# IGBT BASED
# DC SOLID STATE RELAY

**SDI0501700**

▶ **Latest IGBT technology generation.**

▶ **Ultra low drop out voltage at on-state (low power losses).**

▶ **Built-in protection against overvoltage and fasts transients bursts.**

▶ **Built-in protection against overload and shorts-circuits of the load.**

▶ **Built-in over-temperature protection.**

▶ **Pluggable control connector with spring terminals**

| | |
|---|---|
| **Nominal Control voltage** | **24&48VDC** |
| **Nominal. output voltage** | **750VDC** |
| **Nom. load current with heatsink** | **50ADC** |

| Load voltage range | Load current range | Control input voltage | Supply voltage range | Visualizations | Dimensions (WxHxD) | Weight |
|---|---|---|---|---|---|---|
| 12 to 940VDC | 0 à 50A (with heatsink) | 24-48VDC | 24-48VDC | 3 LEDs : -SUPPLY (Green) -STATUS (Orange) -FAULT (Red) | 157 x 68 x 83 (mm) | 1050g |

| **Fig. 1** | **INTERNAL DIAGRAM** |
|---|---|

| Fig. 2 | EXAMPLES OF WIRING DIAGRAM |
|--------|---------------------------|
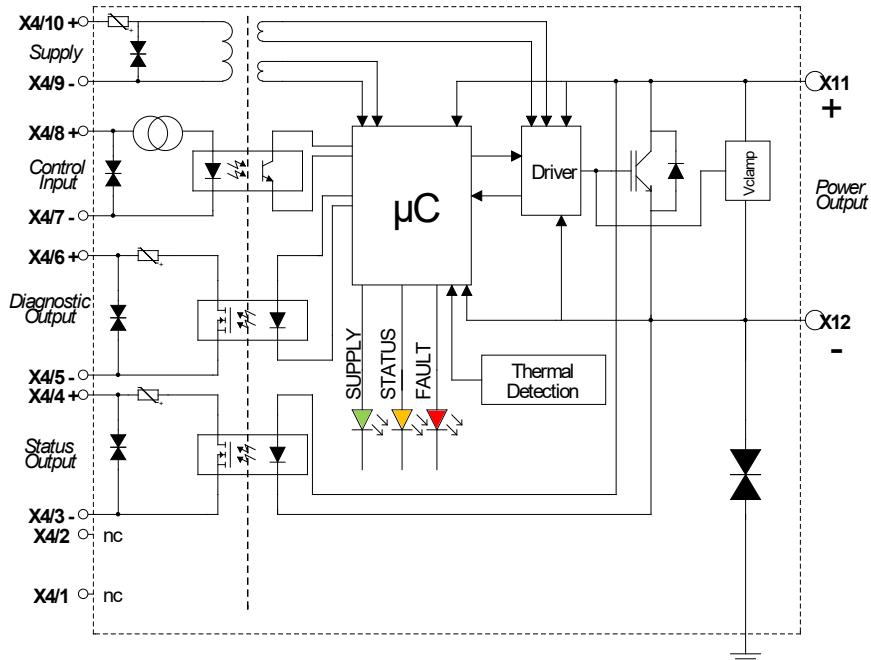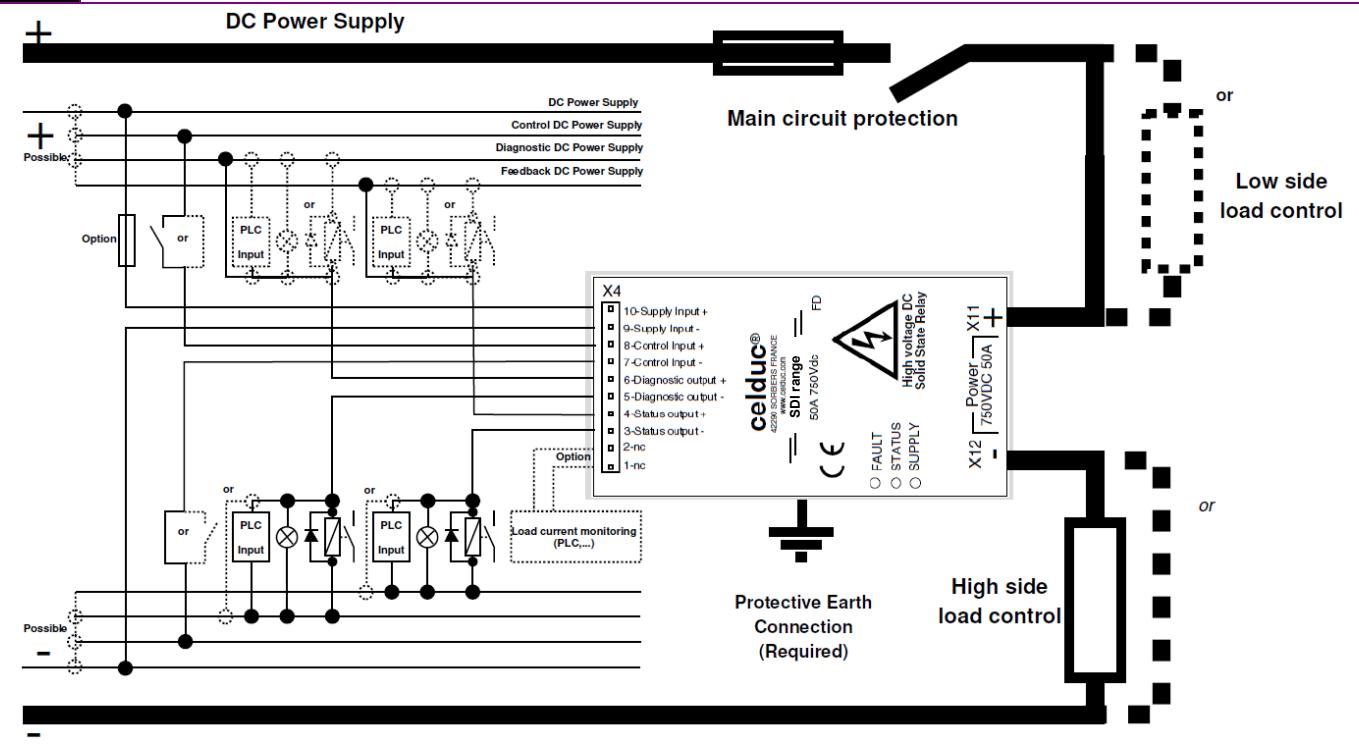


## SUPPLY INPUT

| | CHARACTERISTIC | LABEL | VALUE | INFO. |
|---|---|---|---|---|
| **SUPPLY CIRCUIT** | Marking | | X4/10 & X4/9 | |
| | Nom. supply voltage | Us | **24 & 48Vdc** | |
| | Min. supply voltage | Us min | 16.8Vdc | |
| | Max. supply voltage | Us max | 60Vdc | |
| | Max. peak voltage | Usp | 67.2Vdc | @pulse<1s |
| | Typ. operating current | Is | <100mA | |
| | Max. reverse current | -Is | <1µA | |
| | Overvoltage protection | | Transient voltage suppressor | |
| | Internal Overcurrent and shorts-circuits protection | | Thermistor | |
| | Reverse polarity protection | | YES | |
| | Under Voltage Lockout protection UVLO | | YES | |

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## CONTROL INPUT

| | CHARACTERISTIC | LABEL | VALUE | INFO. |
|---|---|---|---|---|
| INPUT CIRCUIT | Marking | | X4/8 & X4/7 | |
| | Control voltage range | **Uc** | **24 & 48Vdc** | |
| | Current consumption | **Ic** | <5mA | See fig. 3 |
| | Max. reverse current | **-Ic** | <1µA | |
| | Min. switch-on voltage | **Uc_on_min** | 14.4V | |
| | Min. releasing voltage | **Uc_off_min** | 4Vdc | |
| | Max. input voltage | **Ucmax** | 60Vdc | |
| | Max. reverse voltage | **-Ucmax** | 60Vdc | |
| | Input impedance | **Re** | Current limitation | |

| Fig. 3 | CONTROL INPUT CHARACTERISTICS |
|---|---|
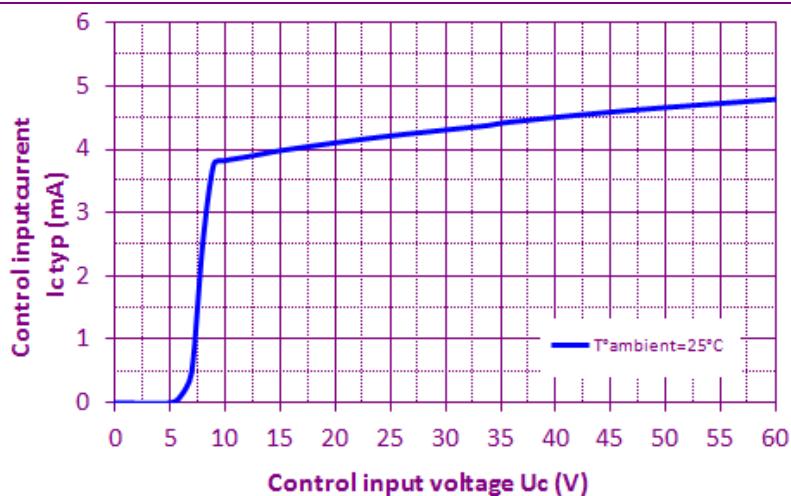
## POWER OUTPUT

| CHARACTERISTIC | LABEL | VALUE | INFO. |
|---|---|---|---|
| Nom. power voltage | Ue | 750Vdc | |
| Min. power voltage | Uemin | 12Vdc | |
| Max permanent voltage | Umax1 | 940Vdc | |
| Non-permanent voltage | Umax2 | 1000Vdc | @pulse<5min |
| Repetitive peak voltage | Umax3 | 1270V | @pulse<20ms |
| Max. nominal currents | Ice | 50A | See fig. 4 Values with heatsink |
| Min. nominal currents | Ice min | 0.1A[(*1)] | |
| Non-repetitive IGBT peak overload current | Icepeak | 300A | See fig. 8 |
| Max. leakage current | Icelk | 15µA | |
| On-state voltage | VCEsat | 1.08V | See fig. 5 @Ie=50A |
| Reverse voltage (internal diode) | -Ut | 1.12V | See fig. 6 @Ie=50A Tj=125°C |
| Max. inductive load (load + line length) | | 5mH | See fig. 9 @Ie=50A Tjmax=125°C |
| Overvoltage protection | | Activ Clamp Protection | |
| Shorts-circuits/Overload protection | | Automatic Desaturation detection | |
| Nominal desaturation current detection | Ice desat | 225A | @Tj=25°C |
| Min Desaturation detection time | | 7µs | |
| Max. single pulse avalanche energy | Eep | 20J | @tpulse=1ms |
| Max. repetitive pulse avalanche energy | Eep | 5J | @Ie=50A |
| Typ. output capacitance | Cout | 1.65nf | @Uc=0 |
| IGBT junction/case thermal resistance | Rthjc | 0.054K/W | See fig. 7 |
| Reverse diode junction/case thermal resistance | Rthjc | 0.11K/W | See fig. 7 |
| Built-in heatsink thermal resistance vertically mounted | Rthra | 2.4K/W | @ΔTra=65°C |
| Heatsink thermal time constant | Tthra | 30min | @ΔTra=65°C |
| Maximum junction temperature | Tjmax | 105°C | @Ie=50A |
| Storage temperature | Tstg | -40->+85°C | |
| Operating temperature | Tamb | -40->+70°C | |
| Ambient humidity | Hr | 5 à 95% | |

POWER CIRCUIT

(*1)    To have a good diagnostic operation, we recommend a minimum load current of 3Amps.

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**Fig. 4** | **POWER DISSIPATION AND LOAD CURRENT LIMIT VS TEMPERATURE**

Please refere to the installation notice for
precautions about mounting the device on a heatsink.



50% on State

No heatsink | 1,5K/W | 1K/W | 0,75K/W | 0,55K/W

Puissance Dissipée / Power Dissipation (W)

Courant de charge /Load current (A)

Température ambiante / Ambient temperature (°C)
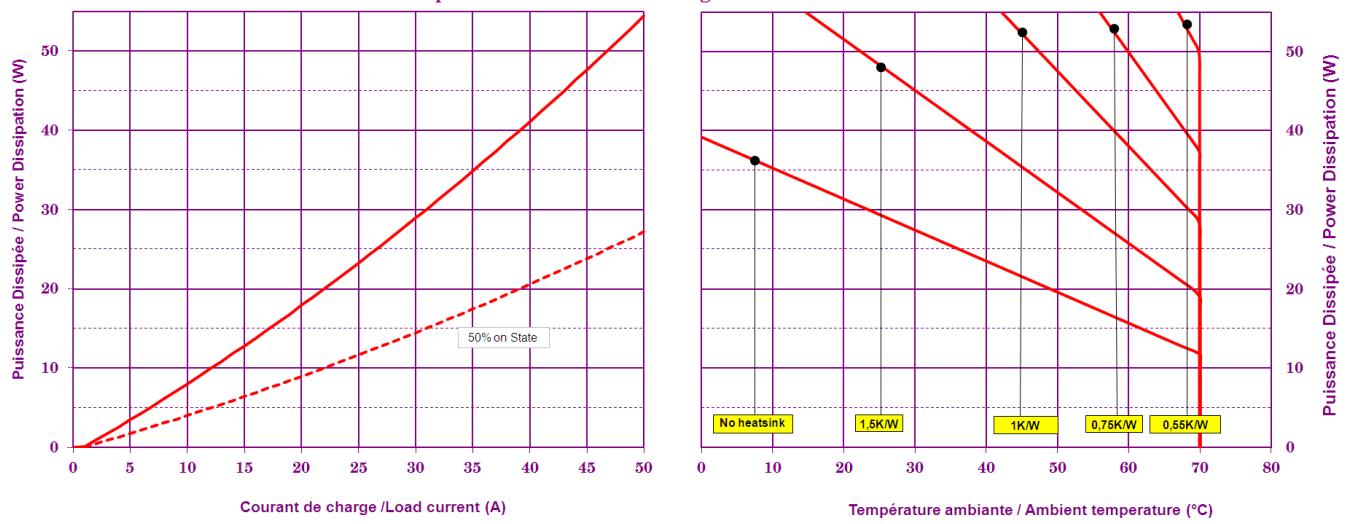
**Fig. 5** | **IGBT DROP OUT VOLTAGE**



Ice (A)

Vce sat (V)

Tj=25°C
Tj=125°C
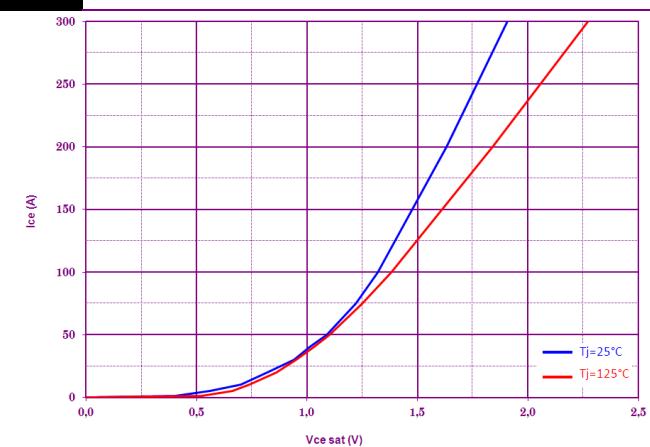
**Fig. 6** | **REVERSE DIODE DROP OUT VOLTAGE**



-Ice (A)

-Ut (V)

Tj=25°C
Tj=125°C
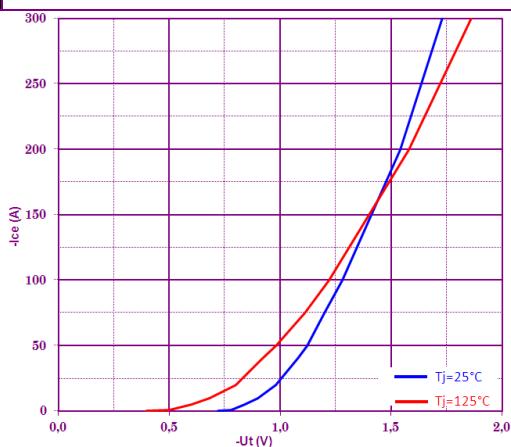
**Fig. 7** | **POWER ELEMENT TRANSCIENT THERMAL IMPEDANCE vs. PULSE DURATION**



Zth (k/W)

t (sec)

Zth Diode
Zth IGBT
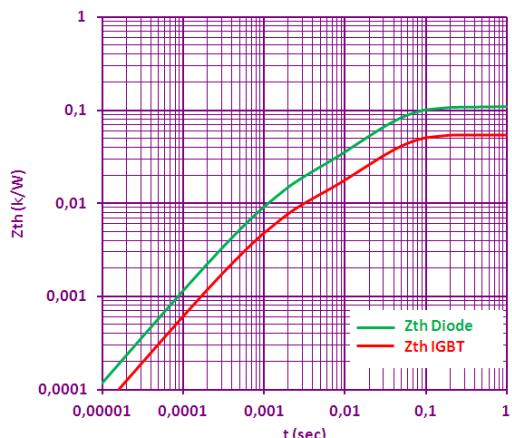
**Fig. 8** | **ON-STATE PEAK OVERLOAD CURRENT vs. PULSE DURATION**
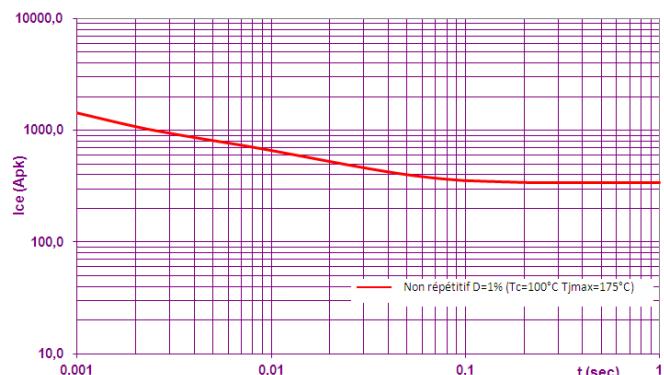


Ice (Apk)

t (sec)

Non répétitif D=1% (Tc=100°C Tjmax=175°C)

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| Fig. 9 | **MAXIMUN TOTAL INDUCTANCE (LOAD+LINE) ADMISSIBLE BY THE IGBT** | Fig. 10 | **MAXIMUN TIME CONSTANT WITH RL INDUCTIVE LOAD** |
|---|---|---|---|
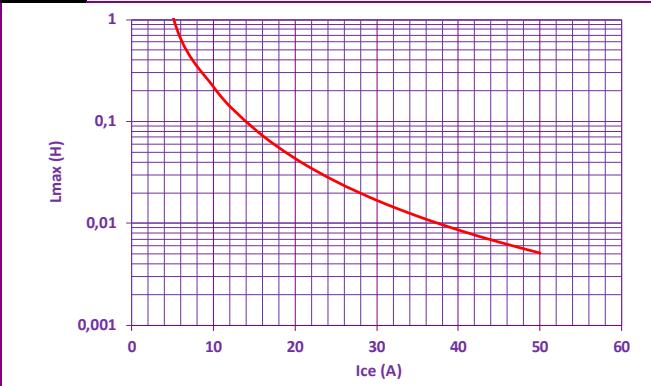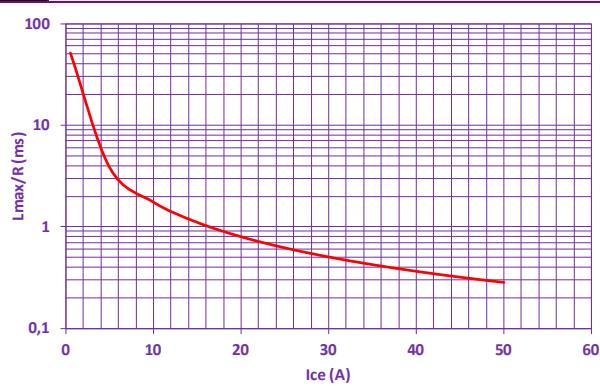
## DIAGNOSTIC & STATUS OUTPUTS

| CHARACTERISTIC | LABEL | VALUE | INFO. |
|---|---|---|---|
| Marking | | X4/6 & X4/5 (Diagnostic Output)<br>X4/4 & X4/3 (Status Output) | |
| Type of contact | | Semiconductor (Photo-MOS)<br>NO Contact ("Opened" without activation or supply) | |
| Nominal switching voltage | | **24 & 48Vdc** | |
| Max. switching voltage | | 60Vdc | |
| Min. switching voltage | | 16.8Vdc | |
| Max. switching current | | 50mA | |
| Min. switching current | | 0.1mA | |
| Max. on-state resistance | **Rds_on** | 35Ω | |
| Overvoltage protection | | Transient voltage suppressor | |
| Overload and shorts-circuits protection | | Thermistor | |
| Reverse polarity protection | | YES | |

| SUPPLY INPUT | CONTROL INPUT | MAIN VOLTAGE | LOAD CIRCUIT | RELAYS BASEPLATE TEMPERATURE | SUPPLY LED | STATUS LED | FAULT LED | DIAGNOSTIC OUTPUT | STATUS OUTPUT |
|---|---|---|---|---|---|---|---|---|---|
| 0 | x | x | x | x | ○ | ○ | ○ | Open | Open |
| UVLO | x | x | x | x | ◐ green | ○ | ○ | Open | Open |
| 1 | 0 | YES | OK | <90°C | ● green | ○ | ○ | Open | Open |
| 1 | 1 | YES | OK | <90°C | ● green | ● orange | ○ | Open | Closed |
| 1 | 0 | NO | OK | <90°C | ● green | ○ | ◐ red | Closed | Open |
| 1 | 1 | NO | OK | <90°C | ● green | ● orange | ◐ red | Closed | Closed |
| 1 | 0 | YES | BREAKING | <90°C | ● green | ● orange | ◐ red | Closed | Open |
| 1 | 1 | YES | BREAKING | <90°C | ● green | ● orange | ◐ red | Closed | Closed |
| 1 | 1 | YES | OVERLOAD [*2] | <90°C | ● green | ○ | ◑ | Closed | Open |
| 1 | 1 | YES | SHORT-CIRCUIT [*2] | <90°C | ● green | ○ | ◑ | Closed | Open |
| 1 | 0 | x | ≠0A | x | ● green | ● orange | ⊖ | Closed | Closed |
| 1 | x | x | x | >90°C | ● green | ○ | ● red | Open | Closed |

LEGEND:

◐ Flashing ton=0,1s toff=0,1s

◑ Flashing ton=0,1s toff=2s

⊖ Flashing ton=1s toff=1s

◐ green Flashing ton=0,1s toff=0,1s

(*2) After four Short-circuits and/or overload detection , the relay will be block for safety, this mode is indicated by a flasing chaser of leds, in this case the diagnostic output would be closed and the Status output would be open, to cancel this fault, you should reset the product with supply input (pin X4/10 et X4/9).

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## TIME CHARACTERISTICS

| Fig. 2 | TIME DIAGRAMS |
|---|---|

**TURN-ON**

Uc (control)

Ut (switch)

tdon | ton

**TURN-OFF**

Uc (control)

Ut (switch)
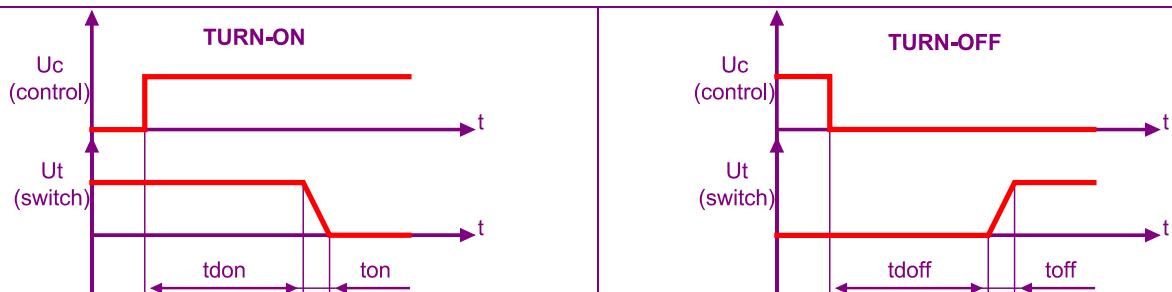
tdoff | toff

### TIME CHARACT.

| CHARACTERISTIC | LABEL | VALUE | INFO. |
|---|---|---|---|
| Turn on time | ton | 1ms | Rload=20Ω Lload=5mH Ue=750Vdc |
| Turn on delay | tdon | 1.5ms | |
| Turn off time | toff | 300µs | Rload=20Ω Lload=5mH Ue=750Vdc |
| Turn off delay | tdoff | 1.5ms | |
| Max. On-Off frequency | F(on-off) | 1Hz | |

## GENERAL INFORMATION

### WIRING

| Connections | | Power | Control | |
|---|---|---|---|---|
| Type | | M6 Hexagonal screw | Cage spring with manual lever plug | |
| Tightening torque | | 3.75Nm | By pushing with DIN 5264 Screwdriver 0.4x2.5 | |
| Recommended wiring type | | round tabs, eyelet type, M6 | 1x1.5mm2 max | |

| | | | |
|---|---|---|---|
| Plastic material housing | WELLAMID 6600 PA66 HWV0CP | | |
| Mounting | 4 screws M5 | | See mounting sheet |
| Noise level | No audible noise | | |
| Weight | 1050g | | |

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## STANDARDS

| GENERAL | | | | |
|---|---|---|---|---|
| | Standards | | EN50155 | |
| | Temperature class | | TX | |
| | Protection level | | IP00 | |
| | CE marking | | Yes | |
| | UL, cULUS and VDE approvals | | Possible on request | |
| | Reliability | | MTTF = 118 years<br>MTTFd ≥ 24 years | ISO13849-1<br>@40°C/750Vdc<br>and 50A |

| INSULATION | | | | |
|---|---|---|---|---|
| | Standards | | EN50124-1 | |
| | Overvoltage categories | | OV4 | |
| | Pollution Degree | | PD2 | |
| | Rated impulse voltage between Input and Power outputs | Uni | 8kV | |
| | Rated insulation voltage between Input and Power outputs | Unm | 0.9kV | |
| | Rated impulse voltage between different signals of X4 connector (supply, control input, Diagnostic output and Status output) | | 2.5kV | |
| | Rated impulse voltage between Power output and ground (Aluminum baseplate) | | 4kV[*3] | |

[*3] Warning: The rated impulse voltage test can damage the reliability of some components, we invite you to do this insulation test with reduced voltages (1500Vpk).

| E.M.C. IMMUNITY | TYPE OF TEST | STANDARD | RESULTS | TESTS STANDARD |
|---|---|---|---|---|
| | E.S.D. (Electrostatic discharges) | EN50121-3-2 | PASS | EN61000-4-2 |
| | Radiated electromagnetic fields | EN50121-3-2 | PASS | EN61000-4-3 |
| | Fast transients bursts | EN50121-3-2 | PASS | EN61000-4-4 |
| | Electric chocks | EN50121-3-2 | PASS | EN61000-4-5 |
| | Radio-frequency fields | EN50121-3-2 | PASS | EN61000-4-6 |

| E.M.C. EMISSION | | | | |
|---|---|---|---|---|
| | Radiated and conducted disturbances | EN50121-3-2 | PASS | EN55011 |

| OTHERS | | | | |
|---|---|---|---|---|
| | Fire & smoke protection | EN45545-2 | HL2 with requirement R22 | |
| | Mechanical test Shocks and Vibrations | EN61373 | PASS | |

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## DIMENSIONS

| Fig. 8 | DIMENSIONS (in mm) |
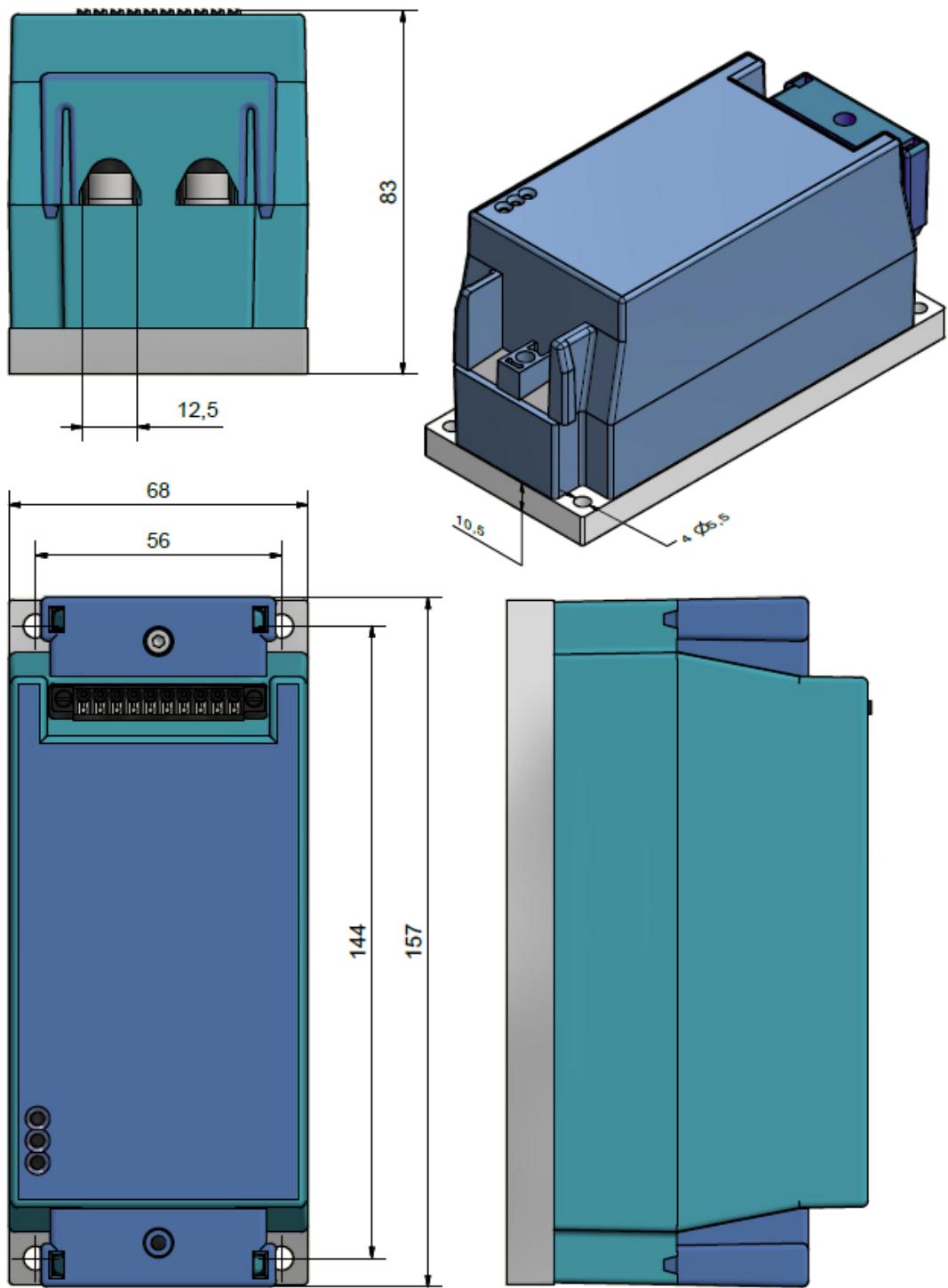


83

12,5

68

56

144

157

10,5

4 Ø5,5

## CONNECTIONS-WIRING

### CONTROL CONNECTOR

X4/1

X4/10

==>Spring connector
« PUSH IN »

3.81

1.5 mm²

180°
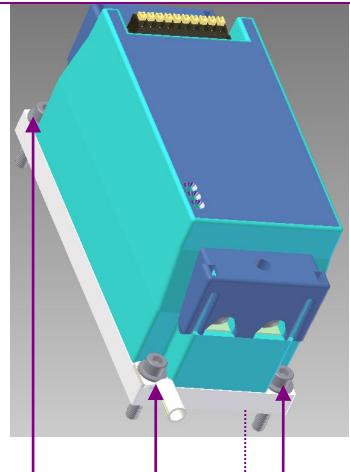
### GROUND WIRING

The Ground-wiring of the product with the rest of installation is made by screwing directly to the relay baseplate with one of the 4 holes (M5).
Fastening screws and round terminals (power, ground…) are not supplied with the product.

### POWER WIRING

X12  -

X11  +

B max=12mm
d min=6.2mm
N max=7mm
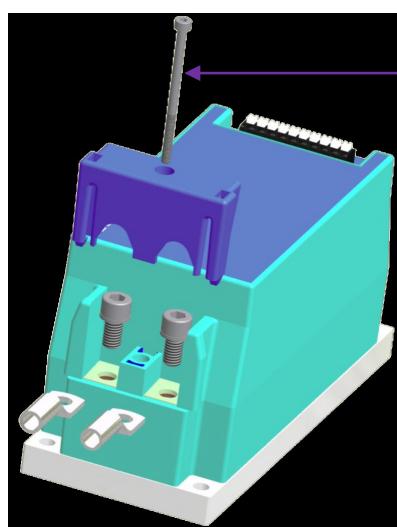
Locking of plastic covers by screws CHC M3
Maximum tightening torque: 1.0Nm

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*OPTIONS*

### *Control connector with screws :*

**3.81**  **1.5 mm²**  **90°**
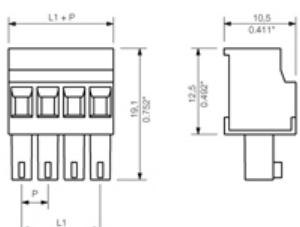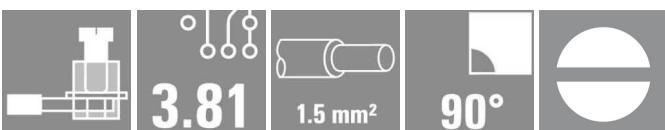
### *Connection kit for large cable ends :*
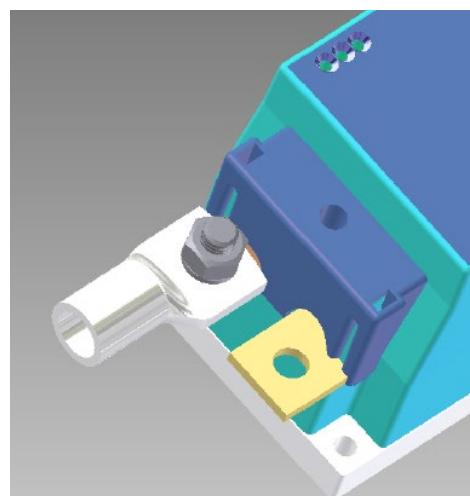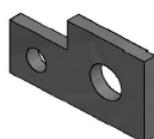
### *Possibility of current measurement output (isolated) on signal connector (pin X4/9 and X4/10):*

Measurment current output X4/9 & X4/10 (V)

Load Current (A)

Tambient=20°C
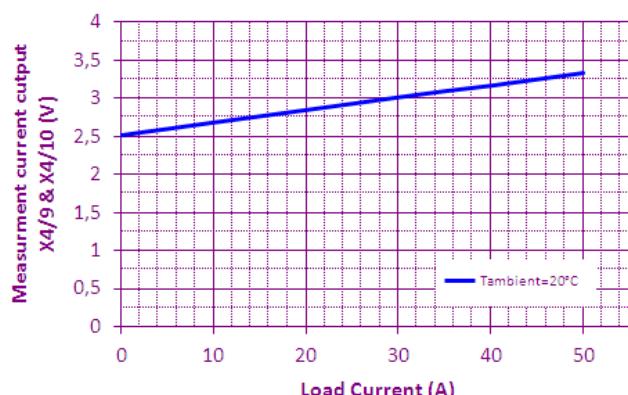
**Please consult our website for other accessory references**
**(Heatsink, mounting adaptors, thermal grease…).**

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