a touch point is not touched within 30 seconds, the utility is closed, returning to the "Touchkit… Tools" dialog box. A progress bar at the bottom of the screen indicates the time remaining.

Draw Test

To verify the calibration and other settings of the touch screen, click the "Draw Test" key. This utility opens a scratch pad for testing purposes. Touch the screen and perform typical operations to evaluate the touch screen calibration and settings.
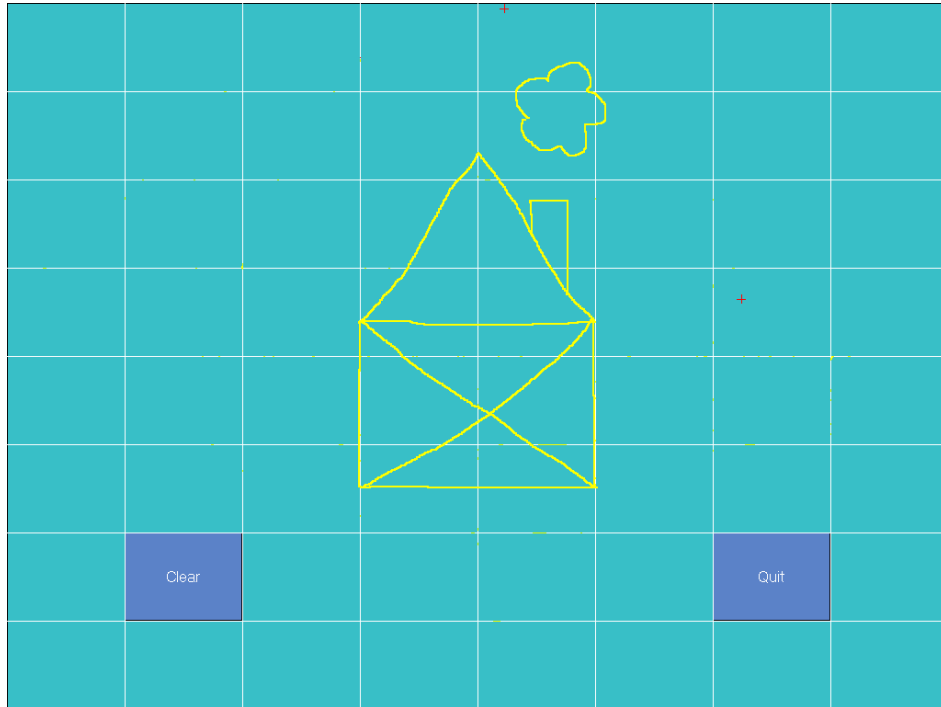
Figure 15:   Draw Test screen

8.3.3 Touchkit Edge Compensation

The "Edge Compensation" tab sets the cursor overshoot and undershoot touch points along the edge of the screen. This helps to compensate for the difficulty sometimes experienced in touching the edge of a screen.
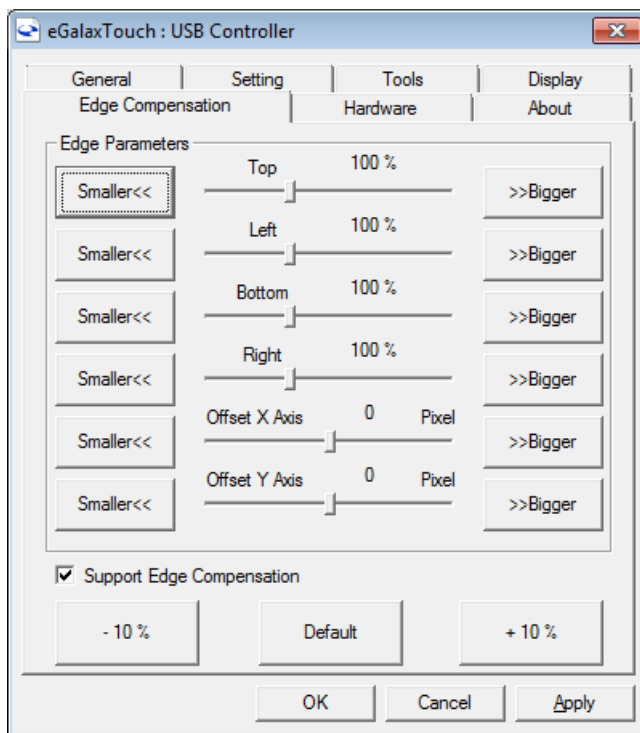
Figure 16: "Touchkit… Edge Compensation" dialog box

Individual adjustment can be made along each edge on a percentage basis. 100% is at the edge of the screen, 50% is approximately 0.5 in. before an edge (on the screen) and 200% past an edge where the cursor is not visible. In addition, the cursor display position can be shifted along either the X or Y axis, displayed by pixel.
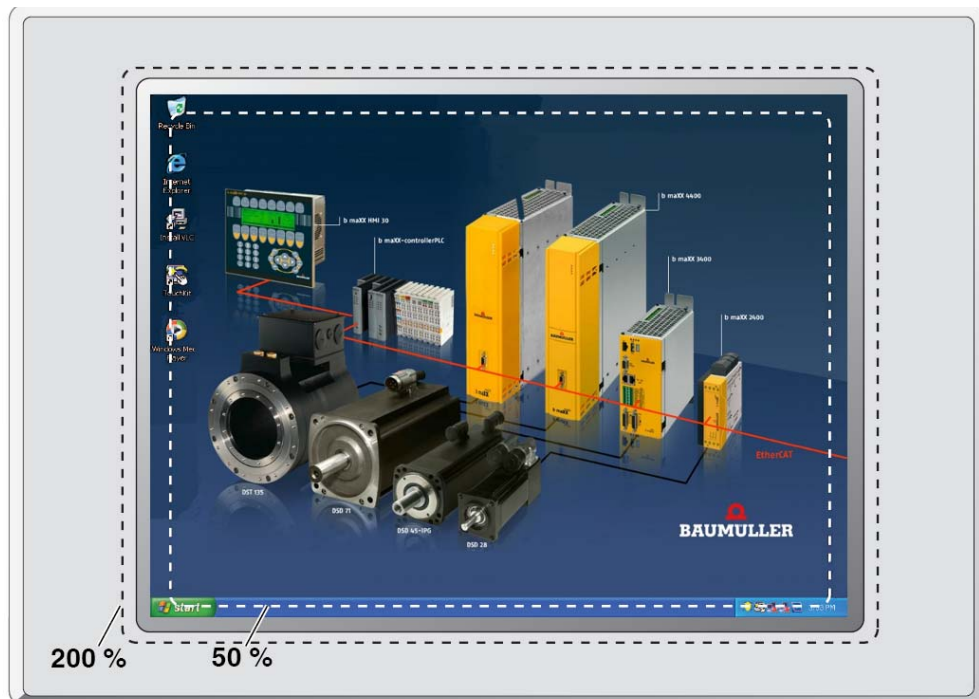
Figure 17:   Example Edge compensation

Click the "Support Edge Compensation" key to activate/deactivate the edge compensation utility.

To adjust all edges of the display "in," click the "-10%" key. Each successive click brings the edge in 10%. To adjust all edges outward, click the "+10%" key. The relative position of each edge is shown on the sliders above. To return all sliders to 100%, click the "Default" key.

8.3.4 Touchkit Hardware

The "Hardware" tab displays controller and firmware information about the touch screen. This information may be required if problems occur.
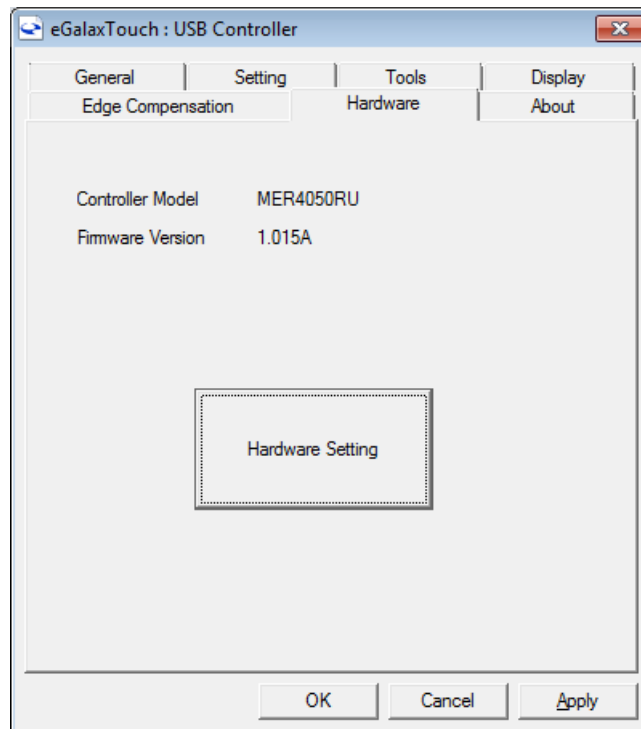
Figure 18: „Touchkit Hardware" dialog box

Click the "Hardware Setting" key to open the "MERCURY - Hardware Configuration" dialog box.
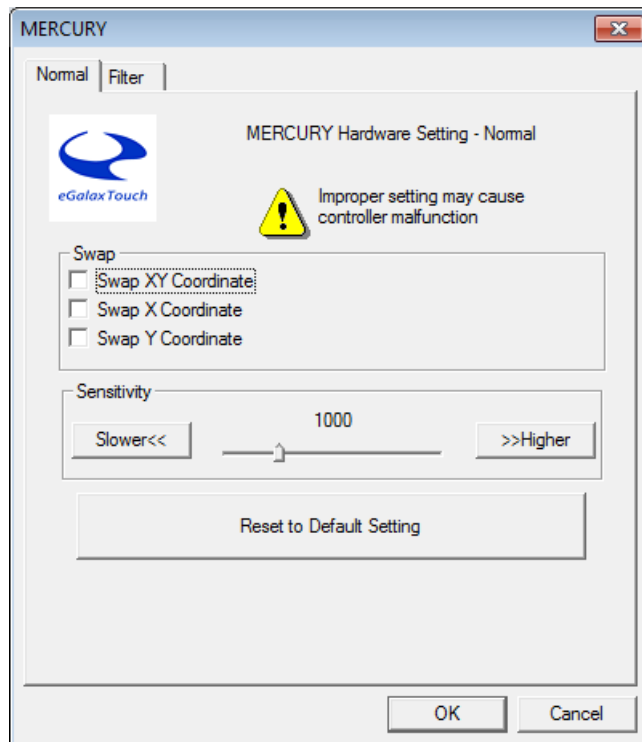
Figure 19: „MERCURY - Hardware-Configuration" dialog box

Sliders are available to adjust the sensitivity and delay time of touches. Lower sensitivity allows a lighter touch on the screen. Values range between 80 and 255.

Shorter delay time provides a quicker reaction to touches. Values range from 0 to 2550 µs. Click the "Reset …" key to return the sensitivity and delay time values to the factory defaults.

8.3.5 Touchkit „About"

The „About" tab displays information concerning the touch screen driver.

8.3.6 Touchkit (eGalaxTouch) icon

Touchkit tools are also available as menu options from the notification area (system tray) icon.
- Right-click the eGalaxTouch icon.

If the icon is not in the notification area, click the "Start" key and:
- navigate to the "All Programs, eGalaxTouch" folder and then click the "TouchMon" icon.

NOTE!

Multiple methods are available to emulate a right mouse click.
- Enable "Auto Right Click" in the Touchkit utility. This allows a constant touch to "call" a right click.
- Enable "Display key" in the Touchkit utility displays a mouse in the lower right corner of the screen. Click the mouse to alternate between right and left click of the mouse.
- Touch the "Right Click" key in the OnScreen tools palette.

Right-click the icon in the notification area and to display the menu.
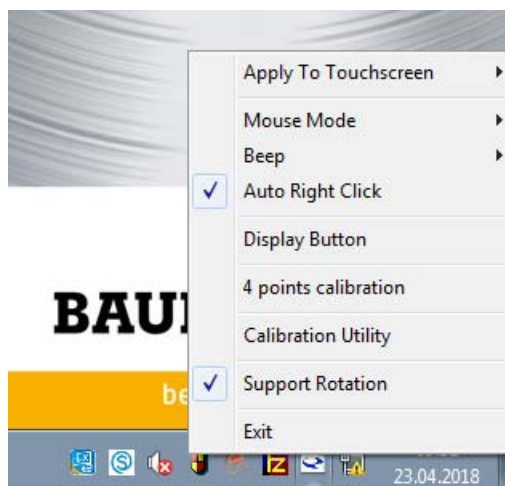
Figure 20:   Touchkit-menu

Touchkit menu functions

Menu	Function
Apply to Touchscreen	Selects the touchscreen controller. The **PLC mc 40** uses a controller called "USB Controller.
Mouse Mode	Selects the mouse mode (see ▷Mouse modes◁ on page 42).
Beep	Selects the Beep mode (see ▷Audio acknowledgment◁ on page 41).
Auto Right Click	When checked, touch the screen for an extended time period simulates a right click (see ▷Mouse modes◁ on page 42).
Display key	When checked a mouse icon appears on the display screen showing the active mouse button in red. Touch the icon to change the active mouse key
4 Points calibration	Launches the "4 Points Calibration" utility (see ▷4 Points Calibration◁ on page 45).
Calibration Utility	Opens the "Touchkit: USB Controller… Tools" dialog box (see ▷Touchkit Tools◁ on page 44).
Support Rotation	When checked, the touch screen orientation is corrected to match the display orientation. (Note that this must be active for the "Auto Right Click" function to work.)
Exit	Closes the Touchkit utility.

8.4   Intel® Graphics Control Panel user interface

The **PLC mc 40** uses the Intel® Graphics Media Accelerator video driver and has a variety of customization features available, including multiple displays.

8.4.1   User interface

To access the video driver controls:
- Right-click on the symbol „Intel® video driver" in the info area (system tray) of the desktop, move the pointer over "Graphics Options…" and navigate to the desired option. This provides a quick path to the required setting.

Graphics Properties…	Output To ▶
Graphics Options ▶	Panel Fit ▶
Exit Tray	Hot Keys ▶
Intel® HD Graphics Control Panel	Rotation ▶
	Balloon Notifications ▶
	Profiles ▶

Figure 21:   Graphic Media Accelerator direct select options

- Click on the symbol „Intel$^{®}$ video driver" in the information area (system tray) and then on the menu item "Graphics Properties"
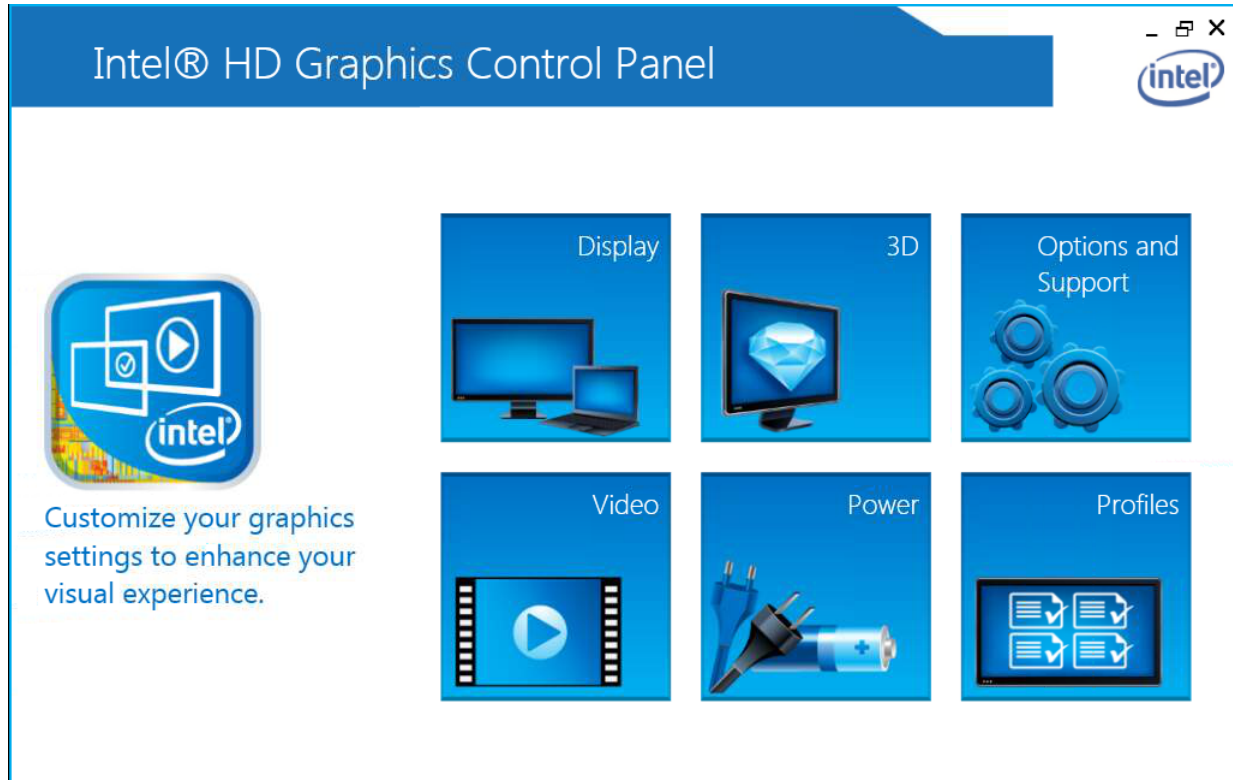
Figure 22:   Graphics Control Panel main user interface screen

8.4.2 Single Display configuration

In order to set the connected displays press by using the left mouse button on "Display".
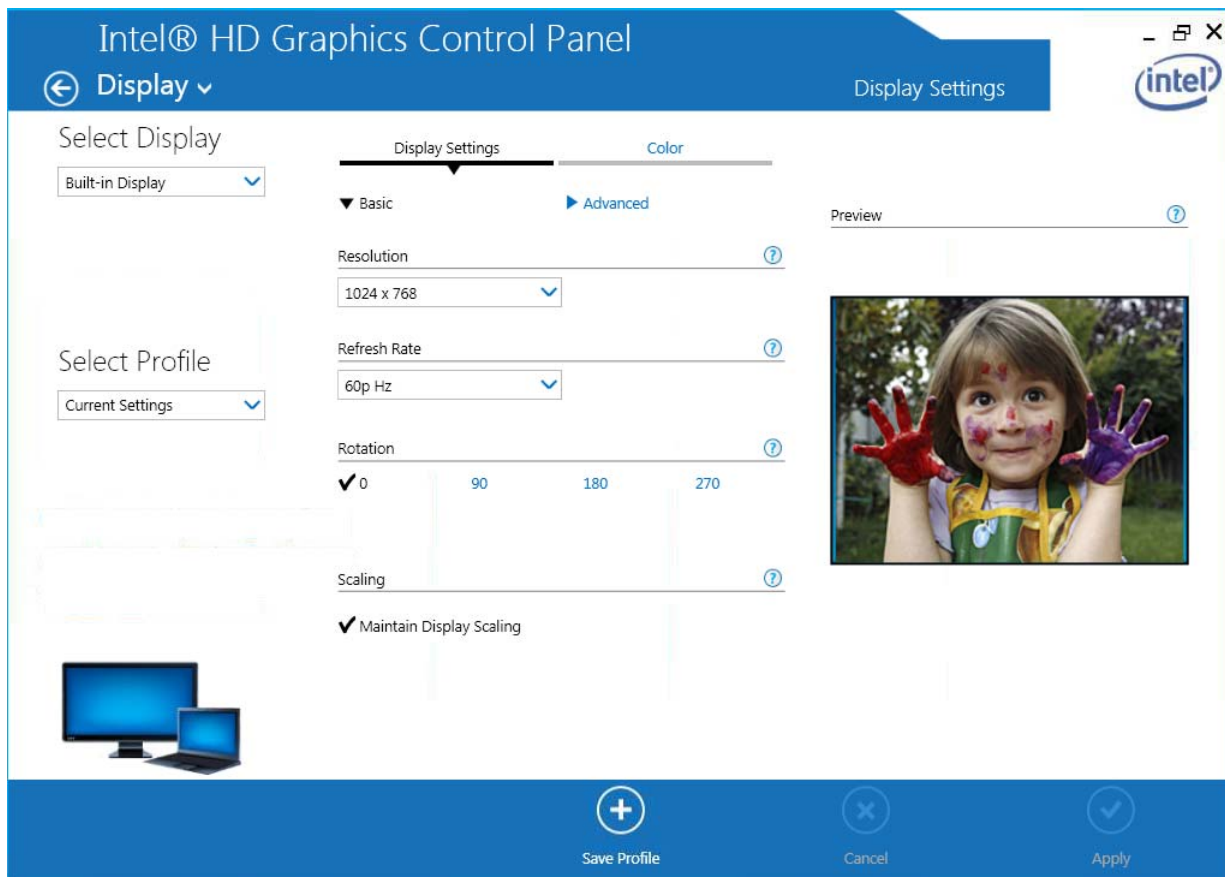
Figure 23:   Display settings

The screen of the user interface can be divided into an upper and a lower range. In the upper range the configuration possibilities are to be found. The configurations can be saved as profiles. The profiles can be called up again if they are required later.

Within the lower range are some additional tools as well as the buttons "Save Profile", "Cancel" and "Apply".

NOTE!

A context-sensitive help can be called up by a click with the right mouse button within the accordant range.

Display-settings

On the left side the screen resolution, the refreshing rate, the turning and the scaling of the screen is set.

Transit the parameterization via the "Apply" button to the selected display.

Color setting

Click on the right side on the register card "Color" to receive setting options referring to the color, brightness and contrast.
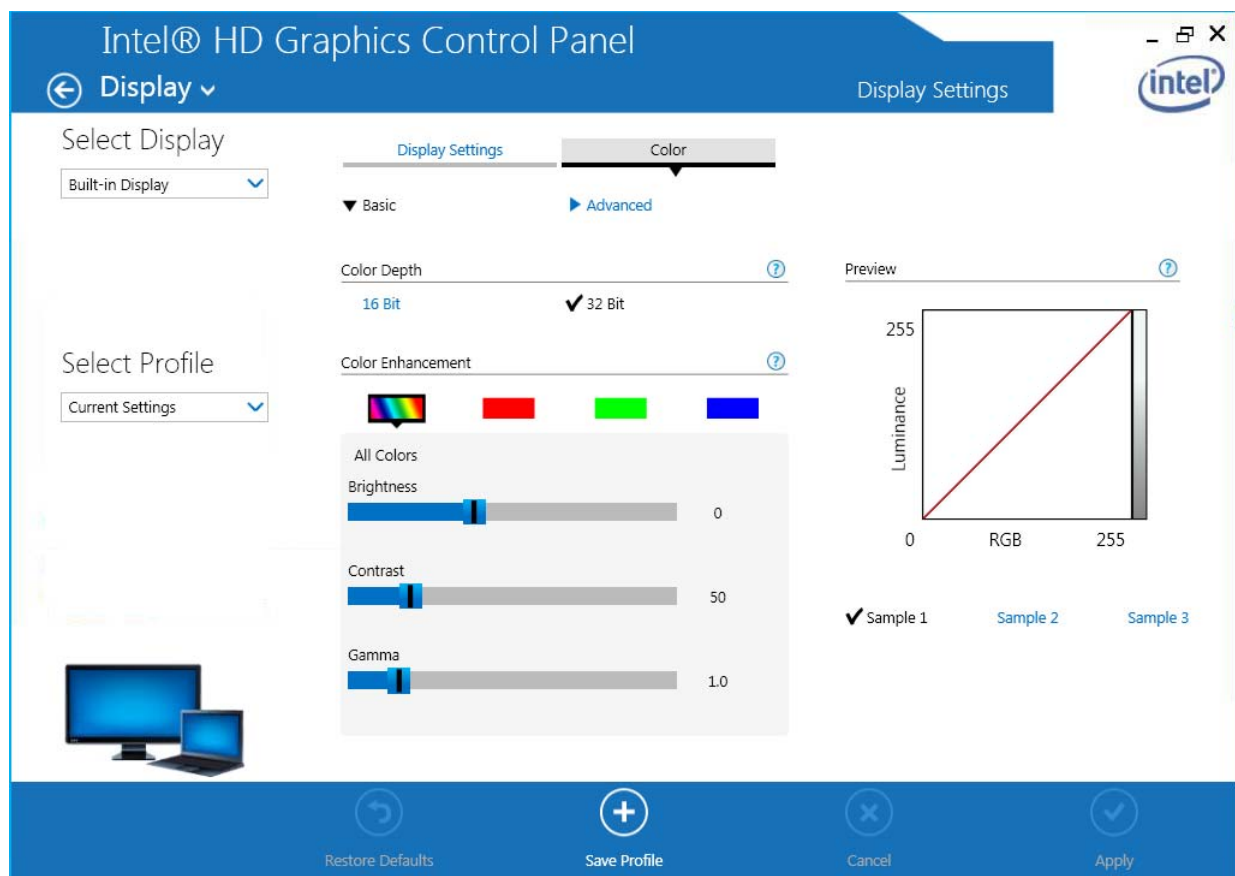
Figure 24:   Color correction

Accept the parameterization via the "Apply" button for the selected display.

8.4.3 Adjusting 3D-operation

Click on the "3D" button to configure the 3D settings.
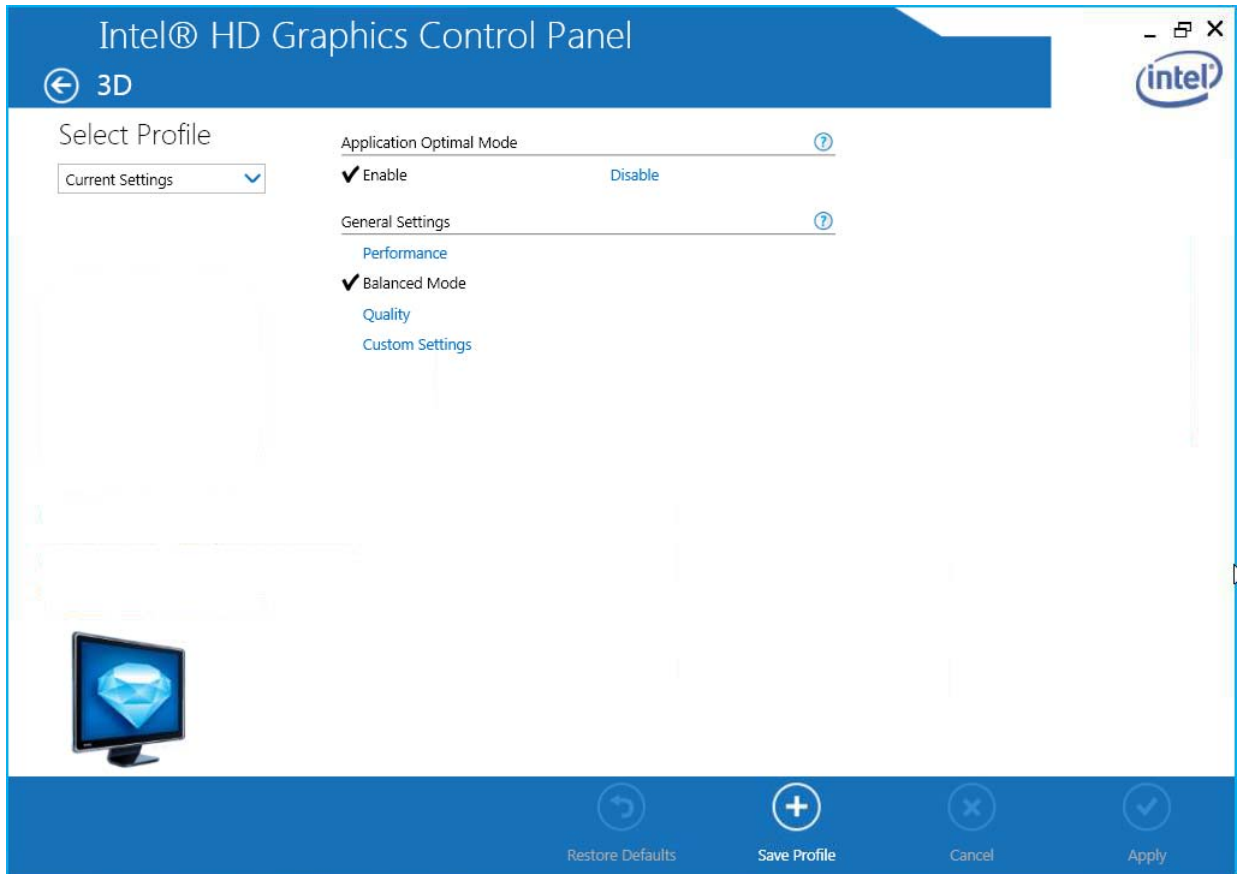
Figure 25: Dialog „3D"

8.4.4   Configuration video overlay

Click on the "Video" button to open the "Video" dialog.
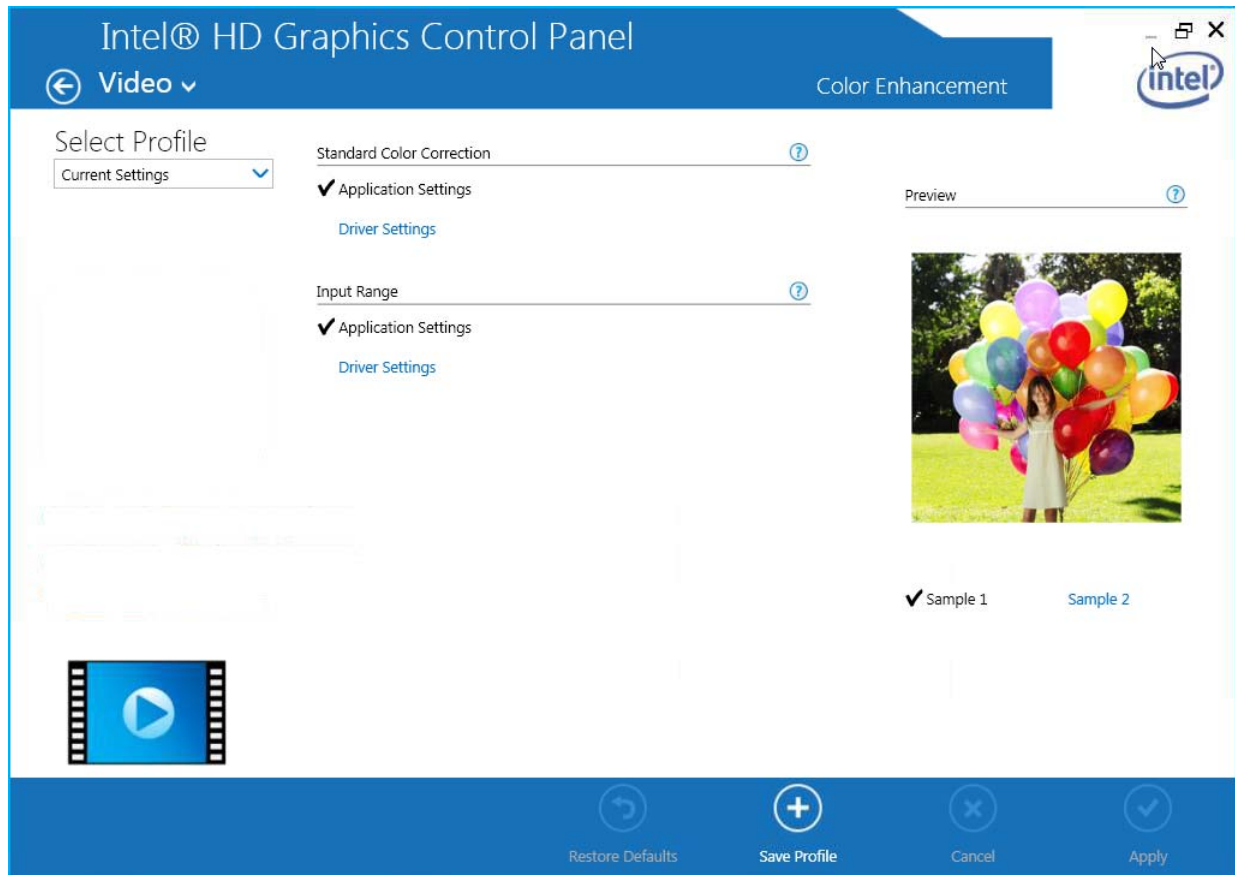
Figure 26:   Dialog „Video"

Using the settings referring to the video overlay within an independent pop-up window changes on a running video reporting can be made.

8.4.5 Profiles

The selected configuration can be saved as profiles. The profiles can be called up as required. Thereby the saved settings are activated without the parameters having to be set individually.
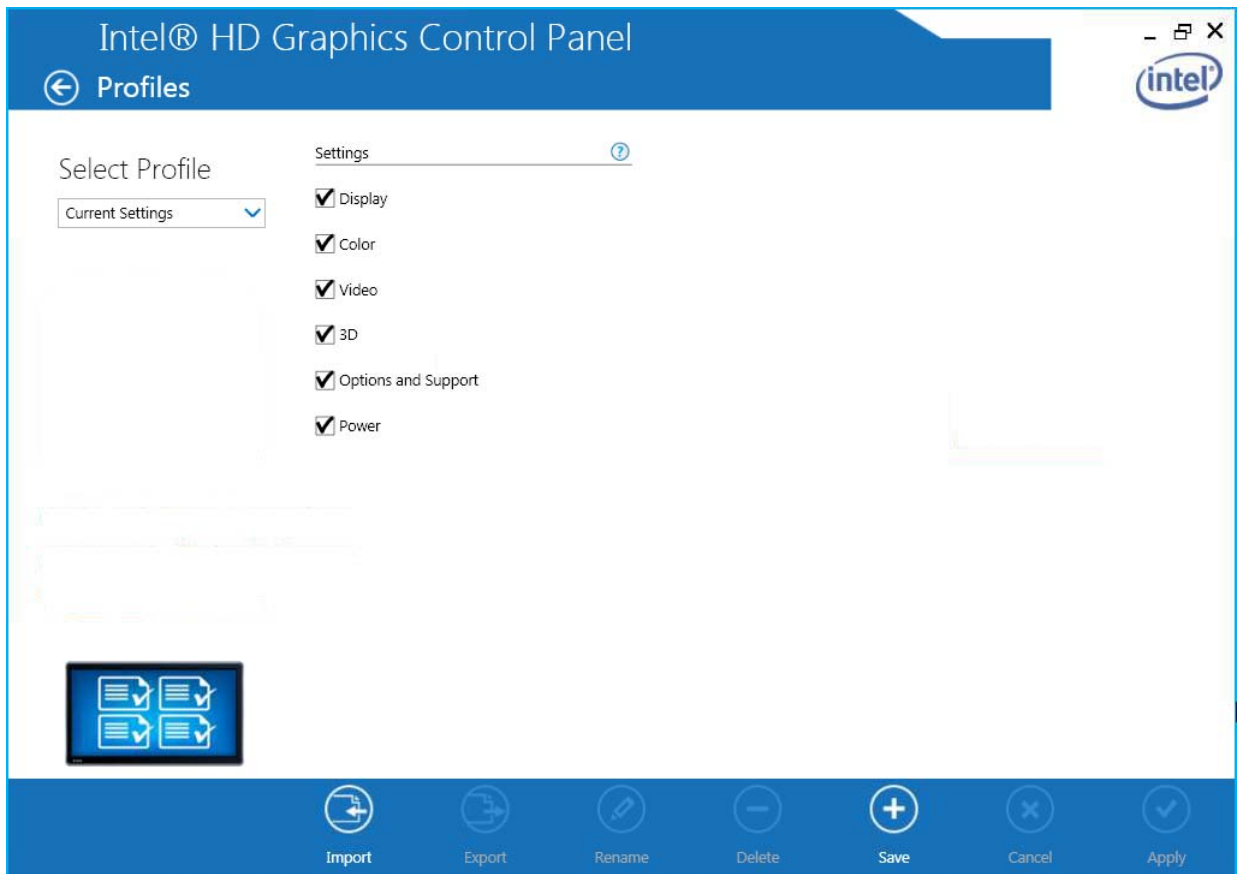
Figure 27:   Dialog „Profiles"

The configuration of a display is saved as profile:

1 Carry out the relevant configuration settings.

2 Enter a name in the field "Current Settings".

3 Click on the "Save Profiles" button to save the profile.

In the following is explained how to call up a saved scheme:

● Click on the symbol in the information range (system tray) in the task bar and then click on the menu point "Select Profile".

● Go to the right mouse button on the desktop and then click on "Select profile".

An application can be started automatically when calling up the scheme on request. Mark the accordant checkbox and then select the accordant application.

8.4.6 Hot Keys

The Intel® graphic driver is available of predefined and assignable hot keys to select an active display and its degree value for the turn at the beginning. Assignment can be changed as explained in the following:
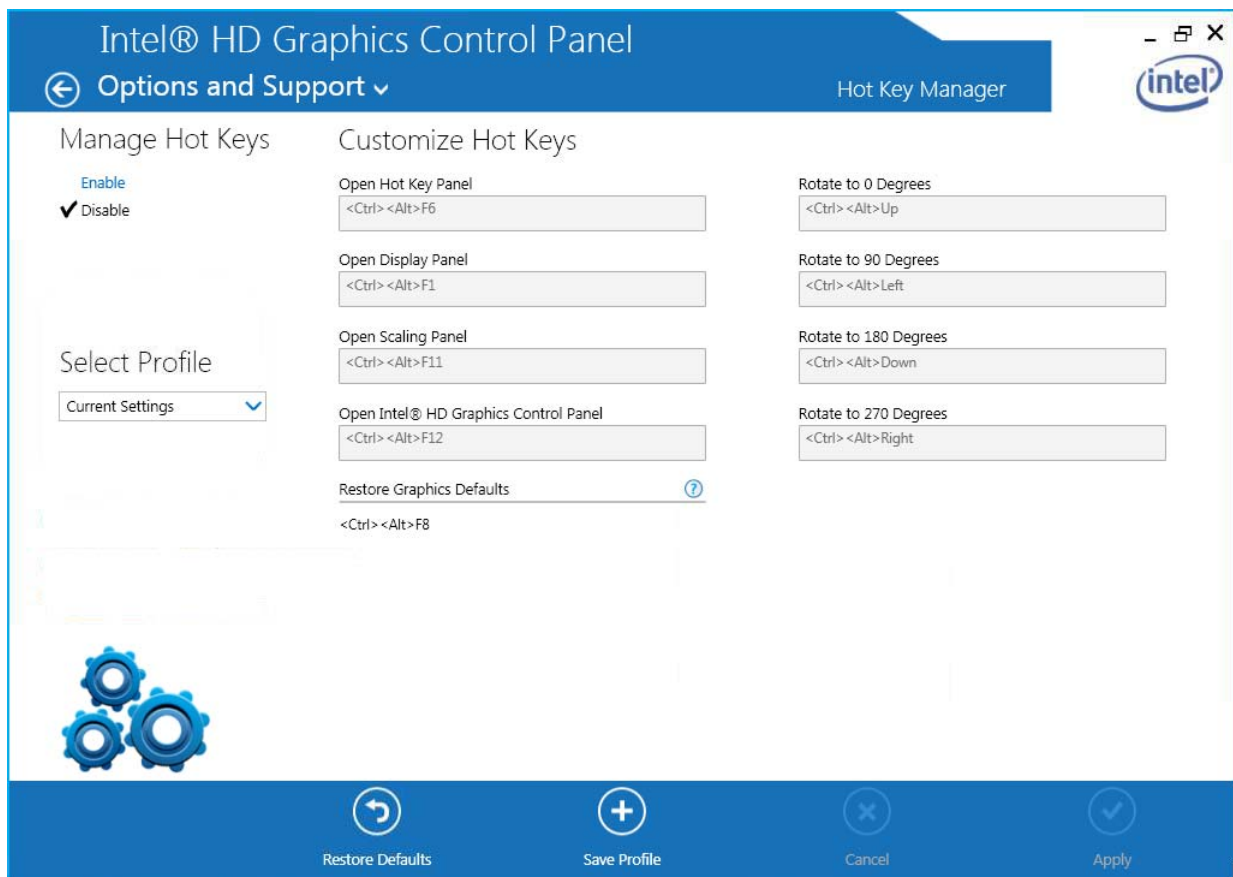
1 Click on the "Options and Support" button

Figure 28: Modification of hot key shortcuts

	NOTE!
(i)	At the login procedure to the system the hot keys were switched off.

2 Set "Manage Hot Keys" menu option to "Enable".

3 Scroll down in the list till to the required action. Write down the button combination of the hot key of the selected action.

4 In order to change the button combination of the hot key in the accordant point enter the new button combination.

5 Click on "Apply" button to save the new hot key combination in the current profile.

6 The new hot key combination can be saved as a new profile as well.

MAINTENANCE

General

⚠️	**WARNING!** **Risk of injury due to improper maintenance!** Improper maintenance can result to serious personal injury and property damage. Therefore: ● Before starting, ensure that there is sufficient room to carry out the work. ● Pay attention to order and cleanliness at the installation site! Components that are loosely stacked or lying around can cause accidents.

ℹ️	**NOTE!** There is no maintenance interval prescribed by the manufacturer for **PLC mc 40**.

9.1   Battery replacement

Use a battery of the type BR1632 as backup battery for the RTC.

Typical battery life depending on use modes:

Tempera-ture	Storage only	1-shift-operation (8 h, 220 workdays/year)	2-shift-operation (16 h, 220 workdays/year)
+20 °C	4,5 years	6,4 years	11,1 years
+60 °C	4,4 years	6,2 years	10,5 years

To replace the battery, pull out the side tab of the battery holder E1 on the device and replace the battery with a new one. The battery holder is then plugged back into the device.

When replacing the battery, make sure that the battery and the battery holder are inserted with the correct orientation as shown in the illustrations below.

☐ Pull out the tab of the battery holder and thus the whole battery holder out of the device. Remove the old battery from the holder.

☐ Insert the battery into the holder with the positive pole facing upwards.

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Document No.: 5.20024.02

Baumüller Nürnberg GmbH

☐ Slide the battery holder with the open side towards the bottom (type plate)
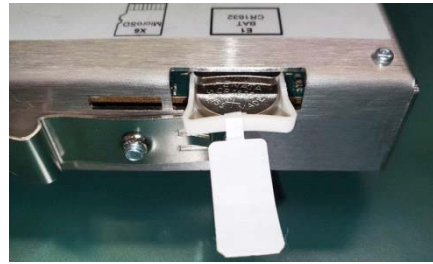
NOTICE!

Insert the battery correctly into the battery holder.

If the battery is inserted with the wrong side, the non-volatile data and real time clock of the device will not be buffered if the supply voltage fails.

The battery must be inserted into the battery holder with the positive pole upwards and the battery holder must be inserted with the open side towards the bottom of the device (type plate).

WARNING!

Only use batteries of the specified type which are in conformity to the EU Directives 2006/66/EC and 2013/56/EU (Battery Directive) and Regulation (EC) No. 1907/2006 (REACH) and observe the safety instructions of the battery manufacturer.

Batteries contain toxic substances which, if used improperly, can lead to chemical burns and material damage.

Only use 3V lithium batteries type CR1632 or BR1632(A) as replacement batteries which comply with the EU Directives 2013/56/EU (Battery Directive) and Regulation (EC) No. 1907/2006 (REACH). Recommended by Kontron Electronics AG are Renata, Varta and Panasonic. Batteries must not be disposed of with household waste and must not be incinerated. Observe the disposal regulations applicable at your location.

Batteries must always be kept out of the reach of children as there is a health hazard if swallowed.

9.2 Cleaning

The device can be cleaned as required. There is no cleaning interval prescribed by the manufacturer of the product.

	NOTICE!
	Damage to property or destruction of the device may result.
	If necessary, the device can be cleaned with a dry cloth. When cleaning the device, make sure that no liquids get inside.

9.3 eMMC flash memory

The bootable eMMC flash memory is recognized in Windows as SSD and is fixed soldered to the mainboard. Please return the **PLC mc 40** to Baumüller for exchange in case of a defect of the eMMC flash memory.

9.4 BIOS configuration

At the BIOS configurations no changes may be made as each change at the BIOS can influence the real-time capability of the system.

Boot options When booting up it is very important that there is no booting-capable data medium in the μSD or USB slot. If the system wasn't booted by the eMMC flash memory the control is inoperative.

9.5 Repair

If the device is out of order, please contact your sales agency or:

Baumüller Nürnberg GmbH

Ostendstr. 80 - 90
90482 Nürnberg
Germany

Tel. +49 9 11 54 32 - 0
Fax: +49 9 11 54 32 - 1 30

E-Mail: mail@baumueller.com
Internet: www.baumueller.com

TROUBLESHOOTING

General

	WARNING!
⚠️	**Risk of injury due to improper troubleshooting!**
	Therefore:
	• Only qualified personnel may work on this device!
	• The personnel, working on the Industry PC must be familiar operating the device and of the safety instructions. The user must know how to react on error displays and error states, The user must have special knowledge of error displays reactions and of the error states.

	NOTICE!
🛈	Loss of warranty due to manipulation of the device
	Repairs and other manipulations of the device may only be carried out by the manufacturer. In particular, opening the device is prohibited. Otherwise any warranty will become void.

ACCESSORIES AND SPARE PARTS

This chapter lists the accessories and spare parts for the **PLC mc 40**. Our Product Management is looking forward to inquiries and suggestions concerning spare parts.

11.1 Video adapter (mini HDMI to DVI)

Recommended:

- to HDMI
- to VGA

☐ Delock HDMI Mini-C to DVI:
  Baumüller part No.: 487790

☐ Delock HDMI Mini-C to HDMI:
  Delock Part No. 65665
  https://www.delock.de/produkte/S_65665/merkmale.html

☐ Delock HDMI Mini-C to VGA:
  Delock Part No. 65471
  https://www.delock.de/produkte/S_65471/merkmale.html

11.2 Zugentlastung

Part No.	Name	
491244	Strain relief	Extron: HDMI cable lacing bracket

Figure 29:   Strain relief

	NOTE!
	For mounting notes refer to **LockIt HDMI Cable Lacing Bracket Installation Guide** at www.extron.de

12

DISPOSAL

	NOTE!
🛈	Baumüller products are not subject to the scope of the EU's Waste Electrical and Electronic Equipment Directive (WEEE, 2002/96/EC). Hence, Baumüller is not obligated to bear costs for return and disposal of waste electronic equipment.

	NOTE!
❗	**Avoid polluting the environment as a result of improper disposal.**
	Therefore:
	• Only dispose in compliance with the health and safety regulations.
	• Take heed of any special local regulations. If you are unable to directly ensure safe disposal yourself, commission a suitable disposal contractor.
	• In the event of a fire, hazardous substances could possibly be generated or released.
	• Do not expose electronic components to high temperatures.
	• Beryllium oxide is used as inner insulation, for example for various power semiconductors. The beryllium dust that is generated upon opening is injurious to the health. Do not open electronic components.
	• Dispose of capacitors, semiconductor modules and electronic scrap as special waste.

>
>
> **WARNING!**
>
> Danger as a result of faulty deinstallation!
>
> The deinstallation and disposal requires qualified personnel with adequate experience.
>
> Therefore:
>
> ● Only allow deinstallation and disposal to be performed by qualified personnel.

12.1 Disposal facilities/authorities

Ensure that the disposal is handled in compliance with the disposal policies of your company, as well as with all national regulations of the responsible disposal facilities and authorities. In case of doubt, consult the bureau of commerce or environmental protection authority responsible for your company.

APPENDIX A - DECLARATION OF CONFORMITY

EC - Declaration of Conformity

Doc.-No: **5.20025.00**
Date: **07-Oct-2020**

according to EMC Directive 2014/30/EU

The manufacturer: Baumüller Nürnberg GmbH
                           Ostendstraße 80-90
                           90482 Nürnberg, Germany

declares that the product:

Designation: Control system PLC mc 40
Type: BMP-40-XXXX-XX-X-XX-XX-XXXX-XXXX-XX
Manufactured since: 01-Oct-2020

is developed, designed and manufactured in accordance with the EMC Directive 2014/30/EU.

Applied harmonized standards:

Standard	Title
EN 61000-6-2: 2005	EMC - Immunity standard for industrial environments
EN 61000-6-4: 2007/ A1:2011	EMC - Emission standard for industrial environments

The products must be installed correctly and all notes and safety notes of the referring instruction handbook must be complied with, to guarantee the compliance to the guidelines.

Nürnberg / 07-Oct-2020
Place / Date

The content of the Declaration of Conformity is subject to change. The current version can be obtained on request.

Table of Figures

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Baumüller Nürnberg GmbH

Revision survey

Version	Status	Changings
5.20024.01	19-Oct-2020	First release
5.20024.02	12-May-2021	Revision

Notes:

Instruction handbook **Control system PLC mc 40**

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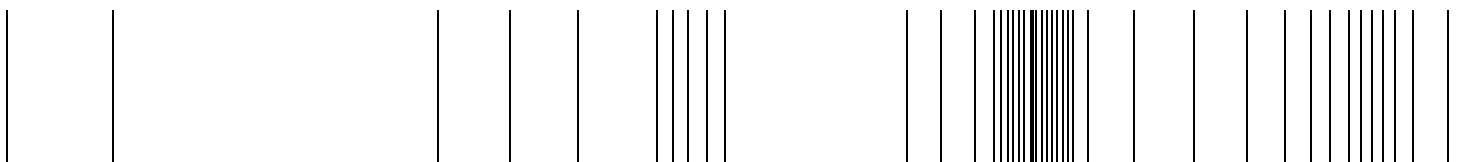
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