System Data S500, Overview

S500 System data

The same system data as for the system AC500 apply to the system S500-FBP. Only additional details are therefore documented here.

Assortment

Parts of the S500-FBP system are

- the FBP Interface Module DC505-FBP
- digital I/O modules
- analog I/O modules
- Terminal Units for the FBP Interface Module and the I/O modules
- accessories

The FBP Interface Module DC505-FBP serves for the data interchange between a fieldbus and the I/O modules attached to the FBP Interface Module. The FBP interface module itself also has some digital inputs and outputs. The fieldbus type is defined by the choice of the FieldBusPlug (see documentation FieldBusPlug / FBP).

Subjects (overview)

Use of the S500 I/O modules

The S500 I/O modules either can be attached directly to an AC500 CPU (central expansion) or be operated by the FBP Interface Module DC505-FBP (decentralized expansion).

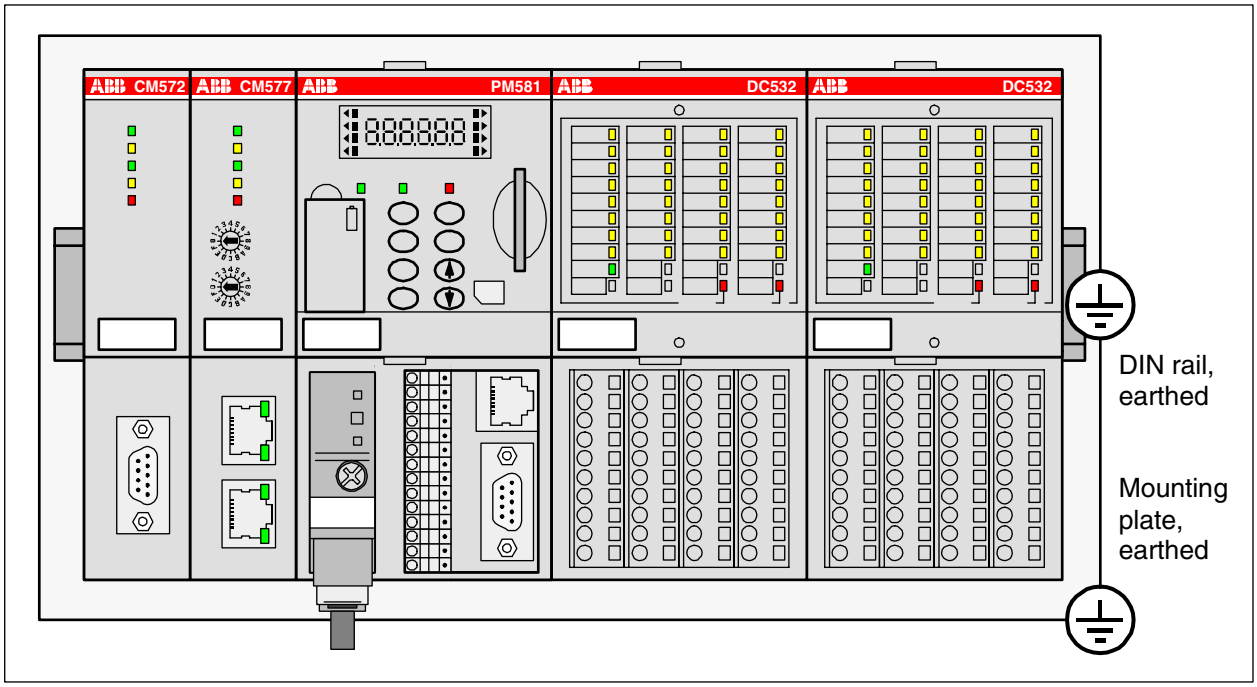


Figure: S500 I/O modules directly attached to an AC500 CPU (central I/O expansion)

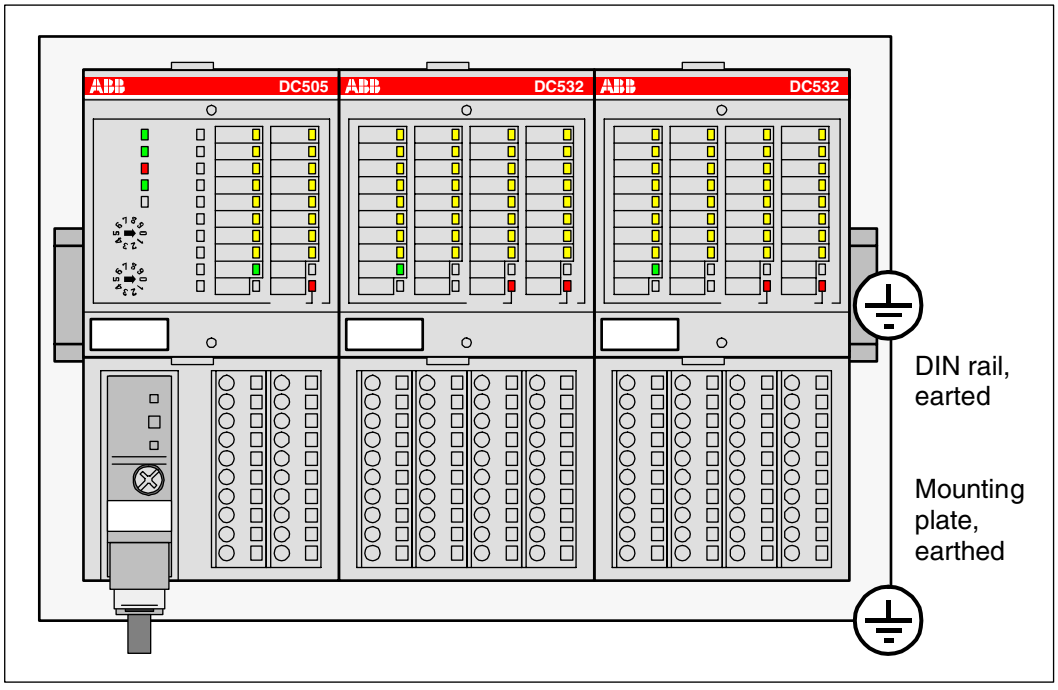


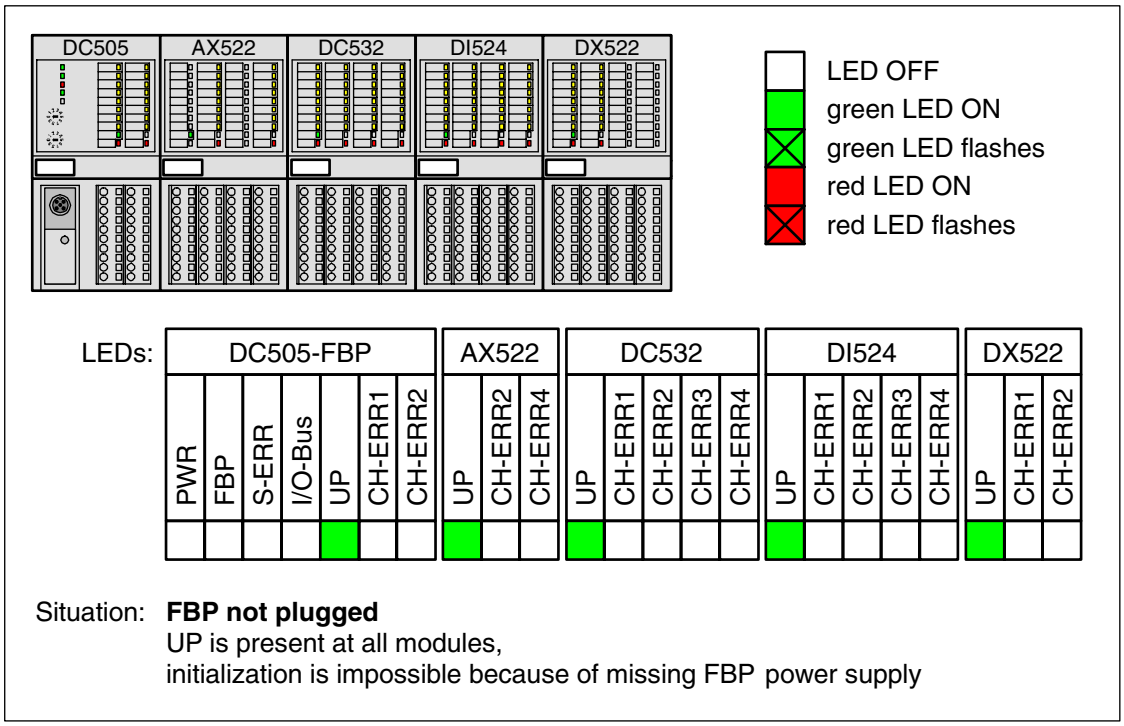
Figure: S500 I/O modules attached to the FBP Interface Module DC505-FBP (decentralized expansion)

Diagnosis LEDs

All S500 modules have LEDs for the display of operating statuses and error messages. They indicate:

LED	Status	Color	LED = ON	LED = OFF	LED flashes
Input	digital input	yellow	input = ON	input = OFF	--
	analog input	yellow	brightness depends on the value of the analog signal		--
Output	digital output	yellow	output = ON	output = OFF	--
	analog output	yellow	brightness depends on the value of the analog signal		--
UP	process voltage 24 V DC via terminal	green	voltage is present	voltage is missing	--
PWR	supply voltage 24 V DC via FBP	green	voltage is present	voltage is missing	--
S-ERR	Sum Error	red	serious error, data exchange is stopped, depends on the behaviour of the master	no error	error (e.g. error on one channel, data exchange is not stopped
FBP	FBP communication	green	communication between FBP and FBP Interface Module is running	communication between FBP and FBP Interface Module is broken	during initialization
I/O-Bus	I/O-Bus communication	green	communication between FBP Interface Module and the I/O modules is running	no communication between FBP Interface Module and the I/O modules	error on one I/O expansion module (e.g. one output short-circuited)
CH-ERR1	Channel Error, error messages in groups (digital or analog inputs and outputs combined into the groups 1, 2, 3, 4)	red	serious error within the corresponding group	no error	error on one channel of the corresponding group (e.g. one output short-circuited)
CH-ERR2		red			
CH-ERR3		red			
CH-ERR4		red			
CH-ERR *)	Module Error	red	error within the I/O module	--	--
*) All of the LEDs CH-ERR1 to CH-ERR4 (as far as they exist) light up together					

Display, if the FBP is not plugged



Situation: **FBP not plugged**
UP is present at all modules,
initialization is impossible because of missing FBP power supply

Figure: LED displays, if the FBP is not plugged

Display examples during the initialization

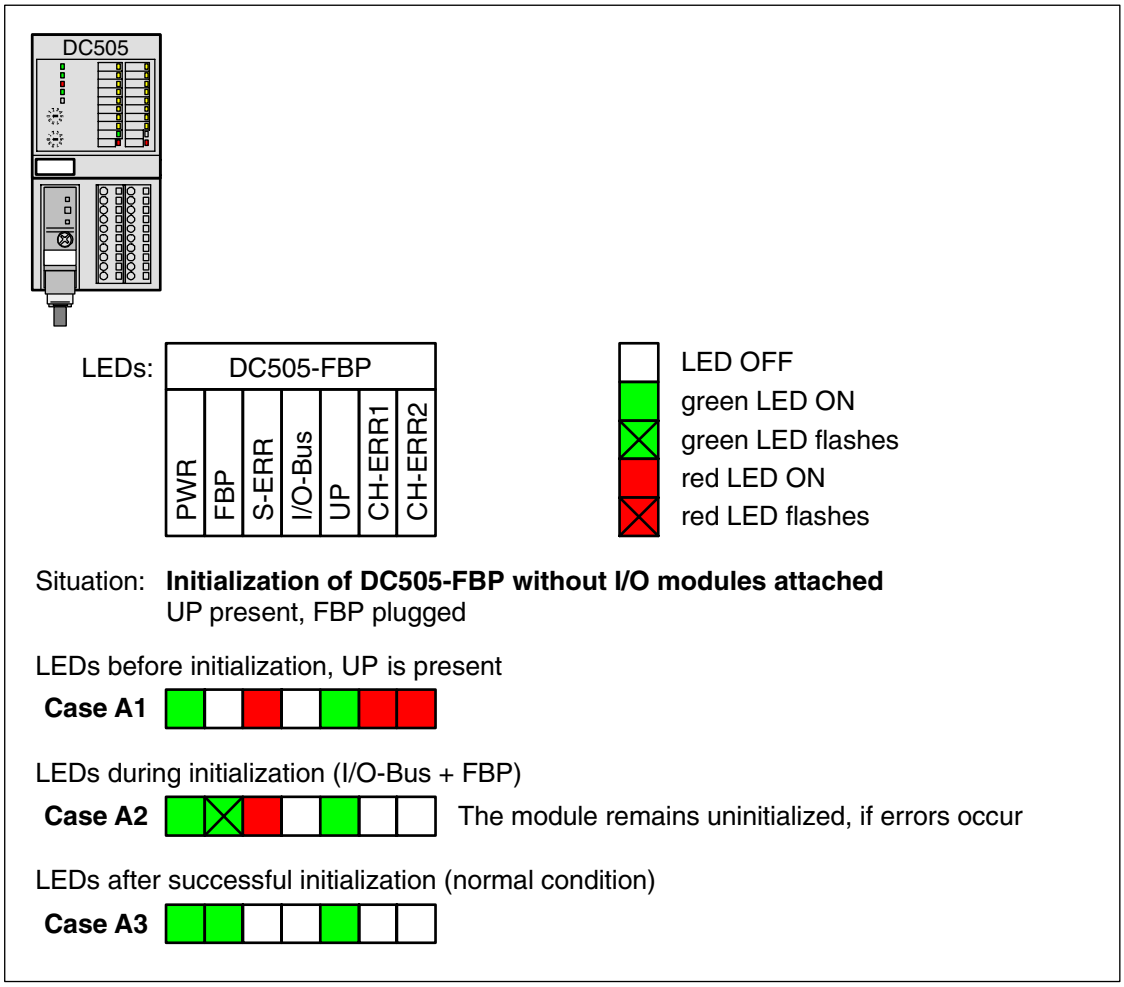


Figure: Initialization DC505-FBP without I/O modules attached

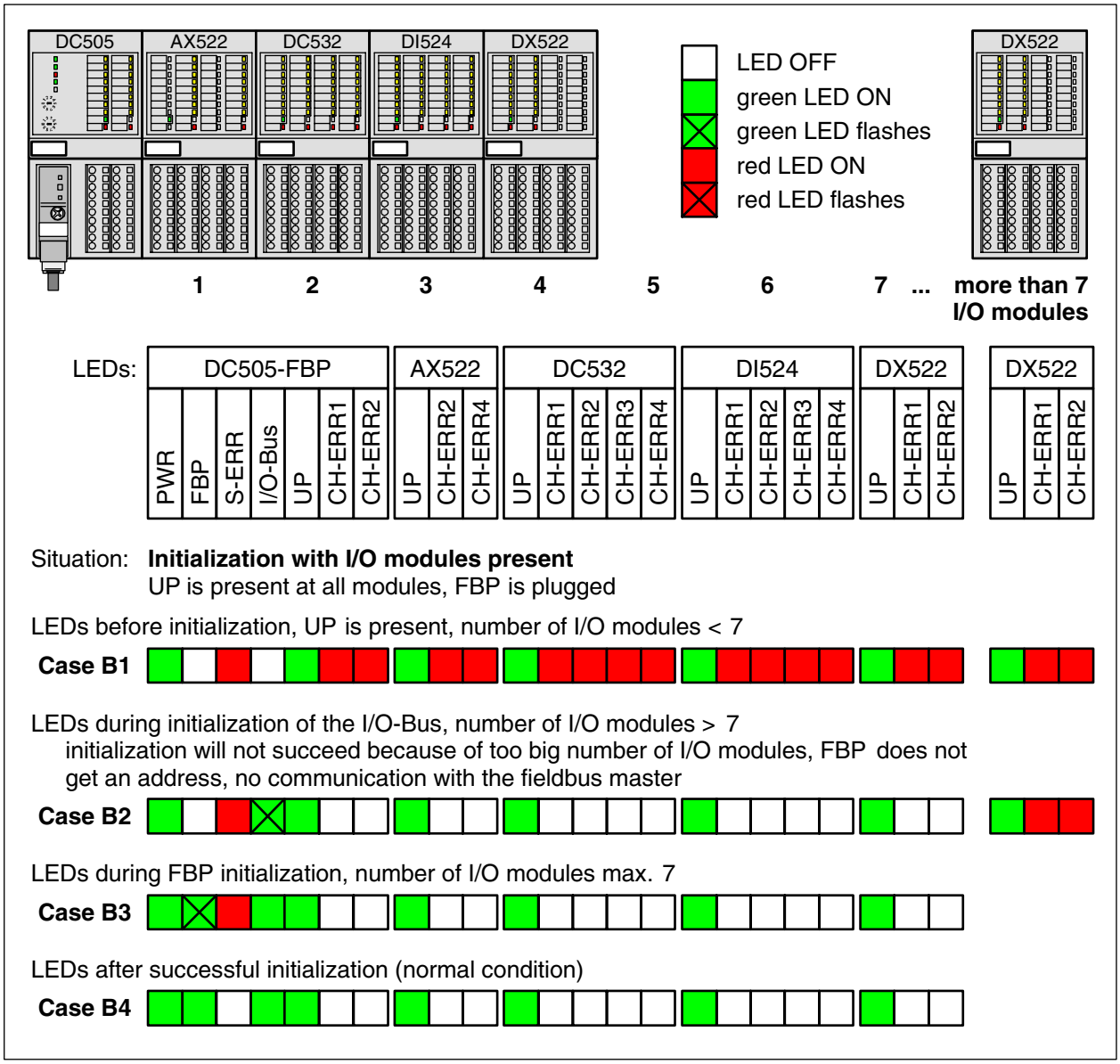


Figure: Initialization DC505-FBP with I/O modules attached

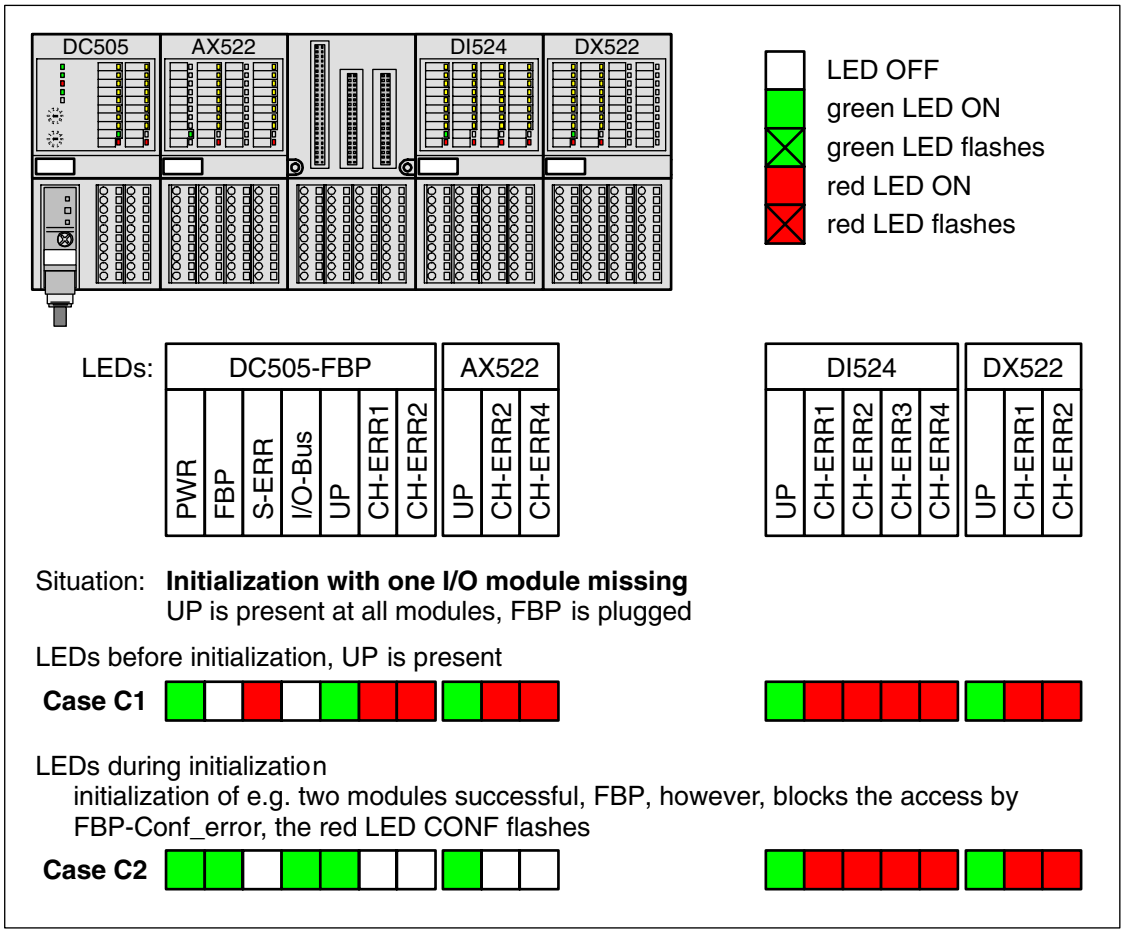


Figure: Initialization with one I/O module missing

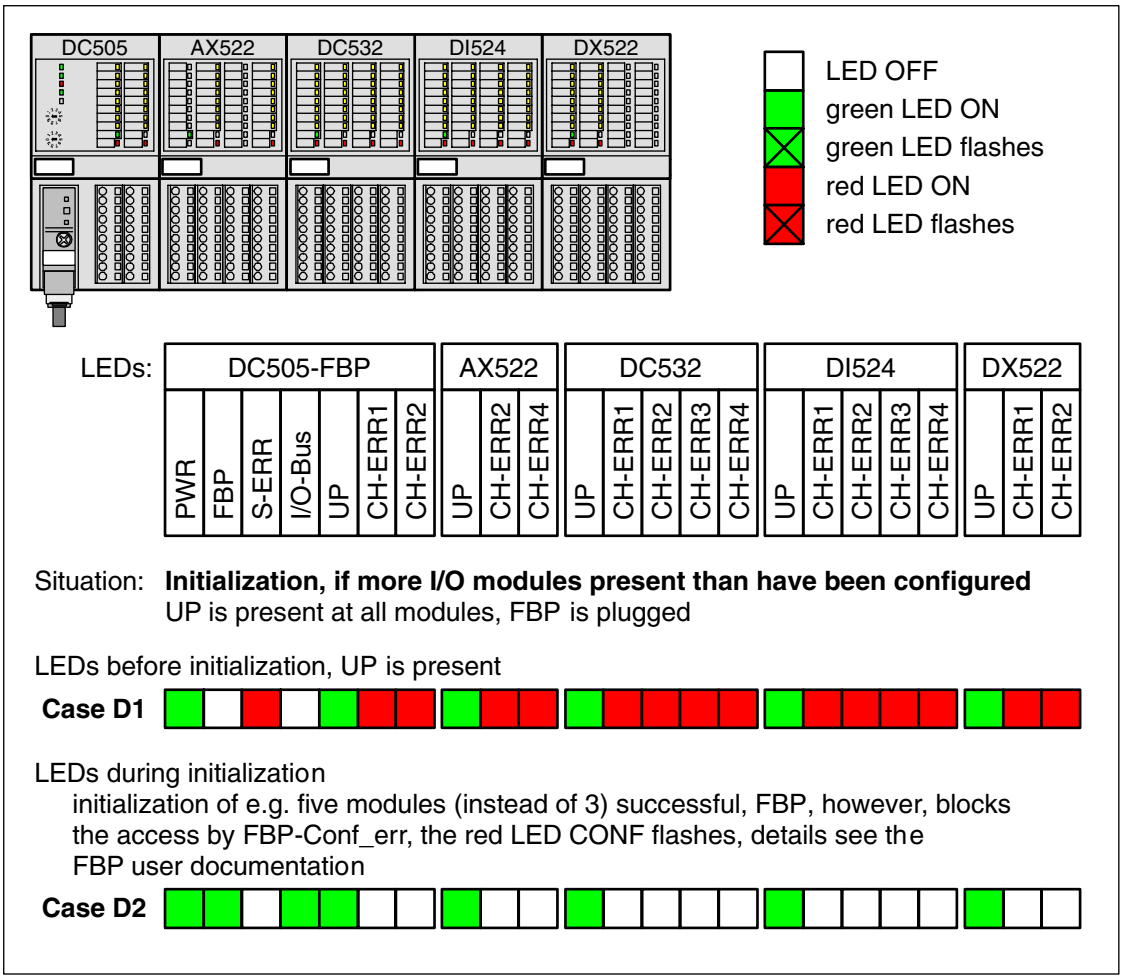


Figure: Initialization, if more I/O modules present than have been configured

Display examples for running operation

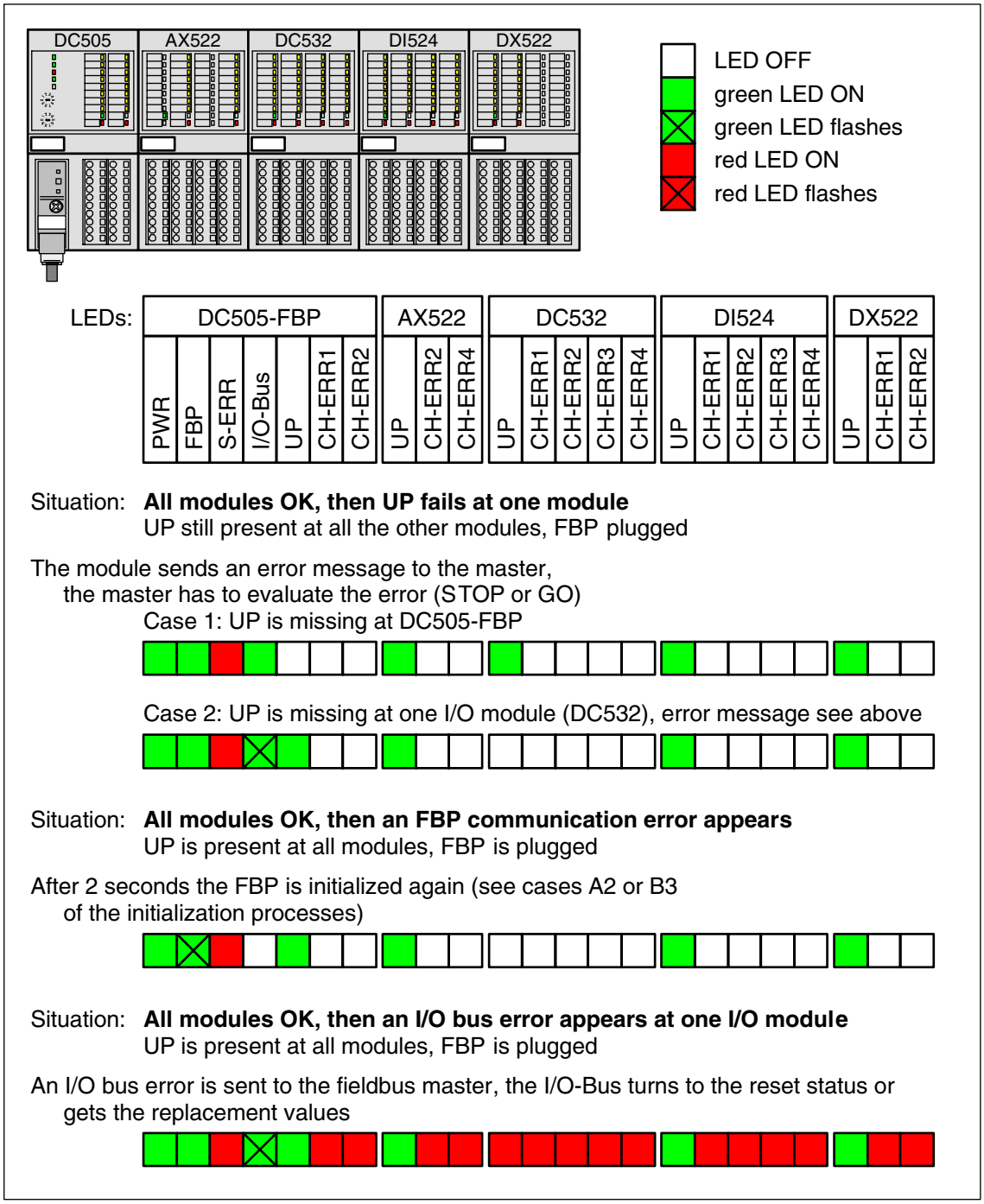


Figure: Appearance of errors in running operation

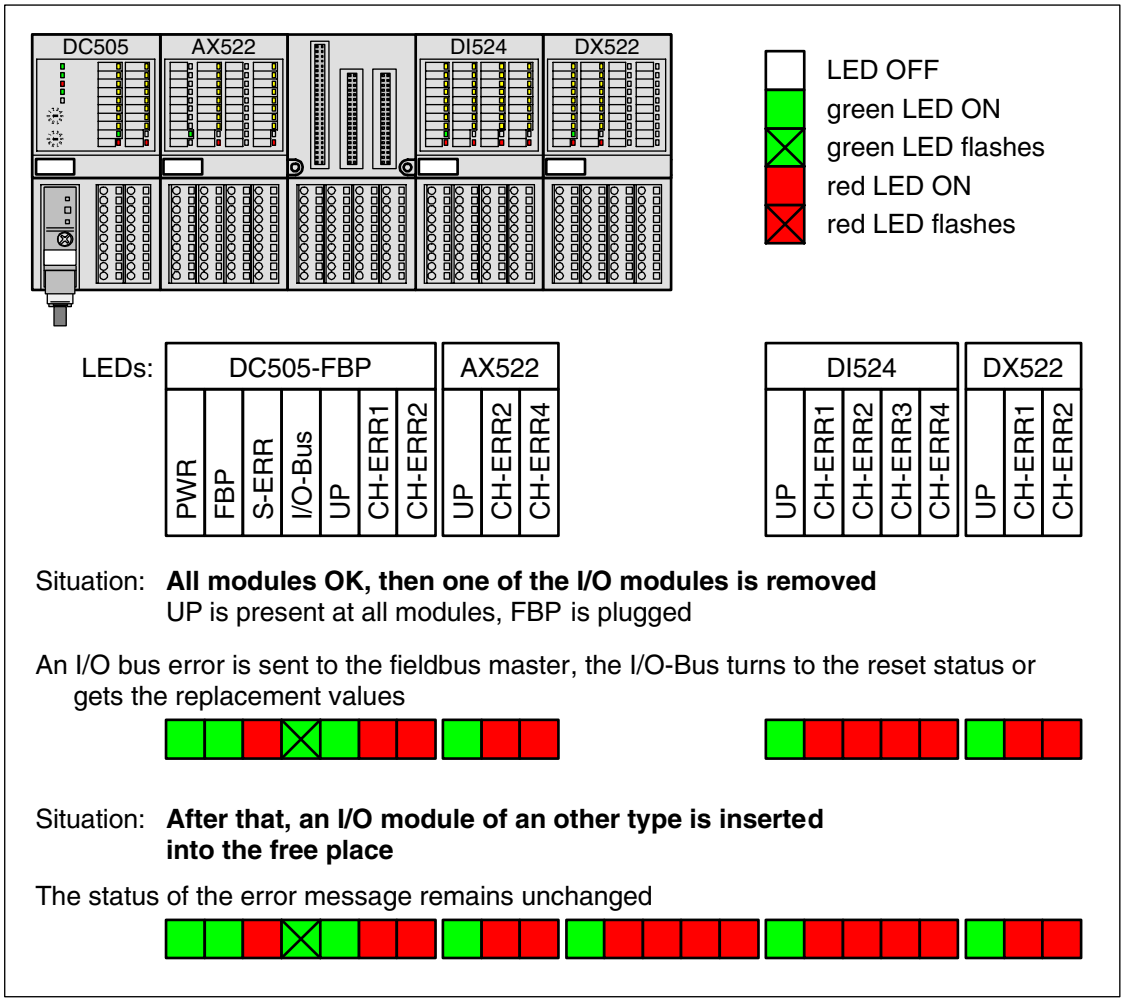


Figure: One module was removed and then replaced by a module of an other type

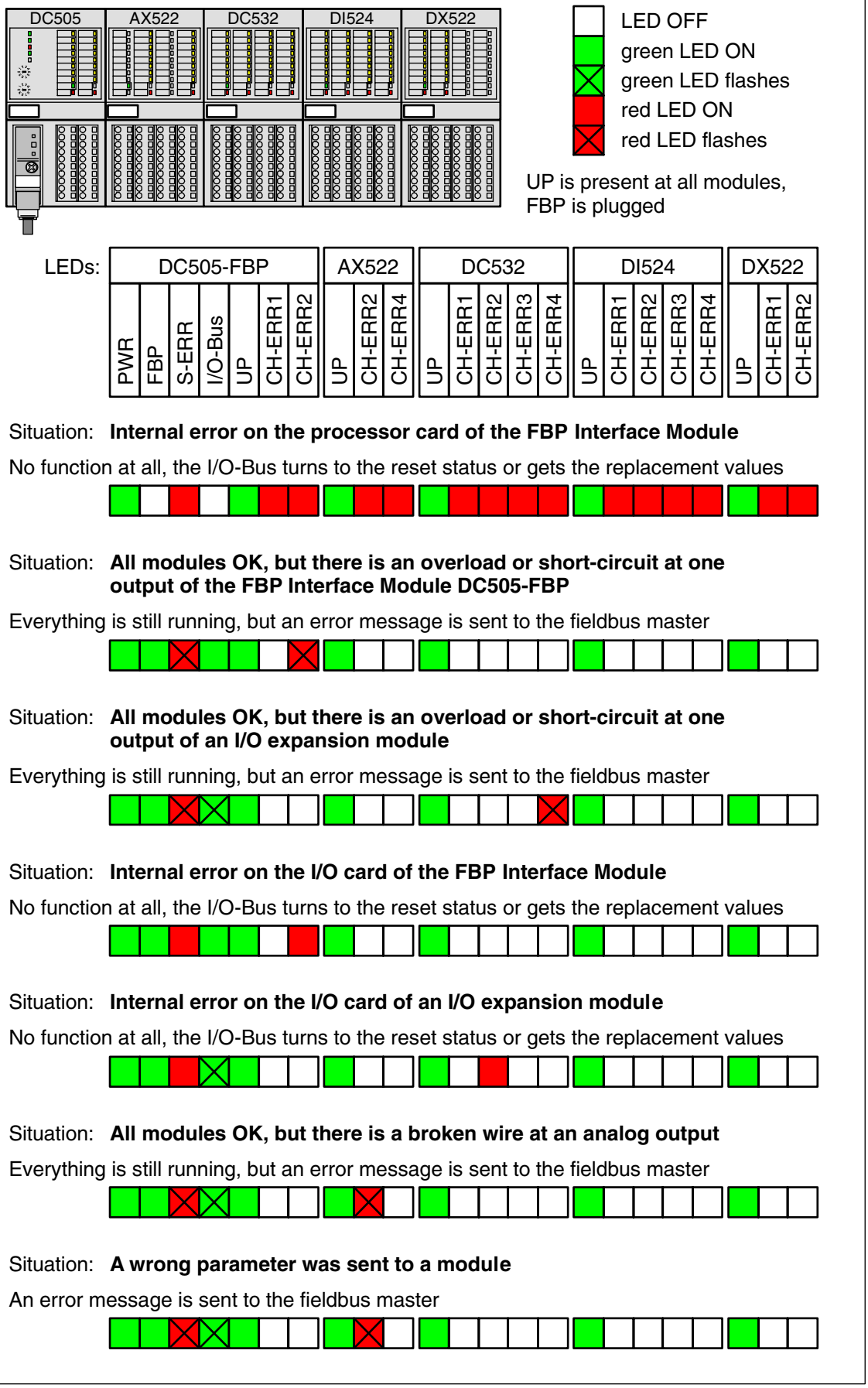


Figure: Displays in case of different errors

Mounting and disassembling the Terminal Units and the I/O modules

Assembly on DIN rail

Step 1: Mount DIN rail 7.5 mm or 15 mm

Step 2: Mount FBP Terminal Unit (TU505 or TU506)

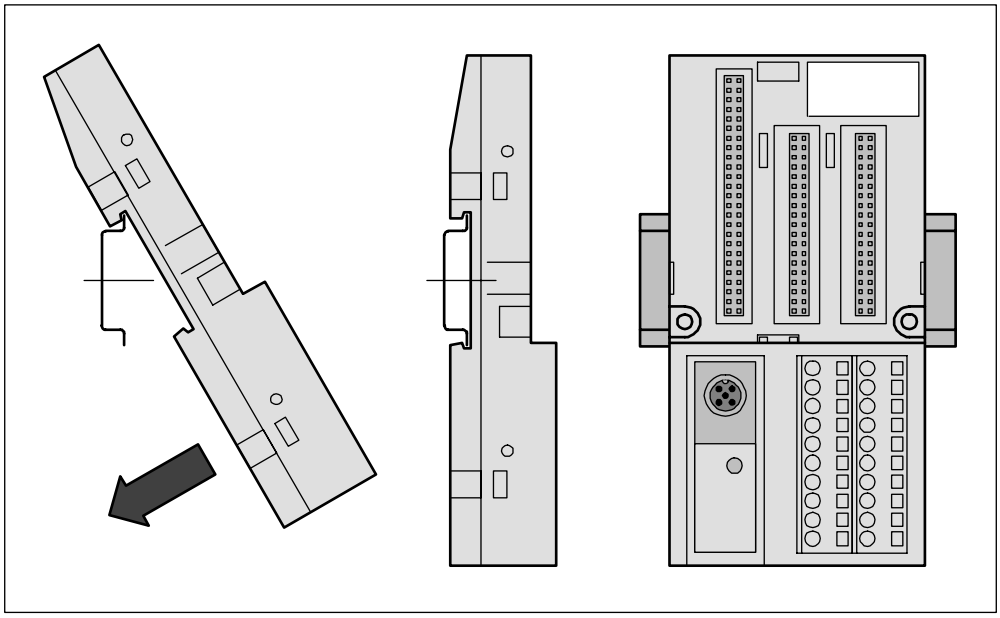


Figure: **Assembly** of the FBP Terminal Unit (TU505 or TU506)

The FBP Terminal Unit is put on the DIN rail above and then snapped-in below. The disassembly is carried out in a reversed order.

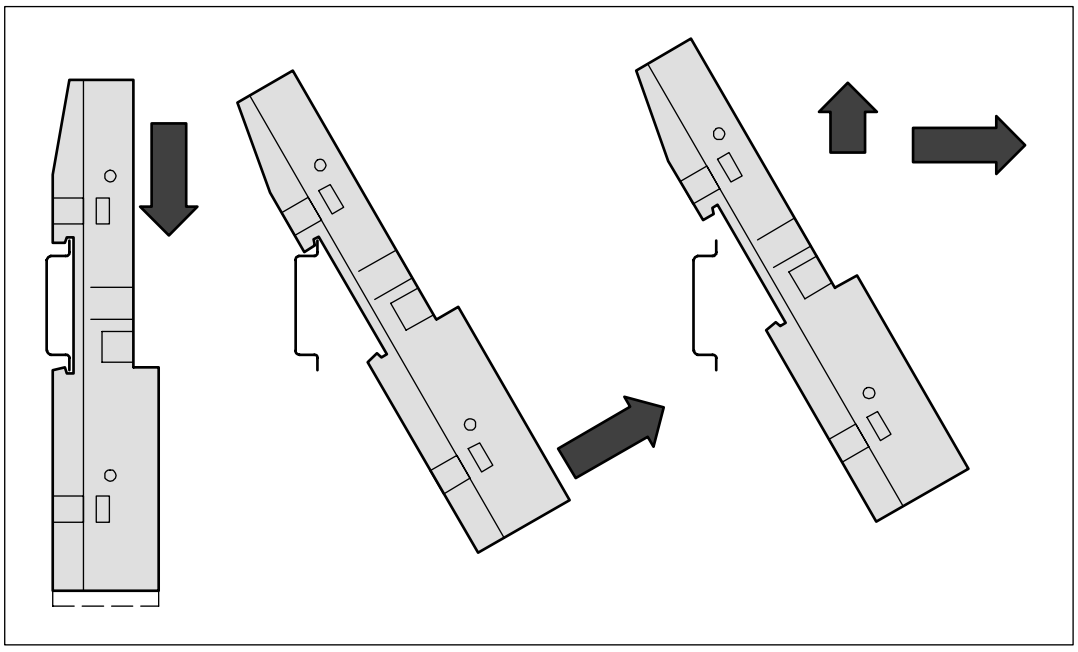


Figure: **Disassembly** of the FBP Terminal Unit (TU505 or TU506)

Step 3: Mount I/O Terminal Unit (TU515, TU516, TU531 or TU532)

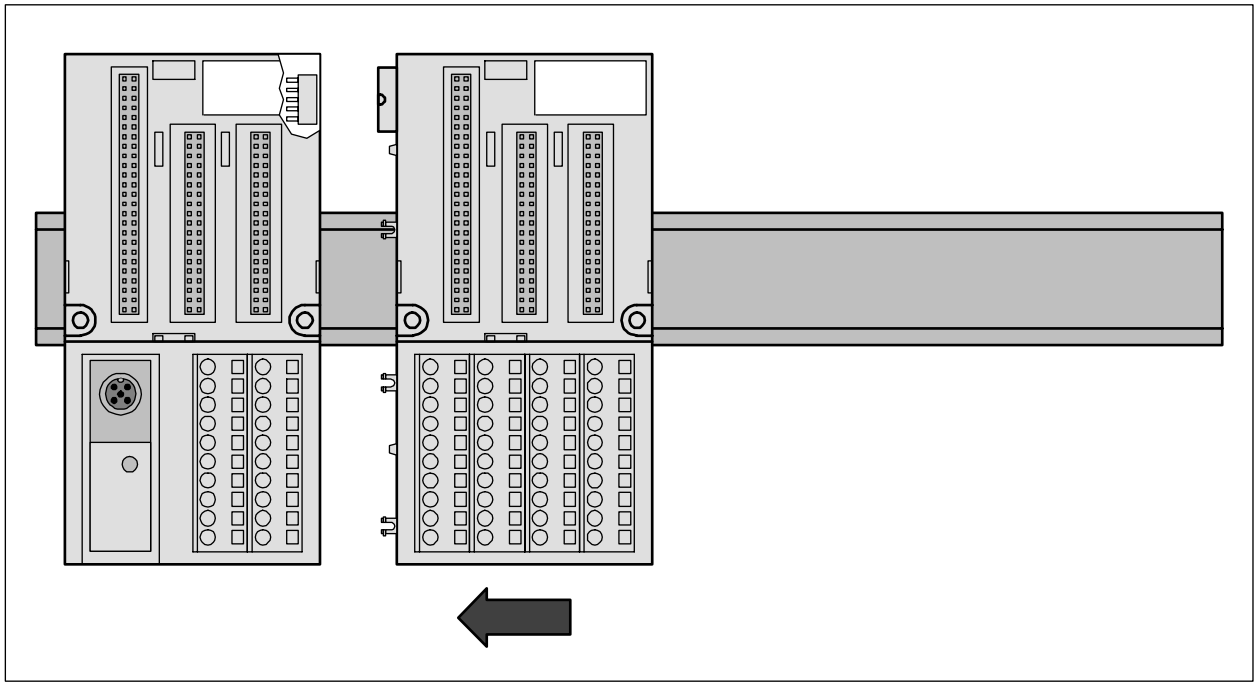


Figure: **Assembly** of the I/O Terminal Unit (TU515, TU516, TU531 or TU532)

The I/O Terminal Unit is installed on the DIN rail in the same way as the FBP Terminal Unit. Once secured on the DIN rail, slide the I/O unit to the left until it fully locks into place creating a solid mechanical and electrical connection.

Altogether 7 I/O Terminal Units can be combined with the FBP Terminal Unit.

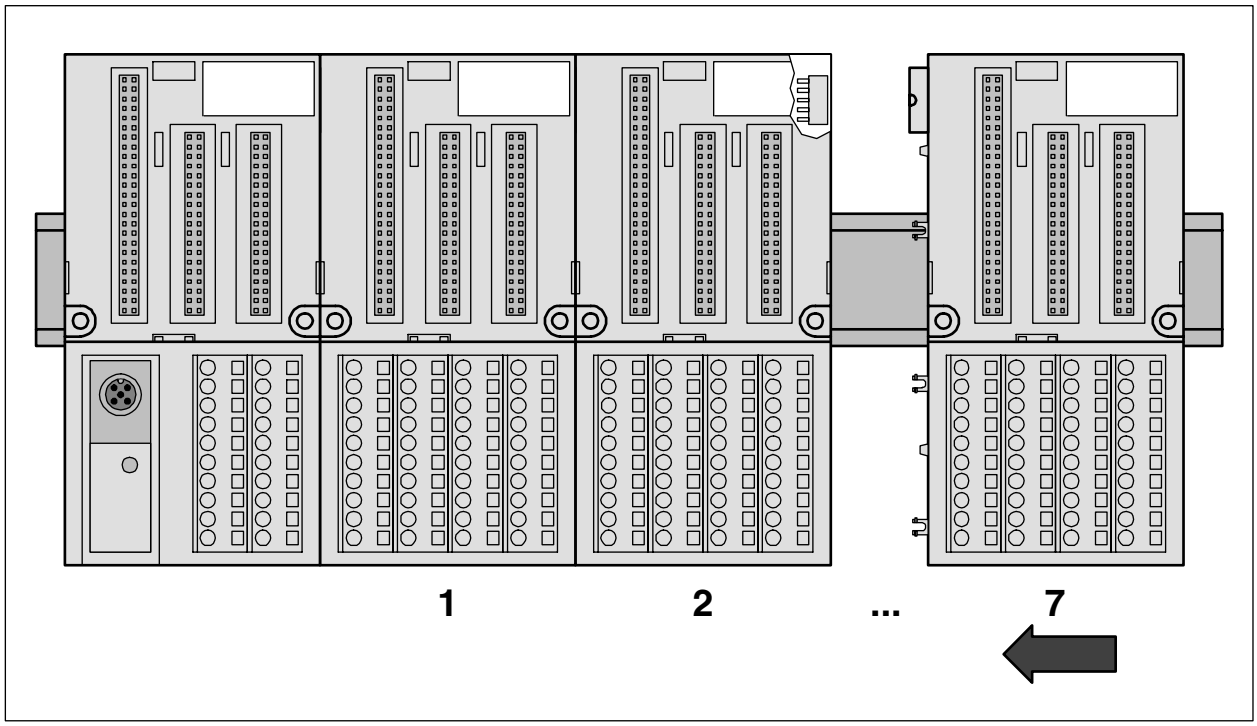


Figure: Maximum configuration (1 FBP Terminal Unit plus 7 I/O Terminal Units)

Important: Up to 7 I/O modules can be used, of which up to **4 analog I/O modules** are possible.

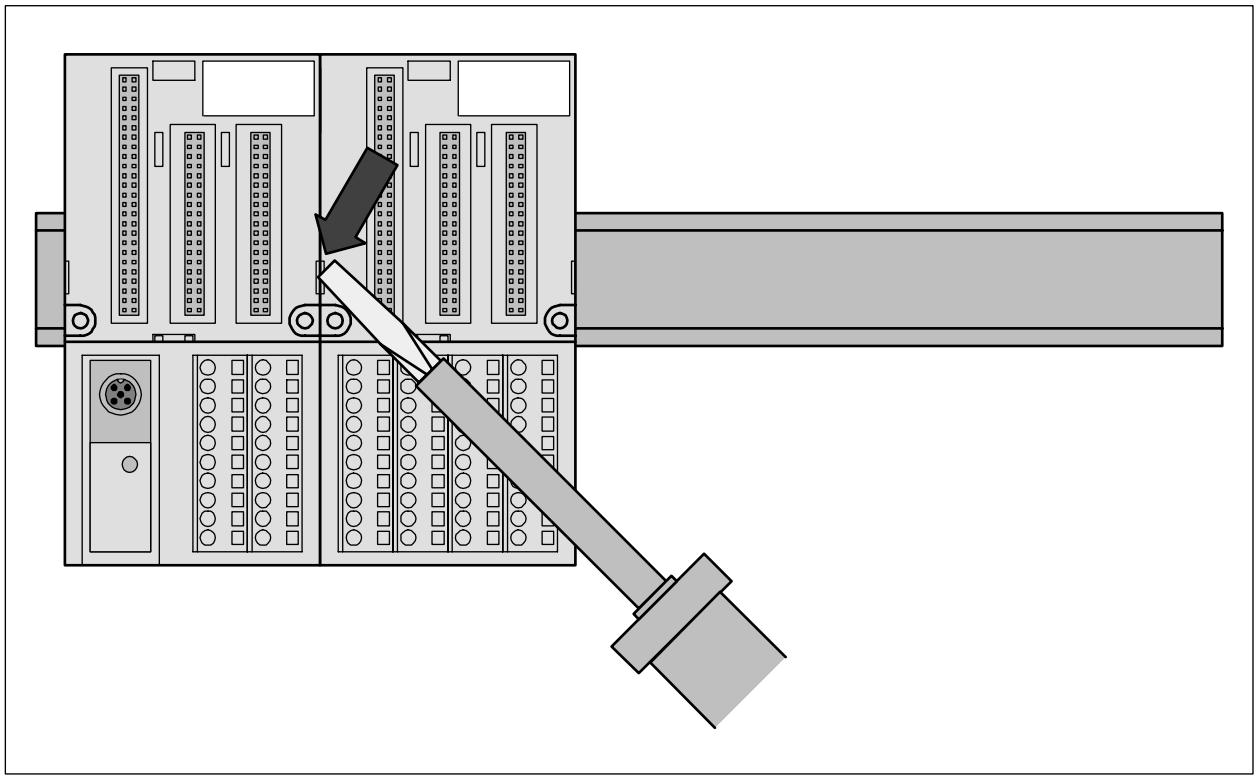


Figure: **Disassembly** of the I/O Terminal Unit (TU515, TU516, TU531 or TU532)

A screwdriver is inserted in the indicated place to separate the Terminal Units.

Step 4: Mount the modules

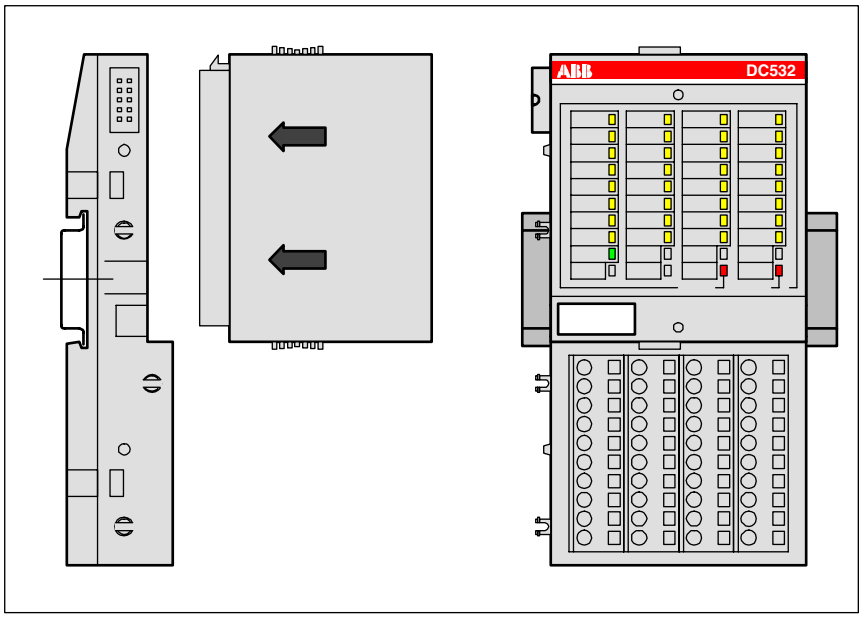


Figure: **Assembly** of the modules

Press the electronic module into the Terminal Unit until it locks in place.

The disassembly is carried out in a reversed order.

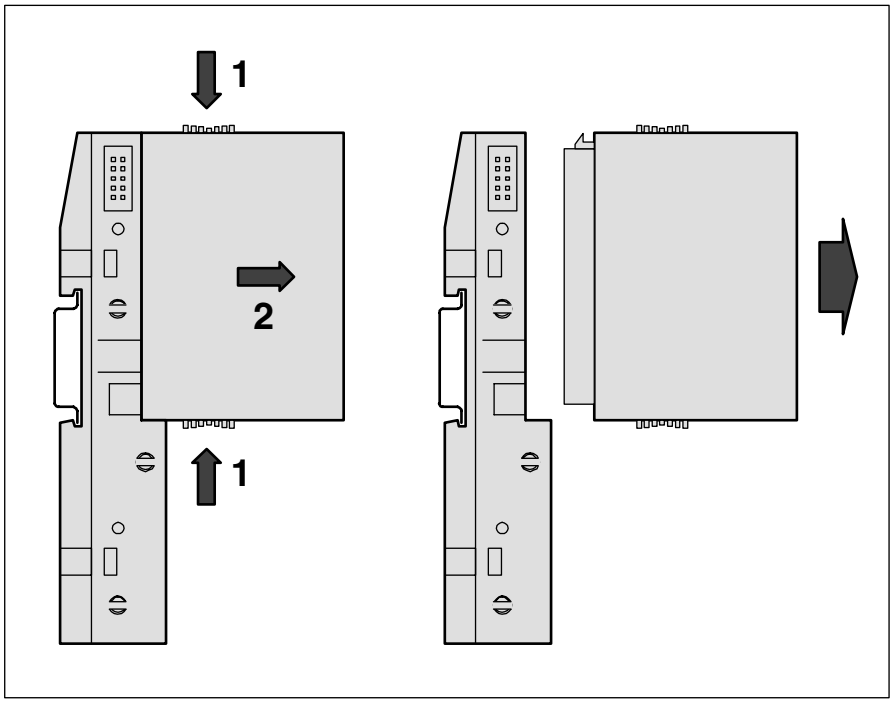


Figure: **Disassembly** of the modules

Disassembly: Press obove and below, then remove the module.

Assembly with screws

If the Terminal Unit should be mounted with screws, a Wall Mounting Accessory TA526 must be inserted at the rear side first. This plastic part prevents bending of the Terminal Unit while screwing on.

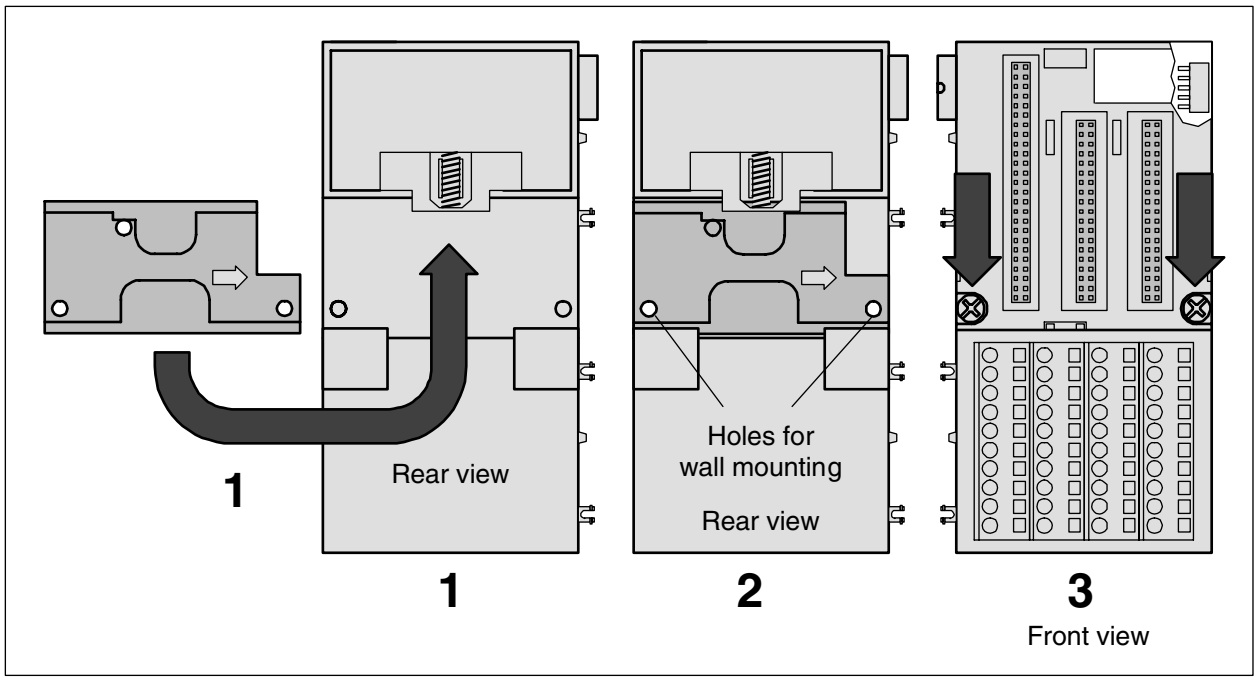


Figure: Fastening with screws of the Terminal Unit TU516 (as an example)

1 The Wall Mounting Accessory TA526 is snapped on the rear side of the Terminal Unit like a DIN rail. The arrow points to the right side.

2 Accessory for wall mounting inserted

3 Terminal Unit, fastened with screws

By wall mounting, the Terminal Unit is earthed through the screws. It is necessary that

- the screws have a conductive surface (e.g. steel zinc-plated or brass nickel-plated)
- the **mounting plate is earthed**
- the screws have a good electrical contact to the mounting plate

Mechanical dimensions S500

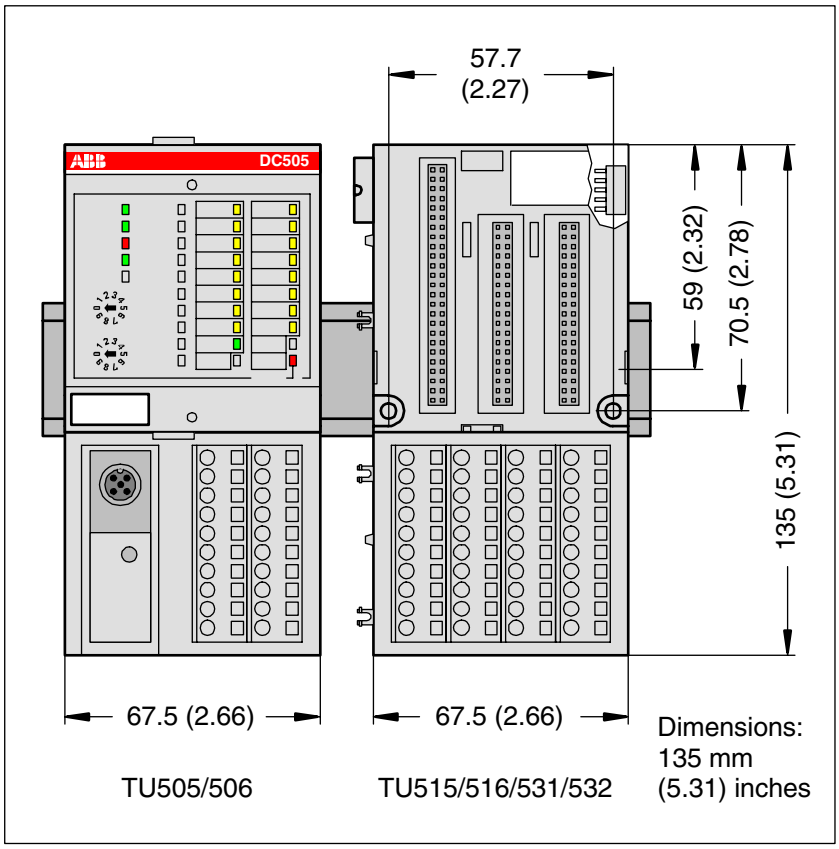


Figure: Dimensions of the Terminal Units (front view)

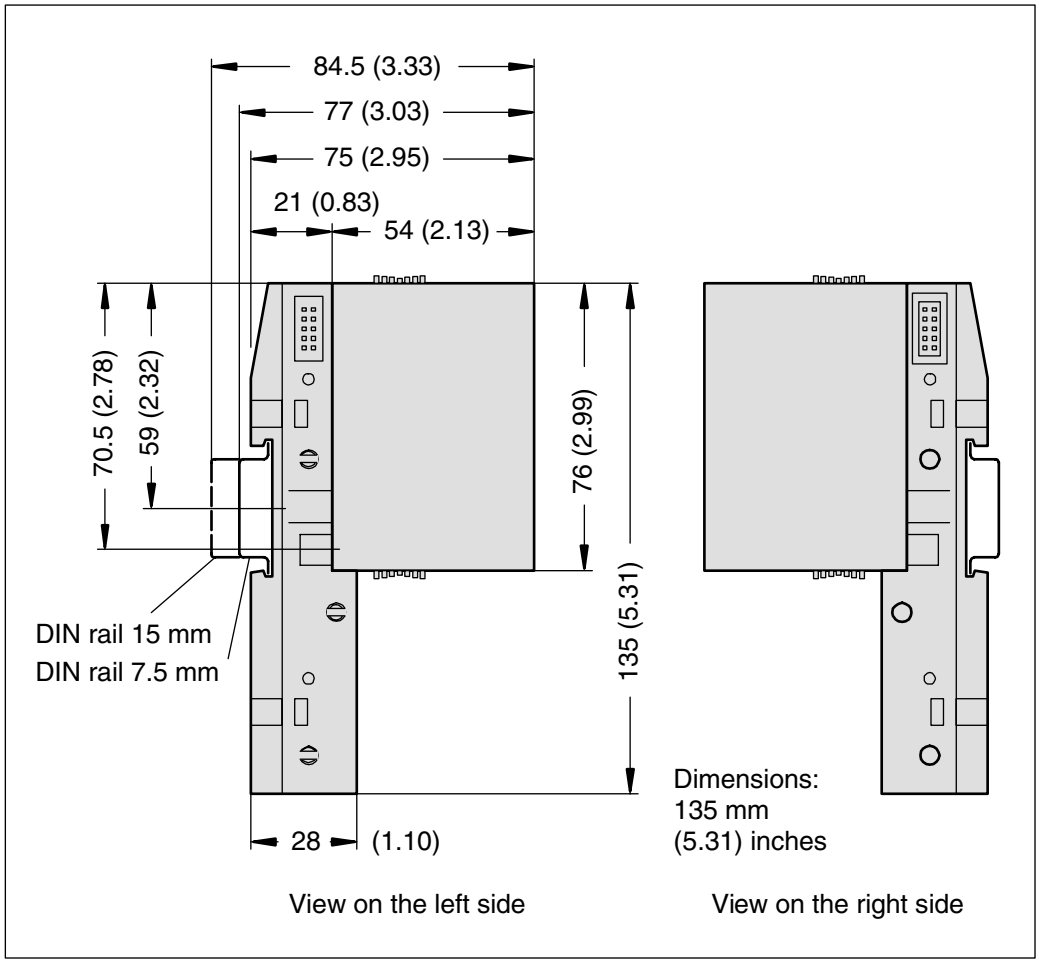


Figure: Dimensions of Terminal Units and modules (lateral views)

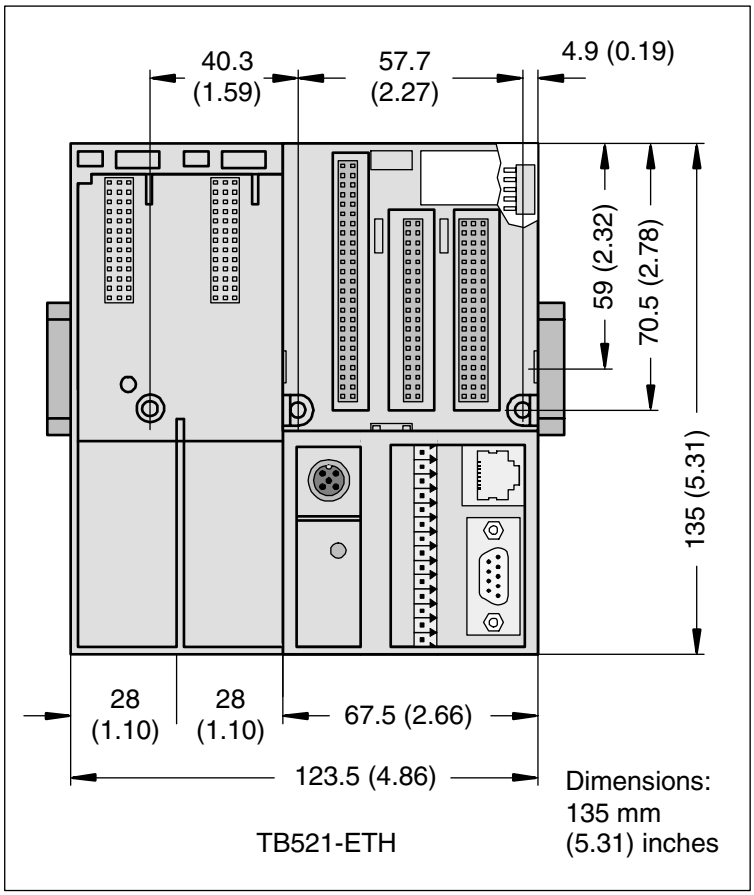


Figure: Dimensions of the AC500 CPU Terminal Base TB521-ETH (for comparison)

Switch-gear cabinet assembly

Basically, it is recommended to mount the modules on an earthed mounting plate, independent of the mounting location.

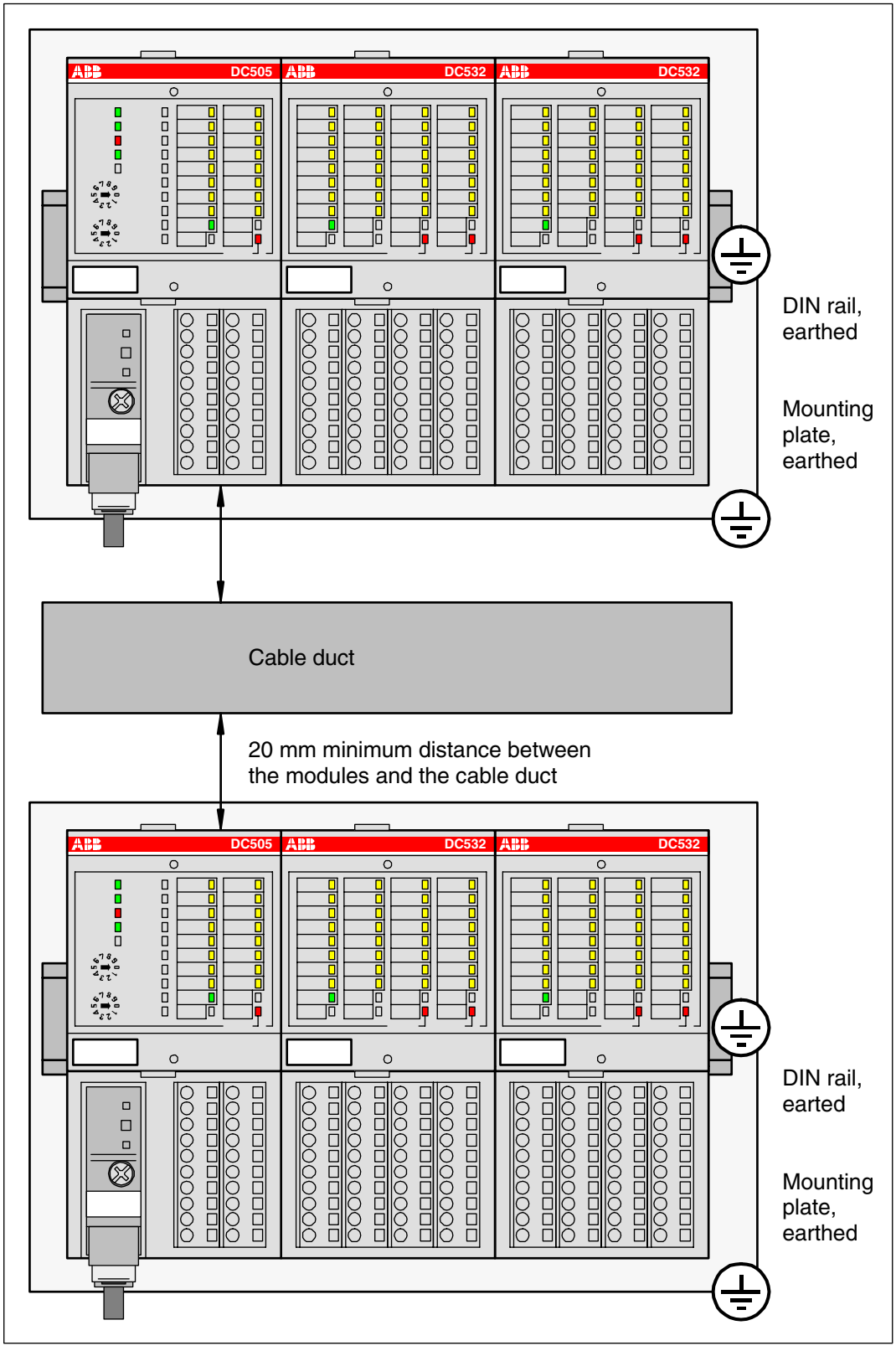


Figure: Installation of AC500/S500 modules in a switch-gear cabinet

Important: Horizontal mounting is highly recommended. Vertical mounting is possible, however, derating consideration should be made to avoid problems with poor air circulation and the potential for excessive temperatures (see also the AC500 system data, operating and ambient conditions, for reduction of ambient temperature).

Note: By vertical mounting, always place an end-stop terminal block at the bottom and on the top of the module to properly secure the modules.

By high-vibration applications, we also recommend to place end-stop terminals at the right and the left side of the device to properly secure the modules:

e.g. type BADL, P/N: 1SNA 399 903 R0200

Connection system

Terminals for power supply and the COM1 interface (CPU Terminal Base AC500)

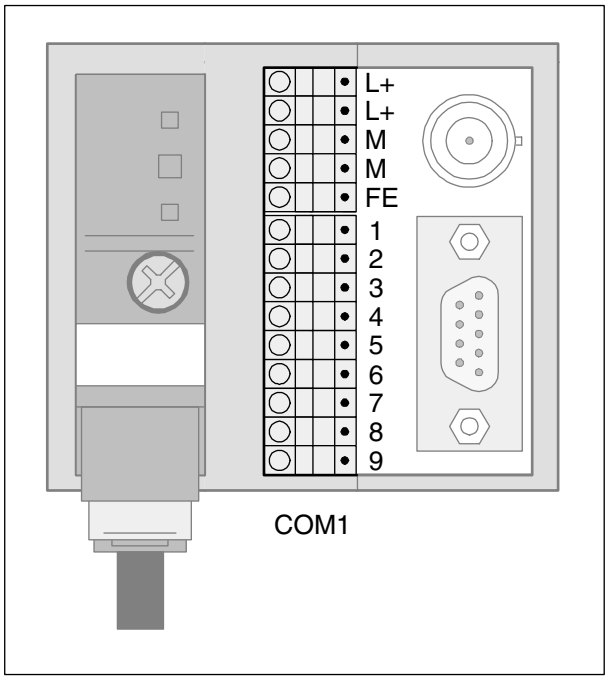


Figure: Terminals for power supply and the COM1 interface (CPU Terminal Base AC500)

Terminal type: **Screw-type terminal**

Number of cores per terminal	Conductor type	Cross section
1	solid	0.08 mm² to 1.5 mm²
1	flexible	0.08 mm² to 1.5 mm²
1 with wire end ferrule (without plastic sleeve)	flexible	0.25 mm² to 1.5 mm²
1 with wire end ferrule (with plastic sleeve)	flexible	0.25 mm² to 0.5 mm²
1 (TWIN wire end ferrule)	flexible	0.5 mm²
2 (with the same cross section)	solid	0.08 mm² to 0.5 mm²
2 (with the same cross section)	flexible	0.08 mm² to 0.75 mm²
2 (with the same cross section) in wire end ferrule, without plastic sleeve	flexible	0.25 mm² to 0.34 mm²

Terminal type: **Spring terminal**

Number of cores per terminal	Conductor type	Cross section
1	solid	0.08 mm² to 1.5 mm²
1	flexible	0.08 mm² to 1.5 mm²
1 with wire end ferrule (without plastic sleeve)	flexible	0.25 mm² to 1.5 mm²
1 with wire end ferrule (with plastic sleeve)	flexible	0.25 mm² to 0.5 mm²
1 (TWIN wire end ferrule)	flexible	0.5 mm²
2 (with the same cross section)	solid	0.08 mm² to 0.5 mm²
2 (with the same cross section)	flexible	0.08 mm² to 0.75 mm²
2 (with the same cross section) in wire end ferrule, without plastic sleeve	flexible	0.25 mm² to 0.34 mm²

Terminals at the Terminal Units (I/O, FBP)

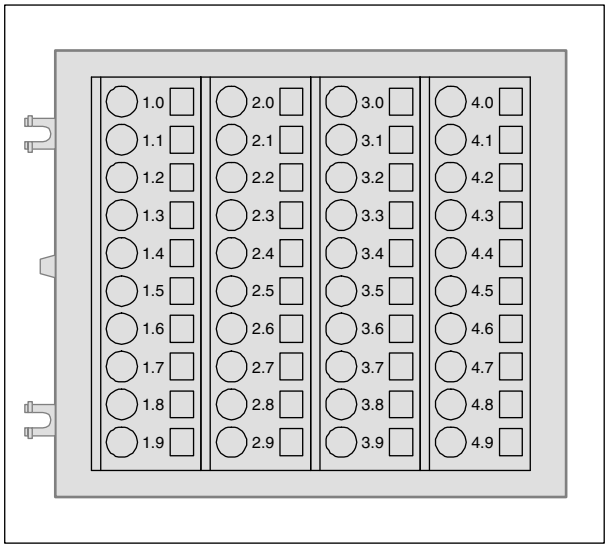


Figure: Terminals at the Terminal Units (I/O, FBP)

Terminal type: **Screw-type terminal**

Number of cores per terminal	Conductor type	Cross section
1	solid	0.08 mm² to 2.5 mm²
1	flexible	0.08 mm² to 2.5 mm²
1 with wire end ferrule	flexible	0.25 mm² to 1.5 mm²
TWIN wire end ferrule	flexible	2 x 0.25 mm² or 2 x 0,5 mm² or 2 x 0,75 mm², with square cross-section of the wire-end ferrule also 2 x 1.0 mm²
2	solid	not intended
2	flexible	not intended

Terminal type: **Spring terminal**

Number of cores per terminal	Conductor type	Cross section
1	solid	0.08 mm² to 2.5 mm²
1	flexible	0.08 mm² to 2.5 mm²
1 with wire end ferrule	flexible	0.25 mm² to 1.5 mm²
TWIN wire end ferrule	flexible	2 x 0.25 mm² or 2 x 0,5 mm² or 2 x 0,75 mm², with square cross-section of the wire-end ferrule also 2 x 1.0 mm²
2	solid	not intended
2	flexible	not intended

Connection of wires at the spring terminals

Connect the wire to the spring terminal

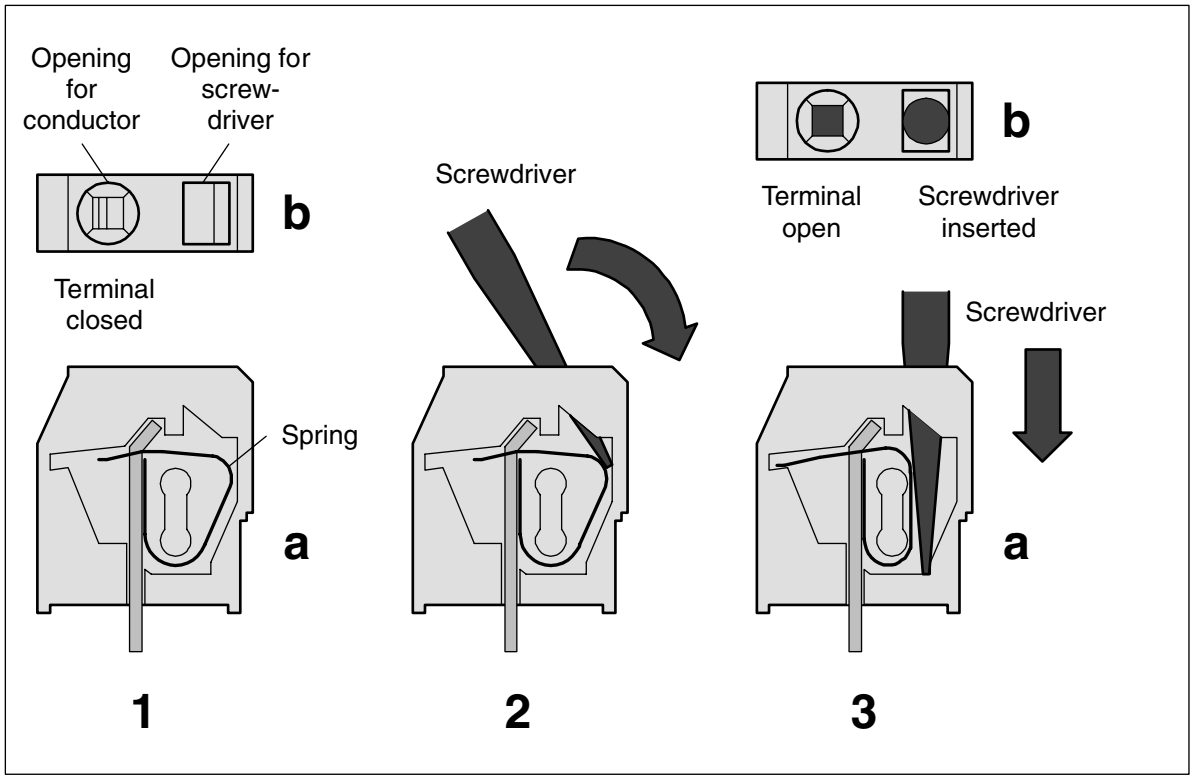


Figure: Connect the wire to the spring terminal (steps 1 to 3)

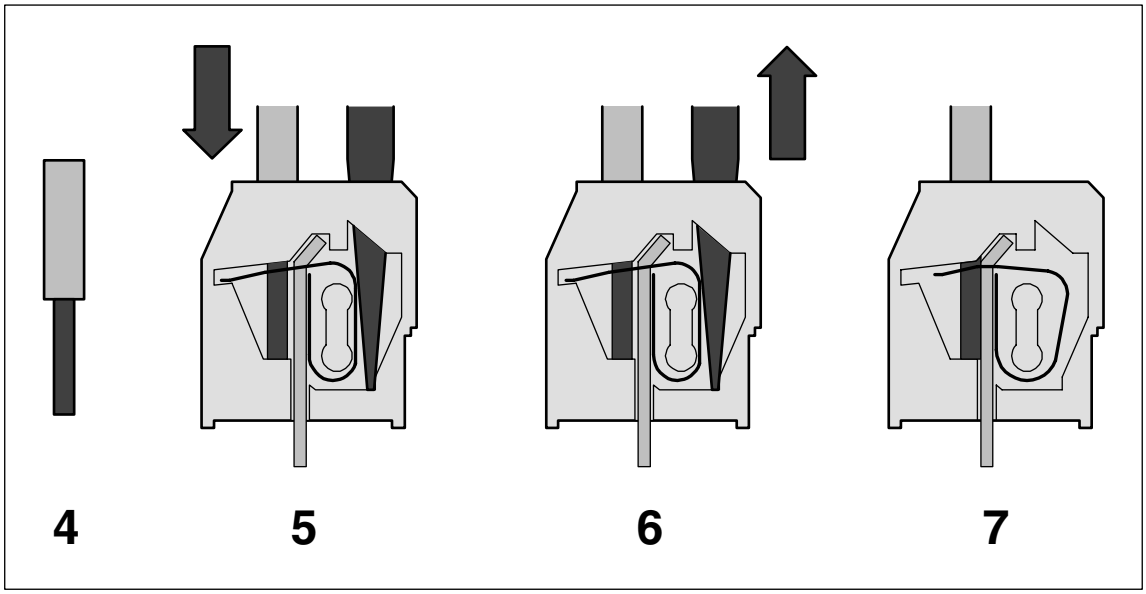


Figure: Connect the wire to the spring terminal (steps 4 to 7)

1 a	Side view (open terminal drawn for illustration)
1 b	The top view shows the openings for wire and screwdriver
2	Insert screwdriver (2.5 x 0.4 to 3.5 x 0.5 mm) at an angle, screwdriver must be at least 15 mm free of insulation at the tip
3 a	While erecting the screwdriver, insert it until the stop (requires a little strength)
3 b	Screwdriver inserted, terminal open
4	Strip the wire for 7 mm (and put on wire end ferrule)
5	Insert wire into the open terminal
6	Remove the screwdriver
7	Done

Disconnect wire from the spring terminal

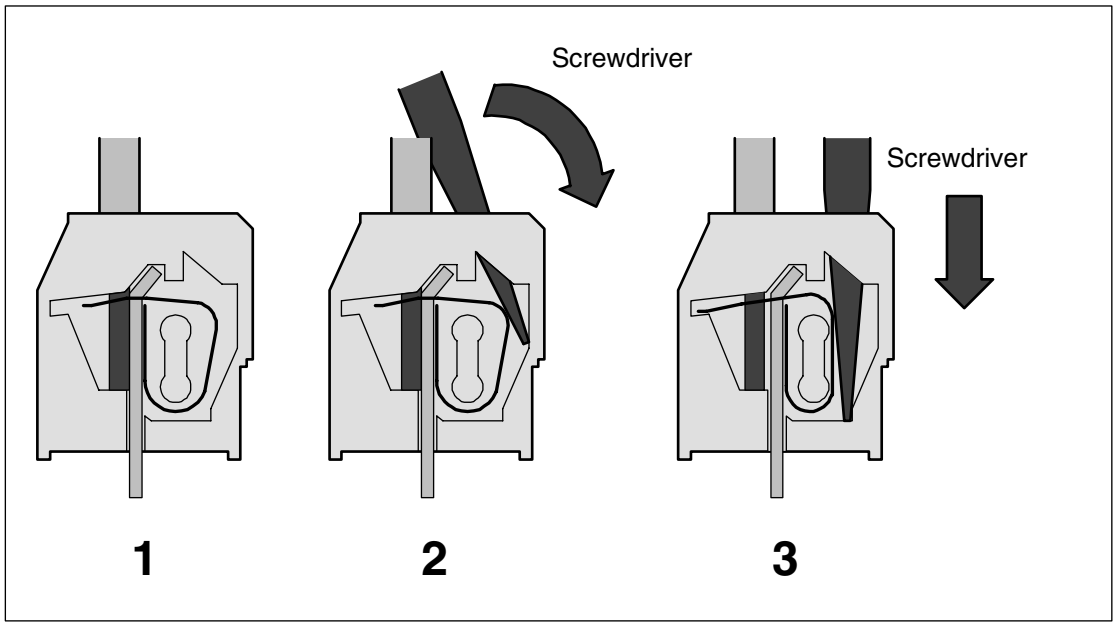


Figure: Disconnect wire from the spring terminal (steps 1 to 3)

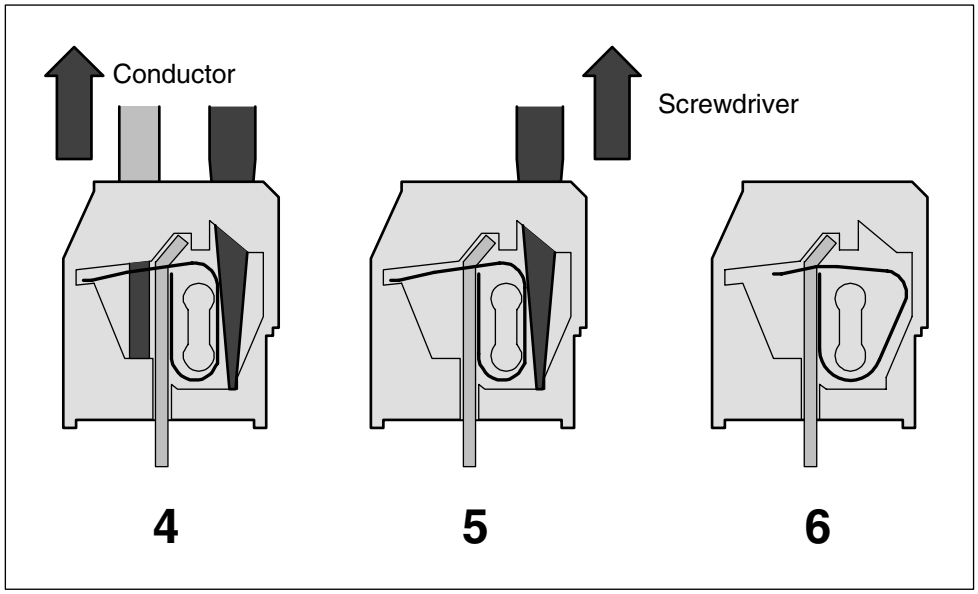


Figure: Disconnect wire from the spring terminal (steps 4 to 6)

1	Terminal with wire connected
2	Insert screwdriver (2.5 x 0.4 to 3.5 x 0.5 mm) at an angle, screwdriver must be at least 15 mm free of insulation at the tip
3	While erecting the screwdriver, insert it until the stop (requires a little strength), terminal is now open
4	Remove wire from the open terminal
5	Remove the screwdriver
6	Done

Mechanical encoding

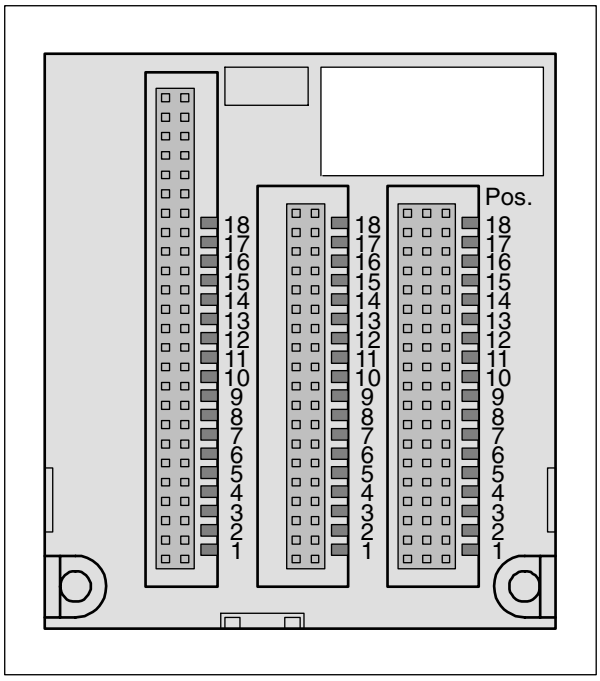


Figure: Possible positions for mechanical encoding (1 to 18)

Terminal Units (S500) and CPU Terminal Bases (AC500) have an mechanical coding which prevents that modules are inserted to wrong places. Otherwise

- dangerous parasitic voltages could occur or
- modules could be destroyed.

The coding either makes it impossible to insert the module to the wrong place or blocks its electrical function (outputs are not activated).

The following figure shows the possible codings.

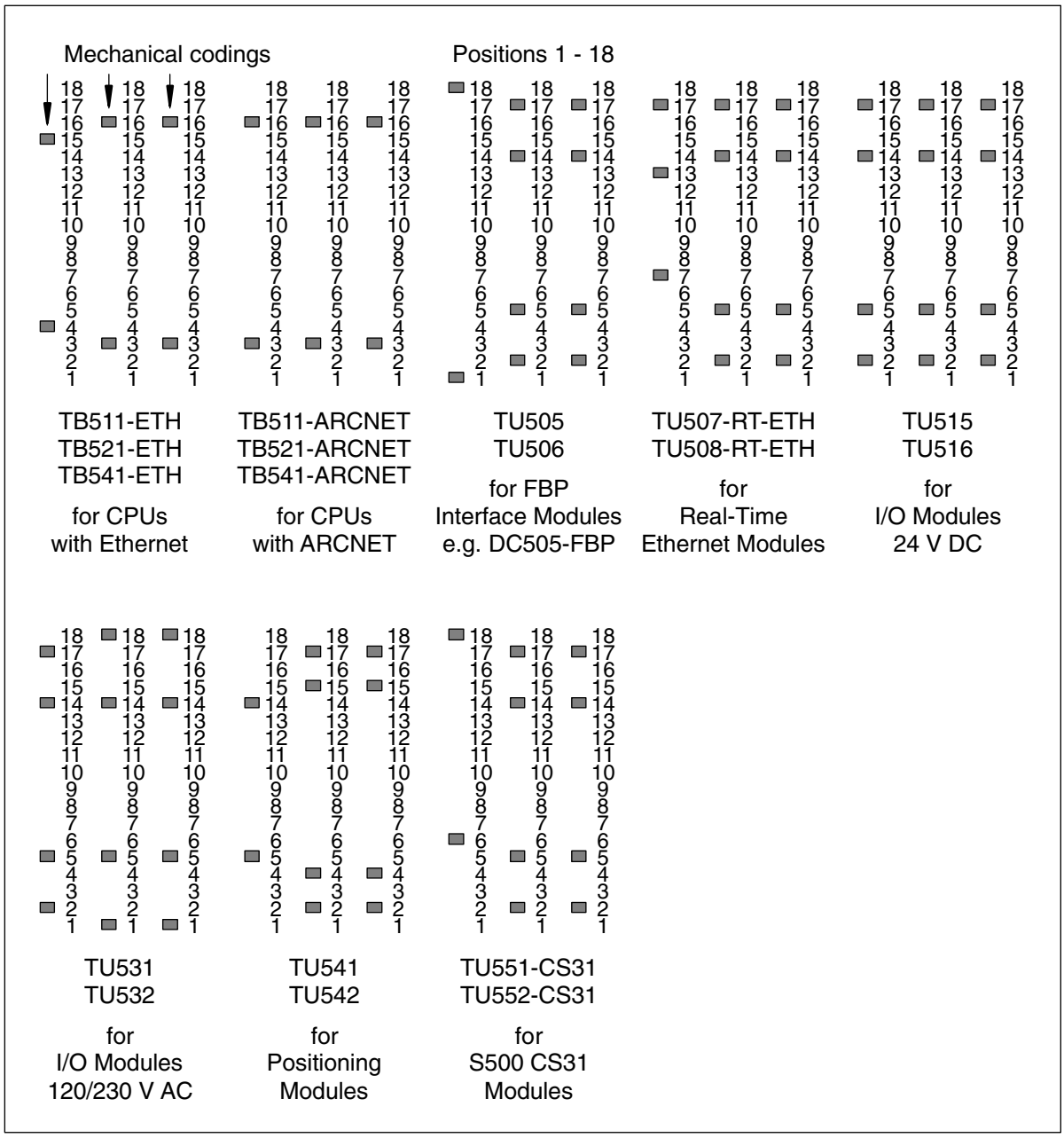


Figure: Mechanical coding

General wiring recommendations

Bad wiring on power supply terminals

Attention: The product should be installed by trained people who have the knowledge of wiring electronic devices. In case of bad wiring, although the modules are protected against various errors (reverse polarity, short circuit, etc.), some problems could always happen:

- On the CPU Terminal Base, the terminals L+ and M are doubled. If the power supply is badly connected, a short circuit could happen and lead to a destruction of the power supply or its fuse. If no suitable fuse exists, the Terminal Base itself could be destroyed.

- The CPUs (Terminal Bases) and all electronic modules (and Terminal Units) are protected against reverse polarity.

- All necessary measures should be carried out to avoid damages to modules and wiring. Notice the wiring plans and connection examples.

Bad wiring on I/O terminals

Attention: All I/O channels (digital and analog) are protected against reverse polarity, reverse supply, short circuit and continuous overvoltage up to 30 V DC.

Behaviour of the system in case of power supply interruptions and power recovering

AC500 system supply (terminals L+, M)

As soon as the CPU power supply is higher than 19.2 V DC, the power supply detection is activated and the CPU is started. When during operation the power supply is going down to lower than 19.2 V DC for more than 10 ms, the CPU is switched to safety mode (see System Technology of the CPUs).

A warm restart of the CPU only occurs by switching the power supply off and on again (see also the description of the function modes of the CPU in the "AC500 System Technology" chapters.

S500 system supply (is provided through the FBP plug)

AC500 or S500 process power supply (terminals UP and ZP)

Block diagrams, earthing concept

Block diagram DC505-FBP, earthing concept

The S500-FBP modules have to be included into the global earthing concept of the system. The following schematics will help you to understand the internal conception of the device.

The electrical isolation of the device is realized as follow:

- The isolation between the fieldbus and the internal device circuitry is realized by the FBP plug itself.
- Isolation between the I/O terminals and the I/O-Bus: The I/O-Bus and the processors are powered by the FBP plug, the process inputs and outputs need their own process supply voltage. There is an electrical isolation between these two parts within the modules.

- If it is necessary to have an electrical isolation between the I/O terminals of different I/O modules, several power supply units must be used.
- There is no electrical isolation between the I/O channels of an I/O module.

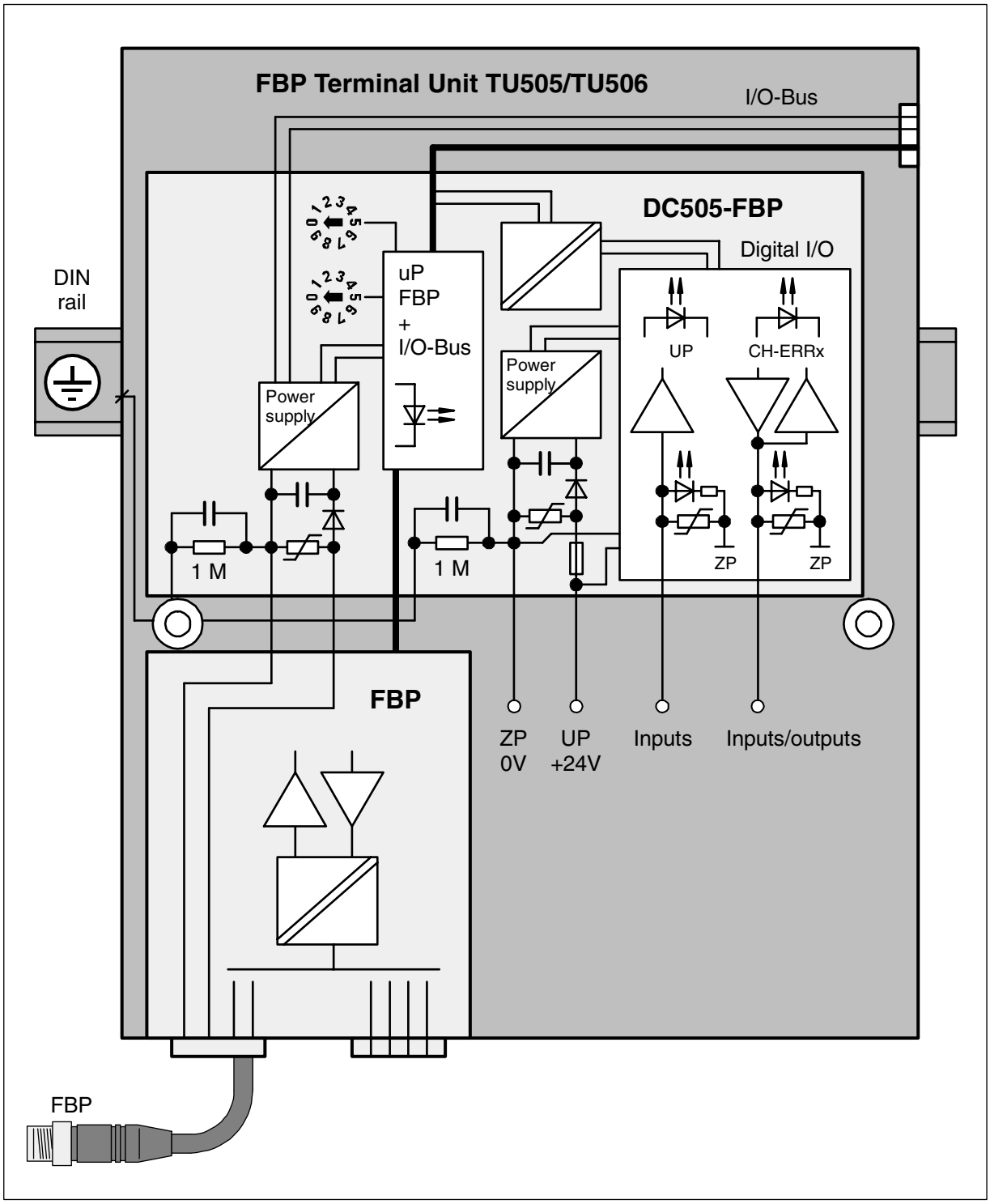


Figure: Blocks diagram DC505-FBP with FBP, earthing concept

Block diagram of the digital I/O modules, earthing concept

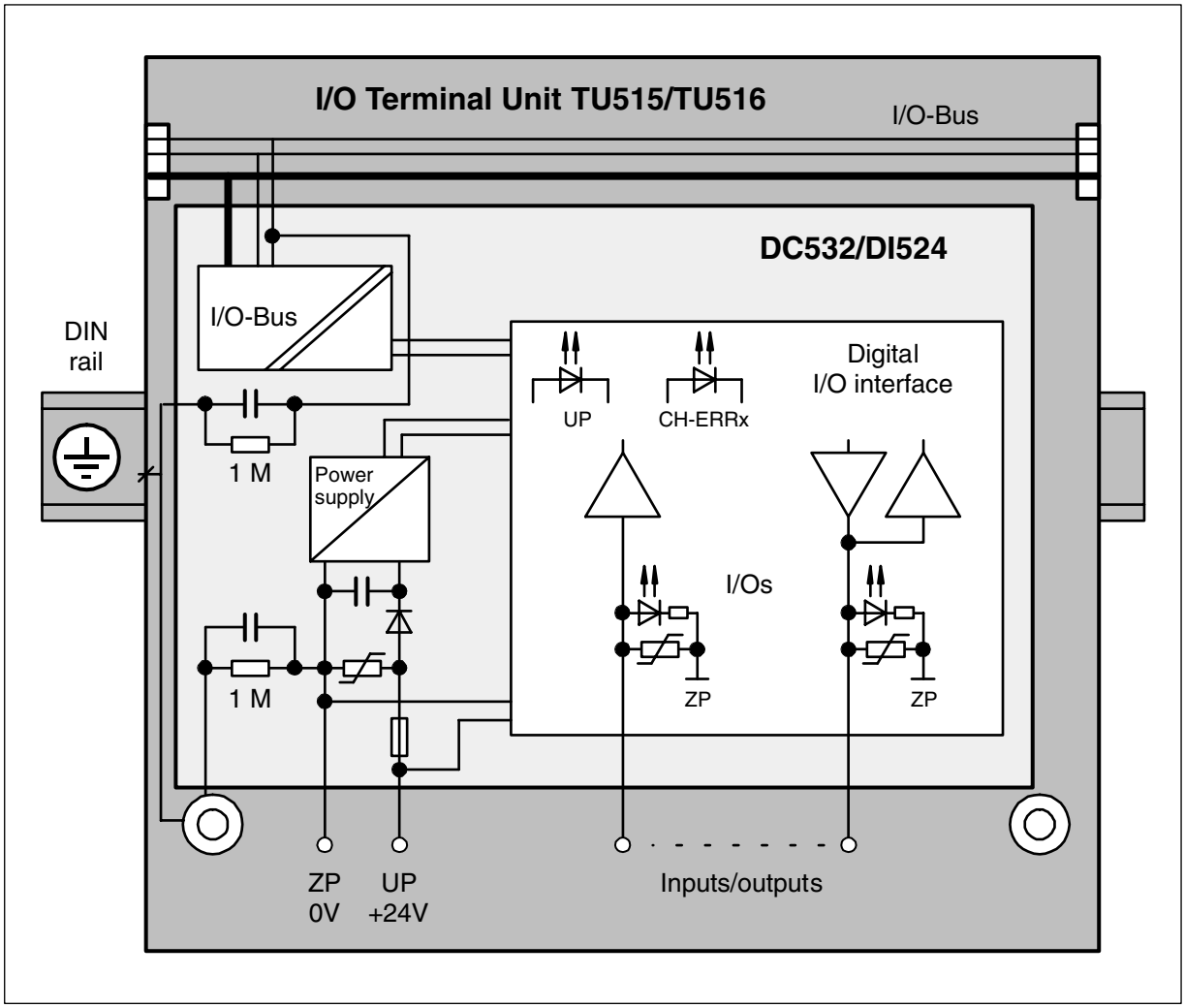


Figure: Block diagram of the digital I/O modules, earthing concept

Block diagram of the analog I/O modules, earthing concept

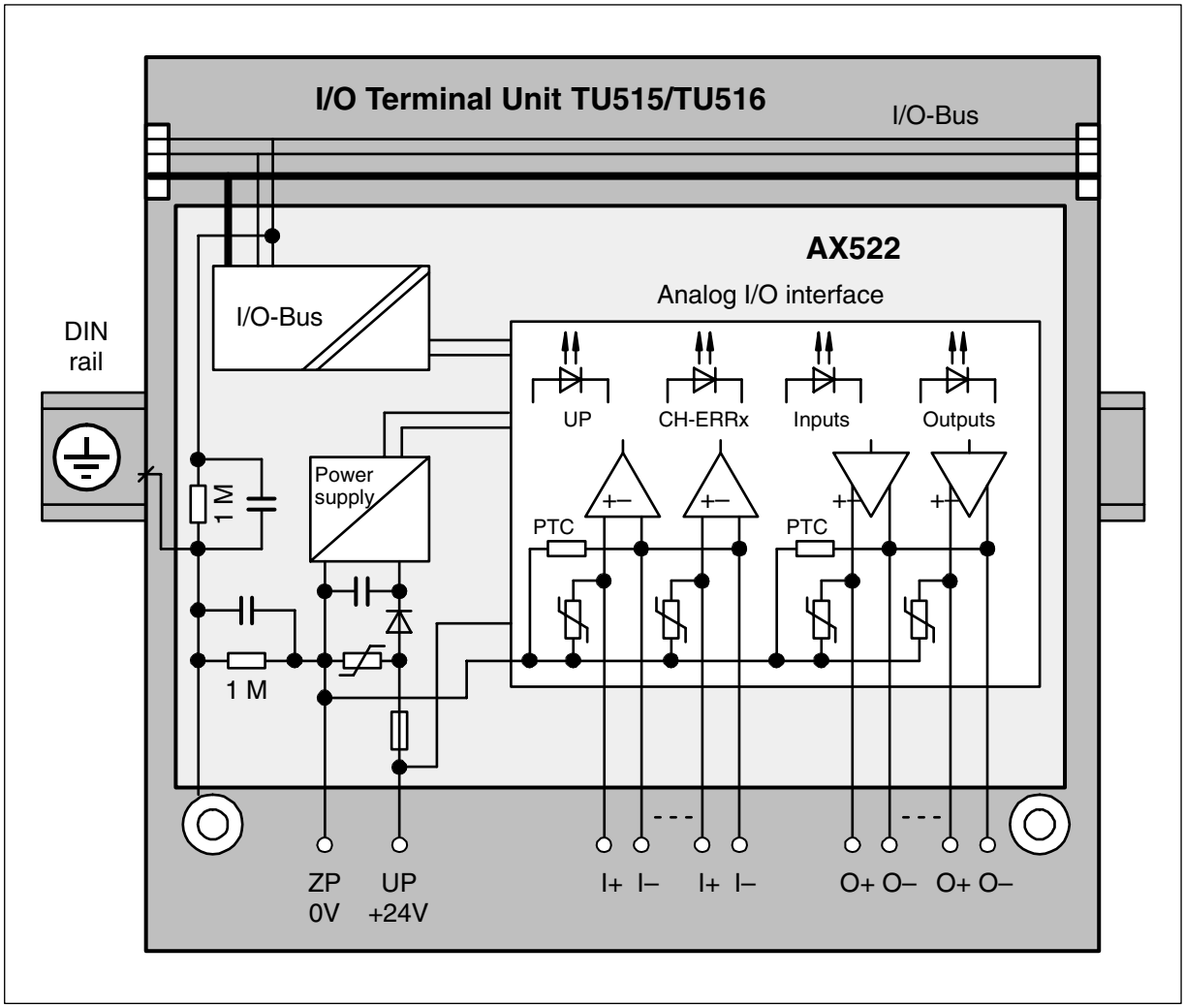


Figure: Block diagram of the analog I/O modules, earthing concept