

ODS-3000

2400...4000VA DC/AC INVERTER

GENERAL FEATURES:

- Sine wave output voltage
- Selectable output frequency: 50/60Hz
- Adjustable output voltage
- High input-output isolation 3000Vrms
- Remote inhibit
- Remote control via RS232
- Alarm by isolated relay contacts
- Remote off opto-coupled
- Optional railway version EN50155
- Fire and smoke: EN45545-2 approved
- Efficiency up to 91%



| In \ Out | 24Vdc 16.8 ... 30V | 36Vdc 25.2 ... 45V | 48Vdc 33.6 ... 60V | 72Vdc 50.4 ... 90V | 110Vdc 77 ... 138V | 120Vdc 84 ... 150V | 300Vdc 290 ... 330V |
|----------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| 120Vac | ODS-3000-7163 2400 W | ODS-3000-7164 2500 W | ODS-3000-7165 2500 W | ODS-3000-7166 2500 W | ODS-3000-7167 2500 W | Available under request | Available under request |
| 230Vac | ODS-3000-7153 2400 W | ODS-3000-7154 3000 W | ODS-3000-7155 3000 W | ODS-3000-7156 3000 W | ODS-3000-7157 3000 W | Available under request | Available under request |
| | Available under request | Available under request | Available under request | Available under request | ODS-3000-7177 4000 W | ODS-3000-7178 4000 W | ODS-3000-7179 4000 W |

Several references are subjected to special MOQs and lead times. Please consult Premium's Sales Dept. and web site.

**INPUT**

| | |
|----------------------|---------------------------------------|
| Input voltage range | See table |
| Maximum input ripple | 5% $V_{in\ nom}$ (V_{rms} , 100Hz) |

OUTPUT

| | |
|----------------------------|--|
| Output voltage | See table |
| Output frequency | 50 / 60Hz \pm 0.25Hz |
| Load regulation | < 4% |
| Line regulation | < 2 % V_{in} -25% ... +25%, < 10% V_{in} -30% ... +30% |
| Output wave distortion THD | < 2% (average of 16 samples) |
| Output HF ripple | < 2.5% |

ENVIRONMENTAL

| | Options B and T | Option L (Note-1) |
|-------------------------------------|----------------------------|----------------------------|
| Storage temperature | -25 ... 80°C | -40 ... 80°C |
| Operating temperature at full load | -25 ... 55°C (EN50155 OT1) | -40 ... 55°C (EN50155 OT2) |
| Operating temperature at 62.5% load | -25 ... 70°C (EN50155 OT3) | -40 ... 70°C (EN50155 OT4) |
| Relative humidity | 5 ... 95% | |
| Cooling | Controlled internal fan | |
| MTBF (MIL-HDBK-217-E; G_b , 25°C) | 100.000 h | |

EMC

| | |
|---------------------|---------------------------|
| Immunity according | EN61000-6-2 (EN50121-3-2) |
| Emissions according | EN61000-6-4 (EN50121-3-2) |

SAFETY

| | |
|-------------------------------------|------------------------------|
| Dielectric strength: Input /output | 3000 V_{rms} / 50Hz / 1min |
| Dielectric strength: Output / Earth | 1500 V_{rms} / 50Hz / 1min |
| Dielectric strength: Input / Earth | 500 V_{rms} / 50Hz / 1min |
| Safety according to | EN60950-1, EN62368-1 |
| Fire and smoke | EN45545-2 approved |

MECHANICAL

| | |
|-------------------|----------|
| Weight | < 6000 g |
| Protection degree | IP20 |

PROTECTIONS

| | |
|--------------------------|--|
| Against overloads | Current and I^2T limited (see overload protection) |
| Against over-temperature | Shutdown with auto-recovery |

CONTROL

| | |
|------------------------|---|
| Output OK LED | Green |
| Alarm LED | Red |
| Output failure alarm | Isolated contact relay open when alarm (<0.3A at 150Vcc) |
| Remote OFF | Off applying 14,4 ... 137.5Vdc, Impedance > 22k Ω (See Note-1) |
| Status and programming | RS232 port |

Note:1 The unit can start up and work at an ambient temperature between -40°C and -25°C without connectors handling.

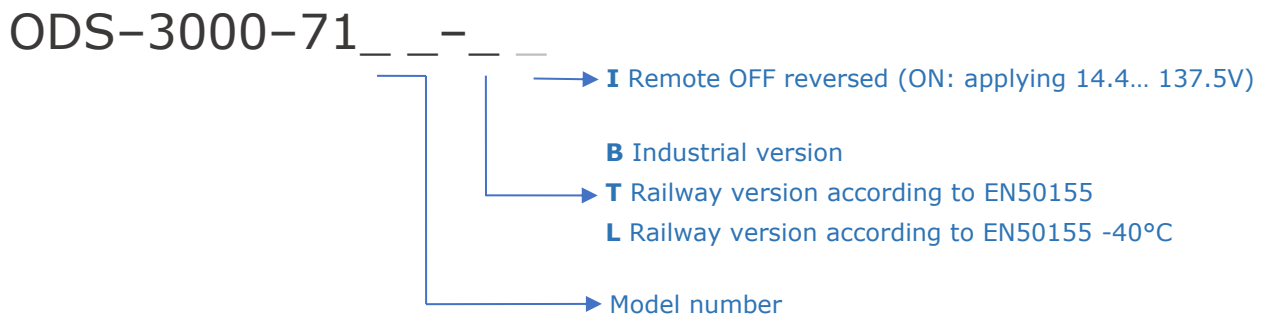
Note-1: Only available depending on HW version. Former models were 4 ... 30V, Impedance 3k Ω



ORDERING CODES

| Model | Input voltage DC [V] | Input voltage range [V] | Max. Input Current [A] | Output voltage AC [V] | Output current [A] | Active output power [W] | Appar. output power [VA] | Output peak current | | Efficien. [%] | No load input current [A] |
|----------------------|----------------------|-------------------------|------------------------|-----------------------|--------------------|-------------------------|--------------------------|---------------------|-------------------|---------------|---------------------------|
| | | | | | | | | 5s [Arms] | (Iopk) 10ms [Apk] | | |
| ODS-3000-7153 | 24 | 16.8 - 30 | 161 | 230 | 10.4 | 2400 | 2400 | 15 | 32 | 89 | < 0.88 |
| ODS-3000-7154 | 36 | 25.2 - 45 | 133 | 230 | 13.0 | 3000 | 3000 | 20 | 32 | 90 | < 0.60 |
| ODS-3000-7155 | 48 | 33.6 - 60 | 99 | 230 | 13.0 | 3000 | 3000 | 20 | 32 | 91 | < 0.42 |
| ODS-3000-7156 | 72 | 50.4 - 90 | 66 | 230 | 13.0 | 3000 | 3000 | 20 | 32 | 91 | < 0.30 |
| ODS-3000-7157 | 110 | 77 - 138 | 43 | 230 | 13.0 | 3000 | 3000 | 20 | 32 | 92 | < 0.17 |
| ODS-3000-7163 | 24 | 16.8 - 30 | 163 | 120 | 20.0 | 2400 | 2400 | 28 | 52 | 88 | < 0.65 |
| ODS-3000-7164 | 36 | 25.2 - 45 | 134 | 120 | 20.8 | 2500 | 2500 | 32 | 52 | 89 | < 0.49 |
| ODS-3000-7165 | 48 | 33.6 - 60 | 84 | 120 | 20.8 | 2500 | 2500 | 32 | 52 | 89 | < 0.38 |
| ODS-3000-7166 | 72 | 50.4 - 90 | 56 | 120 | 20.8 | 2500 | 2500 | 32 | 52 | 90 | < 0.28 |
| ODS-3000-7167 | 110 | 77 - 138 | 36 | 120 | 20.8 | 2500 | 2500 | 32 | 52 | 91 | < 0.17 |
| ODS-3000-7177 | 110 | 77 - 138 | 57 | 230 | 17.4 | 4000 | 4000 | 22 | 34 | 92 | < 0.20 |
| ODS-3000-7178 | 120 | 84 - 150 | 52 | 230 | 17.4 | 4000 | 4000 | 22 | 34 | 92 | |
| ODS-3000-7179 | 300 | 290 - 330 | 15 | 230 | 17.4 | 4000 | 4000 | 22 | 34 | 92 | |

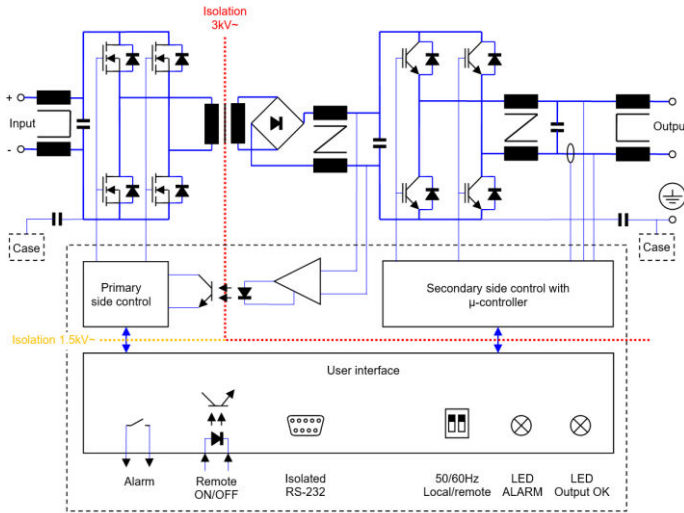
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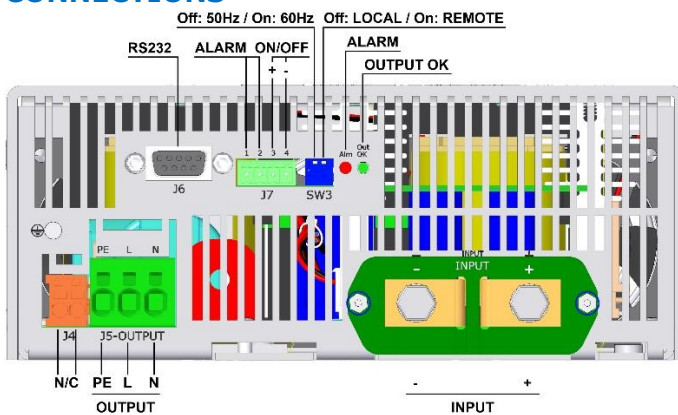
Accessories must be ordered in a separated order line



BLOCKS DIAGRAM

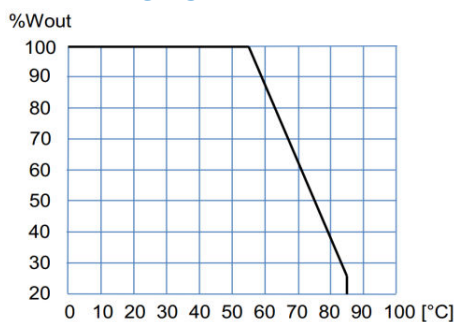


CONNECTIONS



| | |
|--------------|--|
| Input | Terminals M6 (Rec. torque 6 Nm) |
| Output | Cable up to 4 mm ² |
| Alarm ON/OFF | Phoenix Contact MC1.5/4-G-3.81 (See accessories) |
| RS232 | DB9 |
| N/C | Do not use |

POWER DERATING vs AMBIENT TEMP.



DESCRIPTION

The ODS-3000 consists of single phase sine-wave DC/AC inverters with galvanic isolation between input and output

The unit allows:

- Select 50 / 60Hz by means of DIP-switch.
- Select local / remote (RS-232) by means of DIP-switch
- Shutdown applying voltage on pins 3 and 4 of signal connector
- Local signalization of Output OK by means of green LED
- Local alarm. Red LED ON when:
 - Output voltage is not OK
 - Output current > OUTPUT CURRENT ALARM
 - Input voltage out of margins
 - Unit shutdowns by over-current or remote OFF
 - Internal temperature > Internal warning temp.
- Alarm. Open contacts when output voltage is not OK
- Set and monitor parameters via RS-232.

The ODS-3000 are equipped with a maximum average power protection as well as maximum output peak current protection. This protects the unit even when an output short-circuit occurs. It also features a disable function for input under-voltage, which allows protecting the batteries from harmful discharges.

START-UP

- The unit has 6 threaded holes for the fixation on a mounting surface.
- The unit has internal fans. For an appropriate cooling, the air input and output should be free of elements that cause and an air flow reduction (minimum recommended distance to other objects 50mm).
- Make connections as shown in the figure.
- The default output frequency is 50Hz. For 60Hz simply actuate the dip-switch as indicated in the figure.

For safety reasons, the following requirements must be met:

- Provide the equipment with some kind of protective enclosure that complies with the electrical safety directives in effect within the country where the equipment is installed.
- Include a time lag input fuse or current breaker curve D with a rating immediately higher than the maximum input current.
- As per the input and output currents indicated in the table on page 3, choose the appropriate cable cross-section according to the maximum rated current indicated in the following table:

| | | | | | | | | | | |
|----------------------------|------------|------------|----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Max. Current [A] | 16 | 25 | 32 | 40 | 63 | 80 | 100 | 125 | 160 | 190 |
| section [mm ²] | 1.5 | 2.5 | 4 | 6 | 10 | 16 | 25 | 35 | 50 | 70 |

| | Monitor | Set |
|------------------------|----------------------|-----------------------------|
| RS232 Functions | Input voltage | Input under-voltage lockout |
| | Output voltage | Input under-voltage alarm |
| | Output current | ON / OFF |
| | Internal temperature | Output frequency |
| | Output frequency | Maximum output current |
| | Output power | Output voltage |

RS232 communication port

It is possible to control and monitor the unit via RS232 by means of a terminal emulator like "Tera Term" or "Putty".

Also it is possible to control and monitor the unit directly using the protocol showed in table:



A null modem F-M is required

Protocol configuration: ASCII code, 19200 bauds, parity none, 8 bits, 1bit stop

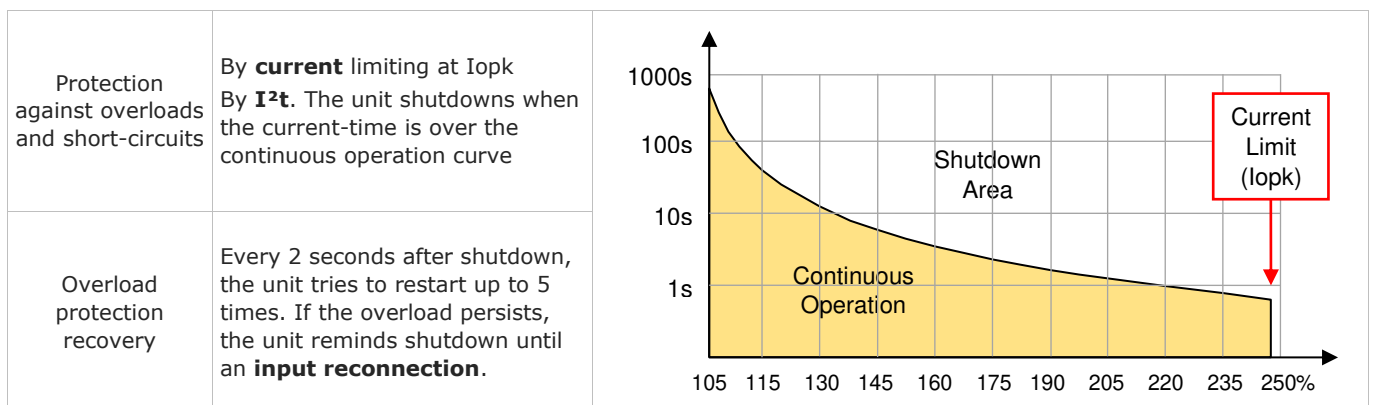
| Header | Function | Parameter | Returns | Explanation | |
|--------|----------|-----------------|--|--|--|
| P | L | V | PTV####.■ | Input voltage in Volts | |
| | | U | PTU####.■ | Output voltage in Volts RMS | |
| | | I | PTI####.■ | Output current in Amps RMS | |
| | | T | PTT####.■ | Internal temperature in °C | |
| | | F | PTF####.■ | Output frequency in Hz | |
| | | W | PTW#### | Output power in W | |
| | | S | PTS####.■ | Inverter state 999.9 → Inverter enabled 000.0 → Inverter disabled 222.2 → Inverter blocked by overload 111.1 → Inverter blocked by overload or short-circuit | |
| | | M | PTM#### | Model number | |
| | | R | PTR#### | Firmware version | |
| | | Other character | PTE | Command not supported | |
| | G | 1 | ####.■ | OK | Set the minimum input working voltage in Volts |
| | | | | ERR | Value NO VALID for this parameter |
| | | 2 | ####.■ | OK | Set the minimum alarm input voltage in Volts (it should be higher than PRG1) |
| | | | | ERR | Value NO VALID for this parameter |
| | | 3 | ####.■ | OK | Changes the status bit (after start-up enabled with SW3 =LOCAL and disabled with SW3 =REMOTE) 999.9 → Inverter enabled 000.0 → Inverter disabled |
| | | | | ERR | Value NO VALID for this parameter |
| | | 4 | ####.■ | OK | Set the output voltage in Volts RMS $80\% V_{nom} \leq \text{####.}\square \leq 105\% V_{nom}$ |
| | | | | ERR | Value NO VALID for this parameter |
| | | 5 | ####.■ | OK | Set the maximum output current in Amps $20\% I_{nom} \leq \text{####.}\square \leq 100\% I_{nom}$ |
| | | | | ERR | Value NO VALID for this parameter |
| 6 | ####.■ | OK | Changes the output frequency (it's not stored for the next start-up) 050.0 → 50Hz 060.0 → 60Hz | | |
| | | ERR | Value NO VALID for this parameter | | |
| 7 | ####.■ | OK | Set the OUTPUT CURRENT ALARM $0 \leq \text{####.}\square \leq 100\% I_{max_warning}$ | | |
| | | ERR | Value NO VALID for this parameter | | |
| 8 | ####.■ | OK | 111.1 → Reset the inverter | | |
| | | ERR | Value NO VALID for this parameter | | |
| A | ####.■ | OR | Set the start-up voltage in volts (it should be higher than PRG1) | | |
| | | ERR | Value NO VALID for this parameter | | |



WORKING PARAMETERS

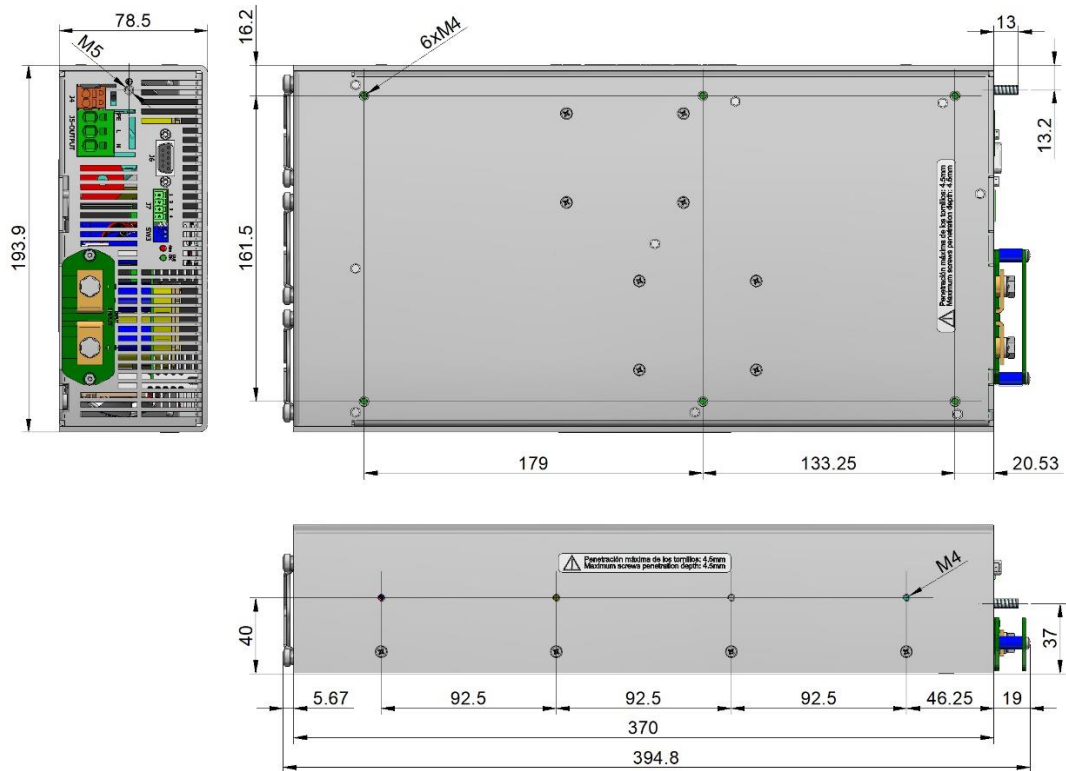
| Thermal protection | 71XX | | | | | | |
|---|------------------|------|------|-------|-------|-------|-----|
| Internal warning temperature | 88 | | | | | | °C |
| Internal shutdown temperature | 92 | | | | | | °C |
| Internal restart temperature after over-temperature shutdown | 75 | | | | | | °C |
| Input voltage parameters | 71X3 | 71X4 | 71X5 | 71X6 | 71X7 | 7179 | |
| Max. input voltage shutdown instantaneous | 33.7 | 50.6 | 67.3 | 100.9 | 154.1 | 368.5 | Vdc |
| Max. input voltage shutdown timed 0.1s | 30.1 | 45.2 | 60.1 | 90.1 | 138.6 | 331.4 | Vdc |
| Maximum star-up voltage | 29.9 | 44.9 | 59.8 | 89.7 | 137.4 | 328.6 | Vdc |
| Minimum star-up voltage | 17.9 | 26.9 | 35.9 | 53.9 | 82.4 | 310.3 | Vdc |
| Min. input voltage shutdown timed 0.1s | 16.7 | 25.1 | 33.5 | 50.3 | 76.9 | 289.6 | Vdc |
| Min. input voltage shutdown instantaneous | 14.4 | 21.6 | 28.7 | 43.1 | 65.9 | 248.2 | Vdc |
| Output voltage parameters | 715X | | 716X | | 717X | | |
| Output voltage of short circuit or deep overload | < 164 | | < 86 | | < 214 | | Vac |
| Time of short-circuit | 1000 | | | | | | ms |
| Time of start-up after shutdown by short-circuit | 2000 | | | | | | ms |
| Number of start-up attempts after short circuit | 5 | | | | | | |
| Output current parameters | 715X | | 716X | | 717X | | |
| Maximum continuous output current | 13.2 | | 21.1 | | 17.7 | | A |
| Warning current | 13 | | 20.8 | | 17.4 | | A |
| Start-up time after shutdown by overload | 1500 | | 2000 | | 1000 | | ms |
| Maximum overload I ² t | See figure below | | | | | | |
| Number of attempts of consecutive overload | 5 | | | | | | |
| Start-up and working errors | 71XX | | | | | | |
| Maximum time for overload or internal failure | unlimited | | | | | | |
| Minimum time required between disconnection and next connection | 2 | | | | | | min |

OVERLOAD PROTECTION





DIMENSIONS



Maximum depth for the screws M4: 4.5mm

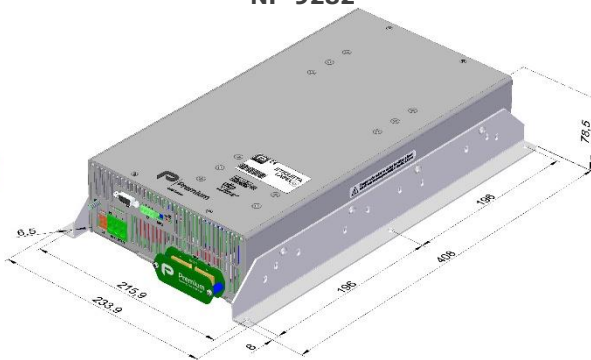
ACCESSORIES

| Description | Notes | CODE |
|--------------------------------|------------------------------------|----------|
| Signals female connector | | 2601-409 |
| Mounting brackets kit | Contains two brackets and screws | NP-9282 |
| 2U 19" rack mounting tray kit. | Allows to install one or two units | NP-9353 |

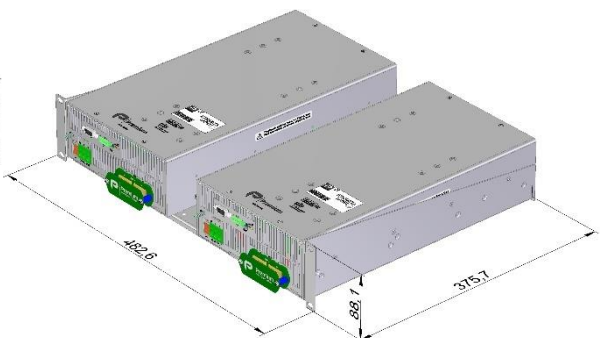
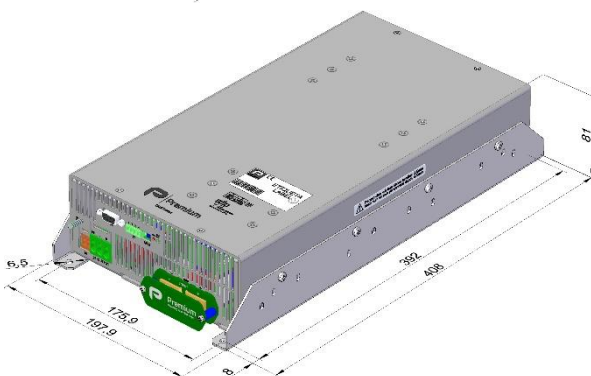
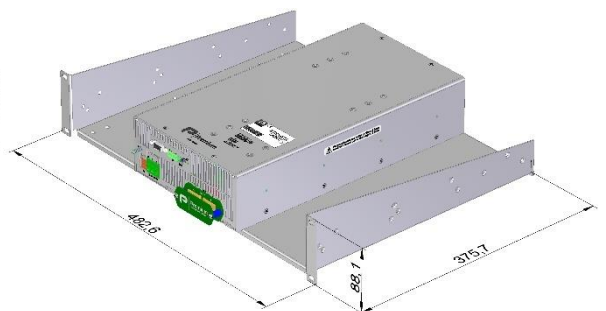
2601-409



NP-9282



NP-9353





CE EU DECLARATION OF CONFORMITY

The undersigned, representing the following:

Manufacturer: PREMIUM, S. A.,
Address: C/ Dolors Aleu 19-21, 08908 L'Hospitalet de Llobregat, SPAIN

herewith declares that the product:

Type: DC/DC converter
Models: **ODS-3000-7153 ... 7179**

Complies with the essential protection requirements of the following EU directives:

| | |
|---|--|
| 2014/35/EU | Low voltage / The electrical equipment (safety) regulations |
| 2014/30/EU | EMC / Electromagnetic compatibility regulations |
| 2011/65/EU Annex II and its amendment 2015/863/EU | RoHS / Restriction of the use of certain hazardous substances in electrical and electronic equipment |

This declaration applies to all specimens manufactured identical to the samples submitted for testing/evaluation.

Assessment of compliance of the product with the requirements relating to aforementioned directives, was performed by Premium S.A. and is based on the following standards:

| | |
|-----------------------|---|
| EN IEC 62368-1:2020 | Safety. Audio/video information and communication technology equipment |
| EN IEC 61000-6-4:2019 | Generic emission standard |
| EN IEC 61000-6-2:2019 | Generic immunity standard |
| EN 50155:2021* | Railway applications. Electronic equipment used on rolling stock material |
| EN 50121-3-2:2016* | Railway applications. EMC Rolling stock equipment |

* Optional, See annexe

CE marking year: **2011**

Notes:

For the fulfilment of this declaration the product must be used only for the aim that has been conceived, considering the limitations established in the instructions manual or datasheet.

L'Hospitalet de Llobregat, 24-04-2023

Albert Sole
Technical Director

PREMIUM S.A. is an ISO9001 and ISO14001
certified company by **Bureau Veritas**



UK CA UKCA DECLARATION OF CONFORMITY

The undersigned, representing the following:

Manufacturer: PREMIUM, S. A.,
Address: C/ Dolors Aleu 19-21, 08908 L'Hospitalet de Llobregat, SPAIN

herewith declares that the product:

Type: DC/DC converter
Models: **ODS-3000-7153 ... 7179**

Complies with the essential protection requirements of the following regulations:

| | |
|------------------|--|
| SI 2016 No 1101 | Low voltage / The electrical equipment (safety) regulations |
| SI 2016 No 1091 | EMC / Electromagnetic compatibility regulations |
| SI 2012 No. 3032 | RoHS / Restriction of the use of certain hazardous substances in electrical and electronic equipment |

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| BS EN 61000-6-2:2019 | Generic immunity standard |
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| BS EN 50121-3-2:2016* | Railway applications. EMC Rolling stock equipment |

* Optional, See annexe

UKCA marking year: **2021**

Notes:

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L'Hospitalet de Llobregat, 24-04-2023

Albert Sole
Technical Director

PREMIUM S.A. is an ISO9001 and ISO14001
certified company by **Bureau Veritas**

ANNEXE

| Applicable values for the different sections of the norm EN50155: 2017 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|---|---------------------|--------------------------|--------------------|----------------------------|---------------------|--------------------|-------------------------|--------------|--------------------------------|-----------------------|---------------------------------|-----------------------|-----------------|----------------------------|-------------------------|--------------|------------------|----------|--|---------------------|-------------|--------------------------|-------------------------------|--------------------------|------------------------------------|--------------------------------|-------------------------------------|--------------|-------|------|----------------|---|--------|------|--------|------|----|------|-------|--------------|--------------|------|-----------------|---|---------------|------|--------------|--------------|-------|-----|--------------------------|---|--------|-----|--------|-----|----|-----|----------------|--------------|------------|--------|----------------------|---|
| 4.3.1 | Working altitude | Up to 2000m | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4.3.2 | Ambient temperature | Class OT1 (-25 to 55°C): load < 100% Class OT3 (-25 to 70°C): load <62.5% For option L: Class OT2 (-40 to 55°C): load < 100% (without connectors handling) For option L: Class OT4 (-40 to 70°C): load <62.5% (without connectors handling) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4.3.3 | Switch-on extended operating temp. | ST1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4.3.4 | Rapid temperature variations | H1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4.3.5 | Shocks and vibrations | According EN61373:2010 Category 1 class B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4.3.6 | EMC Electromagnetic Compatibility EN50121-3-2:2016 | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Test</th> <th>Norm</th> <th>Port</th> <th>Frequency</th> <th>Limits</th> </tr> </thead> <tbody> <tr> <td rowspan="3">Radiated emissions</td> <td rowspan="3">IEC55016</td> <td rowspan="3">Case</td> <td>30MHz...230MHz</td> <td>40dB(µV/m) Qpk at 10m</td> </tr> <tr> <td>230MHz...1GHz</td> <td>47dB(µV/m) Qpk at 10m</td> </tr> <tr> <td>1...3GHz</td> <td>Do not apply</td> </tr> <tr> <td></td> <td></td> <td></td> <td>3...6GHz</td> <td>Internal freq. < 108MHz</td> </tr> <tr> <td rowspan="2">Conducted emissions</td> <td rowspan="2">IEC55016</td> <td rowspan="2">Input</td> <td>150kHz...500kHz</td> <td>99dB(µV) Qpk</td> </tr> <tr> <td>500kHz...30MHz</td> <td>93dB(µV) Qpk</td> </tr> </tbody> </table> | Test | Norm | Port | Frequency | Limits | Radiated emissions | IEC55016 | Case | 30MHz...230MHz | 40dB(µV/m) Qpk at 10m | 230MHz...1GHz | 47dB(µV/m) Qpk at 10m | 1...3GHz | Do not apply | | | | 3...6GHz | Internal freq. < 108MHz | Conducted emissions | IEC55016 | Input | 150kHz...500kHz | 99dB(µV) Qpk | 500kHz...30MHz | 93dB(µV) Qpk | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Test | Norm | Port | Frequency | Limits | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Radiated emissions | IEC55016 | Case | 30MHz...230MHz | 40dB(µV/m) Qpk at 10m | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | 230MHz...1GHz | 47dB(µV/m) Qpk at 10m | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | 1...3GHz | Do not apply | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | 3...6GHz | Internal freq. < 108MHz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Conducted emissions | IEC55016 | Input | 150kHz...500kHz | 99dB(µV) Qpk | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | 500kHz...30MHz | 93dB(µV) Qpk | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Test</th> <th>Norm</th> <th>Port</th> <th>Severity</th> <th>Conditions</th> <th>P</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Electrostatic discharge</td> <td rowspan="2">IEC61000-4-2</td> <td rowspan="2">Case</td> <td>±8kV</td> <td>Air (isolated parts)</td> <td rowspan="2">B</td> </tr> <tr> <td>±8kV</td> <td>Contact (conductive parts)</td> </tr> <tr> <td rowspan="4">Radiated high-frequency</td> <td rowspan="4">IEC61000-4-3</td> <td rowspan="4">X/Y/Z Axis</td> <td>20V/m</td> <td>0.08...1.0GHz M. 80% 1kHz</td> <td rowspan="4">A</td> </tr> <tr> <td>10V/m</td> <td>1.4...2.1GHz M. 80% 1kHz</td> </tr> <tr> <td>5V/m</td> <td>2.1...2.5GHz M. 80% 1kHz</td> </tr> <tr> <td>3V/m</td> <td>5.1...6Ghz M. 80% 1kHz</td> </tr> <tr> <td rowspan="4">Fast transients</td> <td rowspan="4">IEC61000-4-4</td> <td>Input</td> <td>±2kV</td> <td rowspan="4">Tr/Th: 5/50 ns</td> <td rowspan="4">A</td> </tr> <tr> <td>Output</td> <td>±2kV</td> </tr> <tr> <td>Signal</td> <td>±2kV</td> </tr> <tr> <td>PE</td> <td>±1kV</td> </tr> <tr> <td rowspan="2">Surge</td> <td rowspan="2">IEC61000-4-5</td> <td>Input L to L</td> <td>±1kV</td> <td rowspan="2">Tr/Th: 1.2/50µs</td> <td rowspan="2">B</td> </tr> <tr> <td>Input L to PE</td> <td>±2kV</td> </tr> <tr> <td rowspan="4">Conducted RF</td> <td rowspan="4">IEC61000-4-6</td> <td>Input</td> <td>10V</td> <td rowspan="4">0.15...80MHz M. 80% 1kHz</td> <td rowspan="4">A</td> </tr> <tr> <td>Output</td> <td>10V</td> </tr> <tr> <td>Signal</td> <td>10V</td> </tr> <tr> <td>PE</td> <td>10V</td> </tr> <tr> <td>Magnetic field</td> <td>IEC61000-4-8</td> <td>X/Y/Z Axis</td> <td>300A/m</td> <td>0Hz, 16.7Hz, 50/60Hz</td> <td>A</td> </tr> </tbody> </table> | Test | Norm | Port | Severity | Conditions | P | Electrostatic discharge | IEC61000-4-2 | Case | ±8kV | Air (isolated parts) | B | ±8kV | Contact (conductive parts) | Radiated high-frequency | IEC61000-4-3 | X/Y/Z Axis | 20V/m | 0.08...1.0GHz M. 80% 1kHz | A | 10V/m | 1.4...2.1GHz M. 80% 1kHz | 5V/m | 2.1...2.5GHz M. 80% 1kHz | 3V/m | 5.1...6Ghz M. 80% 1kHz | Fast transients | IEC61000-4-4 | Input | ±2kV | Tr/Th: 5/50 ns | A | Output | ±2kV | Signal | ±2kV | PE | ±1kV | Surge | IEC61000-4-5 | Input L to L | ±1kV | Tr/Th: 1.2/50µs | B | Input L to PE | ±2kV | Conducted RF | IEC61000-4-6 | Input | 10V | 0.15...80MHz M. 80% 1kHz | A | Output | 10V | Signal | 10V | PE | 10V | Magnetic field | IEC61000-4-8 | X/Y/Z Axis | 300A/m | 0Hz, 16.7Hz, 50/60Hz | A |
| | | Test | Norm | Port | Severity | Conditions | P | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Electrostatic discharge | IEC61000-4-2 | Case | ±8kV | Air (isolated parts) | B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | ±8kV | Contact (conductive parts) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Radiated high-frequency | IEC61000-4-3 | X/Y/Z Axis | 20V/m | 0.08...1.0GHz M. 80% 1kHz | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | 10V/m | 1.4...2.1GHz M. 80% 1kHz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | 5V/m | 2.1...2.5GHz M. 80% 1kHz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3V/m | 5.1...6Ghz M. 80% 1kHz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fast transients | IEC61000-4-4 | Input | ±2kV | Tr/Th: 5/50 ns | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Output | ±2kV | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Signal | ±2kV | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | PE | ±1kV | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Surge | IEC61000-4-5 | Input L to L | ±1kV | Tr/Th: 1.2/50µs | B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Input L to PE | ±2kV | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Conducted RF | IEC61000-4-6 | Input | 10V | 0.15...80MHz M. 80% 1kHz | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Output | 10V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Signal | 10V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | PE | 10V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Magnetic field | IEC61000-4-8 | X/Y/Z Axis | 300A/m | 0Hz, 16.7Hz, 50/60Hz | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| P = Performance criteria, L= Line, PE= Protective Earth | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4.3.7 | Relative humidity | Up to 95% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5.1.1.2 | DC power supply range | From 0.70 to 1.25 Un continuous | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5.1.1.3 | Temporary DC power supply fluctuation | From 0.60 to 1.40 Un 0.1s From 1.25 to 1.40 Un 1s without damage | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5.1.1.4 | Interruptions of voltage supply | Class S1 (without interruptions) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5.1.1.6 | Input ripple factor | 10% peak to peak with a DC Ripple Factor of 5 % | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5.1.3 | Supply change-over | 0.6 Un duration 100 ms (without interruptions). Performance criterion A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7.2.7 | Input reverse polarity protection | By external fuse | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10.7 | Protective coating for PCB assemblies | Class PC2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13.3 | Tests list | <table style="width: 100%; border-collapse: collapse;"> <tbody> <tr><td>1 Visual Inspection</td><td>Routine</td></tr> <tr><td>2 Performance test</td><td>Routine</td></tr> <tr><td>3 Power supply test</td><td>Routine</td></tr> <tr><td>4 Insulation test</td><td>Routine</td></tr> <tr><td>5 Low temperature storage test</td><td>-</td></tr> <tr><td>6 Low temperature start-up test</td><td>Type</td></tr> <tr><td>7 Dry heat test</td><td>Type</td></tr> <tr><td>8 Cyclic damp heat test</td><td>Type</td></tr> <tr><td>9 Salt mist test</td><td>-</td></tr> <tr><td>10 Enclosure protection test (IP code)</td><td>-</td></tr> <tr><td>11 EMC test</td><td>Type</td></tr> <tr><td>12 Shocks and vibrations test</td><td>Type</td></tr> <tr><td>13 Equipment stress screening test</td><td>Routine: at 40°C and load 100%</td></tr> <tr><td>14 Rapid Temperature variation test</td><td>Type</td></tr> </tbody> </table> | 1 Visual Inspection | Routine | 2 Performance test | Routine | 3 Power supply test | Routine | 4 Insulation test | Routine | 5 Low temperature storage test | - | 6 Low temperature start-up test | Type | 7 Dry heat test | Type | 8 Cyclic damp heat test | Type | 9 Salt mist test | - | 10 Enclosure protection test (IP code) | - | 11 EMC test | Type | 12 Shocks and vibrations test | Type | 13 Equipment stress screening test | Routine: at 40°C and load 100% | 14 Rapid Temperature variation test | Type | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 Visual Inspection | Routine | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 Performance test | Routine | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 Power supply test | Routine | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 Insulation test | Routine | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 Low temperature storage test | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 Low temperature start-up test | Type | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 Dry heat test | Type | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 Cyclic damp heat test | Type | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 Salt mist test | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 Enclosure protection test (IP code) | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 EMC test | Type | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 Shocks and vibrations test | Type | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 Equipment stress screening test | Routine: at 40°C and load 100% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 Rapid Temperature variation test | Type | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |