

PowerPlex[®] Touch Panel 7.0" User Manual



User Manual **PowerPlex**[®]

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About this manual

This manual describes start-up of the **PowerPlex**[®] Touch Panel 7.0" (PP-M-TP07) in connection with compatible **PowerPlex**[®] components. We assume that all **PowerPlex**[®] compatible components and devices were installed correctly. The instruction is meant to be used by all professional electricians who want to integrate this control panel into an E-T-A **PowerPlex**[®] system. The **PowerPlex**[®] Touch Panel 7.0" allows easy and intuitive operation and monitoring of the **PowerPlex**[®] installations.

Besides this document further information on the E-T-A **PowerPlex**[®] can be found in the following manuals (English):

PowerPlex[®] Manual Volume 1
Volume 1: System Description

Volume 1 holds a general system overview, a description of the system architecture **PowerPlex**[®] and a detailed explanation of the functions of the individual **PowerPlex**[®] components. In the appendix you will find background information which could be of interest in connection with the principles of a **PowerPlex**[®] system. The manual gives you a short introduction to CAN networks (Controller Area Network).

PowerPlex[®] Manual Volume 2
Volume 2: Hardware Installation
and Maintenance

Volume 2 provides a step-by-step instruction for installing a **PowerPlex**[®] system. Read here where and how to mount and wire the DC power modules and the panel modules and how to connect the devices and equipment to be controlled. In addition this manual summarises the installation instructions and offers the possibility of quick install.

PowerPlex[®] Manual Volume 3
Volume 1: System set-up and
configuration

Volume 3 describes the **PowerPlex**[®] Configuration Software. You receive a step-by-step instruction how to set up your **PowerPlex**[®] system after installing the hardware. We guide you through all dialog boxes and menus of the configuration software and establish a sample configuration. This configuration can be loaded onto the **PowerPlex**[®] hardware and be tested. There is separate chapter on special **PowerPlex**[®] functions allowing you to establish an even more specific CAN-bus-based control system for the entire electrical equipment of the vehicle.

All manuals contain important instructions for connection and safe operation of the **PowerPlex**[®] devices. Safety instructions have to be observed. All users have to be informed about all safety instructions. The documents have to be accessible for the user.

Qualified personnel

The system must only be installed, connected and configured in connection with this document. Installation and operation of the device/system must only be carried out by qualified personnel. With regard to the safety instructions of this documentation, qualified persons are persons authorised to operate devices, systems and circuits according to the standards and rules of safety engineering.

Safety instructions



Please follow the installation and configuration instructions given in this document carefully. Failure to comply may lead to serious damages of the product or the system. E-T-A does not accept any liability for problems caused by improper installation or handling by the customer or a third person.

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Symbols

You will find the following symbols in the entire manual. Their meaning is as follows:

	<p>CAUTION:</p> <p>You are in a situation which might cause injury. Before working with one of the devices you have to be aware of the risks of electrical circuitries and you ought to be familiar with standard procedures of accident prevention.</p>
	<p>CAUTION:</p> <p>There is a risk in this situation to do something which might cause damage of the devices or data loss.</p>
	<p>INFORMATION:</p> <p>Here you receive information which might be particularly useful for the application.</p>

Notes

Space for your notes.

1 Introduction

You chose **PowerPlex**[®], a comprehensive, future-oriented on-board system which combines safety, user convenience and reliability. It is a decentralised power distribution and control system, regulating, controlling and monitoring various loads, switches and sensors and connecting them via CAN. All **PowerPlex**[®] modules ensure reliable control and monitoring of the electrical installations on board, either alone or in combination with other **PowerPlex**[®] components. Besides the protection against overcurrent they allow readout of data of the connected level sensors and temperature sensors as well as of shunts.

All modules of a system communicate and interact via a SAE-J1939-compliant CAN bus. **PowerPlex**[®] is configured by using the **PowerPlex**[®] Configuration Software and the configuration is transferred to the modules by means of USB/CAN converters. Thanks to its system properties **PowerPlex**[®] is the perfect solution for smart electrical networks on boats and in vehicles. Typical applications include:

- Buses, special vehicles, mobile homes etc.
- Watercraft, e.g. leisure boats, workboats

This document contains the mounting and connection procedures. You will learn more about

- how to mount the **PowerPlex**[®] Touch Panel 7.0"
- how to connect the display with other **PowerPlex**[®] components and
- how to change/adjust the user surfaces of the Touch Panel

BENEFITS FOR THE OEM

The E-T-A **PowerPlex**[®] system provides switching and controlling, timer functions, real load status indication, overcurrent protection and wire break detection. Each function is individually configurable to fit the requirements of the different loads.

Based on CAN network communication, the **PowerPlex**[®] system makes individual wiring between loads and switching equipment to a thing of the past. As the transmission of switching commands and status information is based on peer-to-peer CAN bus communication, there is no need to have direct cabling between the operating element, say a light switch, and the load to be switched, say a lamp. The obvious advantage to the OEM lies in the reduced cabling and build costs, and in the convenient system setup using Windows based configuration software. As the system's control functions are freely configurable with respect to complexity and system size, modification and expansion at a later stage is extremely easy.

PowerPlex[®] FUNCTIONAL RANGE – **PowerPlex**[®] takes charge of the following tasks:

- DISTRIBUTE THE DC 12 V OR DC 24 V SUPPLY to all points where loads are installed, such as lighting and heater control, bilge pumps, water pumps, windscreen wiper motors, etc.¹
- COLLECT STATUS INFORMATION from all sensors and operating elements around the vehicle, such as temperature and tank level measurement points, ON/OFF status signals of actuators.
- SWITCH APPLIANCES AND EQUIPMENT ON AND OFF, according to selectable, predefined scenarios, at the touch of a button.
- MONITOR APPLIANCES AND EQUIPMENT for out-of-range conditions, indicate such faults and respond to them by switching the associated control device, such as switching ON a pump if the potable water tank level is too low.
- PROTECT APPLIANCES AND EQUIPMENT against dangerous overloads and short circuits by isolating the faulty load from the system and indicating its failure.
- PROVIDE BACKUP PROTECTION AND SWITCHING in the unlikely event of **PowerPlex**[®] system or component failure

¹ Distributing AC 230 V supply is with **PowerPlex**[®] AC modules possible

2 System Components: Overview

With **PowerPlex**[®], E-T-A offers a comprehensive, on-board system which combines safety, comfort and reliability. **PowerPlex**[®] allows individual and flexible concepts for switching the illumination, sirens, special signals and much more. It can automatically switch loads and will immediately inform the driver about undesirable behavior of the devices or the electrical installation. This will ensure that everything works as it is designed to – reassuring when loads are not always visible. E-T-A **PowerPlex**[®] is a decentralized power distribution system with electronic protection – fully geared to the future.

Figure 1 shows a typical **PowerPlex**[®] arrangement comprising a number of distributed **PowerPlex**[®] components – modules and user interfaces – installed in different locations of a vehicle.

PowerPlex[®] communication is based on the CAN bus principle using "nodes" that talk to each other over 2-wire serial connections. Therefore, the key components of the **PowerPlex**[®] system are such nodes distributed over the vehicle. The **PowerPlex**[®] term for these interconnected nodes is "module".

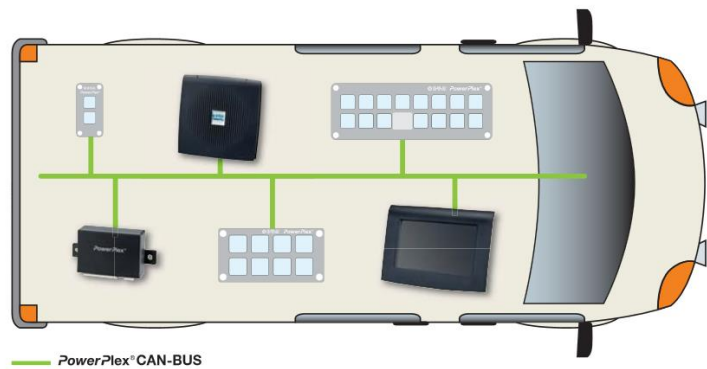


Figure 1: Exemplary **PowerPlex**[®] system design in an ambulance vehicle

To install and setup a **PowerPlex**[®] system are different hardware components necessary.

- One or more **PowerPlex**[®] modules (e. g. Power Module, Compact Module, Mini Module) in care and attention of the module-specific requirements
- USB-CAN-Converter (cable and driver software) for transferring the configuration → more in chapter 10,
- USB cable for the USB service interface for transferring application-specific user interfaces to **PowerPlex**[®] Touch Panels

You also need CAN bus cables to connect the **PowerPlex**[®] components to the CAN bus. A number of manufacturers provide standard cables. Further information about required cable properties in chapter 7 of the manual.

PowerPlex[®] connects, regulates, controls and monitors a wide variety of loads, switches and sensors over CAN – precisely and securely. It controls status functions, operating modes and command executions. Ideally matched software and hardware components provide a total solution with an enormous potential for individual customization.

Each **PowerPlex**[®] module protect loads and harness against overcurrent. In addition the modules are used to collect sensor data from level and temperature sensors as well as shunt resistors. Your **PowerPlex**[®] system will most probably comprise a certain number of each module type, depending on the size of the electrical system you wish to monitor and control, and on the current rating of the loads you wish to switch.

Use the **PowerPlex**[®] Configuration Software to "program" different control configurations, save them on the computer and load them into different **PowerPlex**[®] control systems, as required. Once a **PowerPlex**[®] configuration has been completed, it is loaded into the **PowerPlex**[®] modules (also called "nodes") using a CAN bus interface. It is also over this CAN bus interface that you connect the **PowerPlex**[®] Software when you want to test, analyses and debug the **PowerPlex**[®] installation.

In Figure 2 you see our complete **PowerPlex®** product range for designing your **PowerPlex®** system solution.

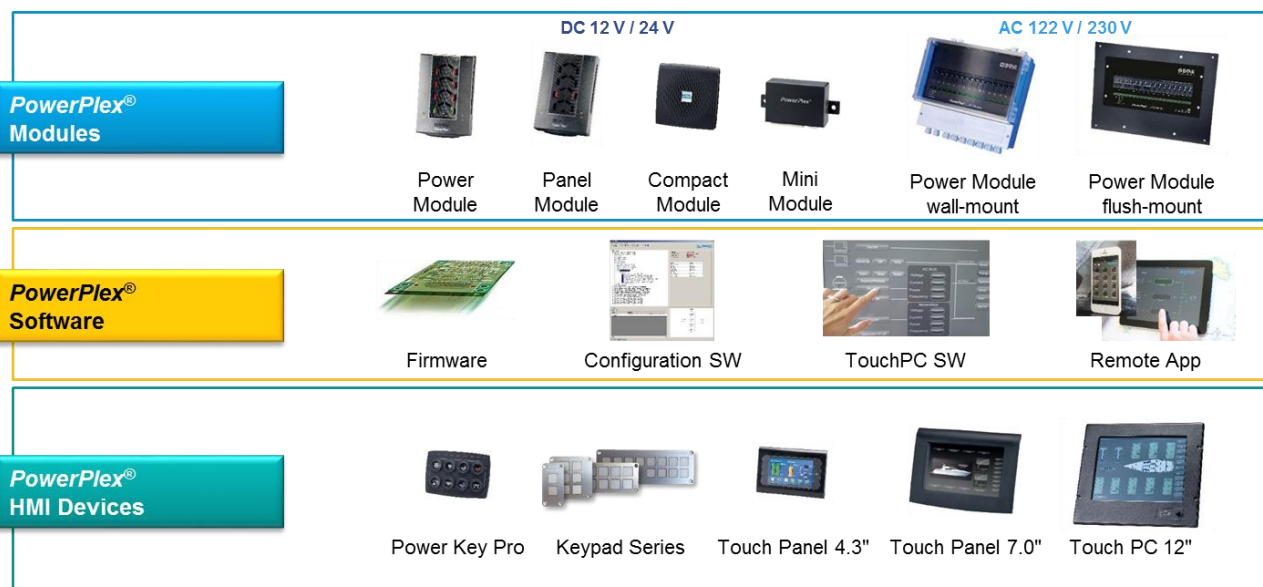


Figure 2: Design your PowerPlex® system - PowerPlex® components

Other components which are necessary to get a functional system are in Table 1 specified.







ACCESSORIES	DESCRIPTION
	POWERPLEX CONFIGURATION SOFTWARE Windows based configuration software for defining the addresses, characteristics and functions of the PowerPlex® modules, assigning inputs and outputs to them, and carrying out system tests and analysis.
	CAN-USB CONVERTER PLUS DRIVER SOFTWARE CAN-USB adapter to connect the CAN bus hardware to the USB interface of the computer running the PowerPlex® configuration software and/or to the USB interface of a touch panel that might be connected to the system.
	TERMINATING RESISTORS Two 120 Ω resistors terminate the CAN bus network, one at each end of the bus structure.
	CAN BUS CABLE A standard twisted-pair CAN bus cable comprising two wires (CAN-H and CAN-L) and the shield (SHLD) connects two PowerPlex® modules to each other.
	VOLTAGE SUPPLY 12 V DC or 24 V DC battery voltage supply
	LINE PROTECTION Protection of the L (+) connection from the PowerPlex® module to the battery or the bus. <i>Recommended:</i> E-T-A thermo-magnetic circuit breaker type 8345

Table 1: Accessories to complete the PowerPlex® system

3 PowerPlex® System: General Characteristic

3.1 PowerPlex® Modules

PowerPlex® modules are the key components of the **PowerPlex®** control network. According to CAN bus terminology, they are the "nodes" in the network and form the switching, relaying and control points.

PowerPlex® for DC systems incorporates high-end power semiconductors with integrated protective elements for switching and protecting electrical loads. The DC modules are free of any mechanical components and are thus hardwearing as well as shock- and vibration-proof.

E-T-A offers four **PowerPlex®** modules for DC 12 V and DC 24 V systems. Every module is different. Table 2 shows exemplify the difference of two modules.

DC MODULES		MINI MODULE	POWER MODULE
Total voltage		DC 12 V / DC 24 V	DC 12 V / DC 24 V
Total current max.		12 A per module	102 A per module
Inputs	digital	8, configurable	8
	analog		4
Outputs		8 (max. 1.5 A)	4 (max. 1 A) 6 (max. 8 A, FLPC) 2 (max. 25 A, FLPC)
Protection Class		IP22	IP22
Order number		PP-M-MM300-000-0-Z-00	PP-M-DC024-000-0-0-00

Table 2: Different PowerPlex® modules

3.2 PowerPlex® CAN Bus

One **PowerPlex®** control network may comprise up to 30 **PowerPlex®** modules of any type. The smallest **PowerPlex®** network would be made up of two such modules interconnected by a CAN bus cable (→ shown in Figure 3).

The loads controlled by the module outputs – here: a lamp and a bilge pump – will typically be installed somewhere in the vehicle, not necessarily close to the input signal. The distributed control architecture of **PowerPlex®** therefore allows you to monitor and switch appliances anywhere on the vehicle from any point you wish.

A level sensor monitors the bilge area and feeds this analog information to Module 1. From there, the information is transmitted to Module 2 over the CAN bus. As soon as the measured bilge level (i.e., the analog input value) exceeds a predefined limit value, Module 2 sends a switching command to the load (i.e. the "Bilge pump") to switch on the pump and empty the bilge to an acceptable level. Information on the bilge pump status can be sent back to Module 1 to light up the visual "Bilge pump running" indicator. Module 2 monitors the position of a light switch – ON or OFF – at one of its digital inputs, sends this switch signal to Module 1 which switches the light ON or OFF depending on the switch position.

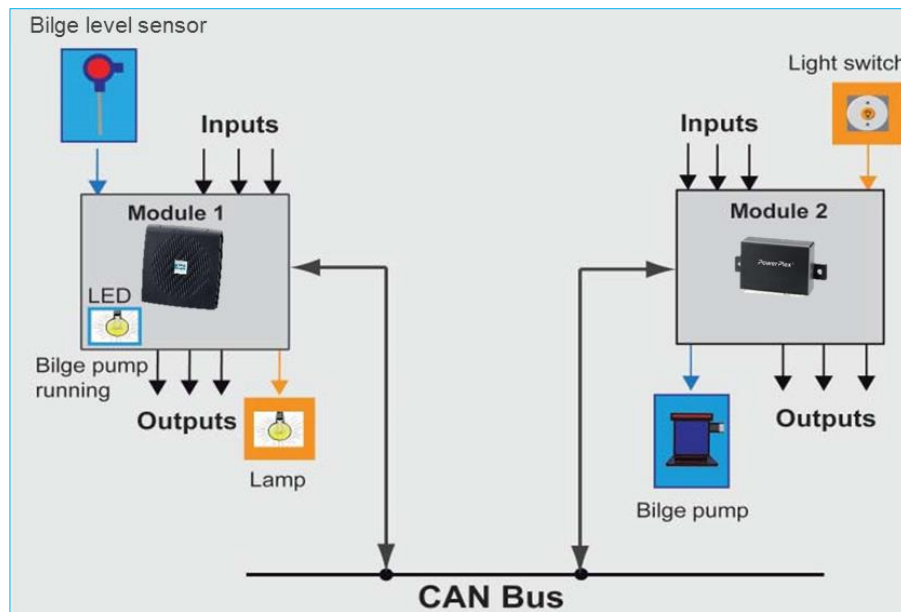


Figure 3: Minimum PowerPlex® System design – two PowerPlex® modules connected via CAN bus cable

The example illustrates the principle of applying sensor and switch signal information to the module inputs and sending, switching or indicating commands to the outputs of the same or another module.

A typical **PowerPlex®** control system will of course interconnect a much larger number of modules, and their inputs and outputs, which are distributed over the entire vehicle. Figure 4 illustrates the electrical connection of several **PowerPlex®** modules in a serial CAN bus topology. Each module must be connected to the DC power supply and to the CAN bus.

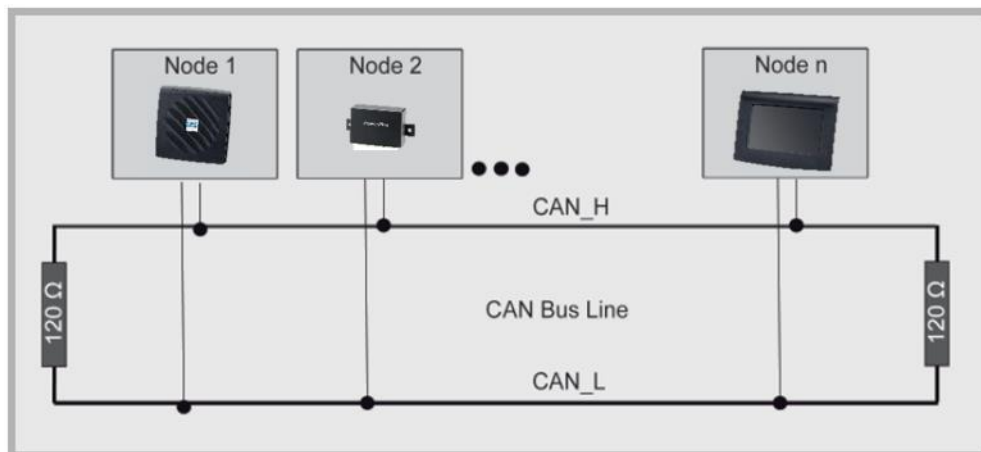


Figure 4: Several PowerPlex® modules connected in a serial CAN bus topology



NOTE:

The first and the last module of the CAN bus topology have to have a 120 Ω terminating resistor connected between the CAN-High and the CAN-Low signals to prevent interferences on the bus.

3.3 Noting the Serial Numbers

Every **PowerPlex**® component has a unique serial number.

We recommend putting down the serial numbers of all **PowerPlex**® modules of the system as well to record an installation sketch with all components. The serial numbers can be found on the module enclosures below the bottom area. The serial number consists of 7 letters and figures which you will need for the later configuration of the system.

The serial number serves as an identifier for new, unconfigured modules which initially have the CAN bus address 0. You will come across the module serial number when you set up your **PowerPlex**® system and assign CAN bus addresses using the **PowerPlex**® Configuration Software.

**NOTE:**

Note the 7-digit serial number for each **PowerPlex**® component. These are needed for the subsequent system configuration with the **PowerPlex**® Configuration Software.

Later on, when you are going to configure and define the modules' role in the CAN network, you will have to make the association between serial number, CAN bus address and mounting position on the boat.

We recommend using the CAN bus address labels 1 to 30 provided and fix them to the upper right corner of the module covers to keep track of module identification.

3.4 The Module CAN Bus Address

Every **PowerPlex**® module connected to the CAN bus must have its own unique CAN bus address in the range from 1 to 30 for unambiguous identification within the network. You assign the address when you set up your **PowerPlex**® system using the **PowerPlex**® Configuration software (see **PowerPlex**® Manual Volume 3: System Setup and Configuration).

We recommend to mark the modules in your **PowerPlex**® system with their corresponding module addresses. This allows you to keep track of module identification.

4 General: **PowerPlex**® Touch Panel 7.0"

Using a Touch Display enables you to benefit from the advantages of a **PowerPlex**® system to the full extent. It is not important whether you wish to combine standard operating and display elements or whether they shall be replaced completely. The **PowerPlex**® Touch Panel 7" is E-T-A's cost-efficient display providing ultramodern operation and monitoring of the on-board electrical system.

It helps to enhance the communication and configuration possibilities of **PowerPlex**® and can completely replace conventional panels and pointer elements. Relevant system data of electrical loads, sensors and operational states are processed and displayed on the customer-specific touchscreen in real time. The ON/OFF operation for all connected loads is accessible via touch operation. Various monitoring functions enable the user to act preventively. The **PowerPlex**® Touch Panel 7.0" has a resistive touchscreen designed for harsh operating conditions. It is fully functional immediately after start-up of the electrical system. Operation is effected by pressure on the surface. Any object, even a hand with gloves can be used.



Figure 5: PowerPlex® Touch Panel 7.0"

When developing the **PowerPlex**® Touch Panel, special attention was paid to meeting the specific requirements of special vehicles and watercraft so as to provide the ideal completion of the **PowerPlex**® system.

4.1 Technical Data

A **PowerPlex®** Touch Panel should be cross-linked with at least one **PowerPlex®** module via a CAN bus. The maximum resolution of the silk-mat display is 800 x 480 pixels at a light density of 400 d/m². The installation of the housing is effected from the front - space-saving due to front panel cut out. The entire frame of the enclosure is encased with a front panel and meets protection degree IP22 as a standard. Supplementary accessories increase the protection degree to IP65 when observing the mounting instructions. Table 3 summarizes the vital information.

TECHNICAL DATA	
Size	7" with resistive touch display
Rated voltage	DC 12 V / 24 V
Operating voltage	9 ... 32 V DC
Operating temperature	-20...+70°C (-4... 158°F)
Storage temperature	-30...+80°C (-22... 176°F)
Degree of protection	IP20 (mounting version A, from the front) IP65 (mounting version B, from the front)
Outer dimensions	215.8 mm x 160.7 mm x 14 mm
Mounting dimensions	175.7 mm x 118.4 mm x 32.5 mm
Resolution	WVGA (800 x 480 pixels)
Brightness	typically 400 cd/m ²
Application memory	16 MB
Interfaces:	CAN according to SAE J1939 250 kBits/s USB 2.0 service interface
Mass	550 g

Table 3: Selection of technical data

*) For further information please see the relevant data sheet.

4.2 Scope of delivery

The following parts are part of the delivery scope of the display (mounted):

- Enclosure front frame
- Touch Display

The following accessories can be ordered separately:

- USB/CAN Konverter XPP-USBCO
XPP-USBC1 (opto-decoupled)
- Sealing gaskets for IP65 XPP-SP-100
- Mating connectors XPP-CP-100
(contains 6-pole and 24-pole connector, 30 x crimp contacts 16AWG (1.31mm²))

For more information please see the relevant data sheet.

4.3 Connections and terminals

The **PowerPlex®** Touch Panel 7.0" has terminals for the CAN bus, the power supply and a USB 2.0 service interface on the bottom side as standard. More interfaces are possible, but have to be requested separately from E-T-A. Please note that the mating connectors are not included in the delivery scope as standard.

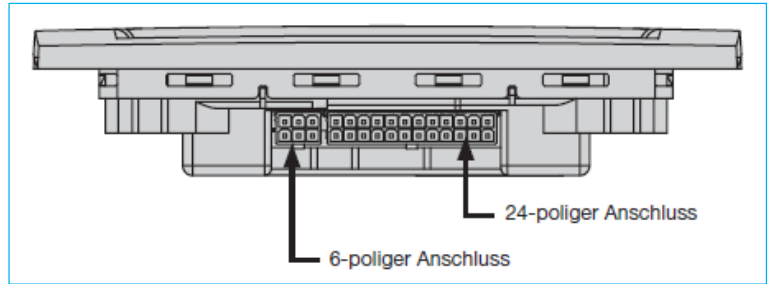


Figure 6: Terminals of the PowerPlex® Touch Panel 7.0"

Pin assignment of the terminals for the standard version of the device is shown in Table 4 and Table 5.

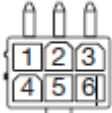
TERMINALS	INTERFACE	ASSIGNMENT	PIN NO.
 6-pole connection	CAN bus	CAN-H	1
		CAN-L	2
		SHLD	3
		CAN-H	4
		CAN-L	5
		SHLD	6

Table 4: 6-pole terminal and standard pin assignment

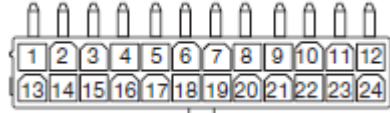
TERMINALS	INTERFACE	ASSIGNMENT	PINS
 24-pole connection	power supply (DC 12 V / DC 24 V; DC 9... 32 V)	U _{Batt} +	1
		U _{Batt} -	2
	cont. plus (DC 12 V / 24 V, max. 36 V)	D +	3
	USB 2.0 service interface	Data _{USB} +	5
		GND _{USB}	6
		Data _{USB} -	17
		+5 V _{USB}	18

Table 5: 24-pole terminal and standard pin assignment

Below Table 6 shows optional interfaces with the corresponding pin assignment. These have to be requested extra and are not a standard part of the device.

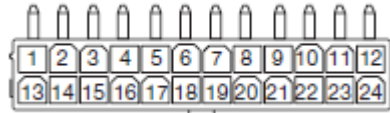
TERMINALS	INTERFACE, UPON REQUEST	ASSIGNMENT	PINS
 24-pole connection	LIN interface (CIB)	LIN	4
	audio interface	L 0	13
		GND _{AUDIO}	14
	multipurpose load outputs	L 1	15
		GND _L	16
		L 2	9
		L 3	10
		L 4	11
		L 5	12
		GND _L	8
	Ethernet	TX+	19
		TX -	20
		RX+	21
		RX -	22
	RS 485	A _{RS485}	23
B _{RS485}		24	

Table 6: 24-pole terminal – optional interfaces

Delivery of a standard **PowerPlex**[®] Touch Panel 7.0" does not include any mating plugs. They can be ordered separately. Please order the corresponding bushing housings (6-/24-pole) and the requested female pins (16 AWG or 18-24 AWG). The corresponding part numbers are shown in the data sheet of the device.



CAUTION:

To avoid accidental short circuits, make sure that the module is disconnected from the power supply before you make any connections.

5 Installation site and mounting

The **PowerPlex**[®] Touch Panel 7.0" has been designed for stationary installation indoors and outdoors. The recommended mounting version depends on the required degree of protection. In the event of environmental conditions such as salt water or saline air, the mounting version has to meet special requirements.



INFORMATION:

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

5.1 Mounting check list

Mounting covers the following installation steps:

STEP	ACTION
1	Application-specific system planning
2	Determine the installation site and prepare all necessary devices and tools
3	Put down the serial number
4	Run the cables
5	Prepare the necessary cut-outs for cables and device in the mounting plate
6	Connect the device for start-up
7	Mount and connect all remaining PowerPlex [®] components if not done before.
8	Start the system by switching on
9	Check the system behaviour by a complete system test

Table 7: Mounting check list

When planning and installing the **PowerPlex**[®] system please observe the limited number of system components. Our recommendation is some 30 **PowerPlex**[®] modules per system. Maximum values depend on the configuration scope so that more modules per system could be possible.

5.2 Recommended installation site

Basically the installation site of all **PowerPlex**[®] components can be chosen totally freely. The **PowerPlex**[®] Touch Panel should be installed in area where it offers maximum benefit for the user. The **PowerPlex**[®] modules on the other hand should be installed close to the connected loads to reduce wiring efforts.



CAUTION:

- Leave enough space for heat dissipation.
- Please make sure to install the **PowerPlex**[®] modules in enclosed rooms.
- Please observe the mounting version so as to reach the required degree of protection.
- Clarify measures before installation to avoid possible radio interference.

For the installation of the Touch Panel, at least the following tools are required: drill machine, jigsaw, screw driver, possibly a rasp.

GENERAL REQUIREMENTS OF INSTALLATION SITE

When choosing the mounting site, various factors that might influence the performance of the device have to be taken into account Table 8 gives you an overview of the major factors.







	VENTILATION Please ensure sufficient ventilation by leaving enough space at all sides of the device and ensure that the vent holes are not blocked. Leave enough space between the devices.
	INSTALLATION AREA Ensure a tight installation of the Touch Panel on the mounting area. Please consider the vehicle-specific properties and do not mount components in places where might affect the safety features of the vehicle. In addition make sure that the mounting surface is flat and even and not too rough so as to ensure the requested protection degree.
	CABLE BUSHING Ensure installation of the Touch Panel at a site where the cables can be laid and connected properly.
	WATER INGRESS The device is suitable for mounting on deck and below. The corresponding mounting version has to be observed to ensure the requested degree of protection. Although the device is waterproof through mounting version B, we recommend mounting it in a protected place, i.e. in an area where the Touch Panel will not be exposed to rain and splash water directly or for a longer period of time.
	ELECTRICAL NOISE PULSES The installation site should provide sufficient distance to any devices that might emit noise pulses.
	VIEWING ANGLE Please consider the viewing angle already prior to installation so that contrast, brightness and colour of the display will not be affected.

Table 8: General requirements of the installation site

5.3 General notes on wiring

The selection of the correct cable types is important for the reliable power distribution, control and monitoring by means of **PowerPlex®** system. Please ensure to use cables of superior quality with the suitable cross sections so as to avoid voltage drops. Please also see the separate chapter 0 concerning the integration of the device into the CAN bus network.

The cables should be laid very carefully so as to achieve the maximum performance of the **PowerPlex®** installation. Table 9 gives general hints which have to be observed regarding wiring of a **PowerPlex®** system and the connected loads.

ITEM	NOTE
1	The cables should not be kinked or bent sharply. Please provide sufficient bending radii.
2	Cables must be protected against damages and heat. Avoid the proximity to moveable or hot parts and to machines.
3	Cables should be secured by means of brackets or cable clips. Excessive cable lengths should be disposed of appropriately.
4	Depending on the site of the cables, waterproof bushings might be useful.
5	Ensure a suitable strain relief.
6	Check cables with regard to intact insulation, above all after cable laying.

Table 9: General notes on wiring


If AC and DC current are used for installation, an adequate insulation must be ensured.

5.4 Required installation dimensions - mounting cut-out

The **PowerPlex®** Touch Panel is inserted from above or from the front into the prepared cut-out of the mounting plate, e.g. in the cockpit or in the side trim panel. The required dimensions are shown in Figure 7 Dimensions and space requirements.

All cables are connected to the display from below. This has to be considered in the planning stage and ensures ease of mounting, preventing a possible kinking of the cables.

CAUTION:



When mounting, the achieved degree of protection of the Touch Panel will depend on the selected mounting version.

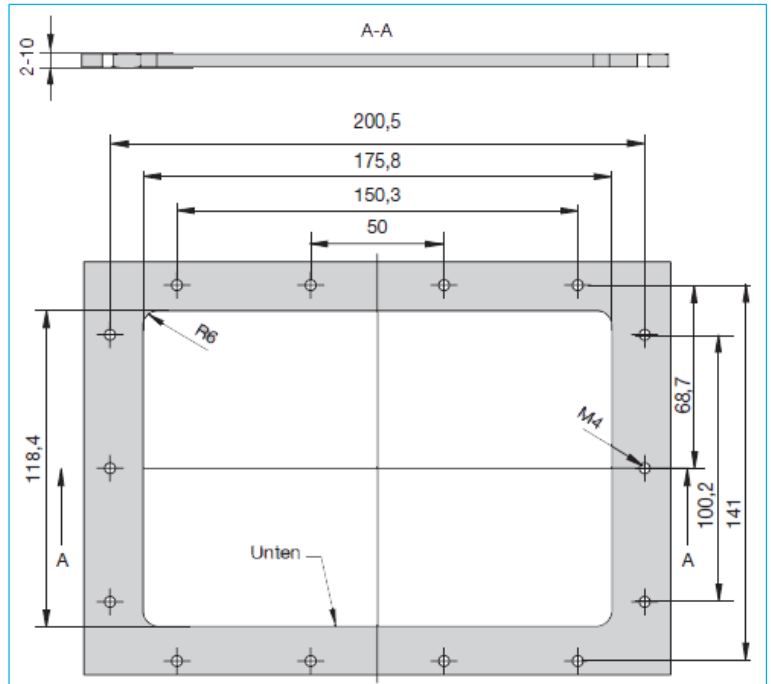


Figure 7: Dimensions for the required mounting cut-out

5.5 Dimensions and space requirements

According to EMC conditions there must always be sufficient space between the different electrical devices. Space requirement of a device depends on its dimensions shown in Figure 8

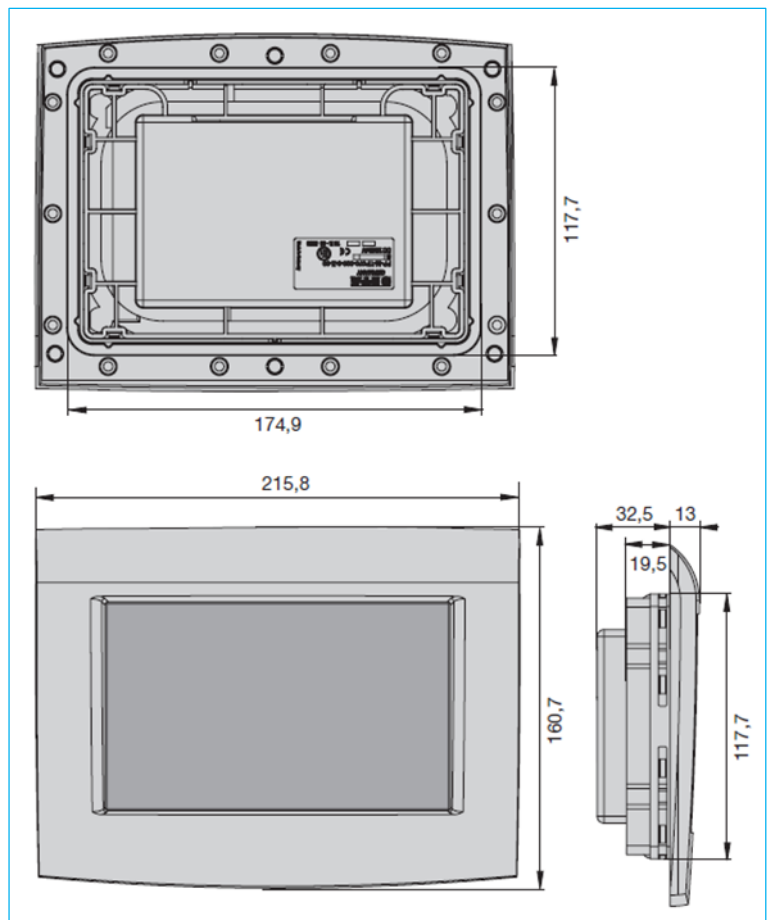



Figure 8: Dimensions of the PowerPlex® Touch Panel 7.0"

5.6 Mounting versions

We have already pointed out before in this manual that the IP protection class depends on the mounting version. The standard version of the **PowerPlex®** Touch Panel 7.0" features IP20 as shown in Figure 9. If a higher degree of protection is required in the application, this is enabled by additional sealing gaskets. The sealing gaskets can be ordered as accessories and are mounted according to Table 11: Major properties of the CAN bus cable to be used.



CAUTION: PROTECTION AGAINST WATER INGRESS

The gaskets available as accessories form a seal between the device and a sufficiently even and firm mounting surface. In some applications it may be necessary to use an additional sealing agent if the mounting surface is rough, uneven or not firm enough.

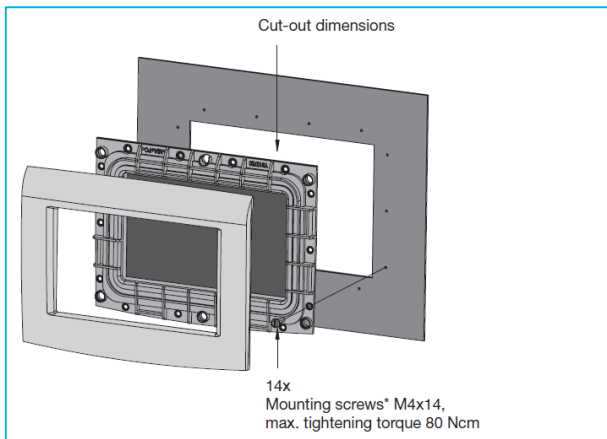


Figure 9: Mounting method A – IP20, front area

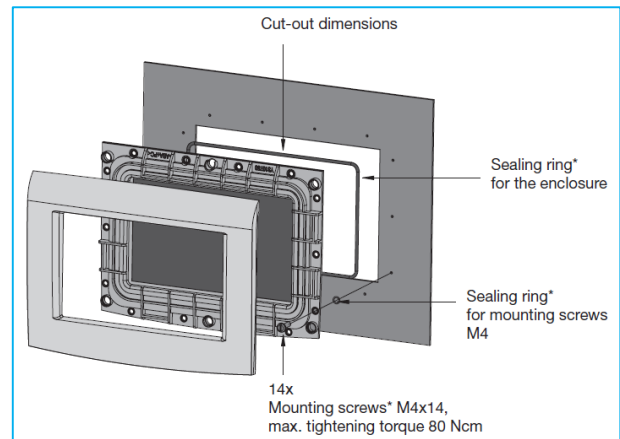



Figure 10: Mounting method B – IP65, front area

5.7 Mounting of the device

The **PowerPlex®** Touch Panel 7.0" requires a corresponding cut-out on the installation site. Before you start installation, please make sure that

- the installation site was selected under consideration of the product-specific requirements
- the cable connections were identified correctly and cable laying was thoroughly planned
- the power supply was disconnected and protected against inadvertent reset



CAUTION: DOUBLE CHECK OF INSTALLATION AREA

A free and even area is required with an appropriate clearance behind the device. Surface of the installation area should not be too rough so as to ensure the required IP protection degree.

STEP	ACTION
1	Mark the intended installation site following the dimensions of the mounting cut-out
2	Prepare the cut-out by means of an adequate tool and drill the mounting holes.
3	Check if the devices fit into the prepared mounting hole and deburr the edges.
4	In the event of mounting version B please fix the big sealing on the rear of the device. The sealing gasket should sit correctly in the intended slot.
5	Depending on the accessibility of the cable connections we recommend to connect all cables (current, CAN etc.) before mounting the device. Important: A cable connection must only be established if the main switch is OFF. Check the cables with regard to correct polarity (→Table 5) and ensure that the max. permissible operating voltage is not exceeded. Please do not forget the terminating resistor if the device is the first or last participant on the CAN bus.
6	Put the device into the cut-out without the front housing frame and fix it with 14 mounting screws M4x14 (alternatively: 14 tapping screws 3.9x14) by tightening the screws. Note: Do not forget the sealing for the screws required for mounting version B. Place them between device and mounting plate (→ Fehler! Verweisquelle konnte nicht gefunden werden.).

Table 10: Mounting of the device

6 Designing Graphical User Interfaces

6.1 User interfaces for development and initial tests

In standard delivery condition the Touch Panel offers standardised user interfaces (masks, → appendix). This allows testing of any optional configuration already during system conception.

The **PowerPlex**® Touch Panel 7.0" can be configured by means of the **PowerPlex**® Configuration Software, just like any other **PowerPlex**® component.

It offers up to

- 24 inputs with switching function,
- 24 signal outputs for status indication (ON/OFF or overcurrent/wire break),
- 32 analog outputs for displaying analog values on the screen.

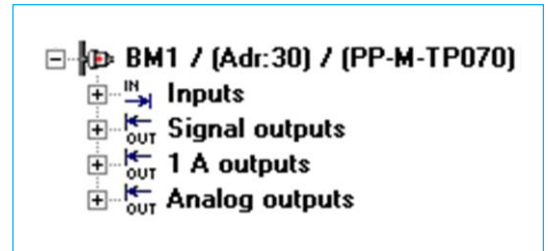


Figure 11: Configurable inputs and outputs

The available 1A outputs can in future be used for special functions (acoustic signals or LEDs). Presently, however, they are not being used.

The first two masks show a total of 32 switches (buttons) with status indication which are directly connected with the inputs 1 to 32 and the signal outputs 1 to 32. The button "switch input 1" serves the first input, the related signal output is therefore "signal output 1".

A circle around the button shows the related status: OFF = no circle; ON = green circle; YELLOW = wire break; RED = short circuit. This is shown in Figure 12.

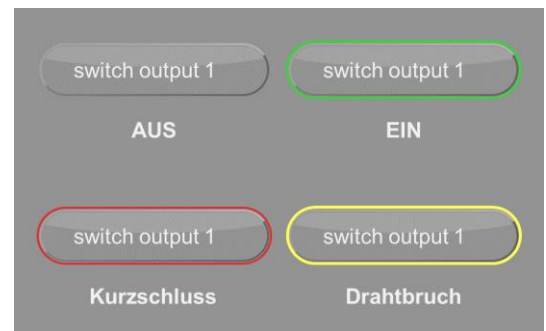


Figure 12: Example 1 – button with status indication

The third user screen "LEVEL" allows display of up to four tank levels (tank level display, Figure 13). They are shown as glass tubes and connected to the analog outputs 1 to 4.

In addition the mask "ROTATION" shows six measuring instruments with rotating hands which are connected to the analog outputs 1 to 10.

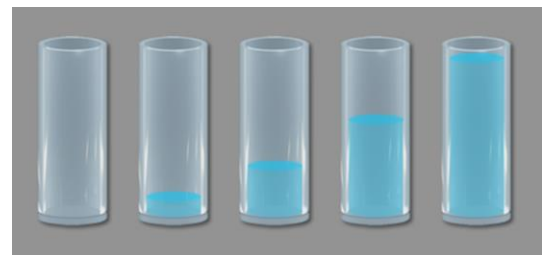


Figure 13: Example 2 – tank level display

The mask "LINEAR" shows linear pointer instruments representing the analog outputs 11 to 18.

The mask "TEMPERATURE" shows thermometer charts which are connected with the analog outputs 19 to 22.

The mask "TEXT" shows the text version of the measuring values. It allows the realisation of digital displays in combination with pictures.



NOTE: SPECIAL FEATURE

Each analog output of the display can be connected with any type of display (graphics). Besides the displays offered by the standard user surface there are other designs available and of course you can include your own graphics.

6.2 Set up user-defined user interfaces

The layout of the user interface is defined by two XML files:

- settings.xml file
- language.xml file

These two files are text files of a certain format similar to HTML.

6.2.1 Settings of the xml file

The settings.xml file defines type, position and size of an element as well as its assigned address in the tree of the **PowerPlex**® Configuration Software. We will explain in more detail with an example:

Figure 14 shows the settings.xml of "button1". Here you can adjust certain settings which will determine how the button will be shown graphically in the user mask and how it will behave depending on the system conditions.

```
<Button1 class="LoadButton2" XPos="26" YPos="166" Option="0">
  <vAlignment>1</vAlignment>
  <hAlignment>1</hAlignment>
  <Red>255</Red>
  <Green>255</Green>
  <Blue>255</Blue>
  <FontName>Arial</FontName>
  <FontSize>12</FontSize>
  <FontBold>0</FontBold>
  <FontItalic>0</FontItalic>
  <ImageOffNormal>\images\Button_normal.bmp</ImageOffNormal>
  <ImageOffPressed>\images\Button_pressed.bmp</ImageOffPressed>
  <ImageOnNormal>\images\Button_green_normal.bmp</ImageOnNormal>
  <ImageOnPressed>\images\Button_green_pressed.bmp</ImageOnPressed>
  <ImageWirebreakNormal>\images\Button_yellow_normal.bmp</ImageWirebreakNormal>
  <ImageWirebreakPressed>\images\Button_yellow_pressed.bmp</ImageWirebreakPressed>
  <ImageOvercurrentNormal>\images\Button_orange_normal.bmp</ImageOvercurrentNormal>
  <ImageOvercurrentPressed>\images\Button_orange_pressed.bmp</ImageOvercurrentPressed>
  <ImageShortCircuitNormal>\images\Button_red_normal.bmp</ImageShortCircuitNormal>
  <ImageShortCircuitPressed>\images\Button_red_pressed.bmp</ImageShortCircuitPressed>
  <SignalAddress>3</SignalAddress>
  <InputAddress>3</InputAddress>
</Button1 >
```

Figure 14: Example 3 – settings.xml-File

1. Alignment of the button on the user mask:
 - **XPos** defines the x position on the screen. The range of XPos = 0 ... 800
 - **YPos** defines the y position on the screen. The range of YPos = 0 ... 480
 - **Alignment** (**v** = vertical, **h** = horizontal) defines the vertical/horizontal orientation towards y and y position. The following is possible: 0 = flush left, 1 = centre justified and 2 = flush right.
2. Determination of the text properties of the button:
 - **Red/Green/Blue** determines the share of brightness of the three base colours red, green and blue. Per each base colour values between 0 and 255 are adjusted which in combination determine the text colour.
 - **FontName/FontSize/FontBold/FontItalic** determine the text properties: typeface, font size, line width (FontBold: 0 = normal, 1 = bold), line layout (FontItalic: 0 = normal, 1 = italics)
3. Determination of graphical elements for various system conditions:

Via the various **Image values** different graphics can be determined (png format) which are shown upon reaching the state on the display. The path to the file has to be indicated in relation to the directory of the conversion program "DESIGN_XML_BIN_CONVERTER".

4. Assignment to addresses in the **PowerPlex**® Configuration Software

- **SignalAddress** is the address of the associated signal output in the configuration software
- **InputAddress** is the address of the associated input in the configuration software

All elements of the settings.xml file are structured along these lines and can be adjusted accordingly.

6.2.2 Language.xml file

The language.xml file determines the marking (label) of the elements used and determined in the settings.xml file. You can define up to 10 languages which can be set up in the application later by anybody via the display.

For reasons of clarity and ease of handling, a separate file was used for this purpose. It allows ease of translating and editing of text without having to change function and position of the elements. The name, in our example it is "Button 1", determines the assignment between the element in the settings.xml file and the element in the language.xml file.

```
<Button1 >
  <Language idx="0">Taster Nr.1</Language>
  <Language idx="1">Button #1</Language>
  <Language idx="2"> Bouton 1</Language>
  <Language idx="3"> Pulsante 1</Language>
  <Language idx="4"> Nappi 1</Language>
  <Language idx="5">Frei</Language>
  <Language idx="6"> Frei </Language>
  <Language idx="7"> Frei </Language>
  <Language idx="8"> Frei </Language>
  <Language idx="9"> Frei </Language>
</Button1 >
```

Figure 15: Example 4 – language.xml file

6.2.3 Generation and transmission of user interfaces to the device

In the directory of the **PowerPlex**® Configuration Software there is a directory with the name "DISPLAY PROGRAM TOOL". Please copy the sub-directory "DELIVERY STATE" in this directory and assign a name to the copied directory, e.g. "MYDESIGN". The remainder is now done in this directory "MYDESIGN".



NOTE:

All the following actions are carried out in your directory "MYDESIGN".

As described in the two previous chapters, the two XML files (settings.xml and language.xml) are created to allow adjustment of the graphical user interfaces of the **PowerPlex**® Touch Panel 7.0". After completing the two files the programme (.BAT file) "DESIGN_XML_BIN_CONVERTER" from the directory "Mydesign" can be started. This will automatically create the file "DESIGN.BIN.SNG". Subsequently the programme "PP-M-TP070_SERVICE" will be started from the same directory. After opening the programme "PP-M-TP070_SERVICE" a window will appear asking for a connection (→ Figure 16). After hitting the button "Connect", a window will appear which has to be confirmed separately with "OK".

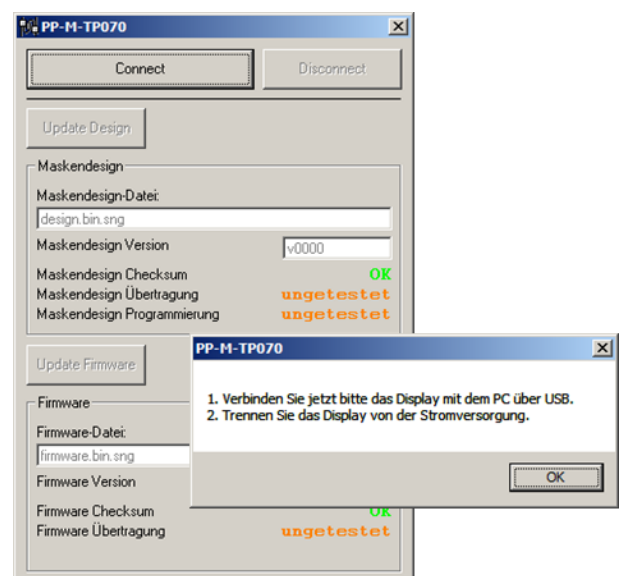


Figure 16: Transmission of a design

**NOTE: FOLLOW THE INSTRUCTION**

- Connect the Touch Panel with the PC by means of the included USB cable (USB/Molex).
- Disconnect the Touch Panel from the power supply.

After following the instruction and having closed the window with the OK button, you can re-connect the supply voltage.

The successful connection of the **PowerPlex**[®] Touch Panel and the PC is indicated with the message "DISPLAY SUCCESSFULLY CONNECTED". Afterwards it is possible to transfer the new design to the Touch Panel. You only have to hit button "UPDATE DESIGN" to allow transmission. Update progress is shown both on the Touch Panel as well as on the computer screen. After transmission has been completed, you have to disconnect the Touch Panel again very briefly to allow a re-start. Afterwards the new user interfaces should be visible on the reset Touch Panel.

7 Integration of the device in the CAN bus network

To set up the CAN bus network all **PowerPlex®** components are connected with each other (→ Figure 17).

A CAN bus has to be closed at the beginning and the end with a 120 Ω resistor each. Bus terminating resistors are not installed in the Touch Panel 7.0. If the device is operated as the first or last participant on the CAN bus, a 120 Ω terminating resistor has to be placed between the pins 1 and 2 or the pins 4 and 5, depending on which are free to use (→ Table 4).

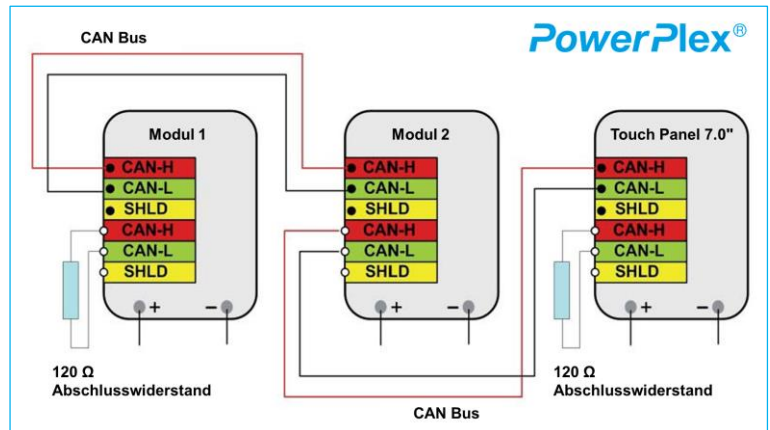


Figure 17: Connection of the PowerPlex® components in the CAN bus system


A CAN bus cable typically is a twisted pair cable with two wires, CAN-H and CAN-L, and shield SHLD.

Table 11 lists the major properties which the CAN bus cable to be used should have. They correspond to a typical CAN bus cable.

MECHANICAL PROPERTIES*	
Diameter - inner conductor	0.97 mm
Nominal cross section	0.5 mm ²
Conductor material	copper, blank
Structure of conductor	multi-stranded copper conductor
Number of cores	2
Total shield	copper braiding, tin-plated
Core colours	CAN-H: white CAN-L: brown
Outer diameter of cable	7.0 mm
Colour of overjacket	purple
Mass	69 kg/km
Min. bending radius	laid out: 90 mm static: 48 mm
Operating temperature	-40 °C... +70 °C (-40 °F... +158 °F)
ELECTRICAL PROPERTIES*	
Surge impedance	120 Ω
Conductor resistance	37 Ω/km max.
Insulation resistance	1 GΩ/km
Test voltage	1.5 kV
OTHER PROPERTIES*	
Resistance against ambient effects	UV resistant, weatherproof, oil-resistant, coolant-resistant, microbe-resistant
Mechanical strength	abrasion-proof, notch-resistant, low adhesion
Chemical resistance	acid- and alkali-proof
Thermal resistance	thermal load: 1.09 MJ/m

Table 11: Major properties of the CAN bus cable to be used
*) Fa. Helukabel: CAN.BUS 1X2X0.50, www.helukabel.de


For more information on CAN networks please see **PowerPlex® Manual Volume1**.

	<p>CAUTION:</p> <p>Please make sure that beginning and end of the CAN bus network are closed off with a 120-Ω resistor, i.e. both the first and the last PowerPlex® component has to have a 120-Ω terminating resistor. This is of major importance for the correct and reliable function of the PowerPlex® installation.</p>
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Note: The terminating resistors are not included in the scope of delivery.


8 Connection to power supply

After interconnecting all **PowerPlex®** components of your system via a CAN bus cable, the installation only has to be connected to electrical power supply. **PowerPlex®** is suitable for both DC 12 V and DC 24 V.

	<p>CAUTION:</p> <ul style="list-style-type: none"> • Please make sure that all electrical installations were carried out in accordance with EN ISO 10133. • Please make sure that the power supply is disconnected and protected against inadvertent re-connection during the works on the system.
---	---

CONNECTING THE DEVICE

The pins 1 and 2 of the 24-pin connector are used for connecting the **PowerPlex®** Touch Panel 7.0" to the power supply (DC 12 V / DC 24 V). A mating plug provides ease of connection.

	<p>CAUTION:</p> <p>The device has to be <u>directly</u> connected with the power supply via a suitable overcurrent protection. It must not be linked up within the system via some other PowerPlex® component to ensure impeccable start-up of the entire system.</p>
---	---

PROTECTION AND CABLE CROSS SECTIONS

Suitable elements for overcurrent protection have to be used to protect the **PowerPlex®** components. The current ratings of the circuit breaker should correspond to the max. expected total current of all outputs of the **PowerPlex®** component to be protected.

The required cable cross section of the supply cable depends on the max. rated current which will be transmitted in the **PowerPlex®** system.

MAX. TOTAL CURRENT	CABLE CROSS SECTION:
54 A	16 mm ²
72 A	25 mm ²
87 A	35 mm ²
105 A	50 mm ²
135 A	70 mm ²
165 A	95 mm ²
190 A	120 mm ²
220 A	190 mm ²

Table 12: Cable cross sections for different current ratings of the entire system

9 PowerPlex® Configuration Software

Up to now, however, you only designed the new user interfaces. To allow the Touch Panel interact with the other **PowerPlex®** components according to your ideas, you have to set up a configuration or adjust an existing configuration. This means that you determine functions, logics etc. for the elements of the user interface by means of the **PowerPlex®** Configuration Software. The configuration performs similarly to other **PowerPlex®** components.

The **PowerPlex®** Configuration Software is part of **PowerPlex®**. You will find it specified in the data sheets of the **PowerPlex®** hardware modules under the heading "Accessories".

When ordering your **PowerPlex®** components, please make sure whether you need the **PowerPlex®** Configuration Software or not. You may already have the software from a previous **PowerPlex®** project. You also can download the Configuration Software from our E-T-A Website.



NOTE:

The **PowerPlex®** Configuration Software will not automatically delivered with the ordered **PowerPlex®** components. You may already have received this software with a previous order or you downloaded it from our E-T-A Website.

9.1 Computer Requirements

The **PowerPlex®** analysis and configuration software runs on any computer or laptop that uses the Windows® operating system. Please check your computer to make sure that it meets the following basic requirements.

TECHNICAL DATA	
Operating system	Windows®, Windows® XP
Processor	Pentium III, or higher
RAM	Minimum: 256 MBytes Recommended: 512 MBytes
Hard disk memory	Minimum: 500 MBytes
Screen resolution	Minimum: 500 MBytes
Input devices	Mouse, or other screen pointing device
Interfaces	USB 2.0

Table 13: Computer requirements for the PowerPlex® Configuration Software

Prior to installing the **PowerPlex®** configuration software check your computer to ensure that it is prepared for the new software.

STEP	ACTION
1	Verify that the computer's hard disk has sufficient free memory space.
2	Uninstall a prior version before installing the new version of the PowerPlex® Configuration Software on your windows-based computer (→ chapter 9.2, Installing the Software)



NOTE:


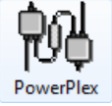
You have to have administrator access rights to be able to install the **PowerPlex®** Configuration Software.

9.2 Installing the Software

The **PowerPlex®** Configuration Software can be downloaded directly online via the E-T-A Website. For this purpose, the username and password are required to be made on request. Upon request we provide the configuration software also provides a USB stick.

The **PowerPlex®** Configuration Software no longer requires you to run through an installation procedure. The **PowerPlex®** Configuration Software can also be started from a USB stick.

If an even earlier version of the **PowerPlex®** Configuration Software is installed on your computer, make sure to uninstall it before you use the newer version.

STEP	Action	
1	Download the PowerPlex® Configuration Software from the provided Internet address to a new folder on your computer's hard disk.	
2	In the folder, double click the software archive and extract all files to the same or a different folder.	
3	To start the PowerPlex® Configuration Software, look in the folder with the extracted program files and double click the POWERPLEX.EXE.	

9.3 Short Introduction: First Steps

The following chapter explains the principal interactive elements of the **PowerPlex®** analysis and configuration software.



NOTE:

Please see the Manual **PowerPlex® Manuel Volume3** "System Setup and Configuration" to get detailed information about "How to configure a **PowerPlex®** System".

9.3.1 The Opening Window

The opening windows opens immediately upon program start. It offers all the functions that you need to configure a **PowerPlex®** system. These are, amongst others:

- Insert, define and modify **PowerPlex®** modules,
- Specify and manage module inputs and outputs,
- Assign links between inputs and outputs
- Print out system information,
- Upload the configuration into the **PowerPlex®** modules using the CAN bus interface.

Figure 18 shows the different elements of the opening windows.

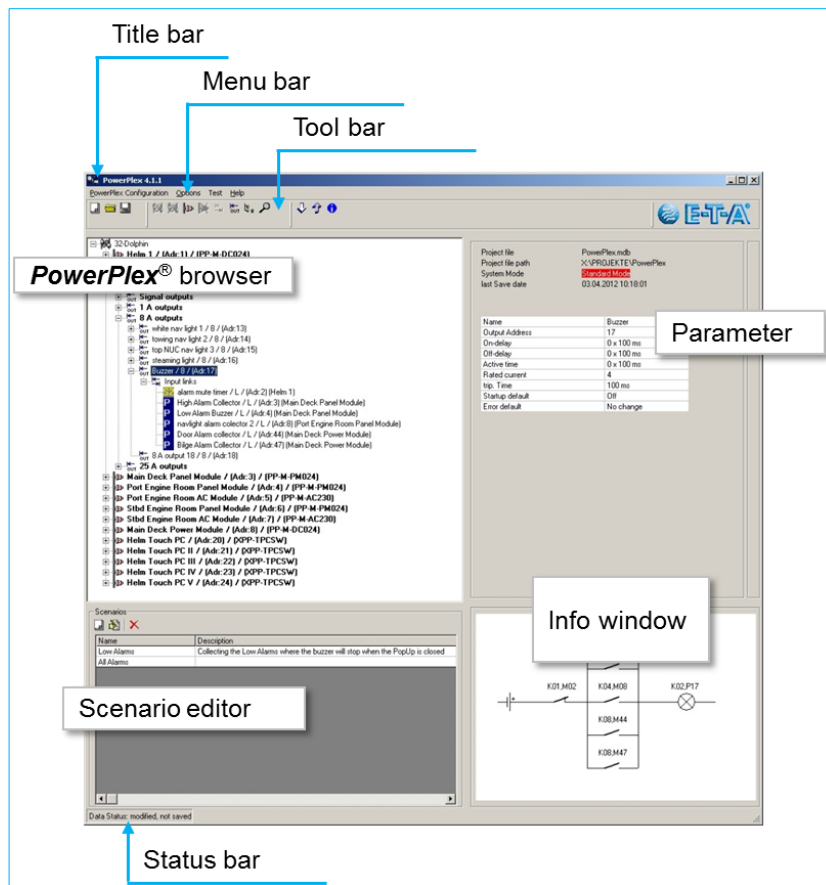


Figure 18: PowerPlex® user interface: The opening window

WINDOWS SECTION	DESCRIPTION
Title bar	Displays program name and version number
Menu bar	Offers interactive PowerPlex® menus for creating, modifying and testing PowerPlex® configurations.
Toolbar	Offers interactive icons for quick access to program functions, such as Create, Save, Edit, Delete...
Browser	Displays the components of the PowerPlex® configuration in tree form. It navigates you through the configuration, i.e. to modules, inputs, outputs, input-output assignments for editing.
Diagnostics window	Displays diagnostics information during testing and debugging
Parameters	Displays important parameters of the selection
Status bar	Shows the status of the PowerPlex® configuration: <ul style="list-style-type: none"> loaded or not loaded new, but not yet saved modified, but not yet saved ...
Scenario editor	Assists you in the creation, modification and deletion of switching scenarios.
Info window	Displays information on program execution and the progress of data transmission. It also informs about errors that may have occurred.

Table 14: Contents of the PowerPlex® opening window

9.3.2 The Menu Bar

The **PowerPlex®** menu bar gives you access to all menus for editing configurations and setting program parameters.



Figure 19: Menu bar

THE **PowerPlex**® CONFIGURATION MENU

The **PowerPlex**® Configuration menu provides you with all the commands you require to handle the configuration:

PowerPlex Configuration	Options		
New	Strg+N	NEW	Creates a new PowerPlex ® configuration.
Load	Strg+O	LOAD	Loads an existing configuration for further modification.
Import	Strg+I	IMPORT	Imports a configuration previously exported and saved in .mux file format.
Save	Strg+S	SAVE	Saves the edited configuration under the specified name. Note that a newly created configuration can only be saved after its first module has been inserted.
Save As...		SAVE AS...	Saves the edited configuration under a new name.
Export	Strg+E	EXPORT	Exports the configuration to a file in .mux format.
Transmit	Umschalt+Strg+F8	TRANSMIT	Transmits the edited configuration to the PowerPlex ® hardware modules.
Print...	Strg+P	PRINT	Takes you to a selection dialog in which you select the documents you wish to print out.
Exit		EXIT	Closes the PowerPlex ® program after having reminded you to save your modifications

Table 15: Configuration Menu

THE OPTIONS MENU

The Options menu in the menu bar offers all the commands necessary to change system and program settings.

Options		
Options Test Help	LANGUAGE	Select the language of the Graphical User Interface (GUI) of the configuration software. The language changes during online mode.
Language	DISPLAY EDITOR	Opens the Display editor which assists you in designing the texts and screens to be displayed on the connected touch screen.
Display editor [Default.dtl] Display editor []	CHANGE MODULE ADDRESSES	Gives you access to the hardware modules in order to change their addresses. *)
Change module addresses Update firmware Delete module configuration	UPDATE FIRMWARE	Updates the firmware of the PowerPlex ® modules. *)
Change project file Create new project CAN interface	DELETE MODULE CONFIGURATION	Deletes the current configuration from a specific module or from all modules of the PowerPlex ® system. In a new dialog box, you will be asked to enter the bus address of the module(s) concerned. *)
	CHANGE PROJECT FILE	Calls a new project file (.mdb-file) into which the configuration can be saved.
	CREATE NEW PROJECT	Creates a new project (.mdb-file) and asks you for confirmation whether this new project file shall be the container for the new configuration(s) you are going to program.
	CAN INTERFACE	Selects the CAN interface driver used for the Configuration PC ↔ PowerPlex ® connection: virtuell, Sontheim CANusb light, PEAK PCI, PEAK USB, HSP-USBCAN,

Table 16: Options menu

*) This action requires a connection between the Configuration PC and the CAN bus interface of the **PowerPlex**® hardware.

THE TOOLBAR

The most important commands offered by the menus in the menu bar can alternatively be activated by symbols displayed in the toolbar. Thus, the toolbar buttons act as shortcuts to the actions most frequently used.

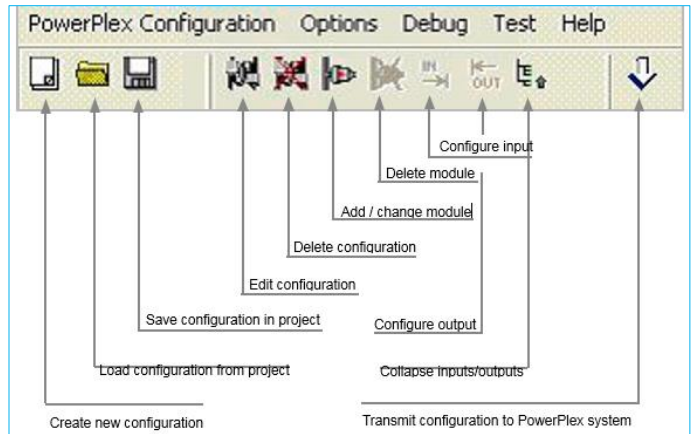


Figure 20: Toolbar

9.4 Configuring analog displays

To allow displaying of analog system information, the display elements have to be linked with analog inputs of the **PowerPlex®** modules. This happens with the help of the **PowerPlex®** Configuration Software. The analog inputs of the **PowerPlex®** modules always provide a value between zero and 1000. This corresponds to 0.0 to 100.0 percent of the measuring range of the linked input. In order to link a display element of the Touch Panel, the menu of the associated analog output will be opened by double-clicking on the output in the tree.

Figure 21 shows an example where the analog output 1 of the display is connected with the analog input "CAPACITIVE PROBE" of a **PowerPlex®** Compact Module.

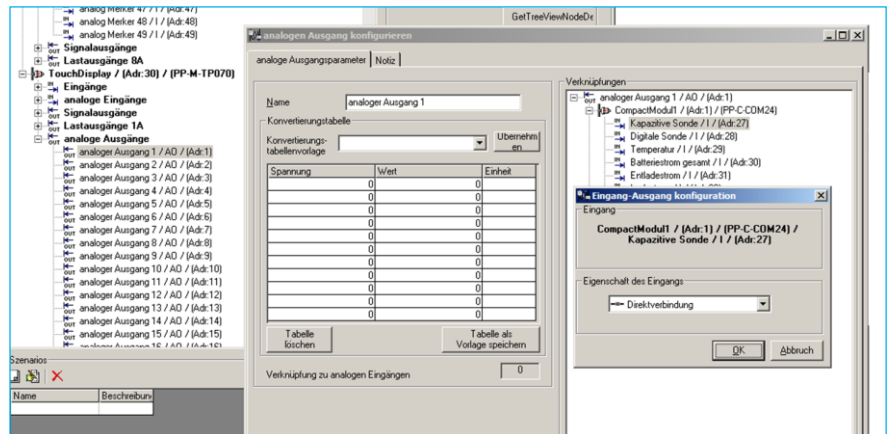


Figure 21: Example 5 – Configuration of analog displays

The conversion table in Figure 22 shows as an example a one-to-one transmission of the measuring value to the display of the Touch Panel.

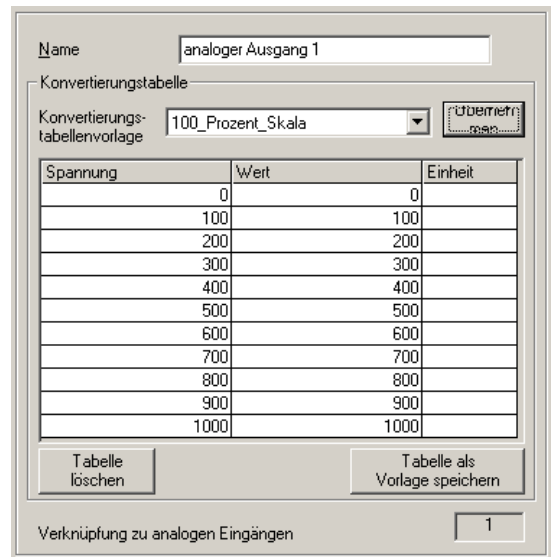


Figure 22: Transmission of the measuring value in percent

Instead of the percent format it can also be shown as a text in the display of the Touch Panel. Figure 23 shows a conversion table which will show the text 0 ... 32 (V) on the display instead of 0 ... 100 %.

Such a table can also be used to compensate irregular tank shapes to as to ensure an adequate level measuring. This allows recording the contents of tank shapes which do not have a linear connection between level and content.

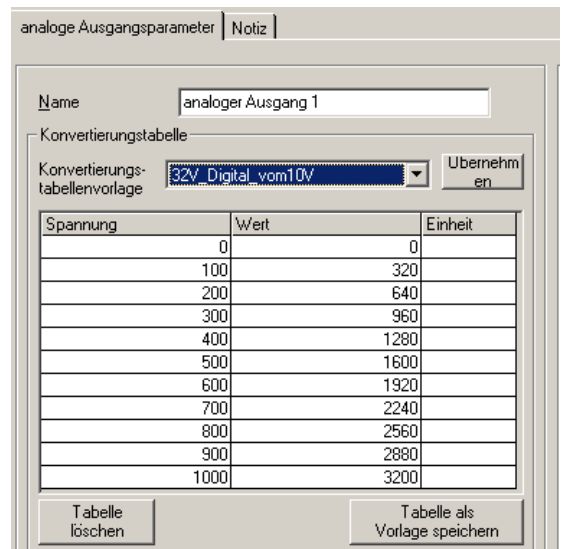


Figure 23: Transmission of the measuring value as text



NOTE: SPECIAL FEATURE

Conversion tables can be stored as templates so that they are then available in the drop-down menu conversion table template.

9.5 Display Simulator

The programme "DISPLAYSIMULATOR" is also started from the directory "MYDESIGN". It allows checking the configured user interfaces directly from the computer. After starting the simulator you have to hit the start button bottom left. Then the design will be automatically loaded and shown from the file "DESIGN.BIN.SNG". The operation via the PC is by means of the mouse, same as with the Touch Display operation.

Figure 24 shows the standard operator screen "LINEAR", showing linear meters (→ chapter 6.1, p. 13). The illustration has been done by means of the simulation tool of the display. On the right side of the picture you see the CAN communication taking place when actuating a button on the CAN bus.

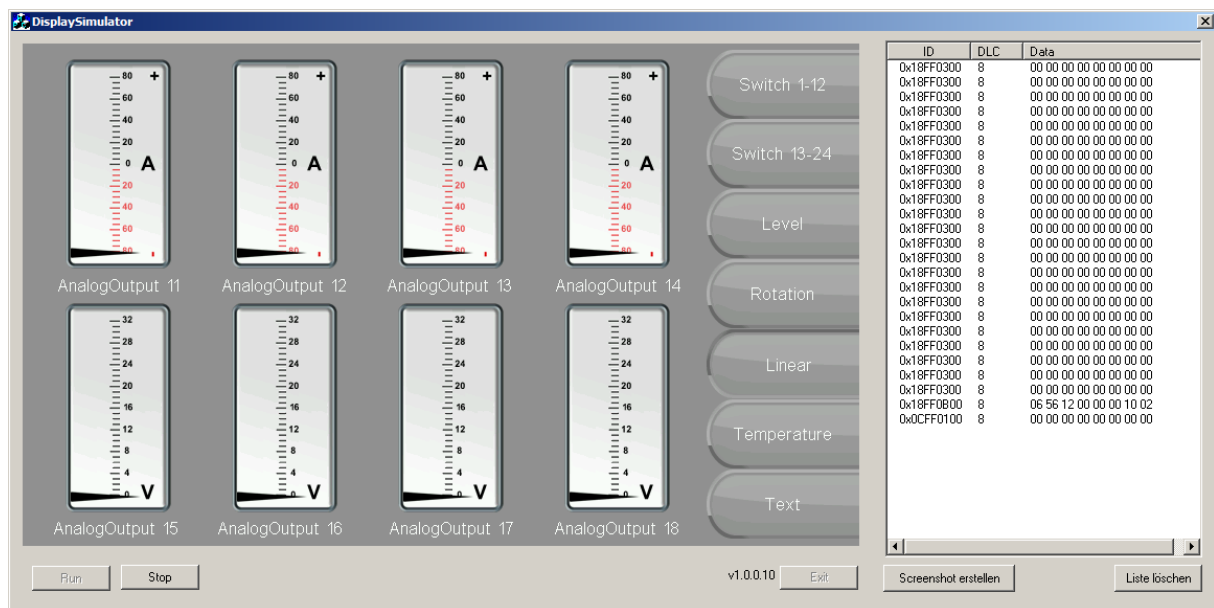


Figure 24: Display of the standard operator screen "Linear" via the display simulator

10 CAN/USB Converter and Driver Software

To upload a completed or modified **PowerPlex**® Configuration into **PowerPlex**® components, you will have to connect your configuration PC to the CAN bus network of the **PowerPlex**® system.

The following adapters are supported by the **PowerPlex**® Software: CAN/USB-light adapter supplied by Sontheim, PEAK USB, PEAK PC.



Figure 25: CAN/USB converter cable (example: Peak)



NOTE:

The driver software of the selected CAN/USB converter must be installed on the configuration computer.

11 Important information and safety instructions

The following table lists various information and safety instructions for start-up and use of the device.









	<p>CAUTION: INSTALLATION AND OPERATION OF THE DEVICE</p> <p>This device has to be installed and operated in compliance with the given instructions. Failure to observe the instructions can cause personal injury, damages of the boat or vehicle or reduced operational performance.</p>
	<p>CAUTION: SWITCH OFF MAIN SWITCH</p> <p>Before starting installation, the main switch of the boat or vehicle has to be switched off. A cable connection must only be established if the main switch is OFF.</p>
	<p>CAUTION: POSSIBLE IGNITION HAZARD</p> <p>The device must NOT be used in inflammable surroundings.</p>
	<p>CAUTION: HIGH VOLTAGE</p> <p>The cover must NEVER be opened. Access to the inner components is not allowed unless indicated otherwise in this manual.</p>
	<p>CAUTION GROUNDING</p> <p>The device must be grounded before switching on.</p>
	<p>CAUTION TOUCHSCREEN DISPLAY</p> <p>If the touchscreen is exposed to environmental conditions such as sun or rain, this may cause unforeseeable consequences. It may lead to limited use or to a reduced life span.</p>
	<p>CAUTION CLEANING THE DEVICE</p> <p>Please do NOT use dry cloth for cleaning the display to prevent scratches. Use of scrubbing or etching solvents as well as products based on ammonia must be avoided as they could permanently damage the display.</p>
	<p>CAUTION WATER INGRESS</p> <p>Disclaimer of warranty in the event of water ingress.</p> <p>Waterproofness depends on the mounting version of the device. Protection degree in the event of mounting version B is IP65. However, water ingress and resulting damages cannot be excluded if the device has not been installed correctly or is subjected to high pressure cleaning. E-T-A does not accept any liability in this case.</p>

Table 17: Important information

EMC INSTALLATION GUIDELINES

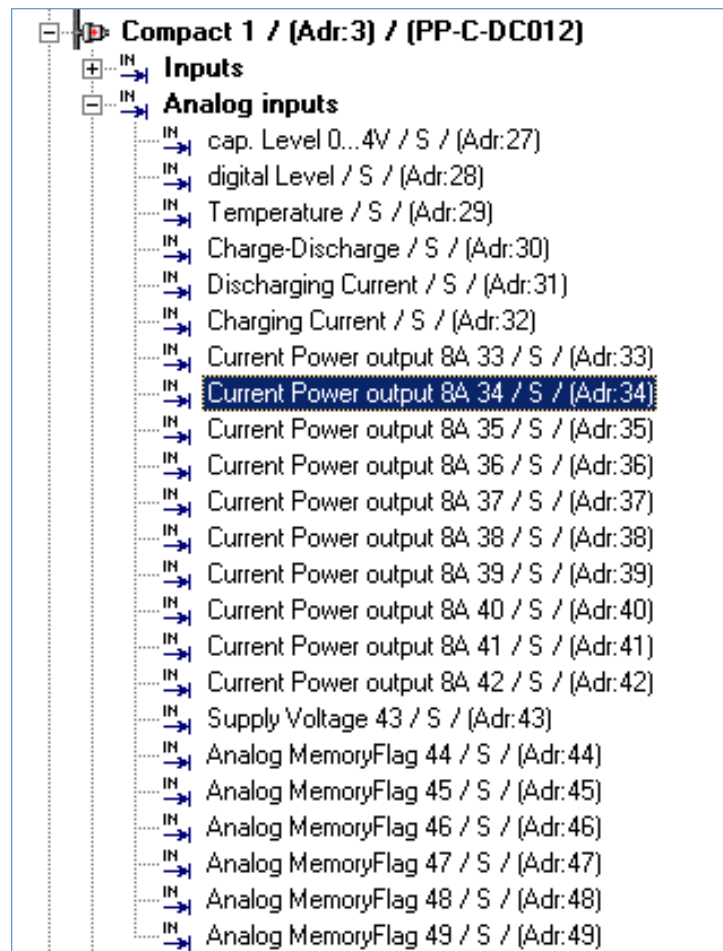
The **PowerPlex**[®] hardware and accessories comply with the EMC directives. Thus electromagnetic interferences between the devices are avoided which would otherwise affect the system performance. A professional installation is mandatory. In order to ensure the best EMC conditions, the widest possible distance between the different electrical devices should be applied.

TECHNICAL ACCURACY

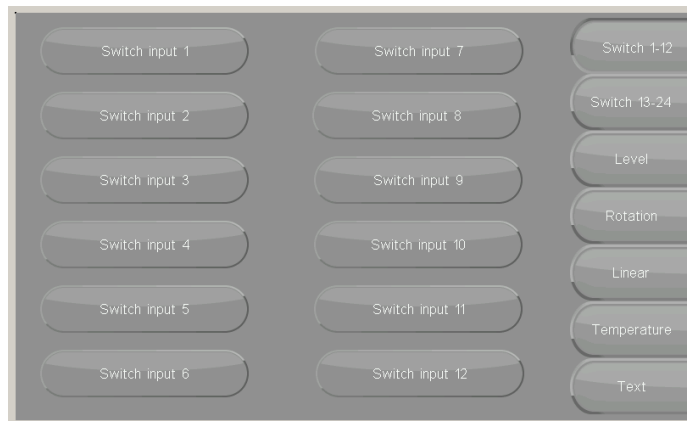
All technical data in this manual were correct in all conscience at the time of printing. E-T-A cannot be held liable for any (inadvertent) errors. Due to continuous product improvements at E-T-A there could be discrepancies between the actual product and the manual. Product changes or amendments of the technical specifications will be carried out without prior notification. The latest versions of the **PowerPlex**[®] manuals are available on our website (www.e-t-a.de).

Appendix:

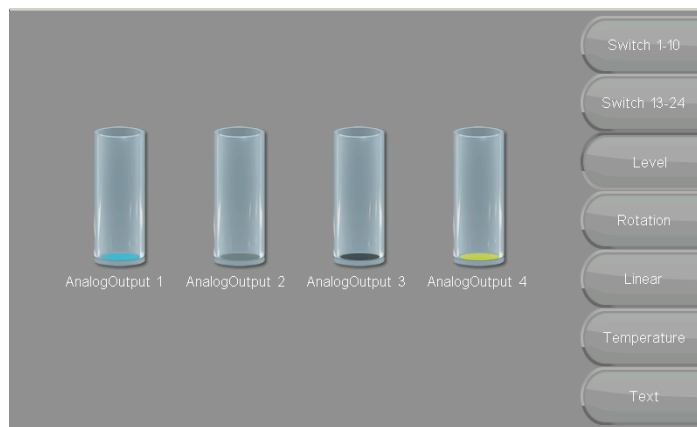
Appendix 1: Function of the analog inputs of a PowerPlex® Compact Module



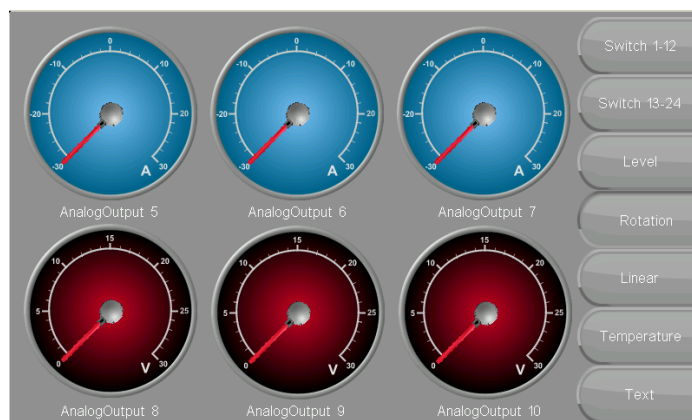
Appendix 2: Standard user interface "Switch"



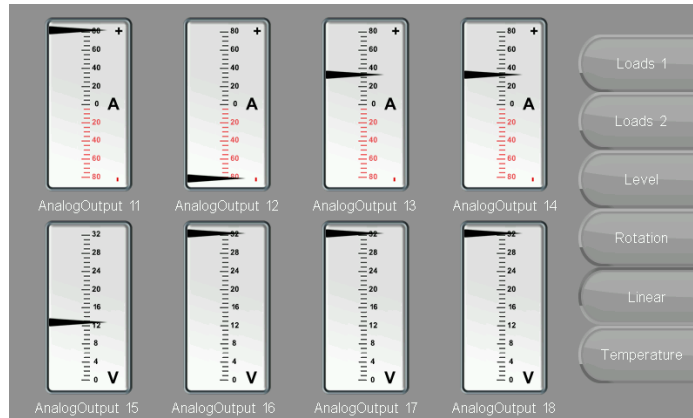
Appendix 3: standard user interface "LEVEL"



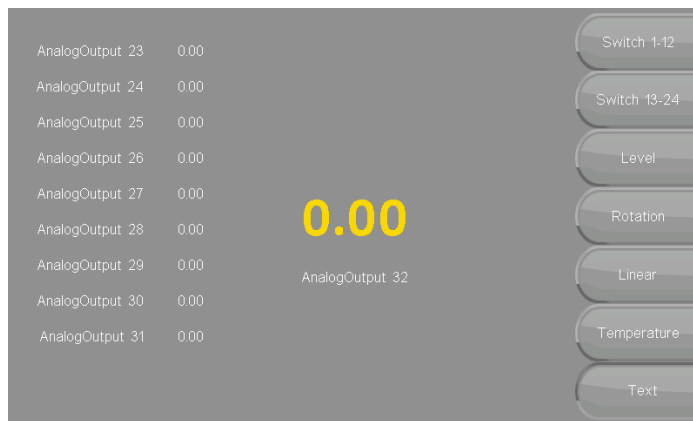
Appendix 4: Standard user interface "ROTATION"



Appendix 5: Standard user interface "LINEAR"



Appendix 6: Standard user interface "Text"





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