# Electrical installation solutions for buildings – Technical details

## Command and signaling

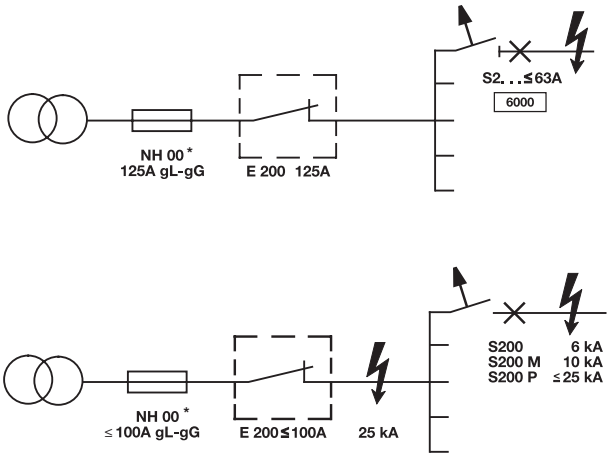


**Index**

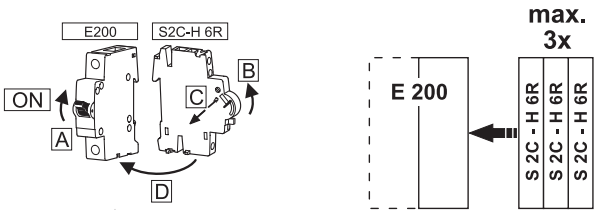
# Command and signaling technical details

## E 200 switches

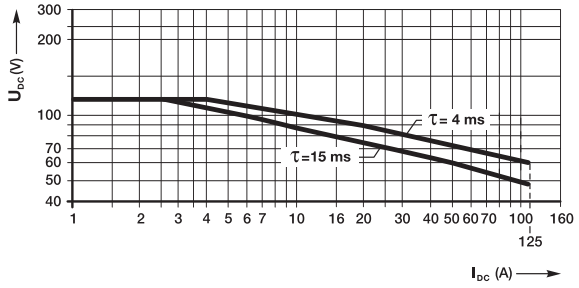
### E200 Short-circuit withstand capacity




### Assembling of S2C-H 6R and E 200



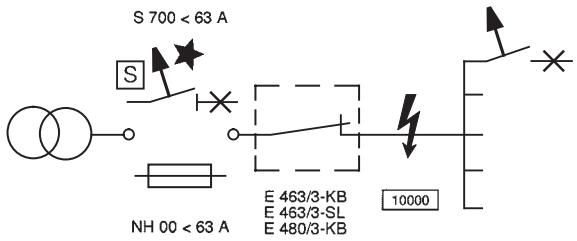

### E 200 DC switching capacity



# Command and signaling technical details

E 463 switches

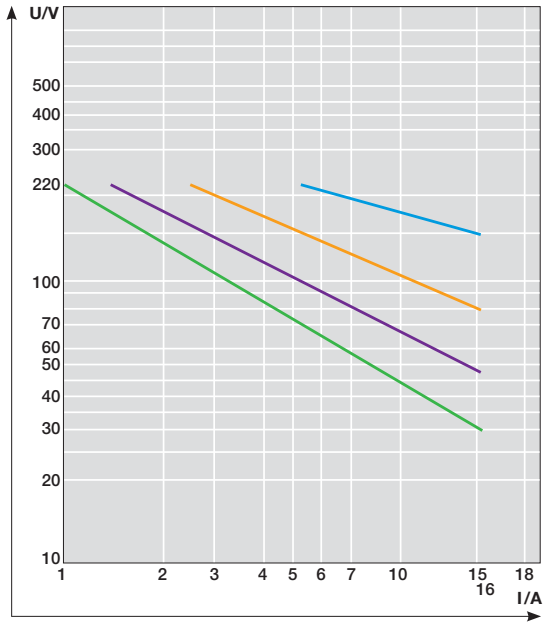
### E463 / E480 Short-circuit withstand capacity



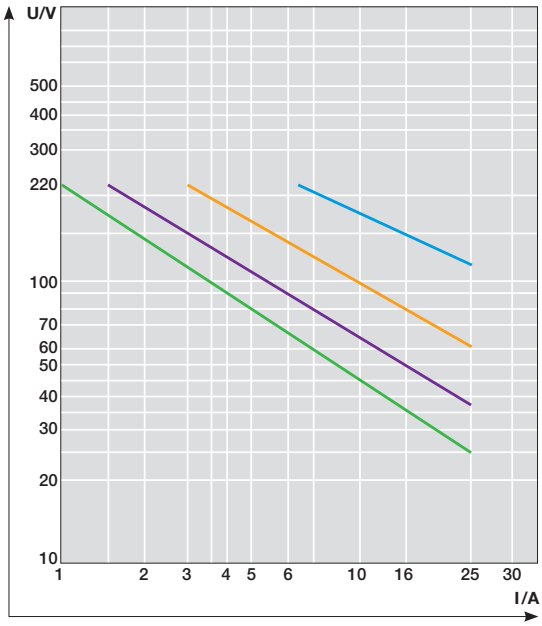
# Command and signaling technical details

## E 210 switches

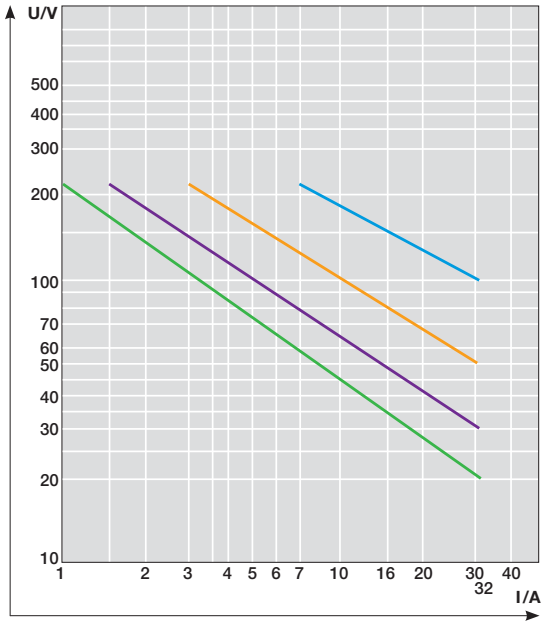
### DC switching capacity E211 16A




### DC switching capacity E211 25A




### DC switching capacity E211 32A




Ohmic load
- Normally-open contact
- Normally-closed contact

Load with time constant
t = 15ms (inductive load)
- Normally-open contact
- Normally-closed contact

# Command and signaling technical details

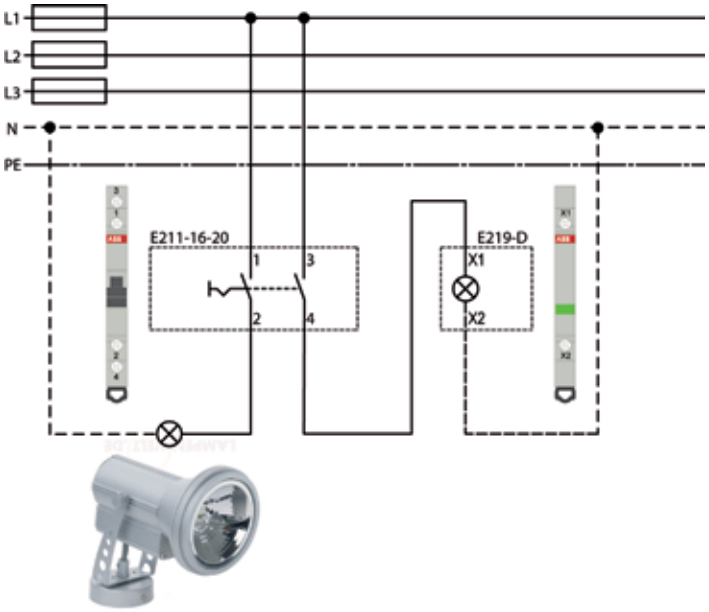
## Technical data – Pushbuttons and indicator lights

**Overview of general meanings of the colours of operator control parts (excerpt from VDE 0199 or DIN EN 60073).**

| Colour | Meaning | Explanation | Application examples |
|---|---|---|---|
| RED | Emergency | Action in hazardous situations or emergency | EMERGENCY STOP, STOP or OFF with EMERGENCY STOP pushbutton Initiating an emergency function |
| YELLOW | Abnormal | Action if an abnormal condition is present | Intervention required to suppress the abnormal condition, manual intervention to restart an interrupted automatic cycle |
| GREEN | Safety | Action in safe conditions or to prepare a normal condition | Activation |
| BLUE | Regulation | Status requiring action | Reset function |
| WHITE<br>GREY<br>BLACK | Non-specific | Functions start | Available for any functions except, except for emergency stop, e.g. ON/OFF; Stop/Start |

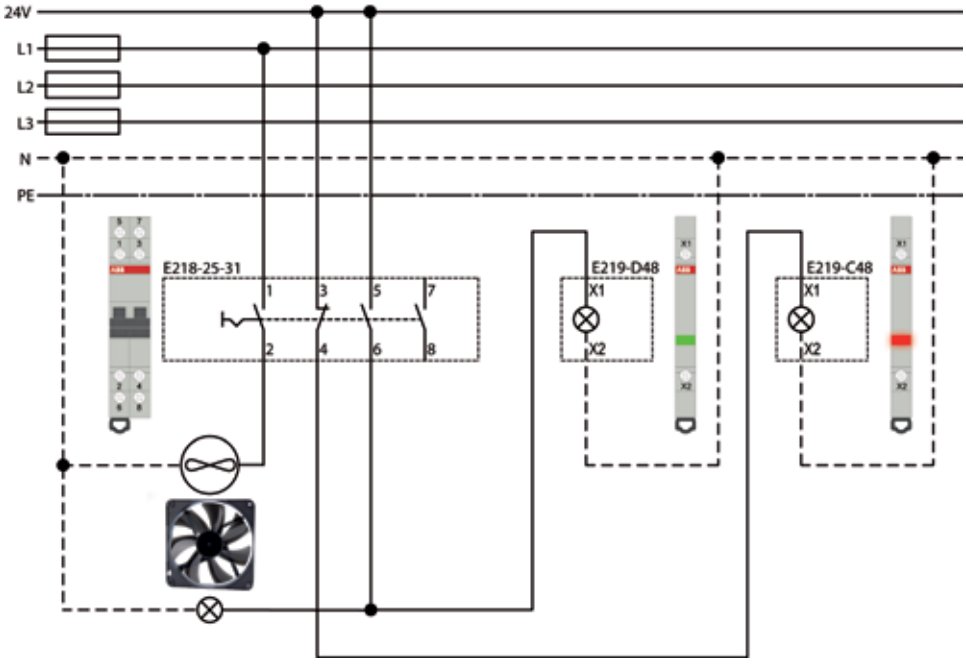
## Command and signaling technical details

Sample applications – On-off switches and control switches




**Additional garden lighting**
**On-off switches E211-16-20 (2NO contacts) and indicator lights E219-D**

- On-off control for additional garden light
- The green indicator light in the cetral distribution board shows whether the garden light is ON or OFF

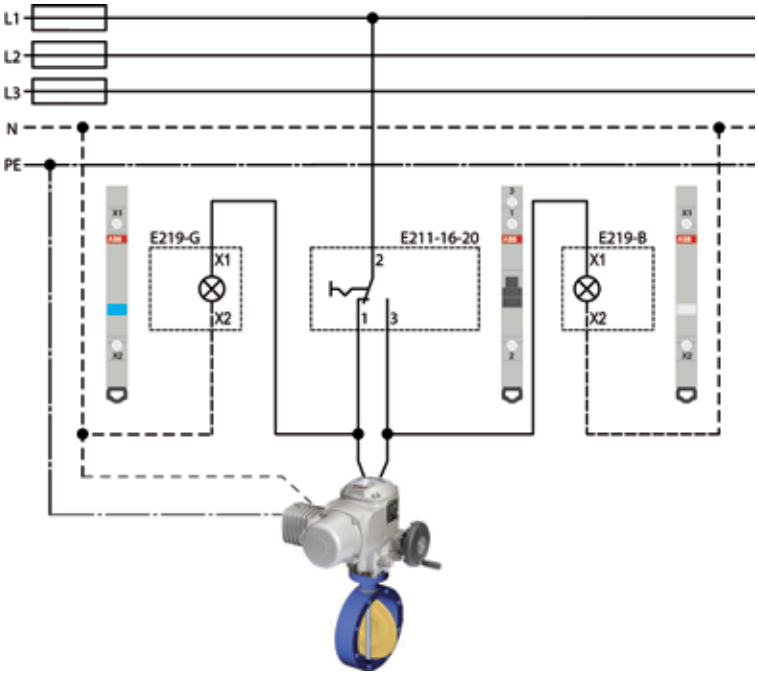



**Room ventilator with status display**
**Control switches E218-25-31 (3NO + 1NC contacts) and E219-D48; E219-C48**

- On-off function control of a ventilator
- Integrated signal lamp 24 V for status detection is directly embedded at the ventilator
- The green and red indicator lights 12-48 V show the current operating position in the central distribution board

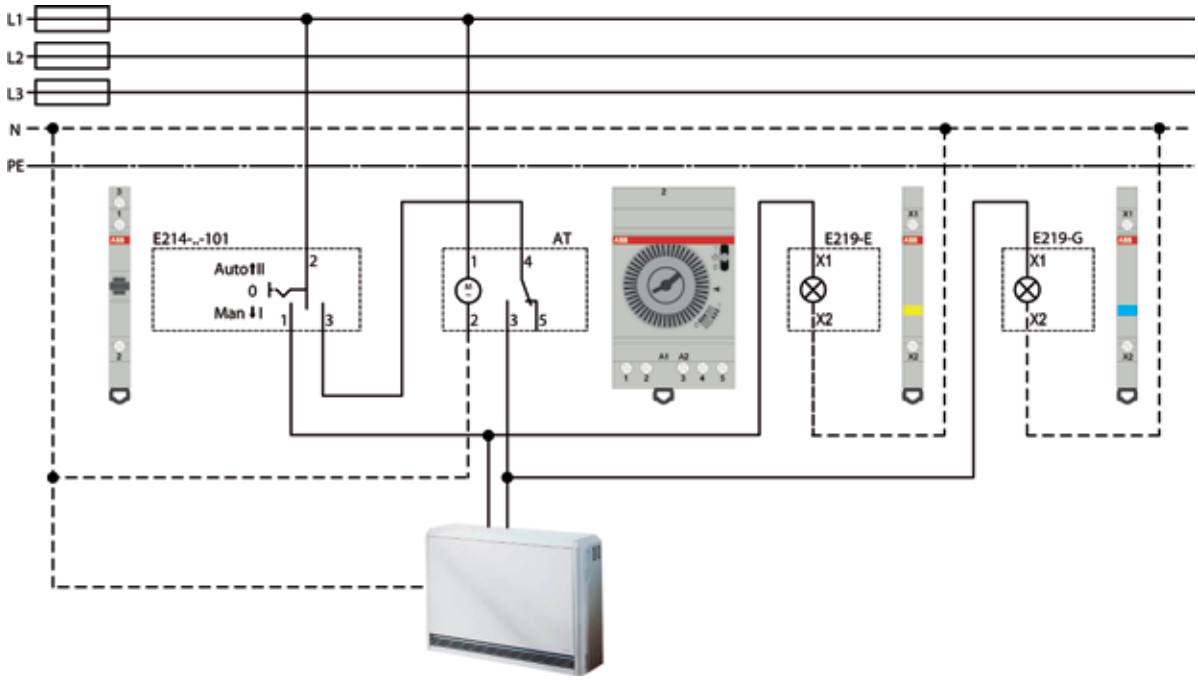
## Command and signaling technical details

Sample applications – Change over switches and group switches




**Flap gate control**
**Change over switches E213-16-001 with position I-II (1CO contact) and E219-G; E219-B**

- Contol of a manual flap gate position with central visualization
- The blue indicator light shows that the flap gate is open
- The white indicator light shines in closed state

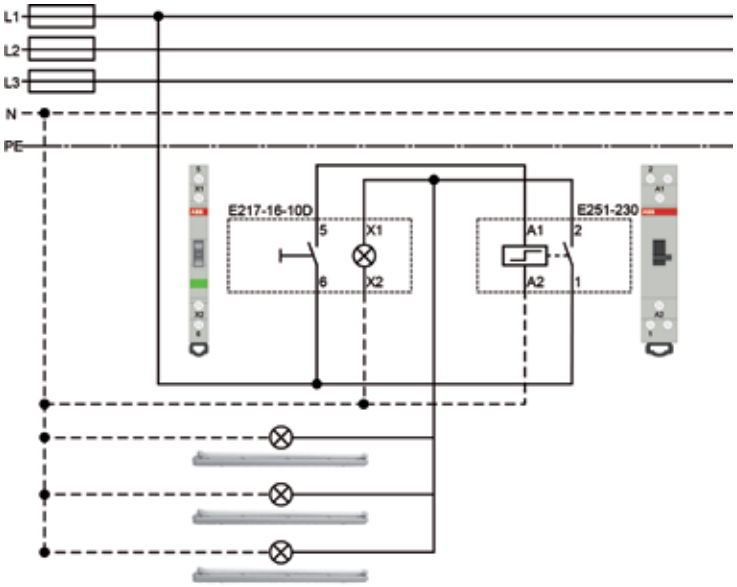



**Electrical room heater**
**Group switches E214-16-101 with position I-0-II (1CO contact) and E219-E; E219-G**

- Changeover switching of manual control to time switch mode, e. g. for an additional heater
- The yellow indicator light shows that the control mode occurs manually
- The heater is set on automatic control when the blue E219-G shines

# Command and signaling technical details

## Sample applications – Push buttons

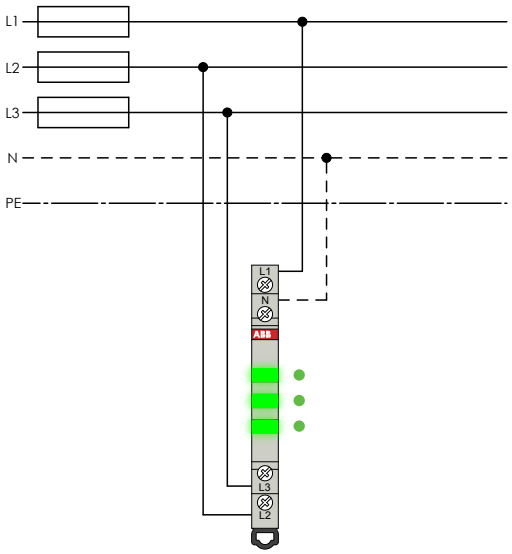


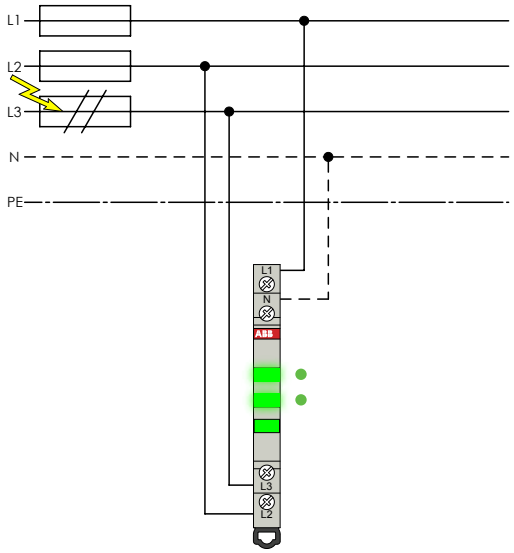

**Room lighting (fluorescent-tubes)**
**Pushbuttons mit 1NO contact (impulse) with geen LED**

- Lighting system with latching relay (impulse switching relais)
- The green LED which is integrated in the pushbutton shines when the lighting group has the status ON

# Command and signaling technical details

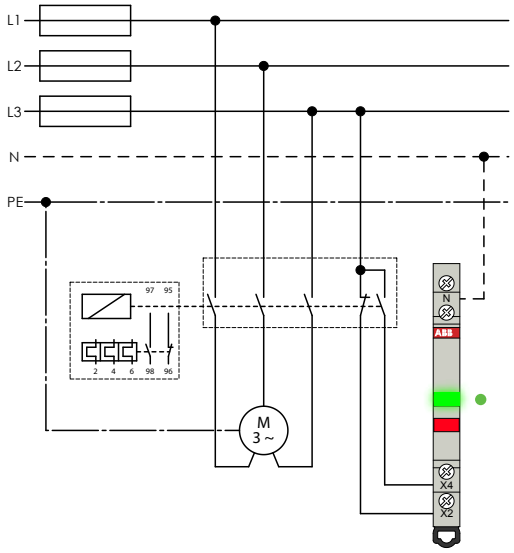
## Sample applications – Multiple indicator lights

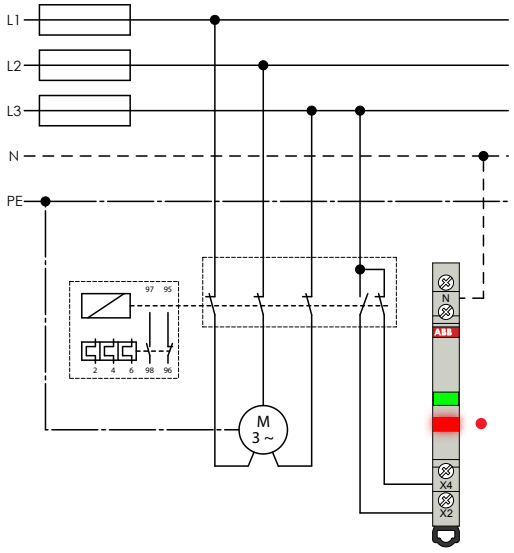



**Network and phase control**
**Multiple indicator lights E219-3D (3x green LEDs)**

- All LEDs shine → Net is working
- If one phase breaks down, the green LED turns off
  → Attention! Phase break down in the network



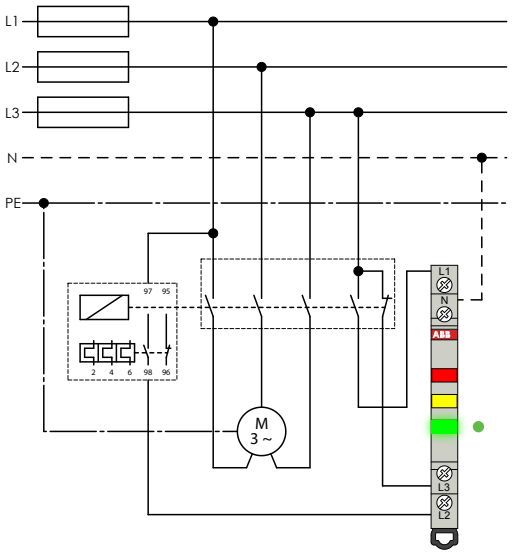




**Motor status display**
**Multiple indicator lights E219-2CD (1x green, 1x red LED)**

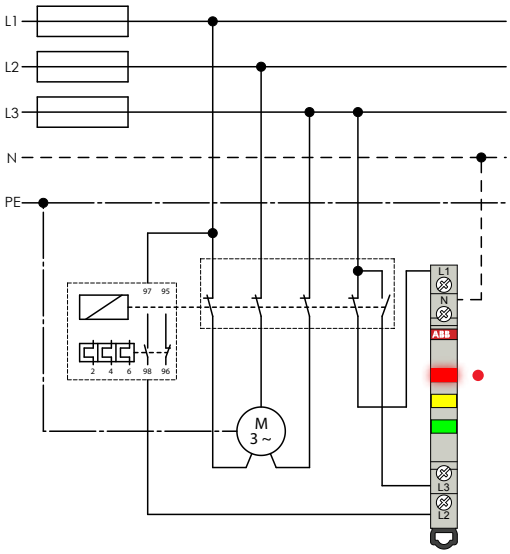
- ABB three-phase contactor (remote controlled with 2 auxiliary contacts (1NO + 1NC))
- The current operating mode of the motor drive is visualized over auxiliary contacts.

# Command and signaling technical details

## Sample applications – Multiple indicator lights




**Signaling motor OFF**




**Signaling motor ON**

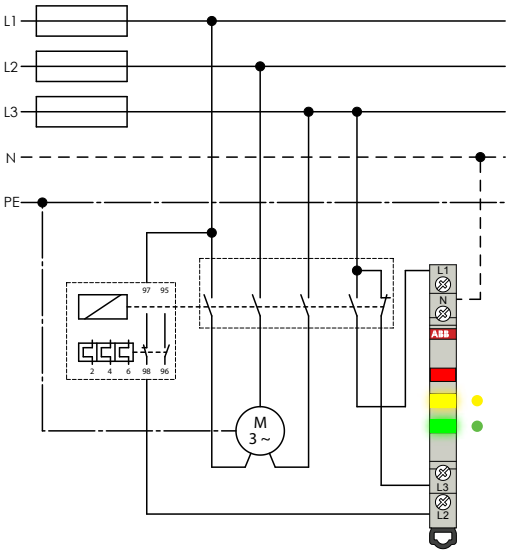
**Motor status display**

**Multiple indicator lights E219-3CDE (1x green, 1x yellow, 1x red LED)**

- ABB polyphase contact gate (remote control) with 2 auxiliary contacts (1NO + 1NC)
- The current operating mode of the motor drive is visualized over contactor auxiliary contacts
- The error indication occurs over the signalling contact of the motor protection relay

# Command and signaling technical details

## Sample applications – Multiple indicator lights




**Signaling motor interference on basis of thermal overload**

**Motor status display (off and interuption)**
**Multiple indicator lights E219-3CDE (1x green, 1x yellow, 1x red LED)**

- A thermal activation is signalized by the use of motor protection relay contacts
- Motor off = green LED on; closed motor protection relay contact = yellow LED shows interference

# Command and signaling technical details

## Installation contactors

## Technical data main circuit

### Main circuit – Utilization characteristics according to IEC/EN

| Contactor type | | ESB16..N | ESB20..N/ EN20..N | ESB25..N/ EN25..N | ESB40..N/ EN40..N | ESB63..N | ESB100..N |
|---|---|---|---|---|---|---|---|
| Standards | | IEC/EN 60947-1, IEC/EN 60947-4-1, IEC/EN 61095 | | | | | |
| Rated operational voltage $U_e$ | | 220 V DC<br>250 V AC | 220 V DC<br>250 V AC | 220 V DC<br>400 V AC | 220 V DC<br>400 V AC | 220 V DC<br>400 V AC | 220 V DC<br>400 V AC |
| Rated frequency | | DC, 50/60 Hz | DC, 50/60 Hz | DC, 50/60 Hz | DC, 50/60 Hz | DC, 50/60 Hz | DC, 50/60 Hz |
| AC-1/AC-7a utilization category for air temperature near the contactor ≤ 55 °C | | | | | | | |
| Rated operational current $I_e$ AC-1/AC-7a | NO | 16 A | 20 A | 25 A | 40 A | 63 A | 100 A |
| | NC | 16 A | 20 A | 25 A | 30 A | 30 A | - |
| Rated operational power AC-1 | 230 V 1 phase | 3.7 kW | 4.6 kW | 5.8 kW | 9.2 kW | 14.5 kW | 23 kW |
| | 400 V 3 phases | – | – | 17.3 kW | 27.7 kW | 43.6 kW | 69.3 kW |
| AC-3/AC-7b utilization category for air temperature close to contactor ≤ 55 °C | | | | | | | |
| Rated operational current AC-3/AC-3e/AC-7b | 230 V 1 phase | 6 A | 9 A | 9 A | 22 A | 30 A | – |
| | 400 V 3 phases | – | – | 9 A | 22 A | 30 A | – |
| Rated operational power AC-3/AC-3e | 230 V 1 phase | 0.9 kW | 1.3 kW | 1.3 kW | 3.7 kW | 5 kW | – |
| | 400 V 3 phases | – | – | 4 kW | 11 kW | 15 kW | – |
| Rated making capacity acc. to IEC 60947-4-1 | | 10 x $I_e$/AC-3<br>13 x $I_e$/AC-3e | 10 x $I_e$/AC-3<br>13 x $I_e$/AC-3e | 10 x $I_e$/AC-3<br>13 x $I_e$/AC-3e | 10 x $I_e$/AC-3<br>13 x $I_e$/AC-3e | 10 x $I_e$/AC-3<br>13 x $I_e$/AC-3e | – |
| Rated breaking capacity acc. to IEC 60947-4-1 | | 10 x $I_e$/AC-3<br>13 x $I_e$/AC-3e | 10 x $I_e$/AC-3<br>13 x $I_e$/AC-3e | 10 x $I_e$/AC-3<br>13 x $I_e$/AC-3e | 10 x $I_e$/AC-3<br>13 x $I_e$/AC-3e | 10 x $I_e$/AC-3<br>13 x $I_e$/AC-3e | – |
| Rated short-time withstand current $I_{cw}$ at 40 °C ambient temp. in free air, from a cold state | 10 s | 48 A | 72 A | 72 A | 176 A | 240 A | – |
| Power loss per pole | | 0.9 W | 1.4 W | 2 W | 3 W | 4.5 W | 6 W |
| Maximum electrical switching frequency | AC-1/AC-7a | 300 cycles/h | 300 cycles/h | 300 cycles/h | 300 cycles/h | 300 cycles/h | 150 cycles/h |
| | AC-3/AC-7b | 600 cycles/h | 600 cycles/h | 600 cycles/h | 600 cycles/h | 600 cycles/h | – |
| Electrical durability | AC-1/AC-7a | 150,000 cycles | 150,000 cycles | 130,000 cycles | 150,000 cycles | 100,000 cycles | 70,000 cycles |
| | AC-3/AC-7b | 150,000 cycles | 150,000 cycles | 500,000 cycles | 150,000 cycles | 240,000 cycles | – |
| Mechanical durability | | 1,000,000 cycles | | | | | |

# Command and signaling technical details

## Installation contactors

## Technical data main circuit

### Short circuit protection with Fuses - Type 1 coordinated

| Fuses type | ESB16..N | ESB20..N/ EN20..N | ESB25..N/ EN25..N | ESB40..N/ EN40..N | ESB63..N | ESB100..N |
|---|---|---|---|---|---|---|
| gG coordinated up to 10kA | **230 V** | **230 V** | **400 V** | **400 V** | **400 V** | **400 V** |
| | 20 A | 20 A | 35 A | 63 A | 80 A | 125 A |

### Short circuit protection with MCBs - Type 1 coordinated

| MCB | Characteristic | Icu | In | ESB16..N | ESB20..N/ EN20..N | ESB25..N/ EN25..N | ESB40..N/ EN40..N | ESB63..N | ESB100..N |
|---|---|---|---|---|---|---|---|---|---|
| | | | | **230 V** | **230 V** | **400 V** | **400 V** | **400 V** | **400 V** |
| S200 | B, C | 10 kA | 16 A | 6 kA | 6 kA | 6 kA | 6 kA | 6 kA | 6 kA |
| | | | 20 A | - | 6 kA | 6 kA | 6 kA | 6 kA | 6 kA |
| | | | 25 A | - | - | 6 kA | 6 kA | 6 kA | 6 kA |
| | | | 40 A | - | - | - | 6 kA | 6 kA | 6 kA |
| | | | 63 A | - | - | - | - | 6 kA | 6 kA |
| S200M | B, C | 15 kA | 16 A | 10 kA | 10 kA | 10 kA | 10 kA | 10 kA | 10 kA |
| | | | 20 A | - | 10 kA | 10 kA | 10 kA | 10 kA | 10 kA |
| | | | 25 A | - | - | 10 kA | 10 kA | 10 kA | 10 kA |
| | | | 40 A | - | - | - | 10 kA | 10 kA | 10 kA |
| | | | 63 A | - | - | - | - | 10 kA | 10 kA |

### Short circuit protection with RCDs - Type 1 coordinated

| RCD | Characteristic | Icu | In | ESB16..N | ESB20..N/ EN20..N | ESB25..N/ EN25..N | ESB40..N/ EN40..N | ESB63..N | ESB100..N |
|---|---|---|---|---|---|---|---|---|---|
| | | | | **230 V** | **230 V** | **400 V** | **400 V** | **400 V** | **400 V** |
| DS201 | B, C | 6 kA | 16 A | 6 kA | 6 kA | 6 kA | 6 kA | 6 kA | 6 kA |
| | | | 20 A | - | 6 kA | 6 kA | 6 kA | 6 kA | 6 kA |
| | | | 25 A | - | - | 6 kA | 6 kA | 6 kA | 6 kA |
| | | | 40 A | - | - | - | 6 kA | 6 kA | 6 kA |
| | | | 63 A | - | - | - | - | 6 kA | 6 kA |
| DS201M DS203NC | B, C | 10 kA | 16 A | 10 kA | 10 kA | 10 kA | 10 kA | 10 kA | 10 kA |
| | | | 20 A | - | 10 kA | 10 kA | 10 kA | 10 kA | 10 kA |
| | | | 25 A | - | - | 10 kA | 10 kA | 10 kA | 10 kA |
| | | | 40 A | - | - | - | 10 kA | 10 kA | 10 kA |
| | | | 63 A | - | - | - | - | 10 kA | 10 kA |

# Command and signaling technical details

## Installation contactors

## Technical data main circuit and control circuit

### Main circuit – Utilization characteristics according to UL/CSA

| Contactor type | | ESB16..N | ESB20..N/ EN20..N | ESB25..N/ EN25..N | ESB40..N/ EN40..N | ESB63..N | ESB100..N |
|---|---|---|---|---|---|---|---|
| Standards | | UL 60947-1, UL 60947-4-1 | | | | | |
| General use rating | 240 V | 16 A | 20 A | – | – | – | – |
| | 480 V | – | – | 25 A | 40 A | 63 A | 100 A |
| Motor rating | | | | | | | |
| Full load current | 220 ... 240 V 1 phase | 6.9 A | 8 A | – | – | – | – |
| | 220 ... 240 V 3 phases | – | – | 9.6 A | 22 A | 28 A | – |
| | 440 ... 480 V 3 phases | – | – | 7.6 A | 21 A | 21 A | – |
| Horse power rating | 220 ... 240 V 1 phase | 0.8 hp | 1 hp | – | – | – | – |
| | 220 ... 240 V 3 phases | – | – | 3 hp | 7.5 hp | 10 hp | – |
| | 440 ... 480 V 3 phases | – | – | 5 hp | 15 hp | 15 hp | – |
| Short-circuit protection for contactors without thermal O/L relay - Motor protection excluded | | | | | | | |
| | Fuse rating | 20 A | 20 A | 25 A | 40 A | 75 A | 125 A |
| | Fuse type 480 V/5kA | K5 | K5 | K5 | K5 | K5 | K5 |
| Max. electrical switching frequency | | | | | | | |
| | for general use | 300 cycles/h | 300 cycles/h | 300 cycles/h | 300 cycles/h | 300 cycles/h | 150 cycles/h |
| | for motor use | 600 cycles/h | 600 cycles/h | 600 cycles/h | 600 cycles/h | 600 cycles/h | – |

### General technical data

| Contactor type | | ESB16..N | ESB20..N/ EN20..N | ESB25..N/ EN25..N | ESB40..N/ EN40..N | ESB63..N | ESB100..N |
|---|---|---|---|---|---|---|---|
| Rated insulation voltage $U_i$ | | | | | | | |
| acc. to IEC 60947-4-1 and VDE 0110 (Gr. C) | | 400 V | 400 V | 500 V | 500 V | 500 V | 500 V |
| Rated impulse withstand voltage $U_{imp}$ | | 6 kV | ESB: 6 kV EN: 6 kV | ESB: 6 kV EN: 4 kV/6 kV with protection cover | | 6 kV | 6 kV |
| Ambient air temperature range [1] | operation | -25 ... +55 °C | -25 ... +55 °C | -25 ... +55 °C | -25 ... +55 °C | -25 ... +55 °C | -25 ... +55 °C |
| | storage | -40 ... +80 °C | -40 ... +80 °C | -40 ... +80 °C | -40 ... +80 °C | -40 ... +80 °C | -40 ... +80 °C |
| Maximum operating altitude permissible | | 2000 m | 2000 m | 2000 m | 2000 m | 2000 m | 2000 m |
| Vibration (sinusoidal) according to IEC/EN 60068-2-6 (Fc) | | 1 g/3-150 Hz | 1 g/3-150 Hz | 1 g/3-150 Hz | 1 g/3-150 Hz | 1 g/3-150 Hz | |
| Shock (half-sine) according to IEC/EN 60947-1 Annex. Q | | Category E | Category E | Category E | Category E | Category E | Category E |
| Shock (half-sine) according to IEC/EN 60068-2-27 (Ea) | | 15g/11ms | 15g/11ms | 15g/11ms | 15g/11ms | 15g/11ms | 15g/11ms |

1) If several contactors are mounted adjacently and the duty time is longer than one hour, every second contactor needs a distance piece, Type ESB-DIS (1/2 module). This is not necessary at an ambient temperature ≤ 40 °C or on Type ESB16..N, ESB/EN20..N and ESB100..N

### Magnet system characteristics

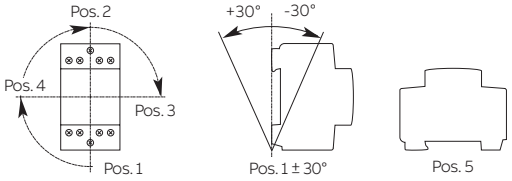
| Contactor type | | | ESB16..N | ESB20..N/ EN20..N | ESB25..N/ EN25..N | ESB40..N/ EN40..N | ESB63..N | ESB100..N |
|---|---|---|---|---|---|---|---|---|
| Coil operating limits acc. to IEC/EN60947-4-1 | | | 0.85 ... 1.1 x $U_c$ (at $\theta \leq 55$ °C) | | | | | |
| Rated frequency | | | DC, 50/60/400 Hz | | | | | |
| Frequency range | | | DC, 40 ... 450 Hz | | | | | |
| Coil consumption | pull-in | 50 Hz | 2.5 VA | 2.5 VA | 4 VA | 4.5 VA | 60 VA | 90 VA |
| | | 60 Hz | 2.5 VA | 2.5 VA | 4 VA | 4.5 VA | 60 VA | 90 VA |
| | | DC | 2.5 W | 2.5 W | 4 W | 5 W | 70 W | 100 W |
| | holding | 50 Hz | 2.5 VA | 2.5 VA | 4 VA | 4.5 VA | 4.5 VA | 7.5 VA |
| | | 60 Hz | 2.5 VA | 2.5 VA | 4 VA | 4.5 VA | 4.5 VA | 7.5 VA |
| | | DC | 2.5 W | 2.5 W | 4 W | 5 W | 5 W | 8.5 W |

# Command and signaling technical details

## Installation contactors

## Technical data main circuit and control circuit

### Mounting characteristics and conditions for use

| Contactor type | ESB16..N | ESB20..N/ EN20..N | ESB25..N/ EN25..N | ESB40..N/ EN40..N | ESB63..N | ESB100..N |
|---|---|---|---|---|---|---|
| Mounting position | Position 1 to 5   | | | | | |
| Mounting on DIN rail | TH35-15 (35 x 15 mm Mounting Rail) acc. to IEC 60715<br>TH35-7.5 (35 x 7.5 mm Mounting Rail) acc. to IEC 60715 | | | | | |

### Main circuit - Connecting characteristics

| Contactor type | ESB16..N | ESB20..N/ EN20..N | ESB25..N/ EN25..N | ESB40..N/ EN40..N | ESB63..N | ESB100..N |
|---|---|---|---|---|---|---|
| Connecting capacity | | | | | | |
| Rigid | 1x 1 ... 10 mm²<br>2x 1 ... 4 mm² | 1x 1 ... 10 mm²<br>2x 1 ... 4 mm² | 1x 1.5 ... 10 mm²<br>2x 1.5 ... 4 mm² | 1x 1.5 ... 25 mm²<br>2x 1.5 ... 10 mm² | 1x 1.5 ... 25 mm²<br>2x 1.5 ... 10 mm² | 1x 10 ... 50 mm² |
| Flexible with ferrule | 1x 1 ... 6 mm²<br>2x 1 ... 2.5 mm² | 1x 1 ... 6 mm²<br>2x 1 ... 2.5 mm² | 1 x 1.5 ... 10 mm²<br>2x 1.5 ... 2.5 mm² | 1x 1.5 ... 16 mm²<br>2x 1.5 ... 10 mm² | 1x 1.5 ... 16 mm²<br>2x 1.5 ... 10 mm² | 1x 10 ... 35 mm² |
| Flexible with insulated ferrule | 1x 1 ... 6 mm²<br>2x 1 ...1.5 mm² | 1x 1 ... 6 mm²<br>2x 1 ...1.5 mm² | 1 x 1 .5 ... 10 mm²<br>2x 1 .5 mm² | 1x 1.5 ... 16 mm²<br>2x 1.5 ... 10 mm² | 1x 1.5 ... 16 mm²<br>2x 1.5 ... 10 mm² | 1x 10 ... 35 mm² |
| Flexible | 1x 1 ... 6 mm²<br>2x 1... 4 mm² | 1x 1 ... 6 mm²<br>2x 1... 4 mm² | 1 x 1.5 ... 10 mm²<br>2x 1.5 ... 4 mm² | 1x 1.5 ... 16 mm²<br>2x 1.5 ... 10 mm² | 1x 1.5 ... 16 mm²<br>2x 1.5 ... 10 mm² | 1x 10 ... 35 mm² |
| Stranded acc. to UL/CSA | 14-8 AWG | 14-8 AWG | 16-8 AWG | 16-4 AWG | 16-4 AWG | 8-0 AWG |
| Degree of protection | IP20 | IP20 | IP20 | IP20 | IP20 | IP20 |
| Wire stripping length | 10 mm | 10 mm | 10 mm | 13 mm | 13 mm | 15 mm |
| Tightening torque | 1.2 N·m/<br>11 lb.in | 1.2 N·m/<br>11 lb.in | 1 N·m/<br>9 lb.in | 2.5 N·m/<br>20 lb.in | 2.5 N·m/<br>20 lb.in | 3 N·m/<br>27 lb.in |
| Recommended screw driver | Pozidriv 1 | Pozidriv 1 | Pozidriv 1 | Pozidriv 2 | Pozidriv 2 | Pozidriv 2 |

### Control circuit - Connecting characteristics

| Contactor type | ESB16..N | ESB20..N/ EN20..N | ESB25..N/ EN25..N | ESB40..N/ EN40..N | ESB63..N | ESB100..N |
|---|---|---|---|---|---|---|
| Connecting capacity | | | | | | |
| Rigid | 1x 1 ... 4 mm²<br>2x 1 ... 2.5 mm² | 1x 1 ... 4 mm²<br>2x 1 ... 2.5 mm² | 1x 1 ... 4 mm²<br>2x 1 ... 2.5 mm² | 1x 1 ... 4 mm²<br>2x 1 ... 2.5 mm² | 1x 1 ... 4 mm²<br>2x 1 ... 2.5 mm² | 1x 1 ... 4 mm²<br>2x 1 ... 2.5 mm² |
| Flexible with ferrule | 1x 0.75 ... 2.5 mm²<br>2x 0.75 ... 1 mm² | 1x 0.75 ... 2.5 mm²<br>2x 0.75 ... 1 mm² | 1x 0.75 ... 2.5 mm²<br>2x 0.75 ... 1 mm² | 1x 0.75 ... 2.5 mm²<br>2x 0.75 ... 1 mm² | 1x 0.75 ... 2.5 mm²<br>2x 0.75 ... 1 mm² | 1x 0.75 ... 2.5mm²<br>2x 0.75 ... 1 mm² |
| Flexible with insulated ferrule | 1x 1 ... 2.5 mm²<br>2x 0.75 ... 1 mm² | 1x 1 ... 2.5 mm²<br>2x 0.75 ... 1 mm² | 1x 1 ... 2.5 mm²<br>2x 0.75 ... 1 mm² | 1x 1 ... 2.5 mm²<br>2x 0.75 ... 1 mm² | 1x 1 ... 2.5 mm²<br>2x 0.75 ... 1 mm² | 1x 1 ... 2.5 mm²<br>2x 0.75 ... 1 mm² |
| Flexible | 1x 1 ... 4 mm²<br>2x 1 ... 2.5 mm² | 1x 1 ... 4 mm²<br>2x 1 ... 2.5 mm² | 1x 1 ... 4 mm²<br>2x 1 ... 2.5 mm² | 1x 1 ... 4 mm²<br>2x 1 ... 2.5 mm² | 1x 1 ... 4 mm²<br>2x 1 ... 2.5 mm² | 1x 1 ... 4 mm²<br>2x 1 ... 2.5 mm² |
| Stranded acc. to UL/CSA | 16-10 AWG | 16-10 AWG | 16-10 AWG | 16-10 AWG | 16-10 AWG | 16-10 AWG |
| Degree of protection | IP20 | IP20 | IP20 | IP20 | IP20 | IP20 |
| Wire stripping length | 7 mm | 7 mm | 7 mm | 7 mm | 7 mm | 7 mm |
| Tightening torque | 0.9 N·m/8 lb.in | 0.9 N·m/8 lb.in | 0.9 N·m/8 lb.in | 0.9 N·m/8 lb.in | 0.9 N·m/8 lb.in | 0.9 N·m/8 lb.in |
| Recommended screw driver | Pozidriv 1 | Pozidriv 1 | Pozidriv 1 | Pozidriv 1 | Pozidriv 1 | Pozidriv 1 |

# Command and signaling technical details

## Installation contactors

## Technical data auxiliary circuit

### Auxiliary circuit - Utilization characteristics according to IEC/EN

For ambient temperature $T_u$ = 40 °C if not stated otherwise.

| Contactor type | | | EH04-xxN |
|---|---|---|---|
| Standards | | | IEC/EN 60947-1, IEC/EN 60947-5-1 |
| Rated operational voltage $U_e$ | | | 500 V AC |
| | | | 250 V DC |
| Rated frequency | | | DC, 50/60 Hz |
| Rated operational current $I_e$ AC-15 | 24 V | NO/NC | 6 A/6 A |
| | 120 V | NO/NC | 6 A/6 A |
| | 240 V | NO/NC | 4 A/4 A |
| | 415 V | NO/NC | 3 A/3 A |
| | 500 V | NO/NC | 2 A/2 A |
| Rated operational current $I_e$ DC-13 | 125 V | NO/NC | 0.55 A/0.55 A |
| | 250 V | NO/NC | 0.27 A/0.27 A |
| Minimum switching capacity | | | 17 V/5 mA |
| Short-circuit protective devices | | | 10 A, gG type fuse |
| Mechanical durability | | | 1,000,000 cycles |
| Electrical durability | AC-15 | 240 V/4 A | 100,000 cycles |
| | DC-13 | 125 V/0.55 A | 100,000 cycles |
| Maximum electrical switching frequency | AC-15 | | 360 cycles/h |
| | DC-13 | | 360 cycles/h |

### General technical data

| Contactor type | | | EH04-xxN |
|---|---|---|---|
| Duty time | | | 100% |
| Rated impulse withstand voltage $U_{imp}$ acc. to IEC/EN 60947-1 | | | 4 kV |
| Rated insulation voltage $U_i$ acc. to IEC/EN 60947-1 | | | 500 V |
| Pollution category acc. to IEC/EN 60664 | | | 2 |
| Overvoltage category acc. to IEC/EN 60664 | | | Up to III |
| Maximum operating altitude permissible | | | 2000 m |
| Ambient air temperature range | Operation | Open | -25 °C ... +55 °C |
| | Storage | | -40 °C ... +80 °C |
| Vibration (sinusoidal) acc. to IEC/EN 60068-2-6 (Fc) | | | 5 g/3-150 Hz |
| Shock (half-sine) acc. to IEC/EN 60947-1 Annex. Q | | | Category E |
| Shock (half-sine) acc. to IEC/EN 60068-2-27 (Ea) | | | 15 g/11 ms |

### Auxiliary circuit - Utilization characteristics according to UL/CSA

| Contactor type | | EH04-xxN |
|---|---|---|
| Standards | | UL 60947-1, UL 60947-5-1 |
| Max. operational voltage | | 600 V AC |
| Pilot duty | | A600 |
| Thermal continuous test current | | 10 A |
| General use rating | 600 V AC per pole | 5 A |

# Command and signaling technical details

## Installation contactors

## Technical data auxiliary circuit



### Mounting characteristics and conditions for use

| Contactor type | EH04-xxN | | |
|---|---|---|---|
| Mounting position | Position 1 | 0° | Yes |
| | Position 2 | 180° | Yes |
| | Position 3 | 270° | Yes |
| | Position 4 | 90° | Yes |
| | Position 5 | standing | Yes |
| | Position 6 | upside down | Not allowed |
| Mounting on DIN rail | TH35-15 (35 x 15 mm Mounting Rail) acc. to IEC 60715<br>TH35-7.5 (35 x 7.5 mm Mounting Rail) acc. to IEC 60715 | | |

### Auxiliary circuit - Connecting characteristics

| Contactor type | | EH04-xxN |
|---|---|---|
| Connecting capacity | | |
|  | Rigid | 1x 1 mm² ...4 mm²<br>2x 1 mm² ... 1.5 mm² |
|  | Flexible with ferrule | 1x 1 mm² ... 1.5 mm² |
|  | Flexible with insulated ferrule | - |
|  | Flexible | 1x 1 mm² ... 1x 2.5 mm² |
| | Stranded acc. to UL/CSA | AWG 18.... AWG 12 |
| Degree of protection | | IP20 |
| Wire stripping length (upper/lower) | | 17 mm (≤ 1.5mm² 7 mm) /<br>9 mm (≤ 1.5mm² 7 mm) |
| Tightening torque | | 0.9 N·m/<br>8 lb.in |
| Recommended screw driver | | Pozidriv 1 |

# Command and signaling technical details

## Installation contactors

## DC switching table installation contactors

| Type | Rated operational voltage | Contact | DC-1/A 1-pole | DC-3/A 1-pole |
|---|---|---|---|---|
| ESB16-..N | 24 V DC | NO | 16 | 12 |
| | 48 V DC | | 12 | 6 |
| | 60 V DC | | 12 | 4 |
| | 110 V DC | | 4 | 1.2 |
| | 220 V DC | | 0.4 | 0.2 |
| | 24 V DC | NC | 11 | 5 |
| | 48 V DC | | 6 | 2 |
| | 60 V DC | | 4 | 1.5 |
| | 110 V DC | | 1.2 | 0.4 |
| | 220 V DC | | 0.2 | 0.1 |
| ESB20-..N | 24 V DC | NO | 20 | 15 |
| EN20-..N | 48 V DC | | 15 | 7 |
| | 60 V DC | | 15 | 5 |
| | 110 V DC | | 5 | 1.5 |
| | 220 V DC | | 0.5 | 0.2 |
| | 24 V DC | NC | 14 | 6 |
| | 48 V DC | | 7 | 3 |
| | 60 V DC | | 4.5 | 2 |
| | 110 V DC | | 1.5 | 0.6 |
| | 220 V DC | | 0.2 | 0.1 |

| Type | Rated operational voltage | Contact | DC-1/A 3 poles in series | DC-3/A 3 poles in series |
|---|---|---|---|---|
| ESB25-..N | 24 V DC | NO | 24 | 24 |
| EN25-..N | 48 V DC | | 24 | 24 |
| | 60 V DC | | 24 | 24 |
| | 110 V DC | | 24 | 16 |
| | 220 V DC | | 13 | 4 |
| | 24 V DC | NC | 24 | 19 |
| | 48 V DC | | 22 | 9.4 |
| | 60 V DC | | 17.5 | 7.5 |
| | 110 V DC | | 9.5 | 4.1 |
| | 220 V DC | | 3.8 | 1.6 |
| ESB40-..N | 24 V DC | NO | 40 | 40 |
| EN40-..N | 48 V DC | | 40 | 40 |
| | 60 V DC | | 40 | 34 |
| | 110 V DC | | 30 | 18 |
| | 220 V DC | | 15 | 4.5 |
| ESB63-..N | 24 V DC | NO | 63 | 63 |
| | 48 V DC | | 63 | 47 |
| | 60 V DC | | 60 | 38 |
| | 110 V DC | | 33 | 21 |
| | 220 V DC | | 17 | 5 |
| ESB100-..N | 24 V DC | NO | 100 | 100 |
| | 48 V DC | | 100 | 70 |
| | 60 V DC | | 80 | 45 |
| | 110 V DC | | 50 | 25 |
| | 220 V DC | | 35 | 7 |

## Notes

# Command and signaling technical details

## Installation contactors

## Lamp load table

Please note that switching lamps is a capacitor load application where high inrush current peaks could occur. These are influenced by the length and cross section of the wire as well as the type of power supply unit and specifications of the lamp brand. For example, long cables can increase the possible number of lamps per pole. The table shows the allowed max. current, at 230 V AC, for one pole and considers already the startup current peaks.
The following selection table shows the current values and the maximum switchable capacitor load for compensated lamps. These two limits have to be considered in the selection of contactors.

| | | ESB16..N | ESB20..N EN20..N | ESB25..N EN25..N | ESB40..N EN40..N | ESB63..N | ESB100..N |
|---|---|---|---|---|---|---|---|
| Permitted compensating capacity per phase Cmax [µF] | | 45 | 75 | 100 | 350 | 500 | 650 |
| Lamp types | | Maximum load of the current paths during switching of electric lamps $I_e$ [A] | | | | | |
| Incandescent and halogen lamps | | 4 | 6 | 7 | 20 | 30 | 45 |
| Mixing lamps without ballast | | 4 | 6 | 7 | 20 | 30 | 45 |
| Fluorescent lamps with conventional ballast | single lamp uncompensated | 14 | 18 | 22 | 36 | 56 | 90 |
| | single lamp parallel compensated | 2 | 3 | 3.5 | 10 | 15 | 22 |
| | series compensation, duo circuit | 14 | 18 | 22 | 36 | 56 | 90 |
| Fluorescent lamps with electronic ballast or CFL | | 4 | 6 | 7 | 20 | 30 | 45 |
| LED lamps | | 4 | 6 | 7 | 20 | 30 | 45 |
| High pressure mercury-vapor lamps | single lamp without compensation | 7 | 9 | 11 | 18 | 28 | 45 |
| | single lamp with parallel compensation | 2 | 3 | 3.5 | 10 | 15 | 22 |
| Halogen metal-vapor lamps | single lamp without compensation | 7 | 9 | 11 | 18 | 28 | 45 |
| | single lamp with parallel compensation | 2 | 3 | 3.5 | 10 | 15 | 22 |
| High pressure sodium-vapor lamps | single lamp without compensation | 7 | 9 | 11 | 18 | 28 | 45 |
| | single lamp with parallel compensation | 2 | 3 | 3.5 | 10 | 15 | 22 |
| Low pressure sodium-vapor lamps | single lamp without compensation | 7 | 9 | 11 | 18 | 28 | 45 |
| | single lamp with parallel compensation | 2 | 3 | 3.5 | 10 | 15 | 22 |

**Example for lamp load calculation**
Due to many varieties of lamps and ballasts we advice to take the current load as base for reference. The lamp table considers already the inrush peaks and other lamp parameters. Please see the following examples for a reliable project lamp calculation.

Fluorescent lamp with conventional ballast, uncompensated
the lamp operating current I = 1.5 A, voltage U = 230 V
1 pole of ESB25..N can be loaded with max. 22 A,
see lamp table => 22 A/1.5 A = 14.66 => 14 lamps
1 pole of ESB20..N can be loaded with max. 18 A,
see lamp table => 18 A/1.5 A = 12 lamps

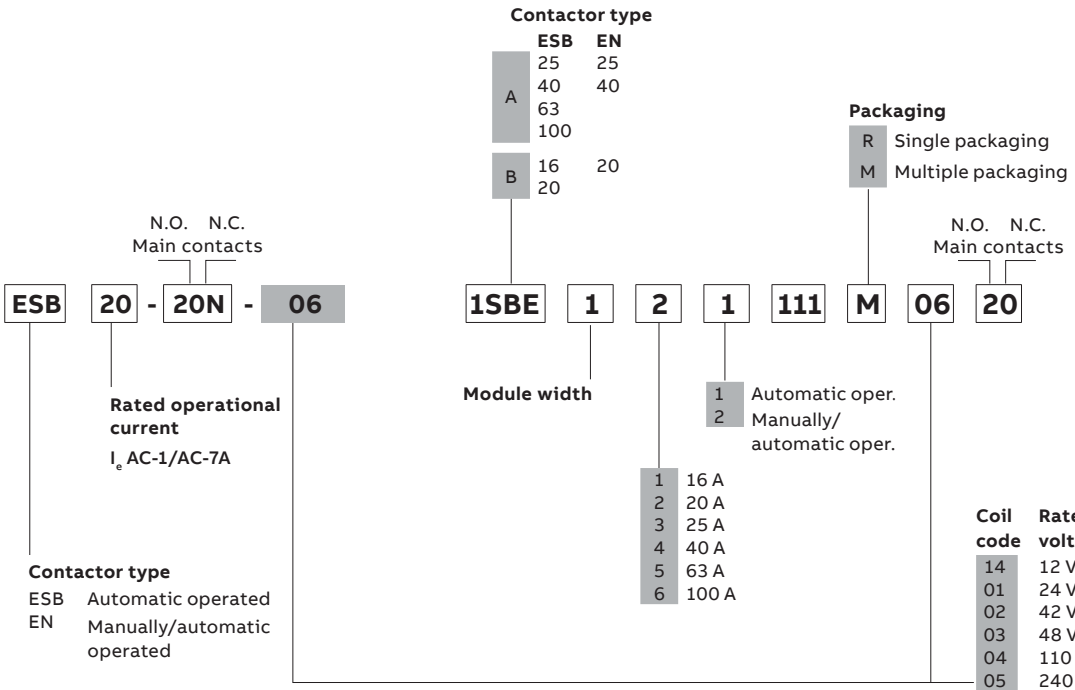
**Please use the referring value in the table stated above and divide it with the current stated on the lamp.**
**This will lead to the number of lamps which can be switched.**

**Example with picture: ESB25..N used for LED lamps:**
**7 A (= 7000 mA) / 85 mA = 82.23 => 82 lamps**

# Command and signaling technical details

## Installation contactors

## Voltage code table




(1) 110 V - 120 V for ESB25..N/EN25..N

(2) only coil 6 available with 230 V - 240 V for ESB25..N/EN25..N

(3) only coil 7 available with 400 V - 415 V for ESB25..N

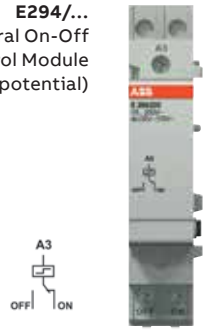
(4) Coil 8 available for ESB40-40N and ESB63-40N only.

# Command and signaling technical details

## E290 mechanical latching relays

### Possible mounting variations (50 Hz only)

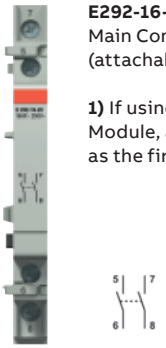
**E294/...**
Central On-Off Control Module (different potential)




By snapping on an E294/... Central On-Off Control Module at the Main Module E290, it's not allowed to use an E292/... contact module or an E299/... auxiliary contact!

**E292-16-20**
Main Contact Module (attachable: max. 1 unit)

**1)** If using a Contact Module, always attach it as the first component.




1

**Always attach on the left side!**
Only one type of Control Module can be attached.

**Always attach on the right side!**
One unit can be snapped on per E290 Main Module in each case.

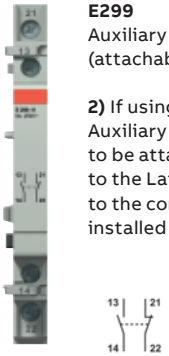
2

**E290-16-11/230**
Latching Relay Main Module


**E295-PS**
Permanent Signal Module (use: In the case of control via a time switch or light sensor) permanent energising


**E299**
Auxiliary Contact (attachable: max. 1 unit)

**2)** If using an attachable Auxiliary Contact, it is to be attached directly to the Latching Relay or to the contact module installed first.



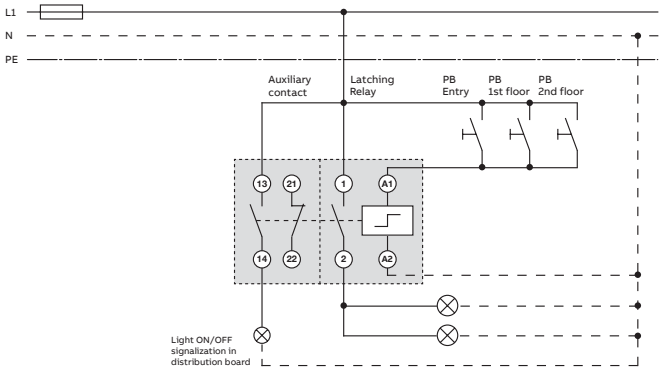

**Safety information**
If more than one Latching Relay installed next to each other, it is recommended to use a intermediate piece (distance). This guarantees optimal heat dissipation by the main modules. The intermediate pieces (9 or 18mm wide) can be found in the order information as types ZLS725 or ZLS726 (the use depends on the application).

# Command and signaling technical details

E290 mechanical latching relays

## E290-16-10 + E299-11 – LATCHING RELAY WITH AUXILIARY CONTACT

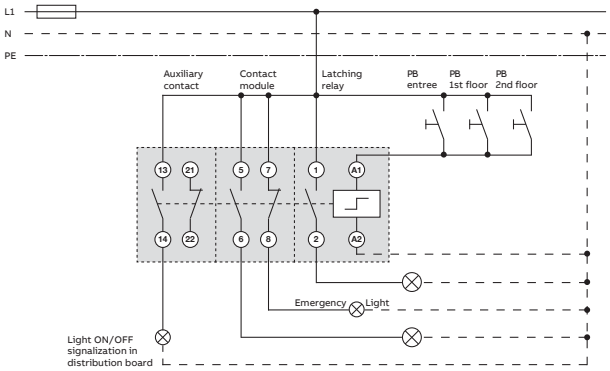
Application at a normal light control via different push buttons (PB): The snapped-on auxiliary contact (E299-11) displays the current switching state of the light control (ON/OFF).




## E290-16-10 + E292-16-11 + E299-11 – LATCHING RELAY WITH AUXILIARY CONTACT (50 HZ ONLY)

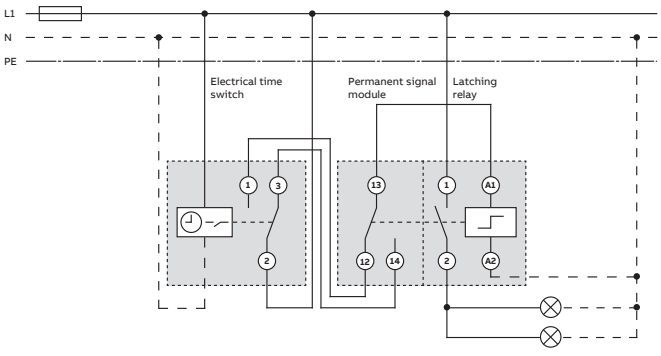
For latching relays with a frequency of 60Hz the combination of E290+E292+E299 is not possible (either E290+E292 or in a separate device combination E290+E299)

Latching Relay E290 with attached contact module E292-16-11 (additional main contact tracks) plus an auxiliary contact to externally display the switching state of the main contacts (ON/OFF).




## E290-16-10 + 295-PS – LATCHING RELAY WITH PERMANENT SIGNAL MODULE

This combination permits control of the E290 coil via a permanent signal (e.g. directly controlled by a timer or a twilight switch).
When using this accessory, manual switching at the main unit is not possible.

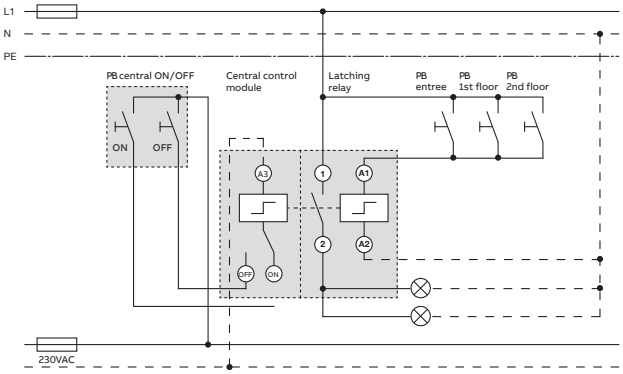


# Command and signaling technical details

## E290 mechanical latching relays

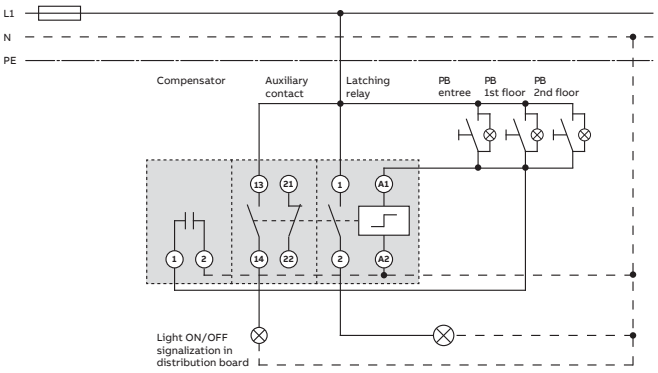
### E290-16-10 + E294/230 – LATCHING RELAY WITH CENTRAL CONTROL MODULE

This is a second possibility to implement a Central ON/OFF control. When a E294/... accessory is snapped on, this Central ON/OFF device uses a different voltage source for coil control. The light control can be performed locally on site via the regular button. The Central ON/OFF button permits a general switching state change from a central location.




### E296CP + E290-16-10 + E299-11 – LATCHING RELAY WITH AUXILIARY CONTACT PLUS COMPENSATOR

The compensator E296-CP is used every time a certain number of lit local buttons is exceeded.
See table in the catalog, page 16.



# Command and signaling technical details

## E290 latching relays

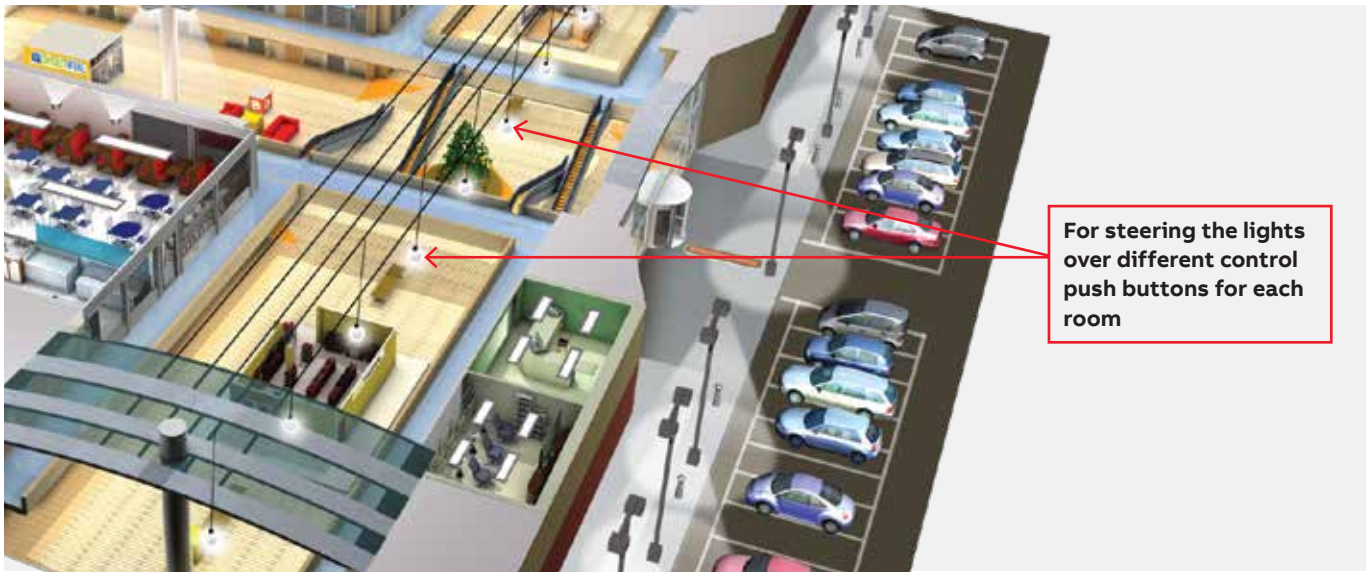
In an office building, supermarket or other large building complex, latching relays can be used to achieve a flexible, modern and reliable lighting control system for the whole site.

**Application for an E290 Latching Relay:**
Each time the impulse button is operated, an electrical pulse is applied to the latching relay that results in a change to the switching state. This state is held mechanically until the next pulse is received.

Switching sequence:
**OFF – ON – OFF – ON**

The main application for a latching relay is to simply switch various independent lighting areas on and off. Switching from „on“ to „off“ is carried out by means of a short impulse.
As the device coil of the latching relay is only excited by a pulse for a short time during switching, no additional holding energy is required. The contact position (on/off) is held by means of a mechanical interlock until the next pulse command is sent. In the event of a power failure, the current switch position will always be held. This technology considerably helps to reduce the temperature rise and current consumption of devices operated by magnetic coils, thus saving on unnecessary energy costs.

**Example of use within a commercial building**



# Command and signaling technical details

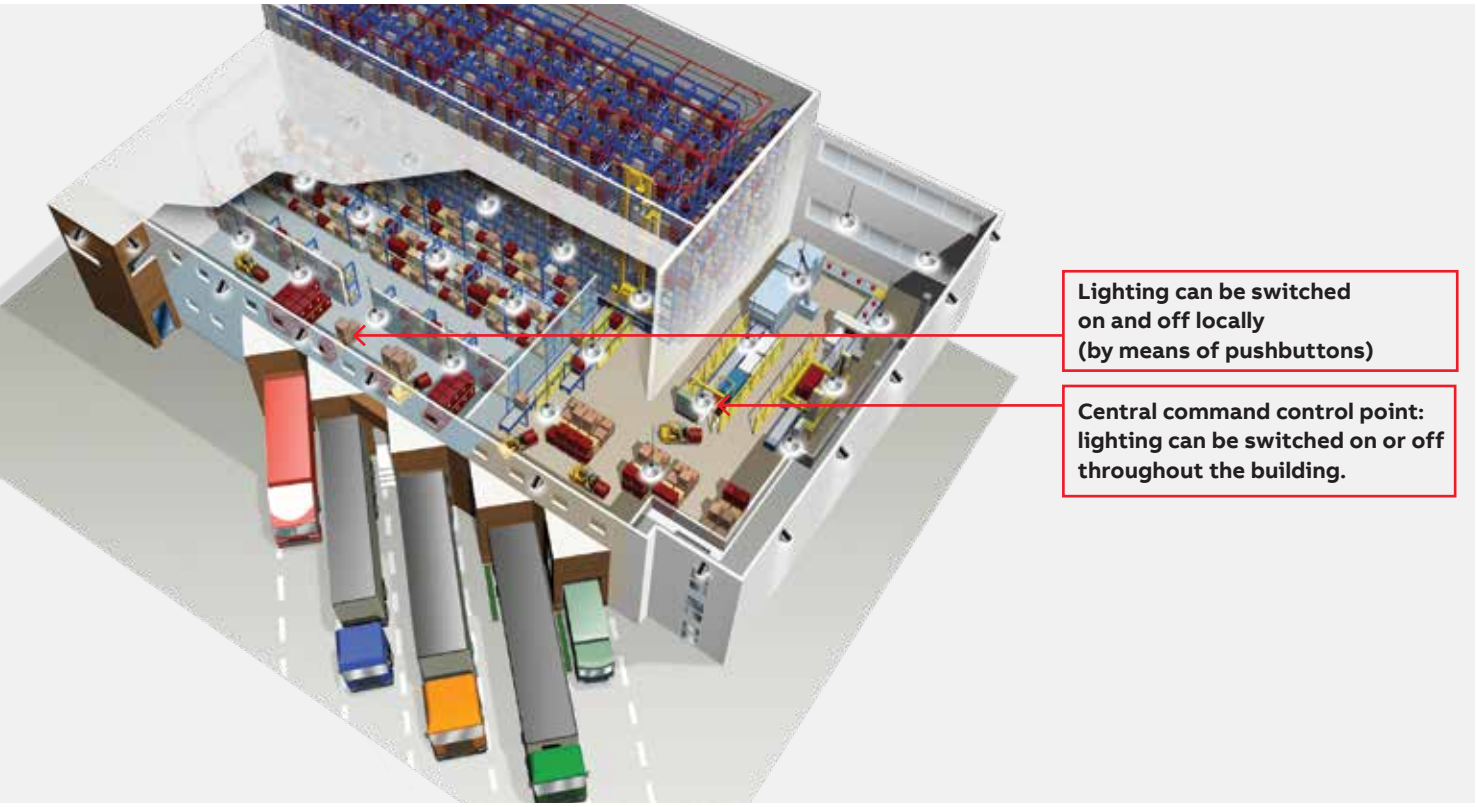
## E290 latching relays

**Application for an E290 Latching Relay in conjunction with an E293/X or E294 Central On-Off Control Module:**
The interior lighting controlled by means of various impulse buttons can also be operated from a central control point by snapping on a central on-off control module onto the left side of the E290 latching relay.

Switching sequence:
**Local => OFF – ON**
**Central => OFF – ON**
(the central command is the superordinate command)

The combination of a Main device plus central on-off control module can be used to switch multiple lights on and off at the same time without any dependence on the current switch position of the devices. The actual switch position of the various devices (on/off) can be indicated by snapping an auxiliary contact (attachable on the right side) to the control center. Another possibility would be the combination of an E290 with an E294 central on-off control module for various control voltages. This combination enables for example the cooperation with a PLC (programmable logic controller). Any number of different logical activations in respect of latching relays can be recorded and visualised.

**Example of use within an industrial warehouse**

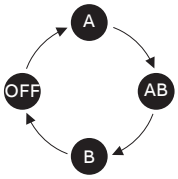


# Command and signaling technical details

## E291 sequential latching relays

**Application using an E291S Sequential Latching Relay:**
This independent special sequential latching relay switches the contact position in a preset fixed switching sequence.

Switching sequence:
**OFF – A – AB – B – OFF**

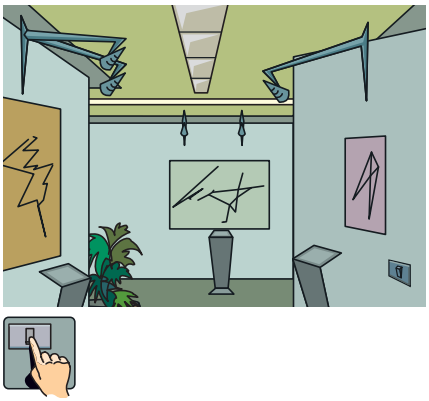


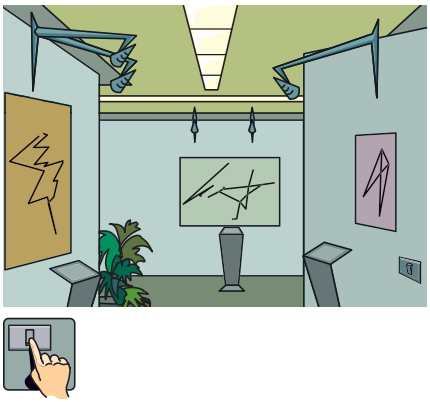

**E291S latching relays with sequential contacts**

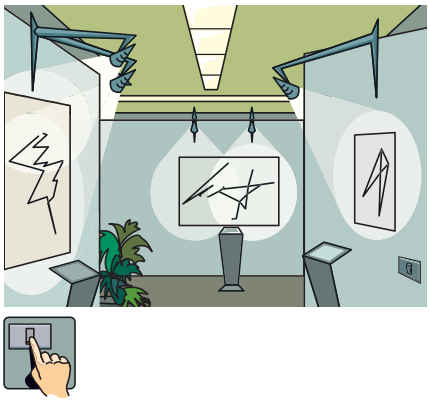
**Operating principle**
The two contacts of the E291S latching relays switch indipendently their position (open/closed) at each impulse according to a preset sequence in the control circuit.

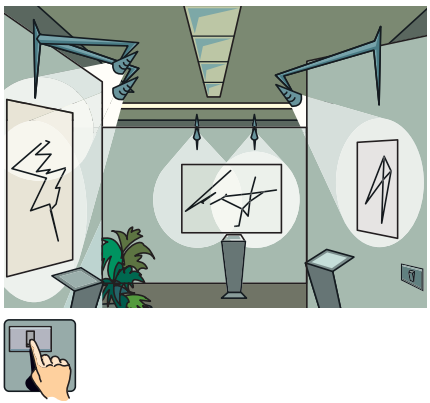
**Application environments**
The E291S latching relays are particularly indicated in environments and situations requiring the load sequential control through a single pushbutton circuit (offices, restaurants, etc.).

**Example of installation**
As shown in the diagrams, one of the possible applications is to mount the E291S latching relays inside the lighting system of an art gallery. The first pushbutton impulse will switch on the ceiling lights, the second triggers the wall lamps, the third switches off the ceiling lights and the fourth switches off the wall lamps.



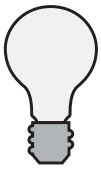
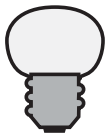
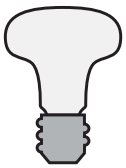






# Command and signaling technical details

## LED lamp latching relays

| | Application for (in W) | P [W] of the LED component | Number of LED components | | |
|---|---|---|---|---|---|
| | | | Latching Relays (E290) | | Installation Relays (E297) |
| | | | 16 A | 32 A | 16 A |
| **Switchable total power P (W) per contact path** | | | **200** | **250** | **200** |
| **LED E27 glow lamp shape** | | | | | |
|  | 40 | 5.5 | 36 | 45 | 25 |
| | 40 | 6.0 | 33 | 42 | 23 |
| | 40 | 7.0 | 29 | 36 | 20 |
| | 60 | 9.0 | 22 | 28 | 16 |
| | 60 | 9.5 | 21 | 26 | 15 |
| | 60 | 10.0 | 20 | 25 | 14 |
| | 75 | 11.5 | 17 | 22 | 12 |
| | 75 | 13.0 | 15 | 19 | 11 |
| | 100 | 15.0 | 13 | 17 | 9 |
| | 100 | 18.0 | 11 | 14 | 8 |
| **LED E14 Candle-shaped bulb** | | | | | |
|  | 25 | 3.0 | 67 | 83 | 40 |
| | 25 | 4.0 | 50 | 63 | 30 |
| | 40 | 6.0 | 33 | 42 | 20 |
| | 40 | 6.0 | 33 | 42 | 20 |
| **27/E14 Drop-shaped bulb** | | | | | |
|  | 25 | 3.0 | 67 | 83 | 40 |
| | 25 | 4.0 | 50 | 63 | 30 |
| | 40 | 6.0 | 33 | 42 | 20 |
| **LED E27/E14 Reflectors** | | | | | |
|  | 40 | 4.5 | 44 | 56 | 27 |
| | 50 | 5.5 | 36 | 45 | 22 |
| | 40 | 8.5 | 24 | 29 | 14 |
| | 40 | 9.5 | 21 | 26 | 13 |
| | 40 | 13.0 | 15 | 19 | 9 |
| **LED Low-voltage reflectors** | | | | | |
|  | 20 | 3.4 | 59 | 74 | 35 |
| | 35 | 5.5 | 36 | 45 | 22 |
| | 35 | 6.5 | 31 | 38 | 18 |
| | 35 | 7.0 | 29 | 36 | 17 |
| | 50 | 8.0 | 25 | 31 | 15 |
| **LED High-voltage reflectors** | | | | | |
|  | 35 | 3.5 | 57 | 71 | 34 |
| | 35 | 4.0 | 50 | 63 | 30 |
| | 50 | 4.5 | 44 | 56 | 27 |
| | 50 | 5.0 | 40 | 50 | 24 |
| | 50 | 5.4 | 37 | 46 | 22 |

# Command and signaling technical details

## LED lamp latching relays

| | Application for (in W) | P [W] of the LED component | Number of LED components | | |
|---|---|---|---|---|---|
| | | | Latching Relays (E290) | | Installation Relays (E297) |
| | | | 16 A | 32 A | 16 A |
| **Switchable total power P (W) per contact path** | | | **200** | **250** | **200** |
| **LEDTube 0.6 m fluorescent lamp with electronic ballast** | | | | | |
|  | 18 | 10.5 | 19 | 24 | 11 |
| **LEDTube 1.2 m fluorescent lamp with electronic ballast** | | | | | |
|  | 36 | 16.5 | 12 | 15 | 7 |
| | 36 | 18.0 | 11 | 14 | 7 |
| | 36 | 21.0 | 10 | 12 | 6 |
| **LEDTube 1.52 m fluorescent lamp with electronic ballast** | | | | | |
|  | 18 | 10.5 | 19 | 24 | 11 |
| | 36 | 16.5 | 12 | 15 | 7 |
| | 36 | 18.0 | 11 | 14 | 7 |
| | 36 | 21.0 | 10 | 12 | 6 |
| | 58 | 22.0 | 9 | 11 | 5 |
| | 58 | 26.0 | 8 | 10 | 5 |
| **LEDTube 1.5 m with concentional/low-loss ballast** | | | | | |
|  | 58 | 20.0 | 10 | 13 | 6 |
| | 58 | 23.0 | 9 | 11 | 5 |
| | 58 | 25.0 | 8 | 10 | 5 |
| **LEDTube 1.2m with concentional/low-loss ballast** | | | | | |
|  | 36 | 16.0 | 13 | 16 | 8 |
| | 36 | 18.0 | 11 | 14 | 7 |
| **LEDTube 0.6m with concentional/low-loss ballast** | | | | | |
|  | 18 | 8.0 | 25 | 31 | 15 |
| | 18 | 9.0 | 22 | 28 | 13 |

# Command and signaling technical details

## E290 latching relays



**Use of lighted pushbuttons**

Latching relays can be controlled through lighted pushbuttons, without any limitations in terms of connection of three-terminal types.

In two-terminals pushbuttons the current that flows through pushbutton lamps can trigger an unwanted activation; in order to avoid this there is the E296-CP compensation module, installed in parallel on the coil.

**Maximum Number of Illuminated buttons per main device (with 0.6 mA glxow lamp)**

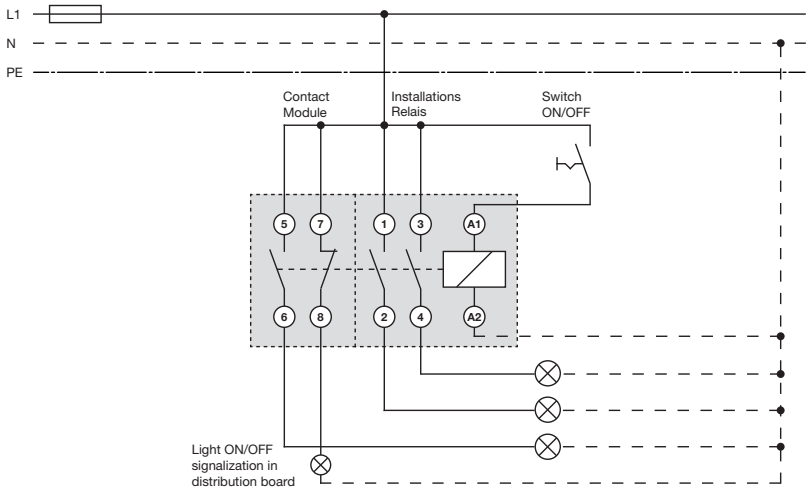
| | | Latching relay | Central ON/OFF, different potential |
|---|---|---|---|
| **contacts** | **1 & 2** | **3 & 4** | **1 & 2** |
| without compensator | 8 | 9 | 12 |
| + with 1 compensator | 18 | 22 | 21 |
| + with 2 compensators | 45 | 38 | 58 |

# Command and signaling technical details

E297 installation relay

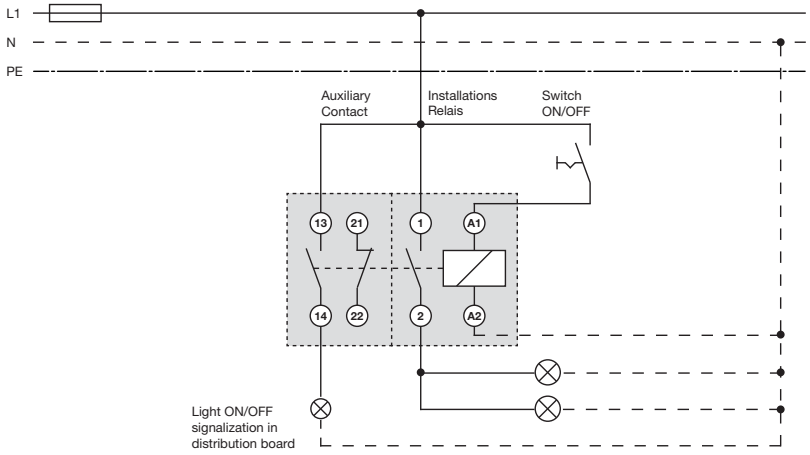
### E297-16-20 + E298-16-11 — Installation Relay with Contact Module

Light control via an Installation Relay E297 with connected Contact Module E298-16-11 (additional main contacts) to externally signal the switching state of the main contacts (ON/OFF).



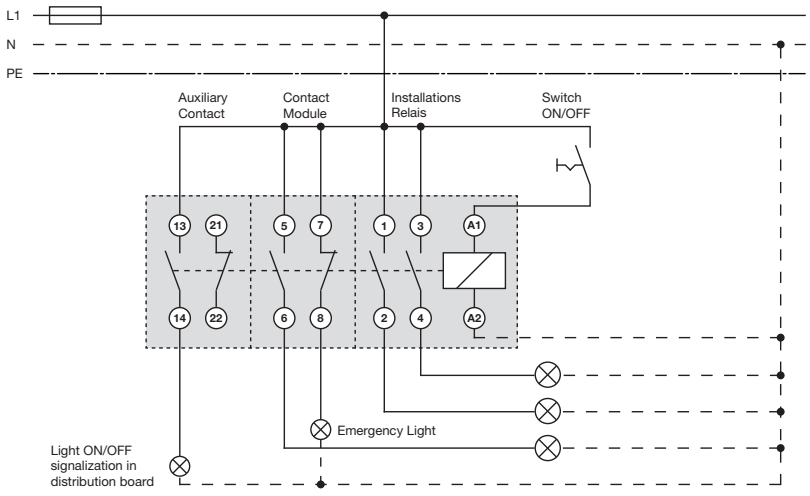

### E297-16-10 + 299-11 — Installation Relay with Auxiliary Contact

Application with a normal light control via an ON/OFF switch. The current condition indication of the light control (ON/OFF) is implemented, e.g., in the distribution board, with the help of the auxiliary contact (E299-11).




### E297-16-20 + E298-16-11 + 299-11 — Installation Relay with Contact Module and Auxiliary Contact

Combination of an installation relay E297 with an attached Contact Module E298-16-11 (additional main contacts) plus an Auxiliary Contact to clearly indicate the switching state of the main contacts (ON/OFF).



# E297 Installation Relay
## Application

Because of the individual options for using Installation Relays in building management systems, these devices can be used to realise a modern and reliable consumer control system.

### APPLICATION FOR AN E297 INSTALLATION RELAY

When current is applied to an Installation Relay, the relay coil attracts one of the main contacts and changes the contact position. The coil of an Installation Relay has to remain energised in order to hold the contact position. If the voltage is removed from the coil, the Installation Relay always returns to the off position.

Switching sequence:
OFF – ON

Main areas of application include exterior lighting for office buildings or supermarket car parks as well as other big installations. An extremely flexible and modern lighting control system can be created, using E297 Installation Relays. Activation can be carried out by means of a twilight switch or a timer but also by means of a simple on-off switch or another electrical control unit.

Reliable switching of an exterior lighting system, for example, is realised by sending clear on and off control commands from an external control point. The magnetic coil has to be permanently energised in order for the Installation Relay to be held in the on position. The energy consumption of the Installation Relay is reduced to a minimum by the performance-optimised magnetic coil. The low switching noise also makes it suitable for professional use in closed inhabited areas.

—
01 Example of use within a technical building

# Command and signaling technical details

## E297 installation relay

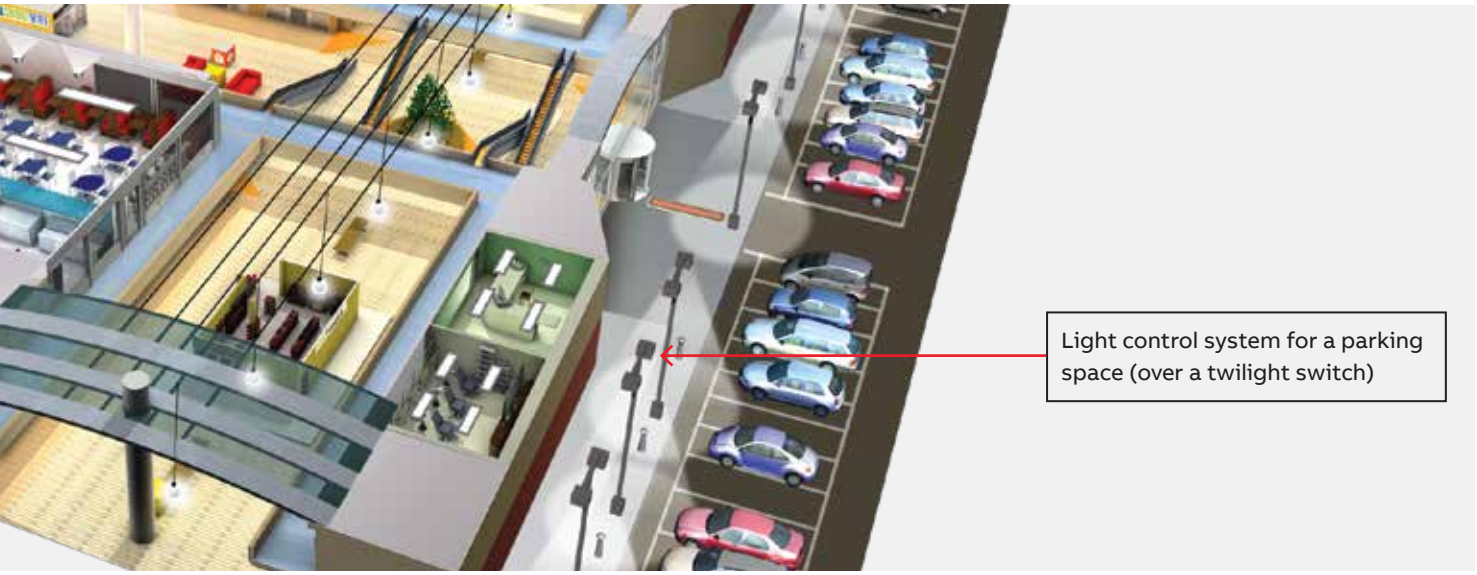
Because of the individual options for using the installation relays in building management systems, these devices can be used to realise a modern and reliable consumer control system.

**Application for an E297 Installation Relay:**
When current is applied to an installation relay, the relay coil attracts one of the main contacts and changes the contact position. The coil of an installation relay has to remain energised in order to hold the contact position. If the voltage is removed from the coil, the installation relay always returns to the off position.

Switching sequence:
**OFF – ON**

Main areas of application include exterior lighting for office buildings or supermarket car parks as well as other big installations. An extremely flexible and modern lighting control system can be created, using E297 installation relays. Activation can be carried out by means of a twilight switch or a timer but also by means of a simple on-off switch or another electrical control unit. Reliable switching of an exterior lighting system, for example, is realised by sending clear on and off control commands from an external control point. The magnetic coil has to be permanently energised in order for the installation relay to be held in the on position. The energy consumption of the installation relay is reduced to a minimum by the performance-optimised magnetic coil. The low switching noise also makes it suitable for professional use in closed inhabited areas.

**Example of use within a commercial building**

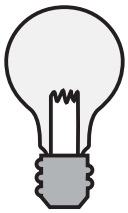
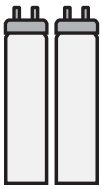


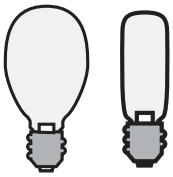
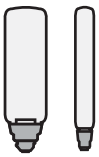
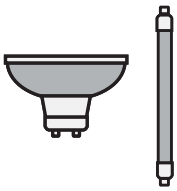
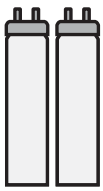
# Command and signaling technical details

## E297 installation relay

### Lamp load table

Latching and Installation Relays

| | Power in W | Latching Relays max. number for E290 16 A | 32 A | Installation Relays max. number for E297 16 A |
|---|---|---|---|---|
| **Glow lamps** | | | | |
|  | 15 | 200 | 266 | 120 |
| | 25 | 120 | 160 | 72 |
| | 40 | 75 | 102 | 45 |
| | 60 | 50 | 65 | 30 |
| | 75 | 40 | 52 | 24 |
| | 100 | 30 | 40 | 18 |
| | 150 | 20 | 26 | 12 |
| | 200 | 15 | 20 | 9 |
| | 300 | 9 | 12 | 6 |
| | 500 | 5 | 7 | 3 |
| **Fluorescent lamps with starter** | | | | |
|  | 18 | 81 | 100 | 50 |
| | 36 | 44 | 58 | 25 |
| | 40 | 38 | 53 | 23 |
| | 58 | 29 | 35 | 16 |
| | 65 | 26 | 34 | 13 |
| **Fluorescent lamps with ballast** | | | | |
|  | 18 | 103 | 132 | 17 |
| | 36 | 63 | 81 | 13 |
| | 40 | 40 | 77 | 12 |
| | 58 | 29 | 35 | 10 |
| | 65 | 17 | 28 | 7 |
| **Fluorescent lamps with duo circuit** | | | | |
|  | 2x18 | 82 | 110 | 50 |
| | 2x36 | 41 | 55 | 25 |
| | 2x40 | 35 | 50 | 23 |
| | 2x58 | 23 | 34 | 16 |
| | 2x65 | 12 | 23 | 13 |
| **Energy saving lamps** | | | | |
|  | 1x18 | 83 | 112 | 38 |
| | 1x36 | 46 | 61 | 30 |
| | 1x58 | 31 | 38 | 17 |
| | 2x18 | 40 | 56 | 19 |
| | 2x36 | 23 | 30 | 15 |
| | 2x58 | 14 | 19 | 8 |

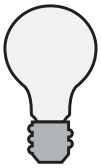
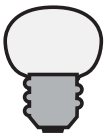
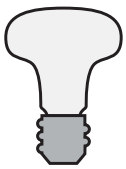
| | Power in W | Latching Relays max. number for E290 16 A | 32 A | Installation Relays max. number for E297 16 A |
|---|---|---|---|---|
| **Halogen lamps 230 V** | | | | |
|  | 55 | 27 | 36 | 6 |
| | 90 | 17 | 22 | 4 |
| | 135 | 11 | 14 | 3 |
| | 185 | 8 | 10 | 2 |
| **High-pressure sodium-vapour lamps** | | | | |
|  | 70 | 15 | 18 | 10 |
| | 150 | 8 | 10 | 5 |
| | 250 | 4 | 6 | 3 |
| | 400 | 3 | 3 | 2 |
| | 1000 | 1 | 1 | – |
| **Low-pressure sodium-vapour lamps** | | | | |
|  | 55 | 25 | 29 | 6 |
| | 90 | 16 | 20 | 4 |
| | 135 | 11 | 12 | 3 |
| | 185 | 4 | 5 | 2 |
| **High-pressure mercury-vapour lamps** | | | | |
|  | 150 | 20 | 27 | 12 |
| | 250 | 12 | 16 | 7 |
| | 300 | 10 | 13 | 6 |
| | 400 | 7 | 10 | 4 |
| | 500 | 6 | 8 | 3 |
| | 1000 | 3 | 4 | 2 |
| **Low-pressure mercury-vapour lamps** | | | | |
|  | 20 | 116 | 160 | 72 |
| | 50 | 46 | 64 | 29 |
| | 75 | 31 | 42 | 20 |
| | 100 | 24 | 32 | 15 |
| | 150 | 15 | 21 | 10 |
| | 200 | 12 | 16 | 7 |
| | 300 | 7 | 10 | 5 |
| **Fluorescent lamps with electronic ballast** | | | | |
|  | 1x18 | 83 | 112 | 38 |
| | 1x36 | 46 | 61 | 30 |
| | 1x58 | 31 | 38 | 17 |
| | 2x18 | 40 | 56 | 19 |
| | 2x36 | 23 | 30 | 15 |
| | 2x58 | 14 | 19 | 8 |

# Command and signaling technical details

## E297 installation relay

### Lamp load table

Latching and Installation Relays

| | Application for (in W) | P [W] of the LED component | Number of LED components | | |
|---|---|---|---|---|---|
| | | | Latching Relays (E290) | | Installation Relays (E297) |
| | | | 16 A | 32 A | 16 A |
| **Switchable total power P (W) per contact path** | | | **200** | **250** | **200** |
| **LED E27 glow lamp shape** | | | | | |
|  | 40 | 5.5 | 36 | 45 | 25 |
| | 40 | 6.0 | 33 | 42 | 23 |
| | 40 | 7.0 | 29 | 36 | 20 |
| | 60 | 9.0 | 22 | 28 | 16 |
| | 60 | 9.5 | 21 | 26 | 15 |
| | 60 | 10.0 | 20 | 25 | 14 |
| | 75 | 11.5 | 17 | 22 | 12 |
| | 75 | 13.0 | 15 | 19 | 11 |
| | 100 | 15.0 | 13 | 17 | 9 |
| | 100 | 18.0 | 11 | 14 | 8 |
| **LED E14 Candle-shaped bulb** | | | | | |
|  | 25 | 3.0 | 67 | 83 | 40 |
| | 25 | 4.0 | 50 | 63 | 30 |
| | 40 | 6.0 | 33 | 42 | 20 |
| | 40 | 6.0 | 33 | 42 | 20 |
| **27/E14 Drop-shaped bulb** | | | | | |
|  | 25 | 3.0 | 67 | 83 | 40 |
| | 25 | 4.0 | 50 | 63 | 30 |
| | 40 | 6.0 | 33 | 42 | 20 |
| **LED E27/E14 Reflectors** | | | | | |
|  | 40 | 4.5 | 44 | 56 | 27 |
| | 50 | 5.5 | 36 | 45 | 22 |
| | 40 | 8.5 | 24 | 29 | 14 |
| | 40 | 9.5 | 21 | 26 | 13 |
| | 40 | 13.0 | 15 | 19 | 9 |
| **LED Low-voltage reflectors** | | | | | |
|  | 20 | 3.4 | 59 | 74 | 35 |
| | 35 | 5.5 | 36 | 45 | 22 |
| | 35 | 6.5 | 31 | 38 | 18 |
| | 35 | 7.0 | 29 | 36 | 17 |
| | 50 | 8.0 | 25 | 31 | 15 |
| **LED High-voltage reflectors** | | | | | |
|  | 35 | 3.5 | 57 | 71 | 34 |
| | 35 | 4.0 | 50 | 63 | 30 |
| | 50 | 4.5 | 44 | 56 | 27 |
| | 50 | 5.0 | 40 | 50 | 24 |
| | 50 | 5.4 | 37 | 46 | 22 |

| | Application for (in W) | P [W] of the LED component | Number of LED components | | |
|---|---|---|---|---|---|
| | | | Latching Relays (E290) | | Installation Relays (E297) |
| | | | 16 A | 32 A | 16 A |
| **Switchable total power P (W) per contact path** | | | **200** | **250** | **200** |
| **LEDTube 0.6 m fluorescent lamp with electronic ballast** | | | | | |
|  | 18 | 10.5 | 19 | 24 | 11 |
| **LEDTube 1.2 m fluorescent lamp with electronic ballast** | | | | | |
|  | 36 | 16.5 | 12 | 15 | 7 |
| | 36 | 18.0 | 11 | 14 | 7 |
| | 36 | 21.0 | 10 | 12 | 6 |
| **LEDTube 1.52 m fluorescent lamp with electronic ballast** | | | | | |
|  | 18 | 10.5 | 19 | 24 | 11 |
| | 36 | 16.5 | 12 | 15 | 7 |
| | 36 | 18.0 | 11 | 14 | 7 |
| | 36 | 21.0 | 10 | 12 | 6 |
| | 58 | 22.0 | 9 | 11 | 5 |
| | 58 | 26.0 | 8 | 10 | 5 |
| **LEDTube 1.5 m with concentional/low-loss ballast** | | | | | |
|  | 58 | 20.0 | 10 | 13 | 6 |
| | 58 | 23.0 | 9 | 11 | 5 |
| | 58 | 25.0 | 8 | 10 | 5 |
| **LEDTube 1.2m with concentional/low-loss ballast** | | | | | |
|  | 36 | 16.0 | 13 | 16 | 8 |
| | 36 | 18.0 | 11 | 14 | 7 |
| **LEDTube 0.6m with concentional/low-loss ballast** | | | | | |
|  | 18 | 8.0 | 25 | 31 | 15 |
| | 18 | 9.0 | 22 | 28 | 13 |

E27 Mostly used bulb fitting for standard lamps
E14 Up to 40 (rarely 60) W with candle-shaped bulb

# Command and signaling technical details

## E297 installation relay

**Operating principle**

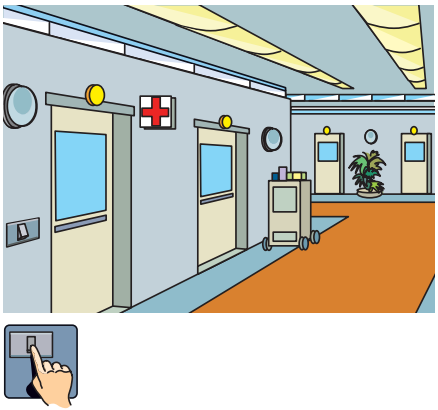
The E297 installation relays are 16 A contactors specifically engineered for residential and commercial applications and are available in a wide range of contact layouts and coil voltages.

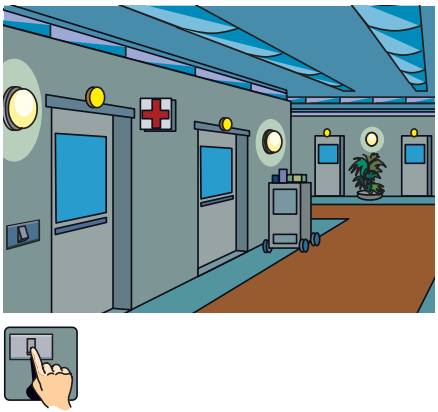
**Application environments**

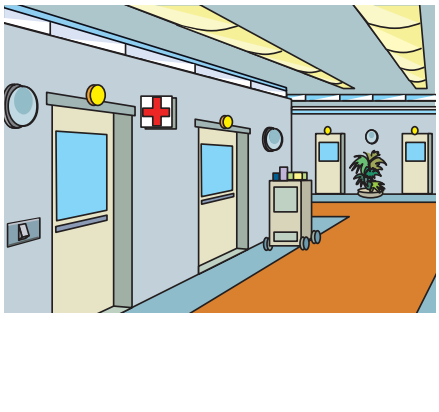
The E297 installation relays are particularly indicated in residential and commercial buildings for lighting control.

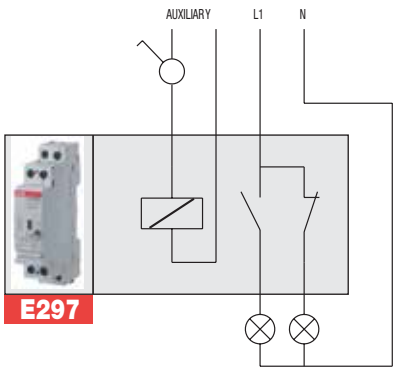
**Example of installation**

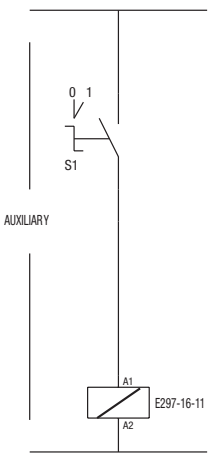
As shown in the diagrams, one of the possible applications is to mount the E297-16-11 installation relay with a NO and a NC contact inside the electric system of a hospital ward. The first control sent through a switch to the command circuit of the relay will turn off the ceiling lights and turn on the corridor lamps, while the second command returns to the previous state.

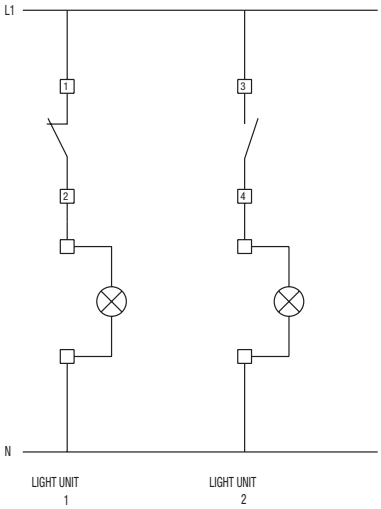








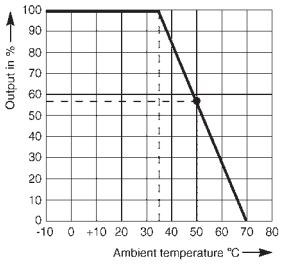



# Command and signaling technical details

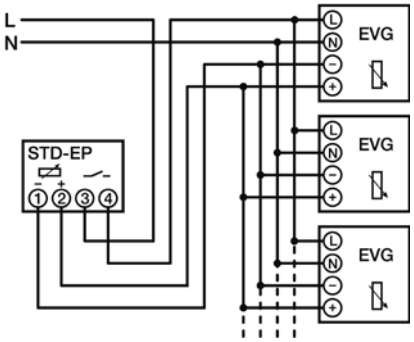
## STD dimmers

Control power STD 50-3: 20-500 W/VA
STD 50-4: 40-420 W/VA

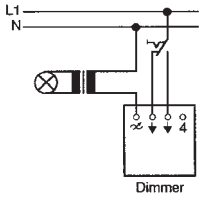



Influence of ambient temperature on the control power
The certified rated power is indicated on the dimmer.
Where higher ambient temperatures occur, reduce values as is specified in the diagram.
At 50 °C /122°F ambient temperature, the permissible load drops to 57%.

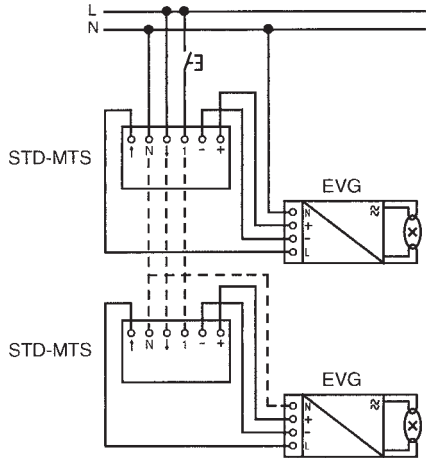
**Electronic potentiometer**



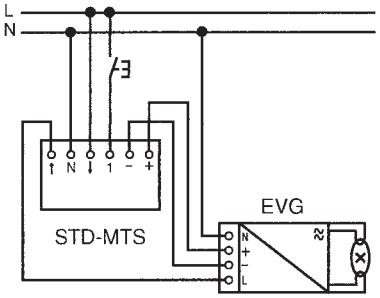

**Dimmer STD 50-4 in two-way circuit, lv halogen lamps via electronic transformer**



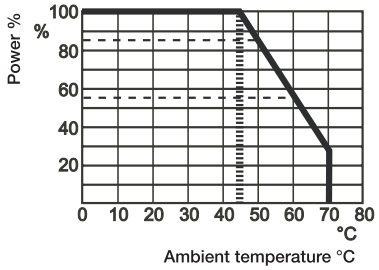

**Brightness control of fluorescent lamps with 1 -10 V control input. Control of more than one memory touch controller STD-MTS via one push-button.**

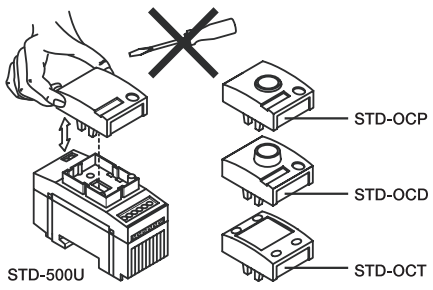



**Brightness control of a fluorescent lamp with 1 - 10 V DC control input with memory touch controller STD-MTS with external pushbutton, e.g. E 225**




**Connected load / ambient temperature diagram**




**STD-500 U**

# Command and signaling technical details

## Modular transformers

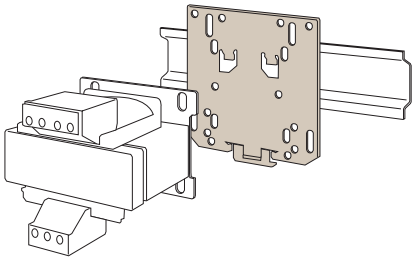
**Modular transformers**

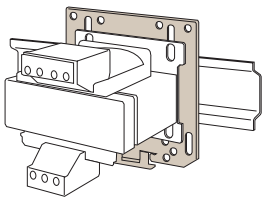
The range of System pro M compact modular transformers consists of a series of safety transformers for general use, TS-C with 12-24 V secondary and powers of 25, 40 and 63 VA, the TM range of bell transformers, with secondary voltages of 12-24 V and a maximum rated power of 10-15-30-40 VA, and the TS range of bell transformers, with secondary voltages of 8-12-24 V and a rated secondary power of 8-16-24 VA (some TS types are available with an integrated switch ON/OFF).

**Modular safety transformers for general use TS-C, continuous functioning**

**Standard: IEC EN 61558-2-6**

The TS-C safety transformer is an insulation transformer for supplying SELV circuits (with extremely low safety voltage) or PELV circuits (with extremely low protection voltage).
In contrast to the bell transformers, TS-C transformers can be used to continuously supply low voltage loads and they have a reduced voltage drop value. Even after a short-circuit they maintain their temperature below the specified limits.
In addition they are equipped with a thermal sensitive restoring device which automatically restores power when the transformer is sufficiently cooled down or the overload has been removed.





**Fail proof bell transformers TM series**

**Standard: IEC EN 61558-2-8**

Following a short-circuit or an overload use the products may not continue to operate, but they continue assuring separation between primary and secondary circuits, safeguarding the user and adjacent electric parts: the serie includes 8 models with 10, 15, 30 and 40 VA power and 4, 8, 12 and 24 V output voltages.

**Non-inherently short-circuit proof bell transformers TS series**

**Standard: IEC EN 61558-2-8**

Even after a short-circuit they maintain their temperature below the specified limits. In fact they are equipped with a thermal protection device which automatically restores power when the transformer is sufficiently cooled down or the overload has been removed. The TS series includes 10 models with 8, 16, 24 VA power and output voltages of 4, 6, 8 and 12 and 24 V AC.
The TS8/SW series is equipped with an ON-OFF switch on the front side that allows the control of the load connected to transformer's secondary circuit. It includes 5 models with 8 VA power and output voltages of 4, 6, 8 and 12 V.

# Command and signaling technical details

## Control, isolating and safety transformers

**Control, isolating and safety transformers**
The choice of supply voltage for a control circuit must take into account two factors: the safety of users, and the functional reliability of the circuits, which can be dependent on the voltage drop.

**Control transformer**
**Reference standard: CEI EN 61558-2-2:**
Transformer for supplying control circuits, for example commands, signaling, interlocks, etc.

**Isolating transformer**
**Reference standard: CEI EN 61558-2-4:**
Transformer in which the primary and secondary windings are electrically separated by a double or reinforced insulation, to protect the circuit supplied by the secondary against hazards due to accidental simultaneous contact with earth and live parts, or grounded parts that may become live in the event of an insulation fault.

**Safety transformer**
**Reference standard: CEI EN 61558-2-6:**
Isolation transformer for supplying safety extra low voltage circuits (<50 V on no load). Accidental contact with the secondary winding phases can be withstood without any danger.

**Impregnation and tropicalization**
ABB transformers are fully impregnated using a thermal class F resin. This treatment improves the characteristics of the insulating materials, making the transformers suitable for installation in harsh environments. It also augments heat exchanges, thereby lowering the transformer temperature, prevents moisture from penetrating the windings and core, and minimises vibrations and the resultant noise.

**Insulation classes**
The duration of the insulation in the products depends on many factors, and in cases where the insulating material electrically segregates live parts from accessible parts, any alteration in its characteristics may put the safety of the user at risk.
The standards prescribe maximum temperature limits for transformer windings as a function of the insulation class. ABB transformers are constructed using class B materials. The maximum permitted ambient temperature is specified on the transformer rating plate as well as on this catalog.

| Insulation class | T MAX |
|---|---|
| A | 100 °C |
| E | 115 °C |
| B | 120 °C |
| F | 140 °C |
| H | 165 °C |

# Command and signaling technical details

## Control, isolating and safety transformers



### Protection of transformers

#### Protection on primary

On the primary side, the transformer cannot generate any overload by itself. During power up, however, a very high inrush current (approx. 20 In) is generated. Protections should therefore be calibrated in order to prevent their tripping during the transformer connection phase. The most suitable types of protection are:

- aM fuses
- S202 miniature circuit breakers, D characteristic.

**Minimum protection on primary**

| Transformer power (VA) | | 230 V single phase | 400 V single phase |
|---|---|---|---|
| 50 | aM fuse | 0.5 A | 0.315 A |
| 100 | aM fuse | 1 A | 0.63 A |
| | Breaker capacity | 1.6 A | 1 A |
| | Trip characteristic | D | D |
| 160 | aM fuse | 1.6 A | 1 A |
| | Breaker capacity | 3 A | 2 A |
| | Trip characteristic | D | D |
| 200 | aM fuse | 2 A | 1.25 A |
| | Breaker capacity | 3 A | 2 A |
| | Trip characteristic | D | D |
| 250 | aM fuse | 2.5 A | 1.6 A |
| | Breaker capacity | 4 A | 3 A |
| | Trip characteristic | D | D |
| 320 | aM fuse | 3.15 A | 2 A |
| | Breaker capacity | 5 A | 3 A |
| | Trip characteristic | D | D |
| 400 | aM fuse | 4 A | 2.5 A |
| | Breaker capacity | 8 A | 5 A |
| | Trip characteristic | D | D |
| 630 | aM fuse | 6.3 A | 4 A |
| | Breaker capacity | 13 A | 8 A |
| | Trip characteristic | D | D |
| 1000 | aM fuse | 10 A | 6 A |
| | Breaker capacity | 20 A | 13 A |
| | Trip characteristic | D | D |
| 1600 | aM fuse | 16 A | 10 A |
| | Breaker capacity | 32 A | 20 A |
| | Trip characteristic | D | D |
| 2000 | aM fuse | 20 A | 12 A |
| | Breaker capacity | 40 A | 25 A |
| | Trip characteristic | D | D |
| 2500 | aM fuse | 25 A | 16 A |
| | Breaker capacity | 50 A | 32 A |
| | Trip characteristic | D | D |

Notes:
The protection specified in the table is the minimum “recommended” for protecting the supply line.
The breaking capacity of the primary miniature circuit breakers is a function of the supply line.

#### Protection on secondary

The secondary circuit must be protected against overload and short-circuit. Moreover, additional protection may need to be adopted depending on the distribution system type.

- Overload: The tripping current value of the protection used should be equal to or lower than the secondary current of the transformer.
- Short-circuit: Any short-circuit in the most distant point of the line should make the protection device trip in less than 5 seconds (IEC 60364). The protection of the transformer and the protection of the line may coincide when the transformer supplies power to a single line and a full compatibility has been ensured. The suitable secondary protection can be found on the selection tables.

# Command and signaling technical details

## Control, isolating and safety transformers

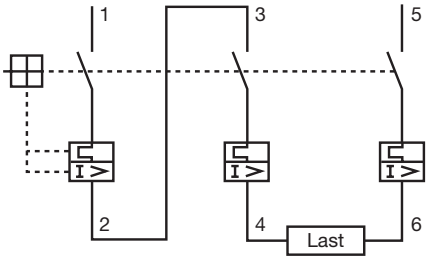
| Transformer | | | | Circuit Breaker for Transformer Protection | | |
|---|---|---|---|---|---|---|
| Type | Rated Power (VA) | Input Voltage (V) | Nominal current (A) | Type | Ordering Code | Current setting (A) |
| TM-...50... | 50 | 230 | 0.22 | MS132-0.25T | 1SAM340000R1002 | 0.22 |
| TM-...100... | 100 | 230 | 0.43 | MS132-0.63T | 1SAM340000R1004 | 0.43 |
| TM-...160... | 160 | 230 | 0.70 | MS132-1.0T | 1SAM340000R1005 | 0.70 |
| TM-...200... | 200 | 230 | 0.87 | MS132-1.0T | 1SAM340000R1005 | 0.87 |
| TM-...250... | 250 | 230 | 1.09 | MS132-1.6T | 1SAM340000R1006 | 1.09 |
| TM-...320... | 320 | 230 | 1.39 | MS132-1.6T | 1SAM340000R1006 | 1.39 |
| TM-...400... | 400 | 230 | 1.74 | MS132-2.5T | 1SAM340000R1007 | 1.74 |
| TM-...630... | 630 | 230 | 2.74 | MS132-4.0T | 1SAM340000R1008 | 2.74 |
| TM-...1000... | 1000 | 230 | 4.35 | MS132-6.3T | 1SAM340000R1009 | 4.35 |
| TM-...1600... | 1600 | 230 | 6.96 | MS132-10T | 1SAM340000R1010 | 6.96 |
| TM-...2000... | 2000 | 230 | 8.70 | MS132-10T | 1SAM340000R1010 | 8.70 |
| TM-...2500... | 2500 | 230 | 10.87 | MS132-12T | 1SAM340000R1012 | 10.87 |
| TM-...50... | 50 | 400 | 0.13 | MS132-0.16T | 1SAM340000R1011 | 0.13 |
| TM-...100... | 100 | 400 | 0.25 | MS132-0.25T | 1SAM340000R1002 | 0.25 |
| TM-...160... | 160 | 400 | 0.40 | MS132-0.4T | 1SAM340000R1003 | 0.40 |
| TM-...200... | 200 | 400 | 0.50 | MS132-0.63T | 1SAM340000R1004 | 0.50 |
| TM-...250... | 250 | 400 | 0.63 | MS132-0.63T | 1SAM340000R1004 | 0.63 |
| TM-...320... | 320 | 400 | 0.80 | MS132-1.0T | 1SAM340000R1005 | 0.80 |
| TM-...400... | 400 | 400 | 1.00 | MS132-1.6T | 1SAM340000R1006 | 1.00 |
| TM-...630... | 630 | 400 | 1.58 | MS132-2.5T | 1SAM340000R1007 | 1.60 |
| TM-...1000... | 1000 | 400 | 2.50 | MS132-4.0T | 1SAM340000R1008 | 2.50 |
| TM-...1600... | 1600 | 400 | 4.00 | MS132-6.3T | 1SAM340000R1009 | 4.00 |
| TM-...2000... | 2000 | 400 | 5.00 | MS132-10T | 1SAM340000R1010 | 6.30 |
| TM-...2500... | 2500 | 400 | 6.25 | MS132-10T | 1SAM340000R1010 | 6.30 |

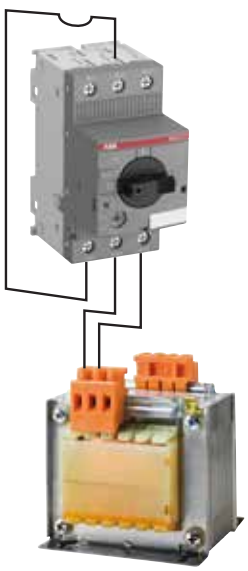
**Properties**

Each type of transformer detailed in the table above can be supplied on the primary side with a line protected by the corresponding Manual Motor Starter.
The indicated devices are calibrated to prevent from tripping during the transformer connection phase.

Caution: the motor starter do not protect the transformer, for this scope another compulsory protection must be installed on the secondary side as detailed on the transformers datasheet.

**Wiring diagram with motorstarter**

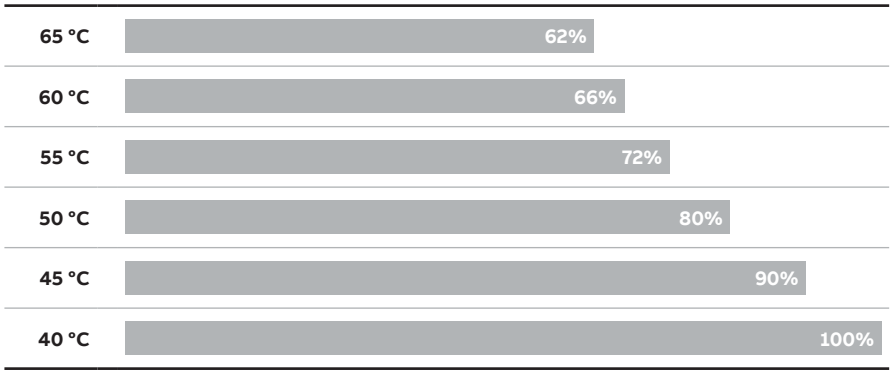


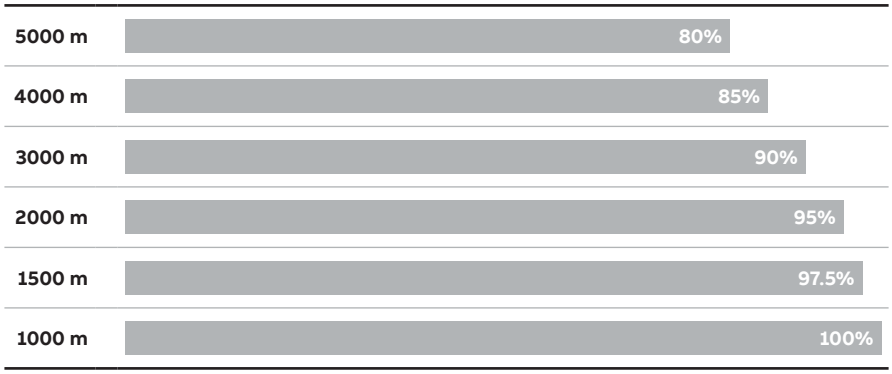
# Command and signaling technical details

## Control, isolating and safety transformers

### Power draw according to temperature and altitude




Power draw % according to temperature




Power draw % according to altitude

**TM-I**

| | Cable section | | | |
|---|---|---|---|---|
| | Primary | | Secondary 115-230 V | |
| Power VA | Min. mm² | Min. mm² | Min. mm² | Min. mm² |
| 50 | 0,5 | 4 | 0,5 | 4 |
| 100 | 0,5 | 4 | 0,5 | 4 |
| 160 | 0,5 | 1,5 | 0,5 | 1,5 |
| 200 | 0,5 | 1,5 | 0,5 | 1,5 |
| 250 | 0,5 | 1,5 | 0,5 | 1,5 |
| 320 | 0,5 | 1,5 | 0,5 | 1,5 |
| 400 | 0,5 | 1,5 | 0,5 | 1,5 |
| 630 | 0,5 | 2,5 | 0,5 | 2,5 |
| 1000 | 0,5 | 2,5 | 0,5 | 2,5 |
| 1600 | 0,5 | 2,5 | 0,5 | 2,5 |
| 2000 | 0,5 | 2,5 | 0,5 | 2,5 |
| 2500 | 0,5 | 2,5 | 0,5 | 2,5 |

# Command and signaling technical details

## Control, isolating and safety transformers

### TM-S

| | Cable section | | | | | |
|---|---|---|---|---|---|---|
| | Primary | | Secondary 12-24V | | Secondary 24-48V | |
| Power VA | Min. mm² | Min. mm² | Min. mm² | Min. mm² | Min. | Max. |
| 50 | 0,5 | 4 | 0,5 | 4 | 0,5 | 4 |
| 100 | 0,5 | 4 | 0,5 | 4 | 0,5 | 4 |
| 160 | 0,5 | 1,5 | 0,5 | 1,5 | 0,5 | 1,5 |
| 200 | 0,5 | 1,5 | 0,5 | 1,5 | 0,5 | 1,5 |
| 250 | 0,5 | 1,5 | 0,5 | 1,5 | 0,5 | 1,5 |
| 320 | 0,5 | 1,5 | 0,5 | 2,5 | 0,5 | 2,5 |
| 400 | 0,5 | 1,5 | 0,5 | 2,5 | 0,5 | 2,5 |
| 630 | 0,5 | 2,5 | 0,5 | 2,5 | 0,5 | 2,5 |
| 1000 | 0,5 | 2,5 | 4 | 10 | - | - |
| 1600 | 0,5 | 2,5 | 1,5 | 50 | - | - |
| 2000 | 0,5 | 2,5 | 1,5 | 50 | - | - |
| 2500 | 0,5 | 2,5 | 1,5 | 50 | - | - |

### TM-C

| | Cable section | | | | | |
|---|---|---|---|---|---|---|
| | Primary | | Secondary 12-24V | | Secondary 24-48V | |
| Power VA | Min. mm² | Min. mm² | Min. mm² | Min. mm² | Min. | Max. |
| 50 | 0,5 | 4 | 0,5 | 4 | 0,5 | 4 |
| 100 | 0,5 | 4 | 0,5 | 4 | 0,5 | 4 |
| 160 | 0,5 | 1,5 | 0,5 | 1,5 | 0,5 | 1,5 |
| 200 | 0,5 | 1,5 | 0,5 | 1,5 | 0,5 | 1,5 |
| 250 | 0,5 | 1,5 | 0,5 | 1,5 | 0,5 | 1,5 |
| 320 | 0,5 | 1,5 | 0,5 | 1,5 | 0,5 | 2,5 |
| 400 | 0,5 | 1,5 | 0,5 | 1,5 | 0,5 | 2,5 |
| 630 | 0,5 | 2,5 | 0,5 | 2,5 | 0,5 | 2,5 |
| 1000 | 0,5 | 2,5 | 0,5 | 2,5 | 4 | 10 |
| 1600 | 0,5 | 2,5 | 0,5 | 2,5 | 1,5 | 50 |
| 2000 | 0,5 | 2,5 | 0,5 | 2,5 | 1,5 | 50 |
| 2500 | 0,5 | 2,5 | 0,5 | 2,5 | 1,5 | 50 |

### Transformer leaks

| Power (VA) | No-load loss (W) | Load loss (W) |
|---|---|---|
| 50 | 4 | 8.5 |
| 100 | 6,5 | 14 |
| 160 | 9 | 21 |
| 200 | 9 | 22 |
| 250 | 12 | 25 |
| 320 | 13 | 30 |
| 400 | 15 | 32 |
| 630 | 23 | 45 |
| 1000 | 36 | 60 |
| 1600 | 50 | 75 |
| 2000 | 60 | 90 |
| 2500 | 65 | 105 |

# Command and signaling technical details

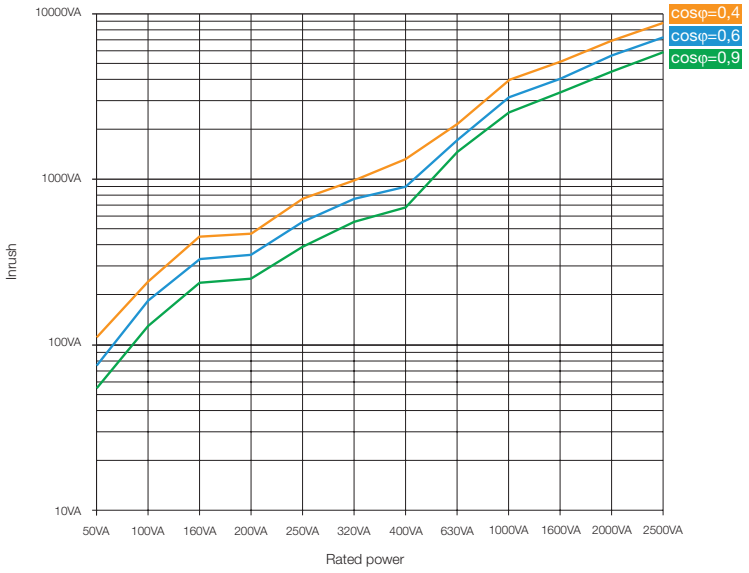
## Control, isolating and safety transformers

### Short circuit voltage, no-load output voltage variations

| Power | (VA) | 50 | 100 | 160 | 200 | 250 | 320 | 400 | 630 | 1000 | 1600 | 2000 | 2500 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vcc ① | (%) | 10.6 | 7.5 | 5.2 | 4.8 | 9.5 | 6.9 | 6 | 4 | 3.5 | 3 | 2.8 | 2.3 |
| ΔV ② | (%) | 11 | 7.8 | 6 | 5.8 | 6.7 | 7 | 5.4 | 4.3 | 3.3 | 2.8 | 2 | 1.8 |

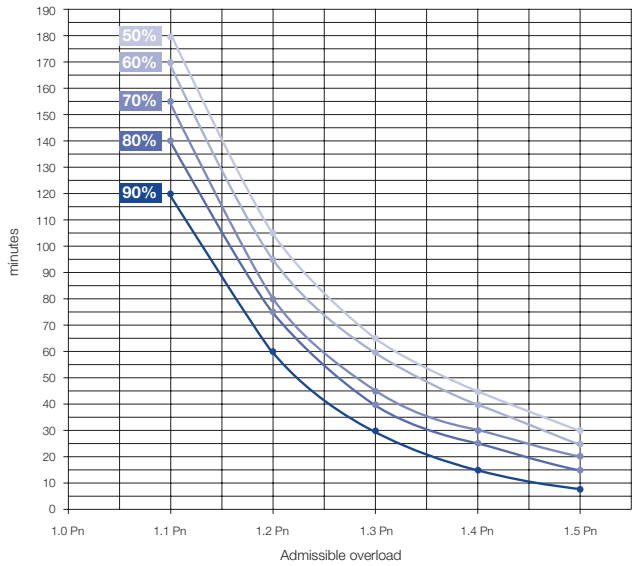
① Percent of rated supply voltage; ② Percent of rated output voltage

### Inrush power trend




### Admissible overload

If the transformer rated power is not drawn on a continuous basis, the transformer may be overloaded, according to the diagram below:




If a transformer is used with an intermittent duty cycle, it can be sized according to the formula:

$$P_{transformer} = P_{intermittent} * \sqrt{\frac{\text{operating time}}{\text{total cycle time (operating + pause time)}}}$$

with time expressed in minutes

# Command and signaling technical details

## Control, isolating and safety transformers

**In control equipment, can I use the two secondary outputs of a single transformer to supply two different auxiliary circuits?**
It is possible to simultaneously use both the secondary outputs of an ABB transformer to supply two circuits with different voltage ratings. The sum of the power draw from each circuit must not exceed the power rating of the transformer.

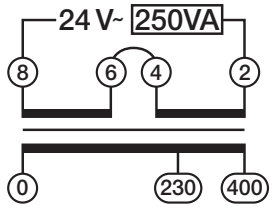
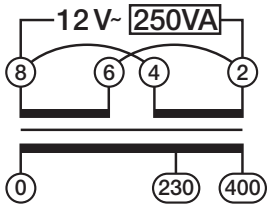
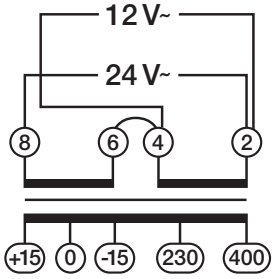
**What type of transformer should be used to supply safety extra low voltage (SELV) circuits?**
To construct a SELV circuit it is necessary to use a safety transformer compliant with the IEC EN 61558-2-6 standard, which guarantees both electrical separation of the systems by means of double insulation and the required extra low voltage (12-24 V±5%).

**Can the secondary windings of two or more ABB single-phase transformers be connected in parallel?**
It is possible to connect in parallel up to a maximum of 3 ABB transformers of equal power, bearing in mind that the total power which can be drawn will be equal to 90% of the sum of the individual powers. Pay great attention to terminal connection and, if necessary, test the circuit first in series and then in parallel.

**In a piece of equipment supplied at 24 V a.c., I need to supply a cooling fan with a voltage rating of 230 V a.c. Can I use**
**a transformer, supplying it from the secondary?**
It is possible to supply the transformers on the secondary side, but due to the nature of their construction, the voltage output from the primary may vary by 10-30% relative to the rated voltage.

**How can I quickly size the power of a transformer?**
P = 0.8 (Σ Pm + Σ Pr + Pa)
Σ Pm = Sum of all continuous power consumptions of contactors
Σ Pr = Sum of all the resistive powers
Pa = Inrush power of the largest contactor

**Use of two output voltages at the same time**

| Case A | Case B | Case C |
|---|---|---|
|  |  |  |
| Use of one output voltage: 24 V | Use of one output voltage: in 12 V | Use of two output voltages:<br>Output 1: 24 V<br>Output 2: 12 V |

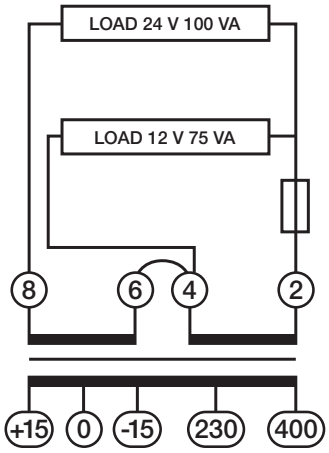
# Command and signaling technical details

## Control, isolating and safety transformers



**Wiring rules for case c:**

- The combined power delivered of the two outputs must not exceed the rated power.
- The power delivered on the output with less voltage must be at most:
- lower voltageP ≤ 0,5 x (ratedP – higher voltageP)
- The protection device for the secondary must be positioned at the point of the passing current of the two outputs and selected based on the higher voltage of the two loads:




The fuse must be selected based on the higher voltage of the load and positioned in the point where the current of the two loads passes.

**Example:**
Transformer with ratedP 250 VA
12-24 V
Fuse 10 A gG or S 202 C10 automatic circuit breaker.

**Examples:**
Transformer with a rated power of 250 VA and 12/24 V secondary voltage:

| | Power on 24 V output | Power on 12 V output | Comment |
|---|---|---|---|
| Es.1 | 250 VA | - | Case A is: the full power is delivered on the 24 V output |
| Es.2 | - | 250 VA | Case B is: the full power is delivered on the 12 V output |
| Es.3 | 100 VA | 75 VA | Case C is: The power is delivered on the two outputs. |
| | | | Rule 1:<br>Total power ≤ ratedP<br>Total power ≤ 250 VA OK<br>Rule 2:<br>lower voltageP ≤ 0,5 x ( ratedP – higher voltageP)<br>lower voltageP ≤ 0,5 x ( 250 – 100)<br>lower voltageP ≤ 75 VA OK |

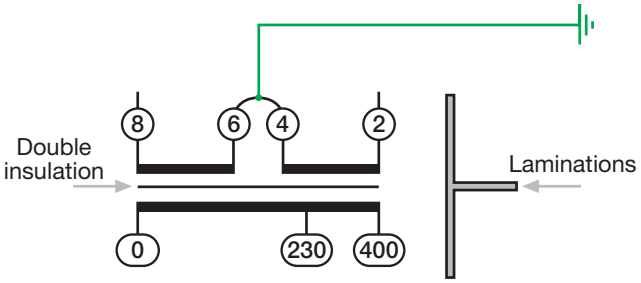
**Connecting the transformer with the central point of the secondary to ground**
Connection of the central point of the secondary of the transformer to ground makes it possible to decrease the potential of the secondary circuit in respect to ground, while maintaining the same output voltage.

# Command and signaling technical details

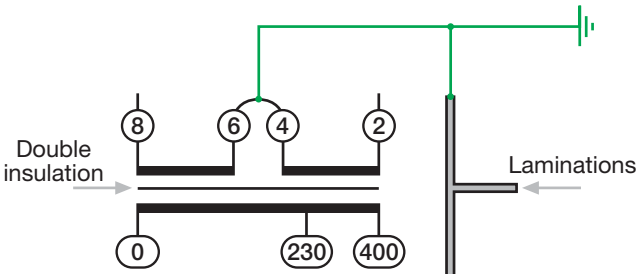
## Control, isolating and safety transformers

**Example:**
with a transformer with 12/24 V output you can connect the central zero and deliver a voltage of -12 V / 0 V / +12 V. The voltage available to the secondary is always 24 V while the difference in potential in respect to the ground does not exceed 12 V, during normal operation.

**Warning for grounding the central point for safety and insulating transformers:**
If the lamination is grounded (with the Faston plug for example), the insulation properties of the safety and insulating transforms will be reduced: the insulation between the secondary and primary becomes one and not double/reinforced, thus decreasing the transformer properties.




**Lamination not grounded**
Connection 12-0-12 preserving double insulation




**Lamination grounded**
The insulation between the primary and secondary is reduced to that between the laminations and primary. Consequently, this assembly takes away the advantage of double insulation.

# Command and signaling technical details

## CP-D power supplies and the CP-D redundancy units

## CP-D range – Technical data

Data at $T_a$ = 25 °C, $U_{in}$ = 230 V AC and rated values, unless otherwise indicated

| Type | | CP-D 12/0.83 | CP-D 12/2.1 |
|---|---|---|---|
| **Input circuit - supply circuit** | | **L, N** | |
| Rated input voltage $U_{in}$ | | 100-240 V AC | |
| Input voltage range | | 90-264 V AC / 120-375 V DC | |
| Frequency range AC | | 47-63 Hz | |
| Typical input current / typical power consumption | at 115 V AC | 200 mA / 12.68 W | 502 mA / 31.14 W |
| | at 230 V AC | 128.3 mA / 13.01 W | 277 mA / 31.2 W |
| Inrush current | at 115 / 230 V AC | 16 A / 32 A | 25 A / 50 A |
| Power failure buffering time | | min. 30 ms | |
| Internal input fuse | | 1 A slow-acting / 250 V AC | 2 A slow-acting / 250 V AC |
| Power factor correction (PFC) | | no | |
| **Indication of operational states** | | | |
| Output voltage | DC ON: green LED | ⎍: output voltage applied | |
| | DC LOW: red LED | ⎍: output voltage too low | |
| **Output circuit** | | **+, -** | **++, --** |
| Rated output voltage | | 12 V DC | |
| Tolerance of the output voltage | | ±1 % | |
| Adjustment range of the output voltage | | - | 12-14 V DC |
| Rated output power | | 10 W | 25 W |
| Rated output current $I_r$ | $T_a \leq 60$ °C | 0.83 A | 2.1 A |
| Derating of the output current | 60 °C < $T_a \leq$ 70 °C | 2.5 %/°C | |
| Maximum deviation with | load change statical | max. 1 % | |
| | change of output voltage within the input voltage range | max. 1 % | |
| Control time | | < 1 ms | |
| Starting time after applying the supply voltage | at $I_r$ | 1000 ms | |
| Rise time | at rated load | typ. 1 ms | |
| Residual ripple and switching peaks | BW = 20 MHz | 50 mV | |
| Parallel connection | | yes, using CP-D RU | |
| Series connection | | yes, to increase voltage | |
| Resistance to reverse feed | | 18 V / 1 s | |
| **Output circuit - No-load, overload and short-circuit behavior** | | | |
| Characteristic curve of output | | hiccup-mode | U/I characteristic curve |
| Short-circuit protection | | continuous short-circuit stability | |
| Short-circuit behavior | | continuation with output power limiting | |
| Current limiting at short circuit | | typ. 1.4 A | typ. 5.9 A |
| Overload protection | | output power limiting | |
| Overvoltage protection | | 15-16.5 V DC | |
| No-load protection | | continuous no-load stability | |
| Starting of capacitive loads | | unlimited | |
| **General data** | | | |
| Efficiency | | typ. 78 % | typ. 82 % |
| Duty cycle | | 100 % | |
| Dimensions | | see “Dimensional drawings” | |
| Material of housing | | plastic | |
| Mounting | | DIN rail (IEC/EN 60715), snap-on mounting without any tool | |
| Mounting position | | horizontal | |
| Minimum distance to other units | horizontal / vertical | 25 mm / 25 mm (0.98 in / 0.98 in) | |
| Degree of protection | housing / terminals | IP20 / IP20 | |
| Protection class | | II | |

# Command and signaling technical details

## CP-D power supplies and the CP-D redundancy units

## CP-D range – Technical data

Data at $T_a$ = 25 °C, $U_{in}$ = 230 V AC and rated values, unless otherwise indicated

| Type | | CP-D 12/0.83 | CP-D 12/2.1 |
|---|---|---|---|
| **Electrical connection - Input circuit / Output circuit** | | | |
| Connecting capacity | fine-strand with wire end ferrule | 0.2-1.5 mm² (24-16 AWG) | 0.2-2.5 mm² (24-14 AWG) |
| | rigid | 0.2-2.5 mm² (26-12 AWG) | 0.2-2.5 mm² (24-12 AWG) |
| Stripping length | | 4-5 mm (0.16-0.2 in) | 7 mm (0.28 in) |
| Tightening torque | | 0.6 Nm (5 lb.in) | 0.7 Nm (6 lb.in) |
| **Environmental data** | | | |
| Ambient temperature range | operation | -40…+70 °C (-40...+158 °F) | |
| | rated load | -40…+60 °C (-40...+131 °F) | |
| | storage | -40…+85 °C (-40...+185 °F) | |
| Altitude during operation | IEC/EN 60068-2-13 | max. 4850 m | |
| Damp heat (cyclic) (IEC/EN 60068-2-30) | | 4 x 24 cycles, 40 °C, 95 % RH | |
| Vibration (sinusoidal) (IEC/EN 60068-2-6) | | 50 m/s², 10 Hz - 2 kHz | |
| Shock (half-sine) (IEC/EN 60068-2-27) | | 40 m/s², 22 ms | |
| **Isolation data** | | | |
| Rated insulation voltage $U_i$ | input circuit / output circuit | 3 kV AC | |
| Pollution degree | | 2 | |
| Overvoltage category | | II | |
| **Standards / Directives** | | | |
| Standards | | IEC / EN 62368-1 | |
| Low Voltage Directive | | 2014/35/EU | |
| EMC Directive | | 2014/30/EU | |
| RoHS Directive | | 2011/65/EU | |
| Protective low voltage | | SELV (IEC60950-1) | |
| **Electromagnetic compatibility** | | | |
| Interference immunity to | | IEC/EN 61000-6-2 | |
| electrostatic discharge | IEC/EN 61000-4-2 | level 4 (4 kV / 8 kV) | level 4 (4 kV / 15 kV) |
| radiated, radio-frequency, electromagnetic field | IEC/EN 61000-4-3 | level 3 (10 V/m) | |
| electrical fast transient/burst | IEC/EN 61000-4-4 | level 4 (4 kV) | |
| surge | IEC/EN 61000-4-5 | level 3 (2 kV L-L) | |
| conducted disturbances, induced by radio-frequency fields | IEC/EN 61000-4-6 | level 3 (10 V) | |
| Interference emission | | IEC/EN 61000-6-3 | |
| high-frequency radiated | | class B | |
| high-frequency conducted | | class B | |

# Command and signaling technical details

## CP-D power supplies and the CP-D redundancy units

## CP-D range – Technical data

Data at $T_a$ = 25 °C, $U_{in}$ = 230 V AC and rated values, unless otherwise indicated

| Type | | CP-D 24/0.42 | CP-D 24/1.3 | CP-D 24/2.5 | CP-D 24/4.2 |
|---|---|---|---|---|---|
| **Input circuit - supply circuit** | | **L, N** | | | |
| Rated input voltage $U_{in}$ | | 100-240 V AC | | | |
| Input voltage range | | 90-264 V AC /120-375 V DC | | | |
| Frequency range AC | | 47-63 Hz | | | |
| Typical input current / typical power consumption | at 115 V AC | 184 mA / 11.62 W | 600 mA / 37.92 W | 1120 mA / 69.3 W | 1800 mA / 117.3 W |
| | at 230 V AC | 120.6 mA / 12 W | 344 mA / 38.16 W | 660 mA / 70.1 W | 900 mA / 114.4 W |
| Inrush current | at 115 / 230 V AC | max. 16 A / 32 A | max. 25 A / 50 A | max. 30 A / 60 A | |
| Power failure buffering time | | min. 30 ms | | min. 60 ms | |
| Internal input fuse | | 1 A slow-acting / 250 V AC | 2 A slow-acting / 250 V AC | | 3.15 A slow-acting / 250 V AC |
| Power factor correction (PFC) | | no | | | |
| **Indication of operational states** | | | | | |
| Output voltage | DC ON: green LED | ⎍: output voltage applied | | | |
| | DC LOW: red LED | ⎍: output voltage too low | | | |
| **Output circuit** | | **+, -** | | **++, --** | |
| Rated output voltage | | 24 V DC | | | |
| Tolerance of the output voltage | | ±1 % | | | |
| Adjustment range of the output voltage | | - | 24-28 V DC | | |
| Rated output power | | 10 W | 30 W | 60 W | 100 W |
| Rated output current $I_r$ | | Ta m 60 °C: 0.42 A | Ta m 60 °C: 1.3 A | Ta m 55 °C: 2.5 A | Ta m 60 °C: 4.2 A |
| Derating of the output current | | 60 °C < Ta m 70 °C: 2.5 %/°C | 60 °C < Ta m 70 °C: 2.5 %/°C | 55 °C < Ta m 70 °C: 2.5 %/°C | 60 °C < Ta m 70 °C: 2.5 %/°C |
| Maximum deviation with | load change statical | max. 1 % | | | |
| | change of output voltage within the input voltage range | max. 1 % | | | |
| Control time | | < 1 ms | | | |
| Starting time after applying the supply voltage | at $I_r$ | 1000 ms | | | |
| Rise time | at rated load | typ. 1 ms | | | |
| Residual ripple and switching peaks | BW = 20 MHz | 50 mV | | | |
| Parallel connection | | yes, using CP-D RU | | | |
| Series connection | | yes, to increase voltage | | | |
| Resistance to reverse feed | | 35 V / 1 s | | | |
| **Output circuit - No-load, overload and short-circuit behavior** | | | | | |
| Characteristic curve of output | | hiccup-mode | U/I characteristic curve | | |
| Short-circuit protection | | continuous short-circuit stability | | | |
| Short-circuit behavior | | continuation with output power limiting | | | |
| Current limiting at short circuit | | typ. 0.78 A | typ. 4.2 A | typ. 6.05 A | typ. 11.5 A |
| Overload protection | | output power limiting | | | |
| Overvoltage protection | | 30-33 V DC | | | |
| No-load protection | | continuous no-load stability | | | |
| Starting of capacitive loads | | unlimited | | | |
| **General data** | | | | | |
| Efficiency | | typ. 80 % | typ. 83 % | typ. 86 % | typ. 89 % |
| Duty cycle | | 100 % | | | |
| Dimensions | | see “Dimensional drawings” | | | |
| Material of housing | | plastic | | | |
| Mounting | | DIN rail (IEC/EN 60715), snap-on mounting without any tool | | | |
| Mounting position | | horizontal | | | |
| Minimum distance to other units | horizontal / vertical | 25 mm / 25 mm (0.98 in / 0.98 in) | | | |
| Degree of protection | housing / terminals | IP20 / IP20 | | | |
| Protection class | | II | | | |

# Command and signaling technical details

## CP-D power supplies and the CP-D redundancy units

## CP-D range – Technical data

Data at $T_a$ = 25 °C, $U_{in}$ = 230 V AC and rated values, unless otherwise indicated

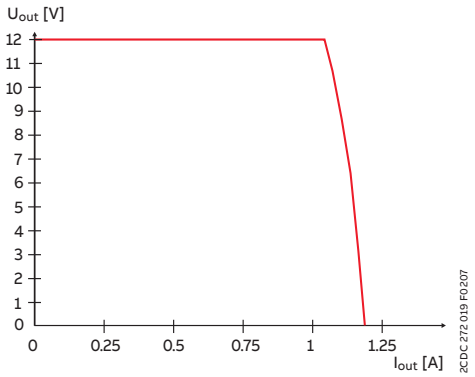
| Type | | CP-D 24/0.42 | CP-D 24/1.3 | CP-D 24/2.5 | CP-D 24/4.2 |
|---|---|---|---|---|---|
| **Electrical connection - Input circuit / Output circuit** | | | | | |
| Connecting capacity | fine-strand with wire end ferrule | 0.2-1.5 mm² (24-16 AWG) | 0.2-2.5 mm² (24-14 AWG) | | |
| | rigid | 0.2-2.5 mm² (26-12 AWG) | 0.2-2.5 mm² (24-12 AWG) | | |
| Stripping length | | 4-5 mm (0.16-0.2 in) | | 7 mm (0.28 in) | |
| Tightening torque | | 0.6 Nm (5 lb.in) | | 0.7 Nm (6 lb.in) | |
| **Environmental data** | | | | | |
| Ambient temperature range | operation | -40…+70 °C | | | |
| | rated load | -40…+60 °C | | -40…+55 °C | -40…+60 °C |
| | storage | -40…+85 °C | | | |
| Altitude during operation | IEC/EN 60068-2-13 | max. 4850 m | | | |
| Damp heat (cyclic) (IEC/EN 60068-2-30) | | 4 x 24 cycles, 40 °C, 95 % RH | | | |
| Vibration (sinusoidal) (IEC/EN 60068-2-6) | | 50 m/s², 10 Hz - 2 kHz | | | |
| Shock (half-sine) (IEC/EN 60068-2-27) | | 40 m/s², 22 ms | | | |
| **Isolation data** | | | | | |
| Rated insulation voltage $U_i$ | input circuit / output circuit | 3 kV AC | | 4 kV AC | 3 kV AC |
| Pollution degree | | 2 | | | |
| Overvoltage category | | II | | | |
| Standards / Directives | | | | | |
| Standards | | IEC / EN 62368-1 | | | |
| Low Voltage Directive | | 2014/35/EU | | | |
| EMC Directive | | 2014/30/EU | | | |
| RoHS Directive | | 2011/65/EU | | | |
| Protective low voltage | | SELV (IEC 60950-1) | | | |
| **Electromagnetic compatibility** | | | | | |
| Interference immunity to | | IEC/EN 61000-6-2 | | | |
| electrostatic discharge | IEC/EN 61000-4-2 | level 4 (4 kV / 8 kV) | level 4 (4 kV / 15 kV) | | level 4 (4 kV / 8 kV) |
| radiated, radio-frequency, electromagnetic field | IEC/EN 61000-4-3 | level 3 (10 V/m) | | | |
| electrical fast transient/burst | IEC/EN 61000-4-4 | level 4 (4 kV) | | | |
| surge | IEC/EN 61000-4-5 | level 3 (2 kV L-L) | | | |
| conducted disturbances, induced by radio-frequency fields | IEC/EN 61000-4-6 | level 3 (10 V) | | | |
| Interference emission | | IEC/EN 61000-6-3 | | | |
| high-frequency radiated | | class B | | | |
| high-frequency conducted | | class B | | | |

# Command and signaling technical details

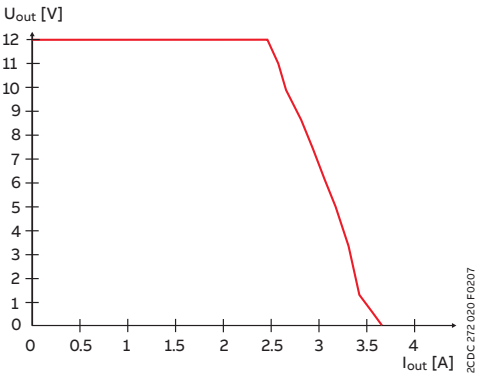
## CP-D power supplies and the CP-D redundancy units

## CP-D range – Technical diagrams

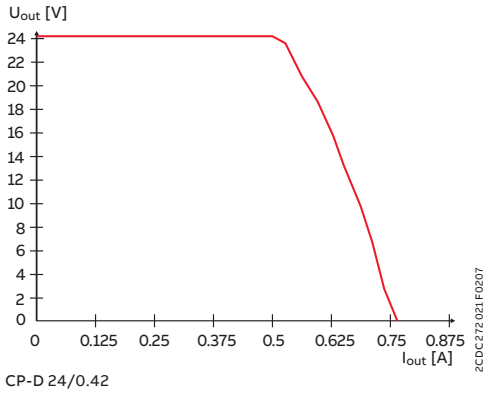
### Characteristic curve of output at $T_a$ = 25 °C



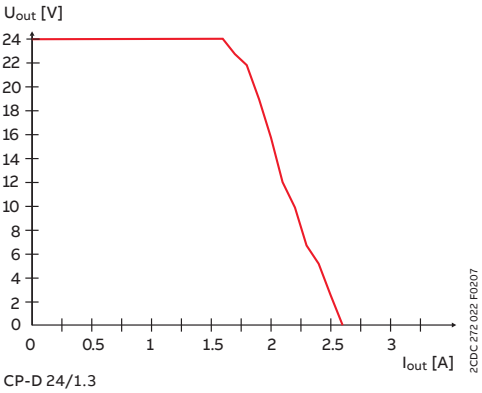

CP-D 12/0.83



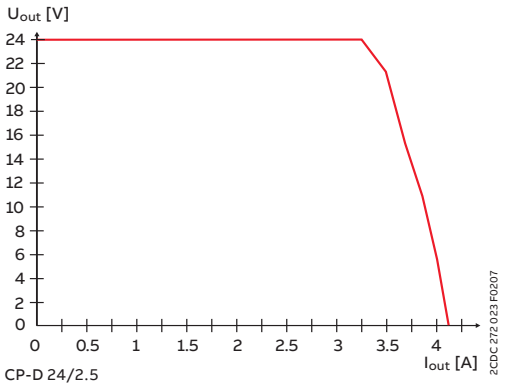

CP-D 12/2.1



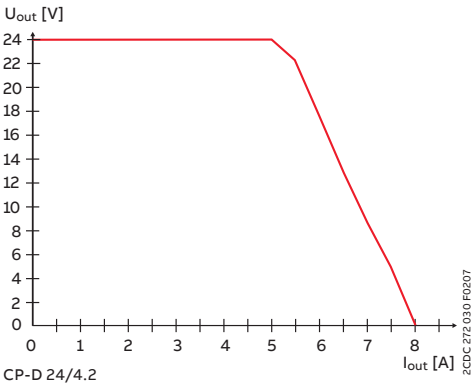

CP-D 24/0.42




CP-D 24/1.3

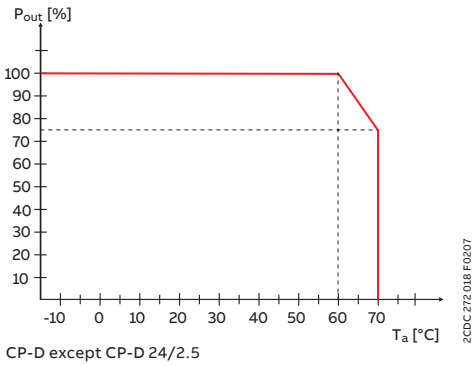



CP-D 24/2.5

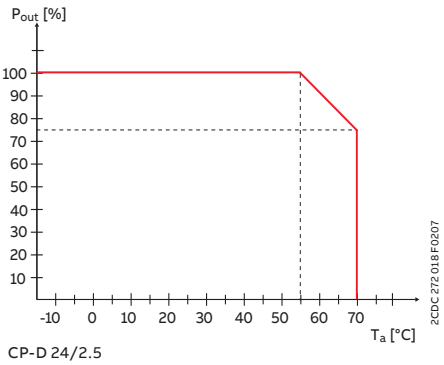



CP-D 24/4.2

### Characteristic curve of temperature at rated output voltage




CP-D except CP-D 24/2.5




CP-D 24/2.5

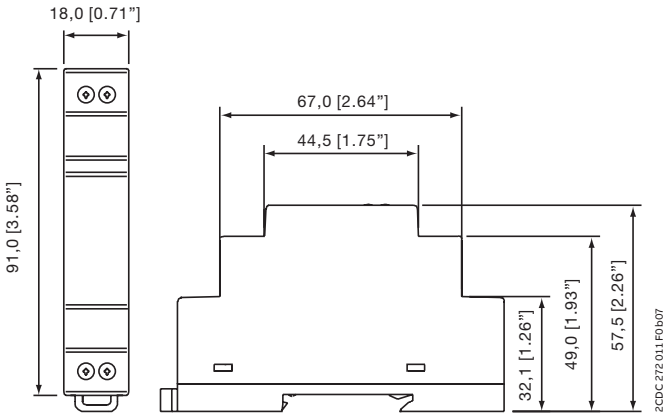
# Command and signaling technical details

## CP-D power supplies and the CP-D redundancy units

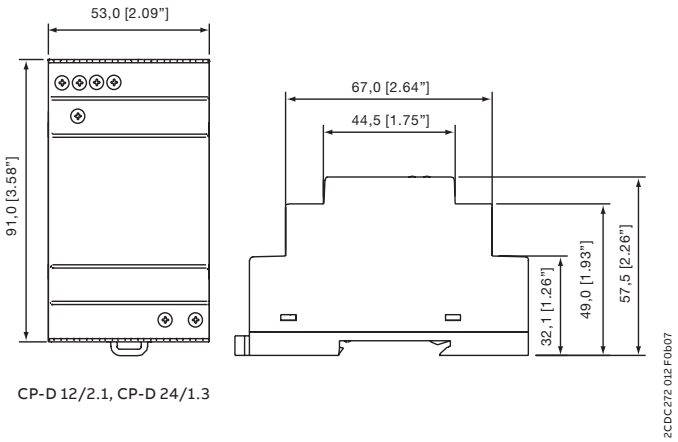
## CP-D range – Technical diagrams

### Dimensional drawings

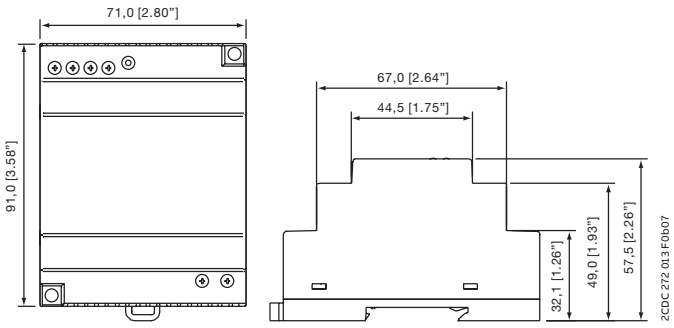
Dimensions in mm



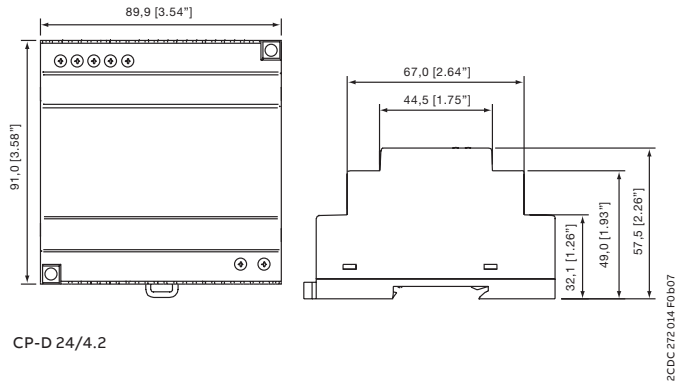

CP-D 12/0.83, CP-D 24/0.42




CP-D 12/2.1, CP-D 24/1.3




CP-D 24/2.5




CP-D 24/4.2

# Command and signaling technical details

## CP-D power supplies and the CP-D redundancy units

## CP-D redundancy unit – Technical diagrams

| Type | | CP-D RU |
|---|---|---|
| **Input circuit - Supply circuit** | | **IN 1 + + -, IN 2 + + -** |
| Rated input voltage $U_{in}$ | | 24 V DC |
| Input voltage range | | 9-35 V DC |
| Rated input current $I_{in}$ per channel | | 5 A |
| Maximum input current per channel | | 10 A for 300 s |
| Transient overvoltage protection | | no |
| **Output circuit** | | **OUT + + +, - - -** |
| Rated output voltage $U_{out}$ | | 24 V DC |
| Voltage drop | | typ. 0.5 V |
| Rated output current $I_{out}$ | | 10 A |
| Resistance to reverse feed | | < 35 V |
| **General data** | | |
| MTBF | | on request |
| Duty cycle | | 100 % |
| Dimensions | | see “Dimensional drawings” |
| Material of housing | | plastic |
| Mounting | | DIN rail, snap-on mounting without any tool |
| Mounting position | | 1, 7 |
| Minimum distance to other units | horizontal / vertical | 25 mm (0.98 in) / 25 mm (0.98 in) |
| **Electrical connection - Input circuit / Output circuit** | | |
| Connecting capacity | fine-strand with (out)wire end ferrule | 0.2-2.5 mm² (24-14 AWG) |
| | rigid | 0.2-2.5 mm² (24-12 AWG) |
| Stripping length | | 7.0 mm (0.28 in) |
| Tightening torque | | 0.67 Nm (6 lb.in) |
| **Environmental data** | | |
| Ambient temperature range | operation | -40...+70 °C |
| | storage | -40...+85 °C |
| Relative humidity | RH at 40 °C | 20-95 %, no condensation |
| Vibration (IEC/EN 60068-2-6) | | mounting by rail:<br>10-500 Hz, 2 G, along X, Y, Z each axis, 60 min for each axis |
| Shock (IEC/EN 60068-2-27) | | 15 G, 11 ms, 3 axis, 6 faces, 3 times for each face |
| **Standards / Directives** | | |
| Standards | | IEC/EN 62368-1, IEC/EN 61204-3 |
| RoHS Directive | | 2011/65/EU |
| **Electromagnetic compatibility** | | |
| Interference immunity to | | EN 55024 |
| electrostatic discharge | IEC/EN 61000-4-2 | level 3, air discharge 8 kV, contact discharge 4 kV |
| radiated, radio-frequency, electromagnetic field | IEC/EN 61000-4-3 | level 3, 10 V/m |
| electrical fast transient/burst | IEC/EN 61000-4-4 | level 3, 2 kV / 5 kHz |
| conducted disturbances, induced by radio-frequency fields | IEC/EN 61000-4-6 | level 3, 10 V |
| Interference emission | | EN 55022 |
| high-frequency radiated | IEC/CISPR 22 / EN 55022 | class B |
| high-frequency conducted | IEC/CISPR 22 / EN 55022 | class B |

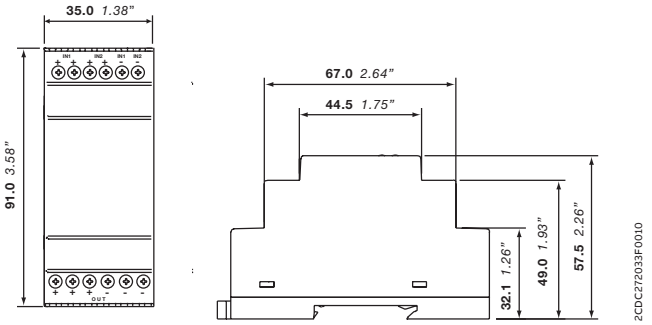
# Command and signaling technical details

## CP-D power supplies and the CP-D redundancy units

## CP-D redundancy unit – Technical diagrams

### Dimensional drawings

Dimensions in mm




CP-D RU

# Command and signaling technical details

## Modular sockets



### Modular sockets

This table gives an indication of the voltage, frequency and modular socket solutions in each country.

Please consider that installation rules may change in each country, and control the local regulations before installing.

| Country | Volt. | | Freq. | | Modular sockets | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 110-130 V | 220-250 V | 50 Hz | 60 Hz | M1011 | M1363 | M1170 | M1173 | M1174 | M1175 |
| Afghanistan | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Albania | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Algeria | ■ | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| American Samoa | ■ | ■ | | ■ | | | ■ | ■ | ■ | ■ |
| Andorra | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Angola | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Argentina | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Armenia | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Aruba | ■ | ■ | | ■ | | | ■ | ■ | ■ | ■ |
| Australia | | ■ | ■ | | | | | | | |
| Austria | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Azerbaijan | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Azores | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Bahrain | | ■ | ■ | | | ■ | | | | |
| Balearic Islands | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Bangladesh | | ■ | ■ | | | ■ | ■ | ■ | ■ | ■ |
| Belarus | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Belgium | | ■ | ■ | | | | | | ■ | |
| Belize | ■ | ■ | | ■ | | ■ | | | | |
| Benin | | ■ | ■ | | | | | | ■ | |
| Bhutan | | ■ | ■ | | | ■ | ■ | ■ | ■ | ■ |
| Bolivia | ■ | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Bosnia & Herzegovina | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Botswana | | ■ | ■ | | | ■ | | | | |
| Brazil | ■ | ■ | | ■ | | | ■ | ■ | ■ | ■ |
| Brunei | | ■ | ■ | | | ■ | | | | |
| Bulgaria | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Burkina Faso | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Burundi | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Cambodia | | ■ | ■ | | | ■ | ■ | ■ | ■ | ■ |
| Cameroon | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Canary Islands | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Cape Verde | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Central African Republic | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Chad | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Channel Islands | | ■ | ■ | | | ■ | | | | |
| Chile | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Comoros | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Congo Dem.Rep. (Zaire) | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Congo, People's Rep. of | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Cook Islands | | ■ | ■ | | | | | | | |
| Croatia | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Cuba | ■ | ■ | | ■ | | | ■ | ■ | ■ | ■ |
| Cyprus | | ■ | ■ | | | ■ | ■ | ■ | ■ | ■ |
| Czech Republic | | ■ | ■ | | | | | | ■ | |
| Denmark | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Djibouti | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Dominica | | ■ | ■ | | | ■ | | | | |
| East Timor | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Egypt | | ■ | ■ | | | | ■ | ■ | ■ | ■ |

| Country | Volt. | | Freq. | | Modular sockets | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 110-130 V | 220-250 V | 50 Hz | 60 Hz | M1011 | M1363 | M1170 | M1173 | M1174 | M1175 |
| Equatorial Guinea | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Eritrea | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Estonia | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Ethiopia | | ■ | ■ | | ■ | | ■ | ■ | ■ | ■ |
| Faeroe Islands | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Falkland Islands | | ■ | ■ | | | ■ | | | | |
| Fiji | | ■ | ■ | | | | | | | |
| Finland | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| France | | ■ | ■ | | | | | | ■ | |
| French Guyana | ■ | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Gabon | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Gambia | | ■ | ■ | | | ■ | | | | |
| Georgia | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Germany | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Ghana | | ■ | ■ | | | ■ | | | | |
| Gibraltar | | ■ | ■ | | | ■ | ■ | ■ | ■ | ■ |
| Greece | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Greenland | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Grenada | | ■ | ■ | | | ■ | | | | |
| Guadeloupe | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Guatemala | ■ | ■ | | ■ | | ■ | | | | |
| Guinea | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Guinea-Bissau | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Guyana | | ■ | | ■ | | ■ | | | | |
| Hong Kong | | ■ | ■ | | | ■ | | | | |
| Hungary | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Iceland | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| India | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Indonesia | ■ | ■ | ■ | | | ■ | ■ | ■ | ■ | ■ |
| Iran | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Iraq | | ■ | ■ | | | ■ | ■ | ■ | ■ | ■ |
| Ireland | | ■ | ■ | | | ■ | | | | |
| Isle of Man | | ■ | ■ | | | ■ | ■ | ■ | ■ | ■ |
| Israel | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Italy | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Ivory Coast | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Jordan | | ■ | ■ | | ■ | ■ | ■ | ■ | ■ | ■ |
| Kazakhstan | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Kenya | | ■ | ■ | | | ■ | | | | |
| Kiribati | | ■ | ■ | | | | | | | |
| Korea, North | | ■ | | ■ | | | ■ | ■ | ■ | ■ |
| Korea, South | ■ | ■ | | ■ | | | ■ | ■ | ■ | ■ |
| Kuwait | | ■ | ■ | | | ■ | ■ | ■ | ■ | ■ |
| Kyrgyzstan | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Laos | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Latvia | | ■ | ■ | | | | ■ | ■ | ■ | ■ |

Main countries are highlighted

# Command and signaling technical details

## Modular sockets

| Country | Volt. | | Freq. | | Modular sockets | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 110-130 V | 220-250 V | 50 Hz | 60 Hz | M1011 | M1163 | M1170 | M1173 | M1174 | M1175 |
| Lebanon | ■ | ■ | ■ | | | ■ | ■ | ■ | ■ | ■ |
| Lithuania | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Luxembourg | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Macau | | ■ | ■ | | | ■ | | | | |
| Macedonia | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Madagascar | ■ | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Madeira | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Malawi | | ■ | ■ | | | ■ | | | | |
| Malaysia | | ■ | ■ | | | ■ | | | | |
| Maldives | | ■ | ■ | | ■ | ■ | ■ | ■ | | |
| Mali | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Malta | | ■ | ■ | | | ■ | | | | |
| Martinique | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Mauritania | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Mauritius | | ■ | ■ | | | ■ | ■ | ■ | ■ | ■ |
| Moldova | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Monaco | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Mongolia | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Montenegro | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Morocco | ■ | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Mozambique | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Myanmar (form. Burma) | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Nauru | | ■ | ■ | | | | | | | |
| Nepal | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Netherlands | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Netherlands Antilles | ■ | ■ | ■ | ■ | | | ■ | ■ | ■ | ■ |
| New Caledonia | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| New Zealand | | ■ | ■ | | | | | | | |
| Niger | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Nigeria | | ■ | ■ | | | ■ | | | | |
| Norway | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Oman | | ■ | ■ | | | ■ | | | | |
| Pakistan | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Papua New Guinea | | ■ | ■ | | | | | | | |
| Paraguay | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Peru | | ■ | | ■ | | | ■ | ■ | ■ | ■ |
| Philippines | | ■ | | ■ | | | ■ | ■ | ■ | ■ |
| Poland | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Portugal | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Qatar | | ■ | ■ | | | ■ | | | | |
| Réunion Island | | ■ | ■ | | | | | | ■ | |
| Romania | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Russian Federation | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Rwanda | | ■ | ■ | | ■ | | ■ | ■ | ■ | ■ |

| Country | Volt. | | Freq. | | Modular sockets | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 110-130 V | 220-250 V | 50 Hz | 60 Hz | M1011 | M1163 | M1170 | M1173 | M1174 | M1175 |
| Samoa | | ■ | ■ | | | | | | | |
| San Marino | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Saudi Arabia | ■ | ■ | | ■ | | ■ | ■ | ■ | ■ | ■ |
| Senegal | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Serbia | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Seychelles | | ■ | ■ | | | ■ | | | | |
| Sierra Leone | | ■ | ■ | | | ■ | | | | |
| Singapore | | ■ | ■ | | | ■ | | | | |
| Slovakia | | ■ | ■ | | | | | | ■ | |
| Slovenia | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Somalia | ■ | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Spain | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Sri Lanka | | ■ | ■ | | | ■ | | | | |
| St. Kitts and Nevis | | ■ | | ■ | | ■ | | | | |
| St. Lucia | | ■ | ■ | | | ■ | | | | |
| St. Vincent | | ■ | ■ | | | ■ | ■ | ■ | ■ | ■ |
| Sudan | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Suriname | ■ | ■ | | ■ | | | ■ | ■ | ■ | ■ |
| Sweden | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Swiss | | ■ | ■ | | ■ | | ■ | ■ | ■ | ■ |
| Syria | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Tahiti | ■ | ■ | | ■ | | | ■ | ■ | ■ | ■ |
| Tajikistan | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Tanzania | | ■ | ■ | | | ■ | | | | |
| Thailand | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Togo | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Tonga | | ■ | ■ | | | | | | | |
| Tunisia | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Turkey | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Turkmenistan | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Uganda | | ■ | ■ | | | ■ | | | | |
| Ukraine | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| United Arab Emirates | | ■ | ■ | | | ■ | | | | |
| United Kingdom | | ■ | ■ | | | ■ | | | | |
| Uruguay | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Uzbekistan | | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| Vietnam | ■ | ■ | ■ | | | ■ | ■ | ■ | ■ | ■ |
| Yemen, Rep. of | | ■ | ■ | | | ■ | | | | |
| Zambia | | ■ | ■ | | | ■ | ■ | ■ | ■ | ■ |
| Zimbabwe | | ■ | ■ | | | ■ | | | | |

**Fuse detail**

2CSC400759F0001

**Indicator light detail**

# Command and signaling technical details

## Modular sockets

### M1175-FL modular socket with fuse

**Operating principle**

The modular sockets with fuse are ideal wherever continuity of service is essential. The embedded fuse protecting the phase prevents tripping of the main protection switch in the event of a malfunction of the device plugged into the socket.

**Application environments**

The modular sockets are suitable for all electrical distribution or automation panels, to allow connection of non modular equipment such as measuring and maintenance instruments etc.

**Example of installation**

As illustrated in the figures, a modular socket allows to supply non modular devices directly from the electrical panel.

If the connected device malfunctions, there is the risk that the entire electrical system will be put out of service due to tripping of an MCB.

This is prevented by blowing of the fuse incorporated into the socket, thus assuring continuity of service.