


PROFINET®

EtherNet/IP™

# CPC20 *ControlPlex*® SYSTEM

## Intelligent DC 24 V protection and power distribution

E-T-A® ENGINEERING TECHNOLOGY


# CPC20 *ControlPlex*® SYSTEM

## The intelligent way of DC 24 V protection

Intelligent power distribution systems increasingly find their way into industrial production plants. Their major purpose is to increase system availability, to ensure stable production processes, to avoid undesired standstills and to provide flexibility of the plants in terms of predictive maintenance.

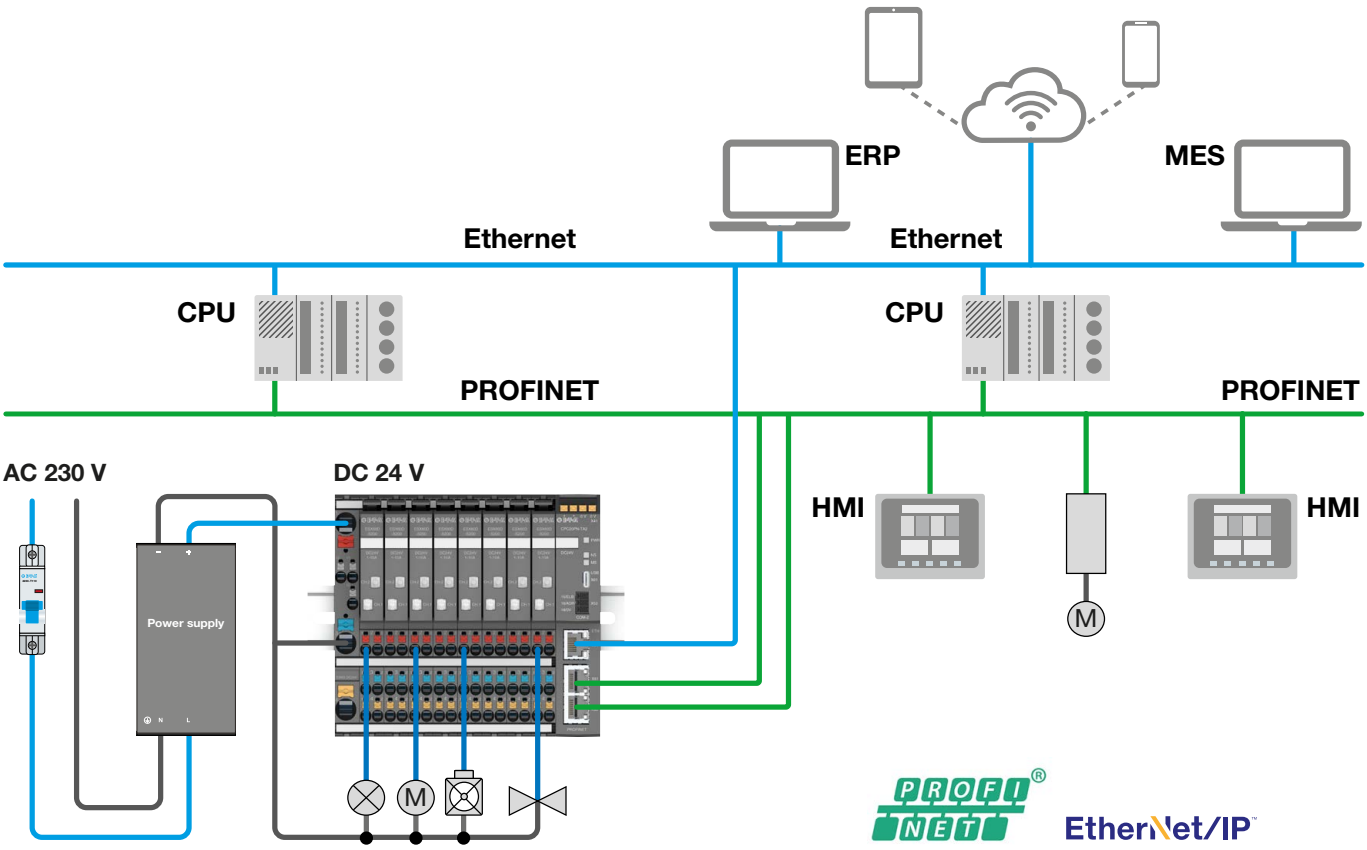
This purpose is best served by the system's consistency from the field level to the cloud. System data are available everywhere and provide the required transparency. Undesirable developments can quickly be identified and rectified. This ensures stable production processes and a constant high quality.

In addition to the **PROFINET** and **EtherNet/IP** interfaces, the system has a further Ethernet interface which allows connection to **OPC UA** and **MQTT**. The operator can also connect to the integral web server and retrieve and analyse all vital data of the DC 24 V power distribution.

The intelligent **CPC20 *ControlPlex*®** system protects your DC 24 V power distribution against overload and short circuit. The basis is the modular **18plus module** terminal block system. The **ESX60D** electronic circuit protector completes the system. It continuously records the load current and the load voltage of the system.

The **CPC20** bus controller collects all measuring values and forwards them to the connected control systems via **PROFINET** and **EtherNet/IP**. The system operator can continuously monitor the power distribution system and detect changes or aberrations at an early stage.

The ***ControlPlex*®** system prevents undesired downtimes, improves system transparency and stabilises the production process in terms of condition monitoring. The quality of the produced goods and the system availability are significantly improved.




*The **CPC20 power distribution system** allows intelligent and transparent protection of the DC 24 V power distribution. Thanks to its interfaces for **PROFINET, EtherNet/IP, OPC UA** and **MQTT,** status information and measuring values of the circuit protectors are available on all levels of the control structure.*

# VERSATILE AND INTELLIGENT 24 V PROTECTION AND POWER DISTRIBUTION

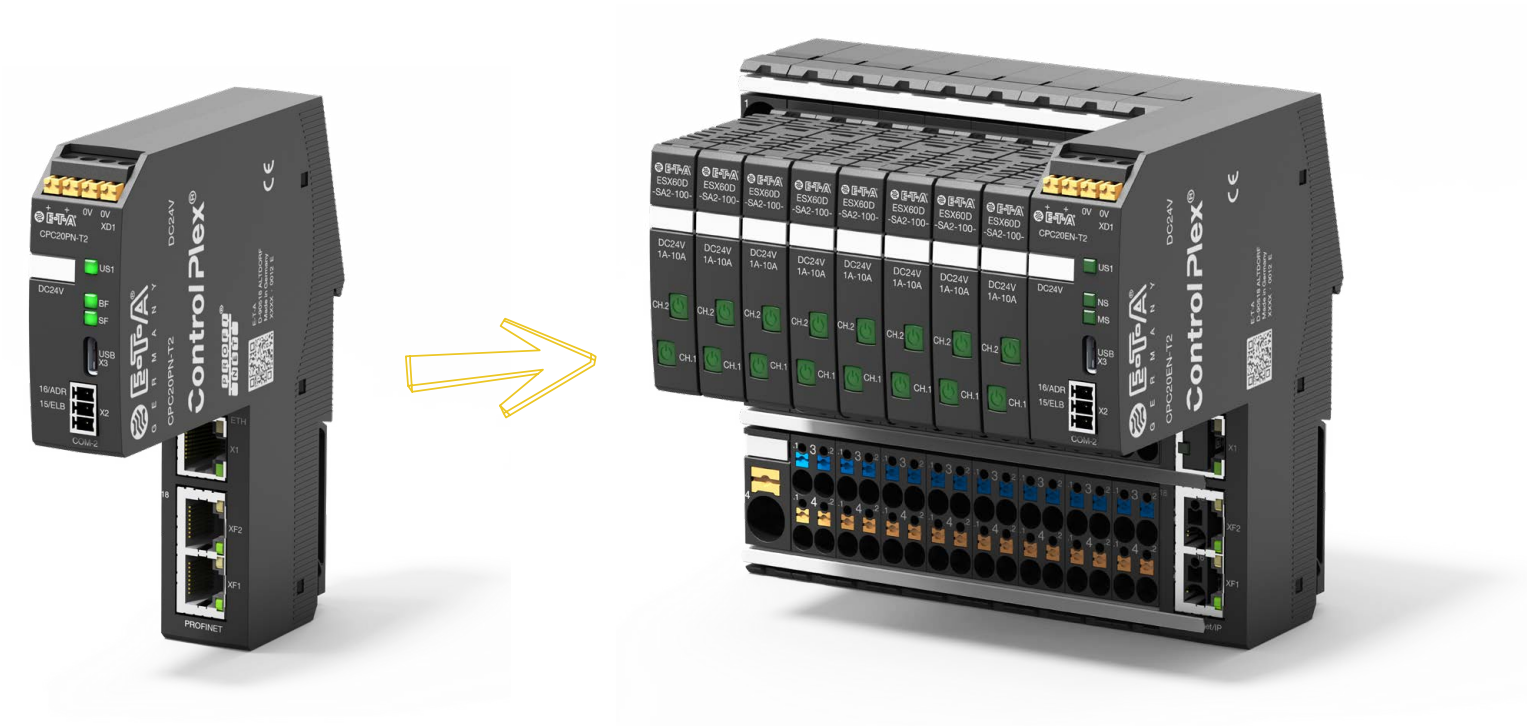
for your individual requirements


**A MODULAR DESIGN PROVIDES MORE FLEXIBILITY**

The modular design of the **CPC20 *ControlPlex*®** system allows individual adjustment of the DC 24 V power distribution to the system operator's requirements. It combines selective protection of the various loads with the flexibility of the terminal block system and the communication capability of the bus controller, enhancing transparency and system availability.

The **18plus *ControlPlex*® module** is the basis of the power distribution system. Up to 16 modules can be mounted at the connection module side-by-side. It has a fully-fledged 80 A potential distribution. The screwless push-in technology for DIN rail mounting significantly reduces wiring time. The user plugs the **ESX60D** circuit protectors into the mounted modules.

The **ESX60D** is an intelligent electronic circuit protector, which offers active current limitation, to enable protection of both capacitive and inductive loads. Despite its small width of only 12.5 mm, it provides two channels. The status per channel is displayed via an LED directly on the device. In addition, the **ESX60D** transmits status and measuring values to the superordinate control unit. Thanks to its parametrisability it can be flexibly used in a wide range of applications.




The **CPC20** bus controller is the brain of the entire system. Its interfaces offer the perfect connection to the superordinate systems. On the field level, it connects the power distribution system with the connected CPUs and HMIs via its **PROFINET** or **EtherNet/IP** interface, which enables the required data exchange. On this basis, measuring values and status information can be visualised for the operator and the maintenance personnel.

**QUICK ACCESS THROUGH INTEGRAL WEB SERVER**

A web server is included on the bus controller. It allows direct access to the data of the DC 24 V power distribution. The maintenance personnel can directly access all measuring data and status information without using the field bus interface. In the event of initial start-up or of a machine downtime, this allows particularly quick access to the necessary information.

**YOUR BENEFITS**

- Maximum system availability through comprehensive diagnostic functions
- Improved protection against voltage dips through selective protection of loads
- Increased flexibility of system planning through a modular terminal block system

# INCREASED SYSTEM AVAILABILITY
through data logging and transmission

The **CPC20 *ControlPlex*® system** increases system availability significantly through continuous data logging and recording of status information. The system provides a precise overview of the DC 24 V power distribution in the plant. The user is immediately informed about changes in the system conditions and the corresponding current consumption. Aberrations can be detected and resolved at an early stage. Maintenance and exchange of defective parts can be planned well in advance. System downtimes are reduced.

The bus controller's analysis functionality provides help with troubleshooting. The system detects an error cause and visualises it. This helps find and remedy error causes quickly. Downtimes are reduced and the system can be restarted faster.


*Permanent data and status logging*

# MEASURING DATA LOGGING UP TO THE FIELD LEVEL

increases system availability

## THE CPC20 BUS CONTROLLER

**SEPARATE POWER SUPPLY**
The devices' power supply is separated from the load circuit of the system and allows an independent supply of the bus controller.

**STATUS INDICATION**
The operating condition of the device can be read any time via the LEDs.

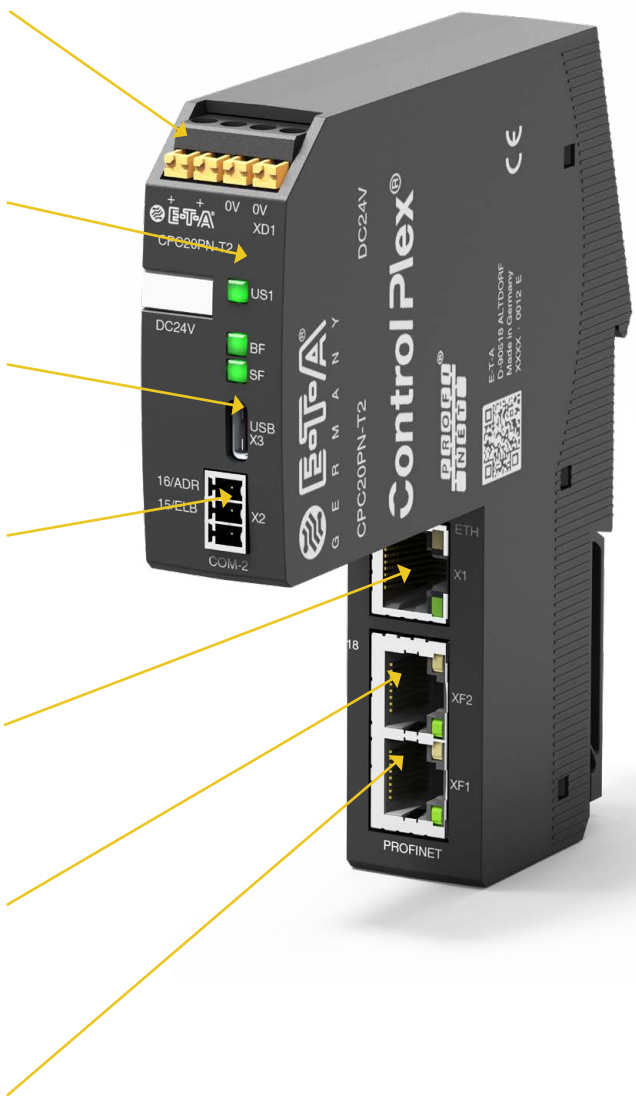
**USB SERVICE INTERFACE**
The service interface allows complete access of the **CPC20 bus controller** via laptop on site. Later firmware updates and extension of the functional scope are therefore possible.

**ELBus® EXTENDED**
The user can connect another 16 modules with 32 channels to the second **ELBus®** interface.

**OPC UA AND MQTT INTERFACE**
Another RJ45 interface allows transmission of measuring values and status information directly via **OPC UA** and **MQTT** into superordinate Ethernet topographies. This is also possible via the two lower interfaces.

**INTEGRAL WEB SERVER**
The integral web server allows direct access to all data of the **CPC20 *ControlPlex*®** system.

**FIELD BUS CONNECTION**
The connection to PROFINET and EtherNet IP provides transmission of measuring values and status information to the superordinate control systems as well as remote access to all circuit protectors.



# THE INTELLIGENT ESX60D CIRCUIT PROTECTOR

## Parametrisable for highest flexibility

### SPACE-SAVING DESIGN

The double channel **ESX60D** is a compact electronic circuit protector with active current limitation. It requires only 12.5 mm for the protection of two channels. By means of the two LEDS, maintenance personnel can see the status of the individual channel in the control cabinet.

### CONTINUOUS DATA COLLECTION

In parallel, the status and the recorded measuring values are forwarded to the superordinate controller and can be visualised there on the connected screens. Continuous recording of the load current, of supply and output voltage as well as of the device temperature provides an overview of the current condition of the power distribution.

### AUTOMATIC PARAMETRISATION

The intelligent **ESX60D** circuit protector is versatile in use due to its parametrisability. The **CPC20** bus controller saves parameters and information on the circuit protectors used. If a protector is replaced or freshly plugged in, this is recognised by the **CPC20** bus controller and the circuit protectors are parametrised automatically. This enables the “Hot Plug” of the devices, allowing a quick start-up of the system. In addition, the warning threshold, inrush behaviour and trip times can be adjusted.

### REDUCED INVENTORY

Since the current ratings of the circuit protectors can be adjusted in 1 A-increments up to 10 A, stock keeping is significantly reduced. One product version on stock is sufficient to provide various current ratings.


*ESX60D electronic circuit protector*

*Parametrisation of the circuit protectors possible via HMIs*

# INCREASED SYSTEM AVAILABILITY

## through intelligent overcurrent protection

### PROPER PROTECTION OF SYSTEMS AND LOADS

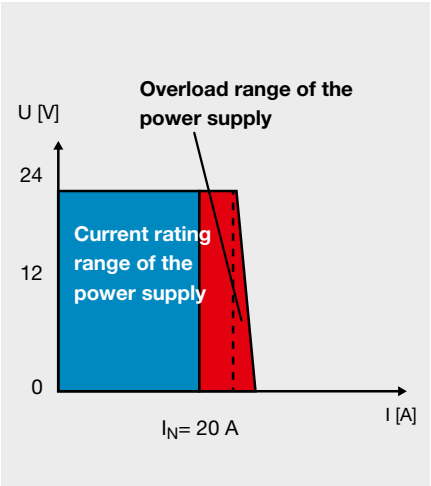
The intelligent **ESX60D** is a state-of-the-art circuit protector and offers ideal protection against overcurrent and short circuit for the connected loads.

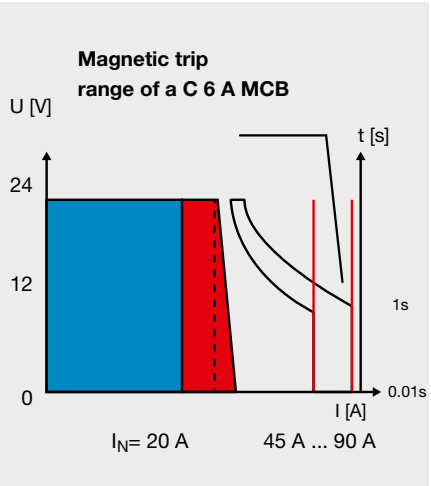
A special field of application is the protection of DC 24 V switch mode power supplies. The power reserve of a standard power supply is often 1.5 times its current rating, so a 20 A switch mode power supply can supply a max. current of 20 A x 1.5, i. e. 30 A. If this value is exceeded, the power supply switches off automatically to protect itself from damage. This leads to a voltage dip at all connected loads, which often causes a breakdown of the entire system.

The figures show the trip curves of a power supply and a thermal-magnetic circuit protector, demonstrating that the trip curve of the circuit protector is outside the work area of the switch mode power supply. The switch mode power supply cannot provide the required current for a fast magnetic trip of the circuit breaker, so the tripping is delayed. This leads to an overload of the power supply, resulting in a voltage dip that applies to all connected loads. This could result in a total breakdown of the system in the event of a short circuit or overload.

### PERFECT OVERCURRENT PROTECTION

The **ESX60D** is the right solution particularly for this application. The two-channel device reacts faster than the power supply to overload conditions, limits the maximum possible overcurrent with its active current limitation to the typical 1.4 multiple of the selected current rating and protects the SMPS against overload. In the event of a failure, only the affected load will be disconnected. All other loads remain unaffected and will be further supplied. This functionality works reliably in the event of a short circuit or overload. Furthermore, it is also possible to switch on capacitive loads of at least 20,000 µF.

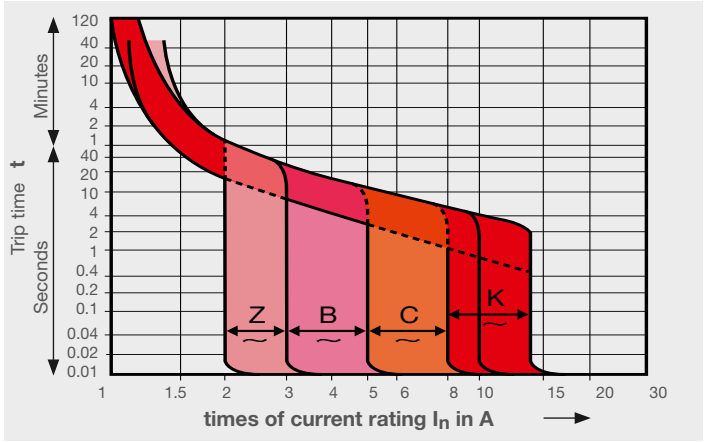



**The magnetic trip range of the circuit protector (45 A ... 90 A) is no longer in the acceptable overload range of the 20 A power supply: the DC 24 V output voltage breaks down.**

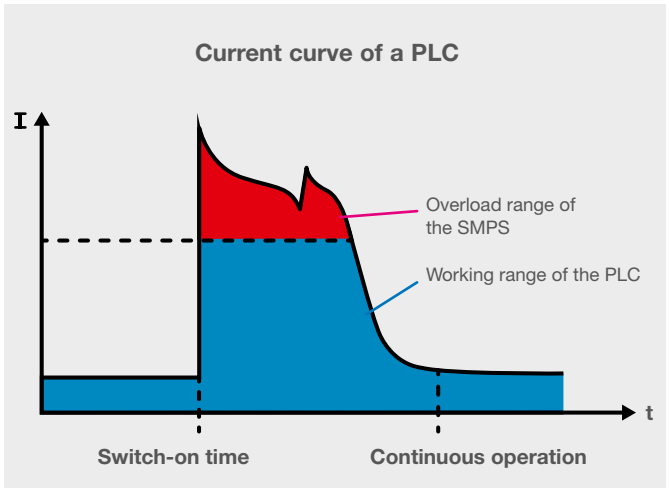
## LIMITING CURRENT PEAKS

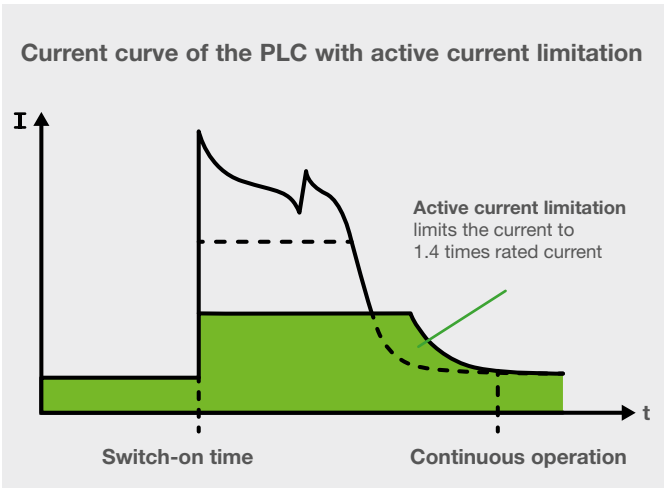
When switching on electronic loads, just as in the event of a short circuit, current peaks may occur for a short time. The active current limitation cuts the peaks and prevents an overload of the switch mode power supply. This functionality is a huge advantage compared to the use of thermal-magnetic circuit protectors, as these, unlike the electronical circuit protector, have a characteristic curve. The characteristic curves in the figure apply to AC current. When DC current is applied, the characteristic curve shifts to the right. This means, for a fast trip behaviour, the current flowing through the circuit breaker must be higher than shown in the figure. So for a circuit breaker with C-characteristic, the trip current at 10 ms must not be 5-10 times the current rating, as in the figure, but 7.5-15 times the current rating.
In case of a C6A circuit breaker, the current would be at 45 A up to 90 A. A current this high cannot be provided by a 20 A switch mode power supply. As a consequence, the switch mode power supply would be overloaded as already mentioned above. Alternatively, a circuit breaker with B or Z characteristic can be used. It would trip in the event of a short circuit and protect the power supply against overload, but it would also trip at low trip currents during the on-switching of loads, such as the mentioned PLC, and prevent the switch on of these loads. Therefore, the electronic overcurrent protection is the most reliable solution.




*The figure displays the different characteristic curves of a thermal-magnetic circuit protector.*

## SWITCH-ON PERFORMANCE AND CURRENT LIMITATION



# 18PLUS *ControlPlex*® MODULE

## Highest flexibility through modular terminal block system

**The smart *ControlPlex*®18plus power distribution module combines compact and innovative wiring technology with the communicative CPC20 *ControlPlex*® bus controller.**

### MODULAR POWER DISTRIBUTION CONCEPT

The **18plus** power distribution module is a complete mounting and power distribution system with push-in technology for DIN rail mounting. The system has a fully-fledged 80 A potential distribution and is suitable for wiring of all load cables and signal lines of the DC 24 V control voltage. The **18plus module** is suitable for decentralised power distribution systems as well as centralised system concepts.

### PUSH-IN TECHNOLOGY FOR QUICK WIRING

The push-in technology for DIN rail mounting is suitable for wiring all load and signal lines of the DC 24 V control voltage. The modular design offers highest flexibility for any requirement in a system and can easily be mounted.

The system consists of the supply module and up to 16 connection modules with 13 mm snap-in dimension each. For supply of max. 80 A, the supply module has three supply terminals.

The design engineer plugs the supply module into the connection modules and connects them. This is extremely flexible and tailored exactly to the required number of channels. Additional terminals and connecting cables are not necessary. This enables the construction of a power distribution system with up to 16 connection modules. Each of these connection modules accommodates one intelligent **ESX60D** circuit protector with two channels each. It is thus possible to protect 32 different load outputs with one flexibly configured system.
The whole set-up can be completed by an additional transfer module. Another 16 connection modules with 2-channel **ESX60D** circuit protectors can be mounted side-by-side to this transfer module. The number of system-controlled and monitored channels is doubled, so that flexible protection of the most different system constellations is made possible.

The additional system can also be connected to the **CPC20** bus controller, so that the entire system can finally protect up to 64 channels (circuits).

### NUMBER OF MODULES
16 modules for 32 channels can be mounted side-by-side. This allows a flexible and individual design of the power distribution system.

### TERMINALS
The supply module has three 0.5-16 mm² terminals for connection of +24 V, GND and functional earth.

### 2 CHANNELS WITH ONLY 12.5 MM
Integration of two channels on an installation width of only 12.5 mm saves space in the control cabinet and allows a compact system design.

### POWER DISTRIBUTION OF MAX. 80 A
The power distribution is done via busbars, which are pushed into the modules and ensure a reliable distribution.

### PUSH-IN TECHNOLOGY
The push-in technology enables quick and maintenance-free wiring of the DC 24 V power distribution.

# FAST ACCESS AND TRANSPARENCY

## thanks to the integral web server

### DIRECT ACCESS TO THE DATA

The integral web server guarantees direct access to all measuring values and parameters of the circuit protectors. All data on the web server are displayed and at the same time sent to the superordinate control unit.

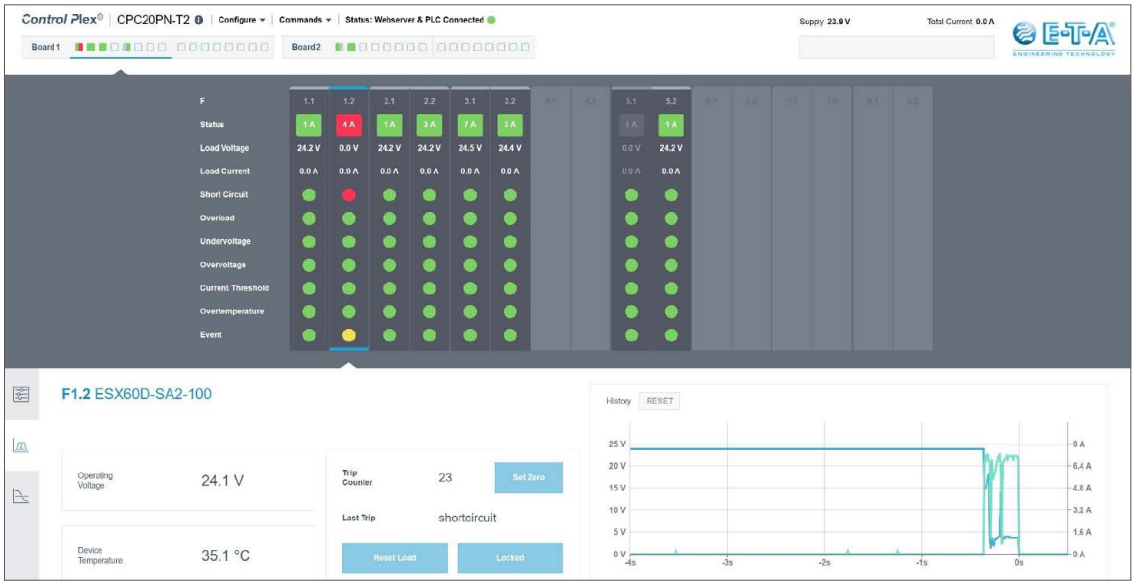
As each individual channel is shown separately, the user gets a quick and detailed overview of the status of the DC 24 V power distribution. Undesirable developments are detected at an early stage and countermeasures can be initiated.

### SYSTEM ERROR DETECTION AT AN EARLY STAGE

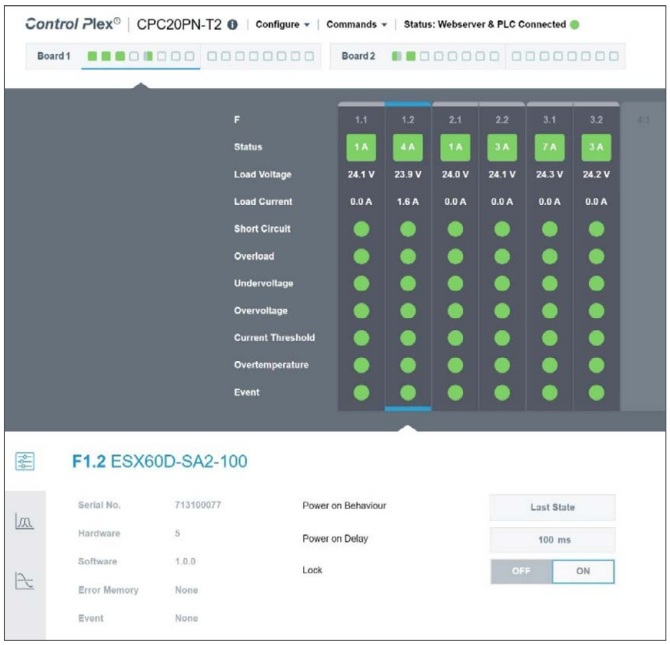
Thanks to continuous data logging, changes in the supply current of the loads can be detected quickly. If a freely parametrisable threshold value is exceeded, this is shown directly at the circuit protector, and also sent to the superordinate control unit. This allows the maintenance staff get active at an early stage and prevent disconnection of loads beforehand. This function therefore increases machine availability.

### FAST RESTART THROUGH CLEAR ERROR DETECTION

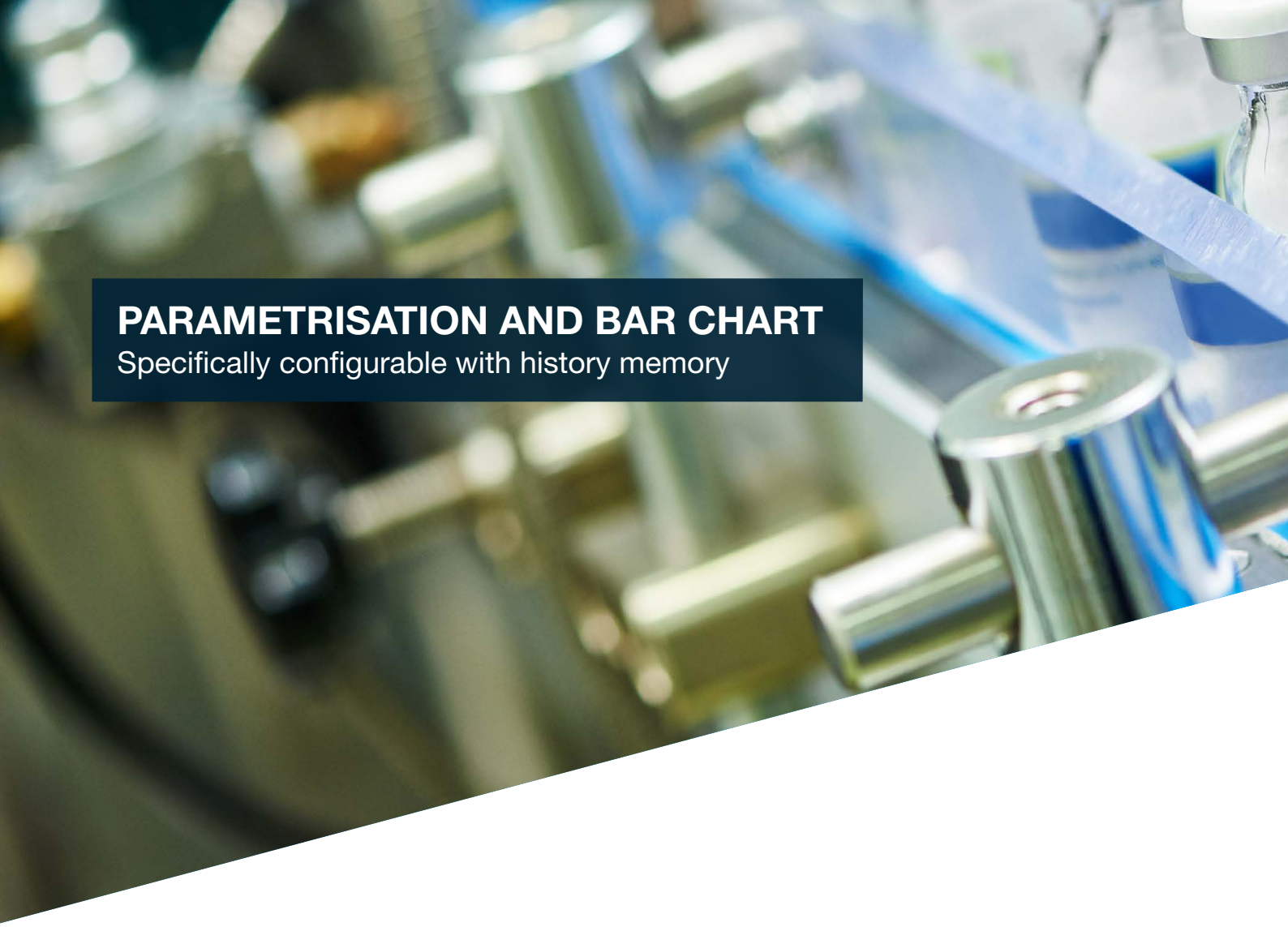
When the circuit protector trips in the event of a short circuit or overcurrent, this is also displayed. This simplifies troubleshooting and reduces system downtimes. In case of a short circuit, most commonly the supply line to the load is occupied. This could be, e.g. a damaged line insulation of a drag chain. In this case, troubleshooting starts in the control cabinet and ends at the load.




The recording of status information and measuring values increases the transparency on the control voltage level. By this, the user receives a quick overview and can take fast and targeted actions in case of an error. This reduces downtimes and increases system and machine uptime.




The web server visualises the status of each circuit protector individually and displays the recorded measuring values. This provides the user with current information on the DC 24 V power distribution and indicates changing system conditions.



# PARAMETRISATION AND BAR CHART

## Specifically configurable with history memory

If the current of a load increases, the stress on the load increases, too. If the load current exceeds a certain value, it can damage the load or the supply line. To avoid critical situations, the current limit value excess is shown first. If the load current continues to rise and exceeds the selected current rating of the circuit breaker, the load circuit is switched off. In this case, troubleshooting starts at the load.

### PARAMETRISING OF THE PROTECTORS

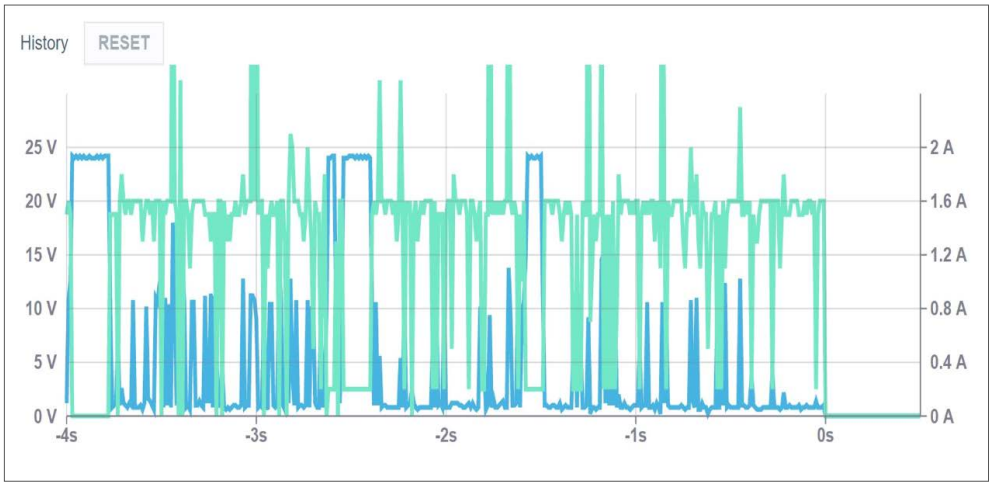
It is possible to directly access the parameters of the circuit protectors via the web server and adjust the current rating of the circuit protectors to the requirements of the system in 1 A increments between 1 A to 10 A. In addition, the threshold value, the switch-on performance of the circuit protectors when applying operating voltage and a high number of further parameters of the protectors are specifically configurable to the requirements of the system.

### THE BAR CHART PROVIDES INFORMATION

Thanks to the bar chart function, the values of the current load current and the related voltage are recorded. In the event of a trip, these values are displayed for 4 seconds before the tripping, to provide the user a detailed overview of the situation before the disconnection of the load circuit. In the above shown figure, the current peaks are clearly visible. This indicates a short circuit and a damaged insulation.


The electronic **ESX60D** circuit protector is completely parametrisable and can be adjusted precisely to all requirements of the loads. For example, the current rating of the circuit protectors can be adjusted between 1 A and 10 A. This reduces stock keeping and allows fast adjustment to changing system configurations.

The **bar chart** shows the current and voltage values in the last 4 seconds before the tripping. This provides the user with information on the causes and enables a fast restart of the system.



# THE CPC20 SYSTEM FOR:

## higher transparency - fast remote access - easy parametrisation

**The CPC20 system for protection and power distribution of the DC 24 V control voltage level enables a wide range of options for increased machine availability.**

### STATUS INDICATION

The continuous transmission of status information provides the user a comprehensive overview of his DC 24 V power distribution. Disturbances are detected immediately and can be remedied.

### MEASURED VALUE LOGGING

The load current, the load voltage and the supply voltage are recorded by the circuit protector and transmitted to the bus controller. Undesirable developments are detected at an early stage and countermeasures can be initiated.

### MEASURED VALUE ANALYSIS

The measuring values are recorded and analysed, and the respective maximum, minimum and average values are determined. This helps the user get a good overview on the load capacity of the system.

### CONTROL UNIT

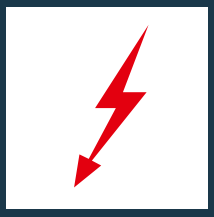
The circuit protectors can be remotely controlled. In addition to resetting the circuit protectors after a trip, the individual devices can also be switched on or off.

### PARAMETRISATION

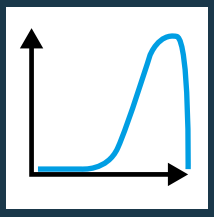
The parameters of the circuit protectors can be adjusted via the control or the web server, not only for the current rating and the limit value, but also for many other settings. The circuit protector is therefore adjustable to all individual requirements of an application.

**STATUS INDICATION**

*Status indication*

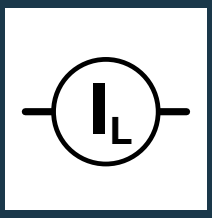


*Short circuit*

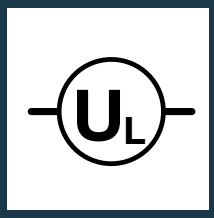


*Overcurrent*

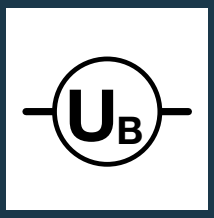
**DATA LOGGING**




*Load current*

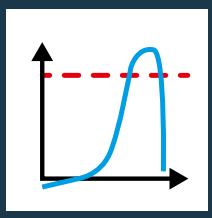



*Load voltage*

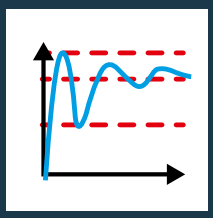



*Input voltage*

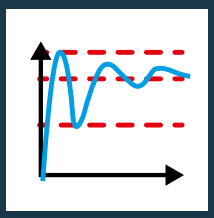
**DATA ANALYSIS**



*Limit value*



*Current curve*

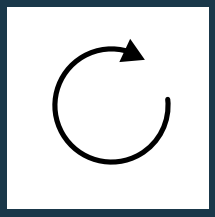


*Voltage curve*

**CONTROL UNIT**

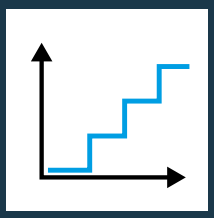
*Control ON*

*Control OFF*

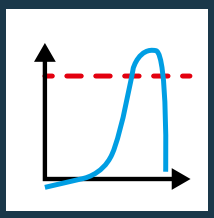


*Control RESET*

**PARA-METRISATION**

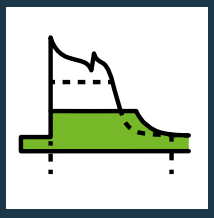


*Current rating adjustment*

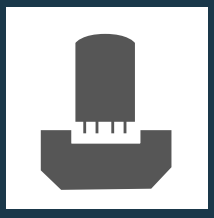


*Limit value*

**CIRCUIT PROTECTORS**



*Active Current limitation*



*Plug-in type*


*Trip counter*

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