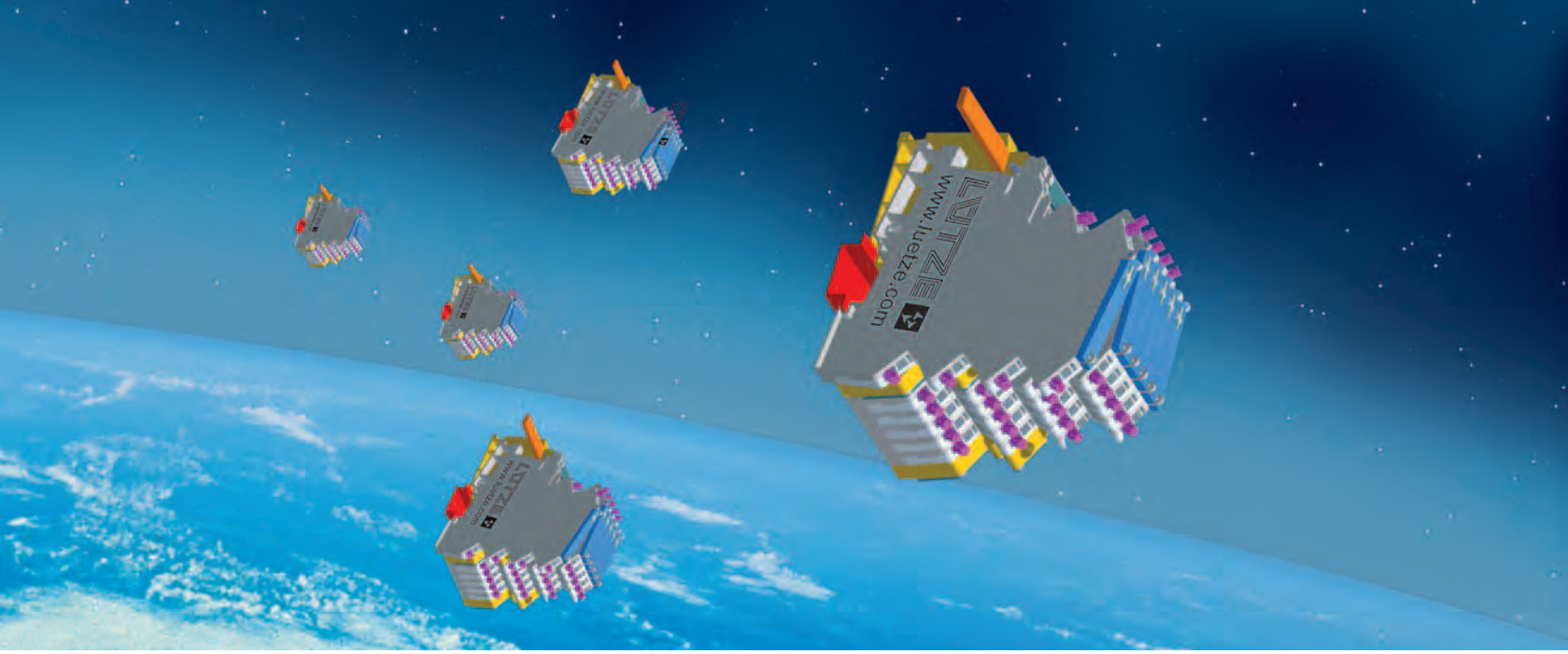


LOCC-Box
Current Control

Reliable protection of 24V DC circuits

Intelligent safeguarding

of selectivity

Modular and flexible

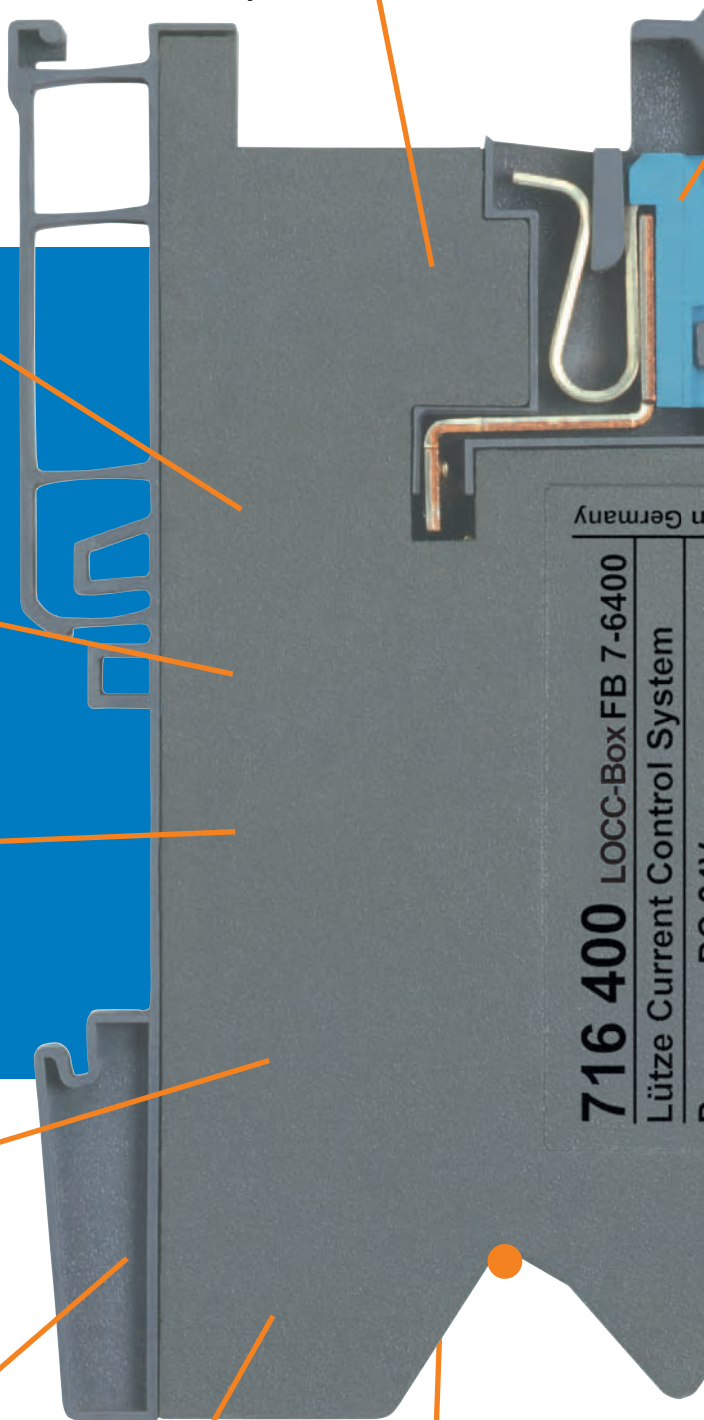
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1958 - 2008 | 50 Years

LUTZE

Tradition in Automation

Modular, flexible and safe: The Current Control System **LOCC-**B



Response time independent of temperature

flammability class UL 94-V0; NFF I2,F2

Single devices can be removed, without interrupting the power supply

„Power-ON“- effect for save switching of capacitive loads

Non-volatile storage of the last status

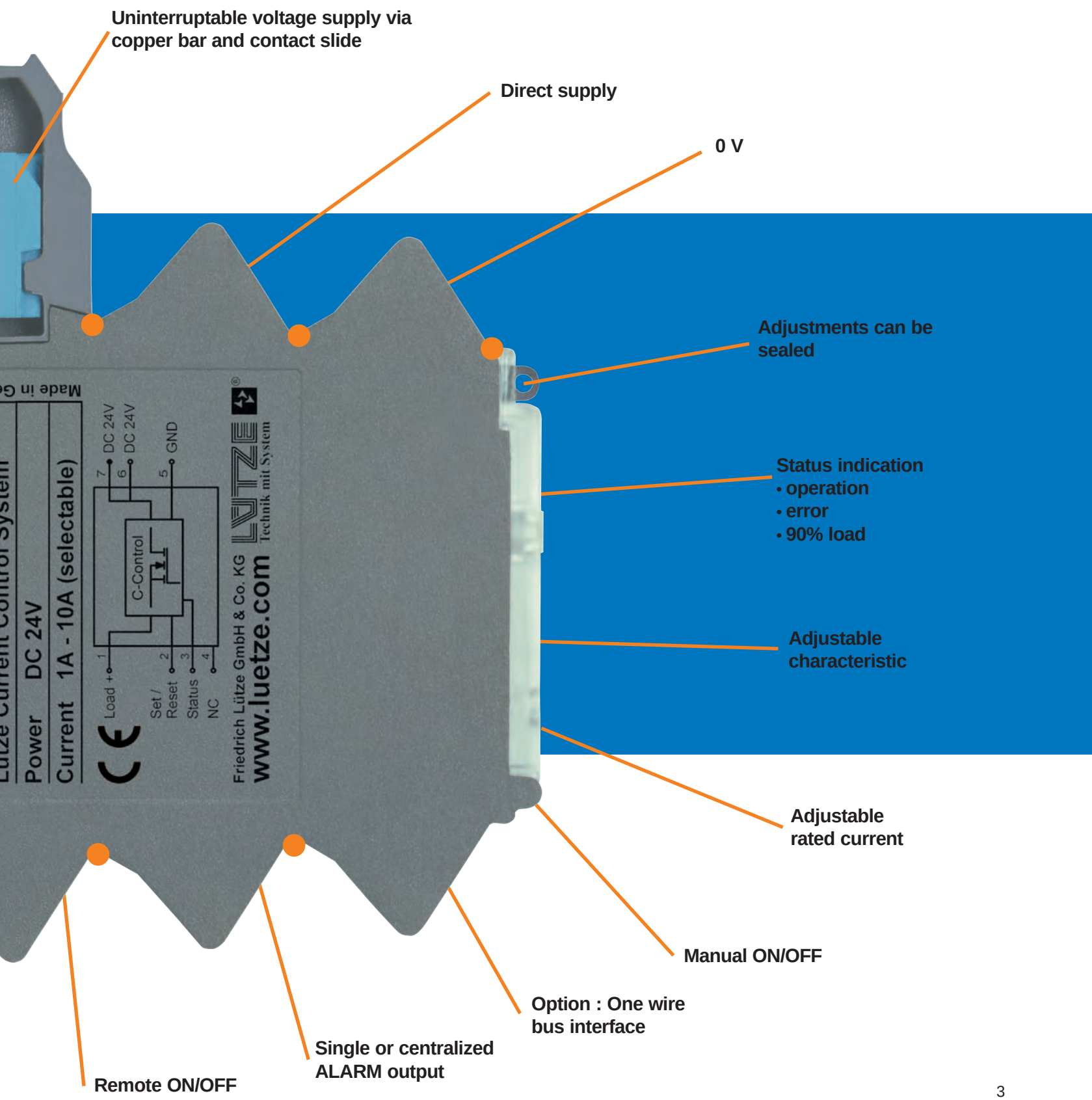
Spring termination

Contact slots for each potential – usable for jumper combs

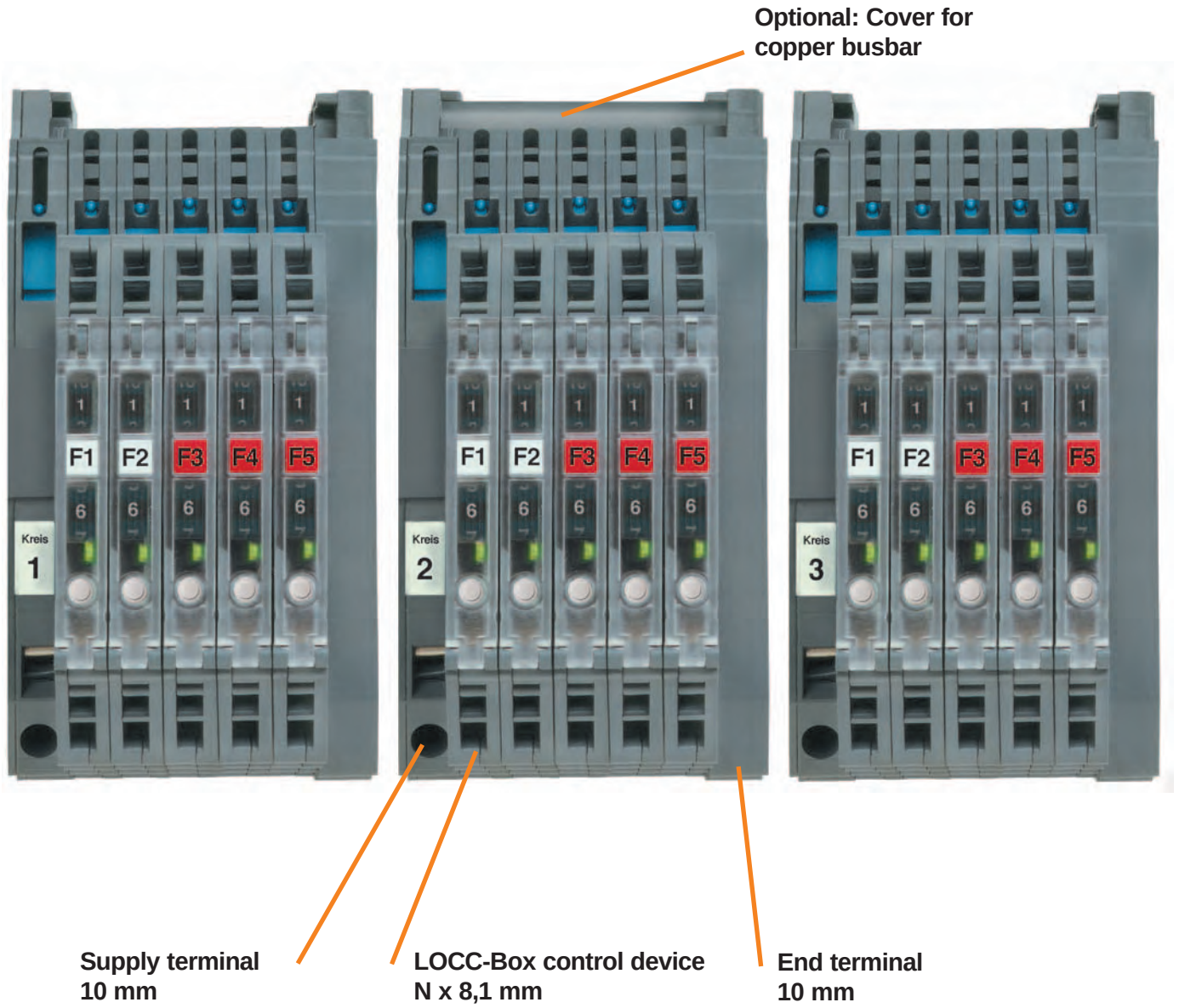
Width 8,1mm

Output „Load“

e intelligent Lutze
3 ox



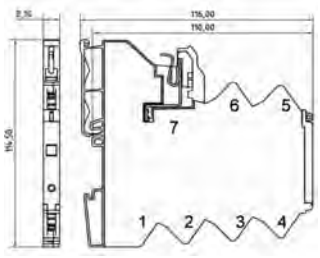
Current control system LOCC-Box:
The principle design



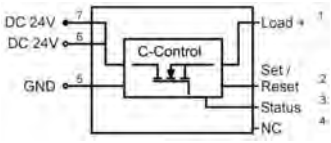
Current control system up to 10A
Single channel version
rated current : adjustable DC 1-10A; characteristic : adjustable fast acting, middle acting, slow acting



Dimensions



Pin assignment

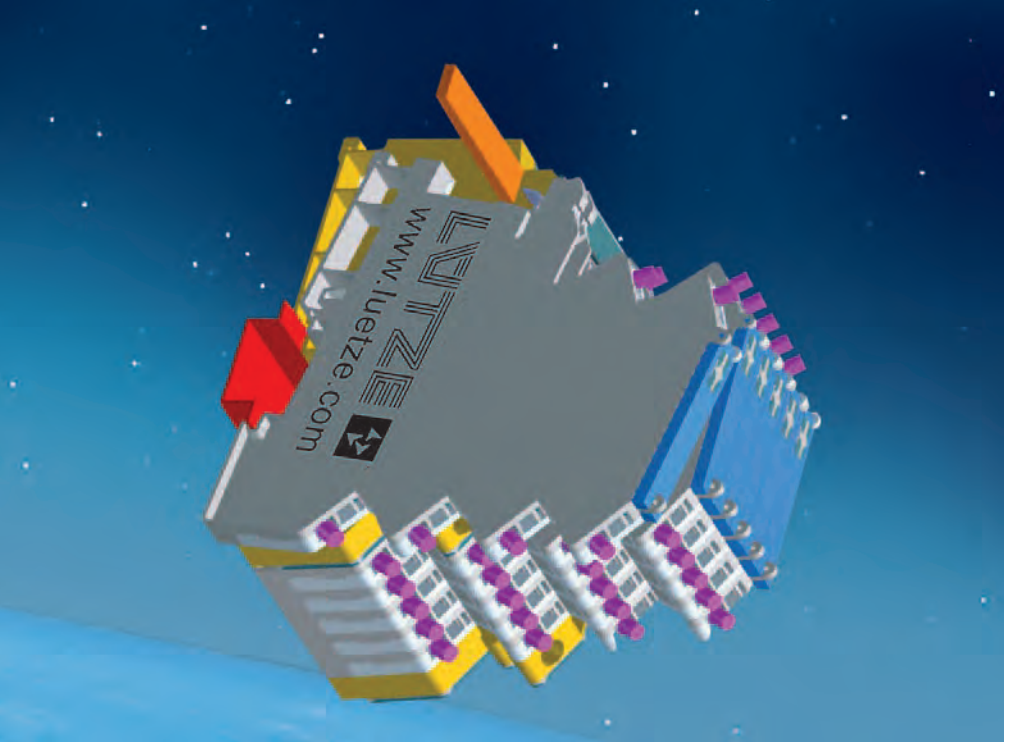


1: + Output
2: Control input (Set / Reset)
3: Status output
4: Optional: 1 wire bus (nc 716400)
5: 0V
6: + Supply (alternative)
7: + Supply

Description		Part number	Type	PU
Spring terminal				
Rated voltage	DC 24V	716400	LOCC-Box 7-6400	1

Input side	
Rated voltage	DC 24V
Operating voltage range	DC 18V - 32V
Rated current	DC 10A max. (control system 716400)
System current max.	DC 40A via copper busbar 10 x 3 mm
Reverse voltage protection	internal electronic
Termination	screwless contact slide
Control input (Set/Reset)	
Signal level	DC 24V (EN61131)
Switch-off time (Reset)	pulse (trailing edge) > 100ms, < 800ms
Switch-on time (Set)	pulse (trailing edge) > 1s
Termination	Spring terminal: 0,25 - 2,5mm²
Output Side	
Switch method	MosFet
Output current	max. DC 10A
Voltage drop	< 170mV (10A)
Status indication	green: ok; green flashing: 90% load, ok; red flashing: error and no acknowledge; red: error
Switch on capacity	10.000µF
Current range	1A - 10A (adjustable via switch in 1A steps)
Cut-off time	Characteristic: slow, middle, fast (adjustable via switch)
Signal Output	
Signal level	DC 24V, 10mA
Switch method	DC 24V: supply voltage is ok, no error; DC 0V: error; output switch off Transistor, open collector with pull up resistor
General data	
Housing material	PA 6.6 (UL94-0; NFF I2, F2)
Field installation	rail TS 35 (EN50022)
IP rating	IP 20
Installation position	any
Termination	Spring terminal: 0,25 - 2,5 mm²
Operation temperature range	-25°C - 50°C
Storage temperature range	-40°C - 85°C
Dimension (LxWxD)	8,1 x 114,5 x 116,0
Weight	0,120 kg
Approvals	cULus, Class 1 Div 2 in preparation
Standards	EN 60950-1; EN61131-1,2; EN 61000; EN 60947-4-1; EN 50022

Accessories			
Terminal set (Supply- and end terminal), 6 mm²	Part number	Type	PU
Copper busbar 1 m	716425	LOCC-Box-ES 7-6425	1
Cover for copper busbar	716426	LOCC-Box-CU 7-6426	1
Jumper comb 8pole, white	716427	LOCC-Box-AD 7-6427	1
Jumper comb 8pole, red	716428	LOCC-Box-BKW 7-6428	5
Jumper comb 8pole, blau	716429	LOCC-Box-BKR 7-6429	5
Identification plate (200pcs), white	716430	LOCC-Box-BKB 7-6430	5
Identification plate (200pcs), red	716431	LOCC-Box-BZW 7-6431	1
Identification plate (200pcs), blue	716432	LOCC-Box-BZR 7-6432	1
Identification plate (200pcs), yellow	716433	LOCC-Box-BKB 7-6433	1
	716434	LOCC-Box-BZG 7-6434	1



Reliable protection of 24V DC circuits

Intelligent safeguarding of selectivity

by Ralf Coors,
Friedrich Lütze GmbH & Co. KG

Primary switching controllers and circuit-breakers today form the basis of the 24V DC power supply plane.
As a consequence of the operational behaviour of these devices, the required selective protection of individual circuits, especially with overload current, is virtually impossible to implement. A complete plant stoppage is as good as pre-programmed.

Operational behaviour of primary switching controllers

Switch-mode power supplies and their component parts are sized for a particular rated value and run hot at higher loads. To prevent them from self-destructing, they trip at between 1.1 to 2.5 times the rated current, depending on type. The Hiccup mode is to be found in simple devices; when there is an overload the device switches off and then, after a short time, back on again. If the overload condition is still present, then the procedure is repeated until the fault is cleared manually. Thus no protection is actually initiated. Even the use of devices with forward current-voltage characteristics does not bring any success. The power-supply does not actually switch off, but supplies only a 1.1 to 1.2 times higher output current with a reduction of the output voltage. But an automatic circuit breaker either does not trigger this curve or only after a few hours. Moreover both types of output behaviour have the disadvantage that loads such as DC motors or capacitive loads cannot be started. With additional outlay it is possible to operate heavy loads, in the simplest instance by using a device with a higher power output or a device with integrated Power Boost. Here the device with the Power Boost delivers from 1.2 to 1.3 times the rated current on a sustained basis in the temperature range up to +45°C. By reduction of the output voltage, up to 2.5 times max. the rated current can be reached, which depending on the device itself and the characteristics of the circuit-breaker may possibly be sufficient to cause the device to trip.

Characteristics of circuit breakers

As an example, let us look at the trip curve of a circuit breaker that has the characteristic B (Fig 1). To detect small overload currents a thermal trip is used in the range of minutes to hours (withstand >1h at I = 1.13 x In and trip <1h at I = 1.45 x In). Switching-off with high overload currents occurs via immediate magnetic tripping within 0.01 to 0.1 seconds. If such a circuit breaker is used in conjunction with a 10A switch-mode power supply, then with a 1.2 times rated current, turn off occurs only after 20 to 60 minutes. Even with a 2.5 times rated current (Power Boost) there is a delay of between 25 seconds and 2 minutes in the thermal area until switch-off occurs. The upshot of this is that the necessary protection, in particular a selective

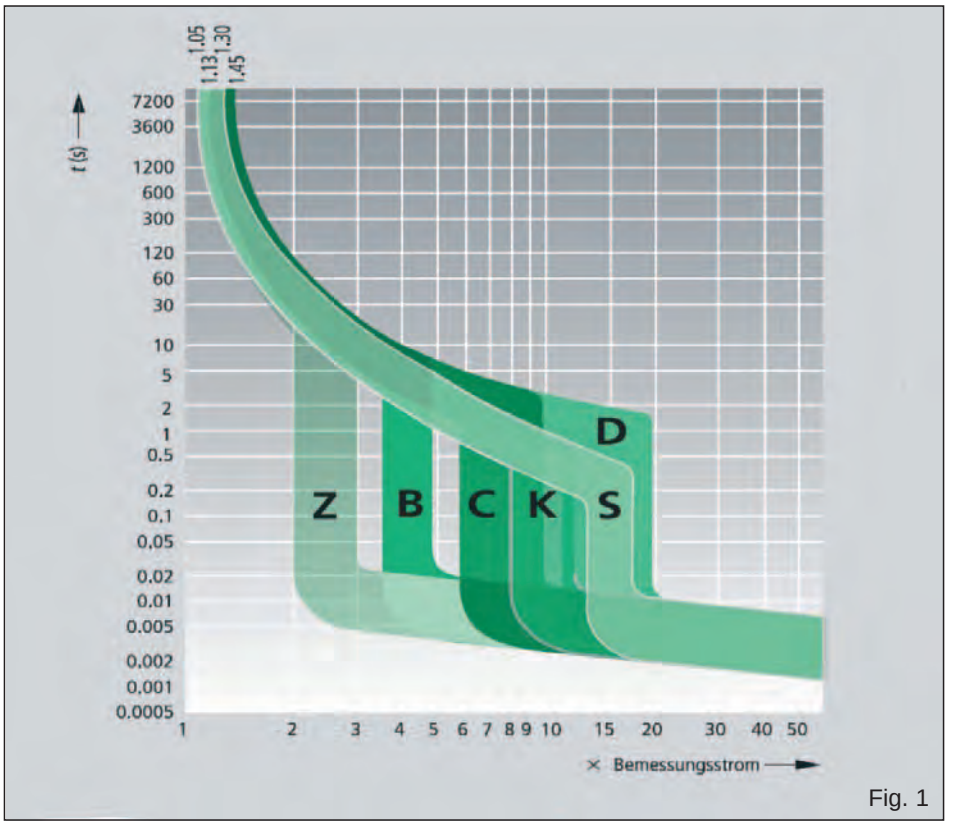


Fig. 1

protection of connected devices, does not take place. The protection in principle adopts purely an alibi function. A short-circuit or faulty circuit continues to be supplied with 2.5 times the rated current. This could result in a plant failure or even a cable fire.

Selective switching off

Selective load switch-off means that if there is an overload or short-circuit, only the defective current circuit is switched off without any repercussions on the supply. When designing the overcurrent protection mechanisms in 24V DC circuits, the following standards should be applied: EN 60204-1 (Cable and fire protection) as well as EN 61131-1 and -2 (operating state and storage). Specifically this means that the system should be able to cope with a power failure of 10ms without its functionality being impaired, which will require the use of large input capacitances. Additionally, dangerous overcurrents must be reduced to a non-hazardous level within 5 sec. The design is made more difficult, due to the fact that nowadays many parallel loads are provided with a protective element.

LOCC-Box – the intelligent current monitoring system

The ideal solution would embrace the ability firstly to handle capacitive loads in the best possible way (so as to be able to start heavy loads) and secondly to be able to quickly recognise an overcurrent during operation and then switch off just the affected path. Of course, such a system must be able to memorize the error in order to prevent any risk of it switching back on again and also to permit error diagnostics. The **LOCC-**Box System from Friedrich Lütze GmbH & Co KG meets these requirements in a modular construction with additional intelligent functions.

In order to satisfy the very diverse demands concerning the tripping behaviour, the **LOCC-**Box system allows for ten different characteristics to be set via a switch. As well as the well-known characteristics from the circuit breaker sector, provision is also made specially for implementing customized characteristics. In addition the rated current range is selectable from 1A up to 10A using presets. The ability to select the current range and the characteristic is very important when retrofitting, as here the device protection often has to be modified and adapted to suit. Additional information is provided via an LED, which shows the capacity utilization of the circuit. When 90% of the set current value is reached, the status LED switches to the blinking condition. If a trip condition is triggered due to an overcurrent or a short-circuit, this is visually indicated by means of a red LED, as well as by a 24 V DC signal being set to 0 which acts as a centralized fault indication. This dispenses with the need for installing and wiring additional auxiliary contacts. After the fault has been eliminated, the system can be switched back on, either using the mechanical switches on the device or remotely from the plant. This possibility to switch individual channels can be of enormous importance during the commissioning phase of a plant, as so many individual plant components can then be specifically targeted and tested.



Fig 2: LOCC-Box - principle design

LOCC-Box – practical and economical

The monitoring function is just one side of the coin. In many systems the flip side is the mechanics that goes with it. If one look at the market-place, one can see that multi-channel solutions are frequently offered, which only then make sense, if all the available channels are actually needed. If this is not the case, or if subsequently another channel has to be added, then money and space are just wasted. A further disadvantage of this solution is that up to 40A can pass across the PCB board. This represents a tremendous loading of the substrate and an interruption to the whole supply when a device is being replaced. What in other branches of automation has been the latest technology for more than 10 years now presents itself in this case as the ideal solution - highly modular construction!

Here Lütze's **LOCC-**Box System is setting new standards. The single channel construction, with all the functions described, offers the highest possible flexibility. As can be seen in Fig 2, the customer can decide, whether each module is to be supplied individually or via the system supply (incoming-feeder terminal, copper busbar, end terminal). The particular advantage of this type of infeed is the screwless contact carriage , which allows individual channels to be exchanged in service without interrupting the whole supply. This also permits the isolation of individual circuits, in order to carry out necessary tasks safely. The maximum supply current is 40A DC; this is determined by the 6mm² terminal. The whole system further benefits from a freely-selectable automobile-style fuse. Thanks to the very slim construction, with a width of just 8.1 mm, then even a system with 40 channels measures only 340 mm wide. To complete the picture, the system housing offers legend plates, the possibility of secure sealing of the terminals and a jumper system for looping the signals.

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