**20kWp PHOTOVOLTAICS APPLICATION AND ELECTRIC CAR CHARGING STATION AT BITOLA**

**TECHNICAL SPECIFICATIONS**

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**FEBRUARY 2020**

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# Introduction

The installations of this study will be constructed in accordance with the applying laws, legislation and Technical Specifications.

# 

# 1. Installation of Strong Currents

## Photovoltaic Panels

Photovoltaic panels of monocrystalline silicon at nominal power 330Wp (± 3% - @STC) and with an efficiency rate greater than or equal to 18.40%. The panel should have a maximum system voltage of 1000VDC, operating temperature from -40 ° C to + 85 ° C, static pressure resistance ≥5.400Pa and IP68 protection (junction box). It will consist of 72 silicon cells connected properly, encased in anodized aluminum profile frame, while the front will be covered with specially treated glass ≥3.2mm thick suitable for use in solar applications. It will have a junction box with at least 3 Schottky diodes and pre-installed cables with positive and negative poles, cross section of 4.00mm², 1.30m long and MC4 connectors for easy and waterproof connection. The framework will be IEC 61215, IEC 61730 certified as well as IEC 61701: 2011 and DIN EN 13501-5 categorized. The frames will have a linear efficiency reduction of up to 20% over 25 years. The frames should be of indicative dimensions of 1956x992x40mm (± 10%). The electrical characteristics of the frame will be:

|  |  |  |
| --- | --- | --- |
| Nominal current Impp [A] | : | 8,77 (±10%) |
| Nominal Voltage Vmpp [V] | : | 37,66 (±10%) |
| Short-circuit current Isc [A] | : | 9,27 (±10%) |
| Open-circuit Voltage Voc [V] | : | 46,29 (±10%) |
| Voltage temperature factor [%/°C] | : | -0,30 |
| Current temperature factor [%/°C] | : | 0,05 |
| Power temperature factor [%/°C] | : | -0,41 |
| **Characteristic Curve U-I** | | |
|  | | |

**Indicative frame type: LUXOR ECOLINE Ρ72/330**

## Inverters

DC/AC inverter, that converts direct voltage/current to alternating voltage/current. The inverter input will be suitable for connecting photovoltaic frames, of maximum voltage ≥1000VDC, start voltage ≥188VDC and nominal input voltage ≥600VDC. The inverter will have at least two Maximum Power Point detectors. The inverter output will be three-phase, 400V voltage, 50Hz frequency, with adjustable power factor cosφ from 0.8 inductive to 0.8 capacitive. The inverter will have load switch at the input side (DC), and built-in protections against errors and earth leakages, short-circuit, DC polarity reversion. The inverter will be transformerless, have IP65 (or above) protection and operating temperatures of at least -25°C to +60°C. The external dimensions of the inverter will be 661x682x264mm (± 20%) for various nominal inverter power. Each inverter will have built-in surge protection (that will provide uninterrupted protection from damaging overvoltages) and a communication unit to record power generation data via RJ45 port and ethernet. At the same time, the inverter will have a screen to display the local electrical indications. Finally, the inverter will have built-in protection against islanding, according to VDE 0126-1 and a 10-year operation warranty.

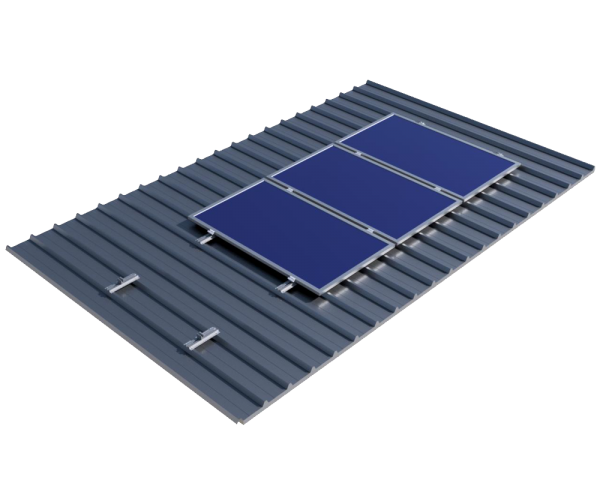
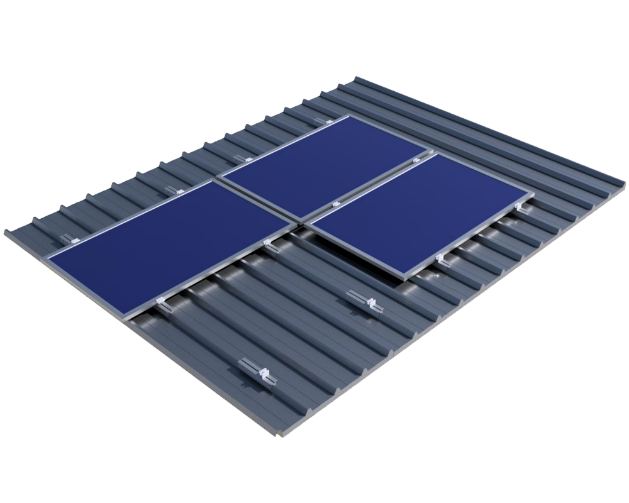
The electrical characteristics of the inverter are listed below:

|  |  |  |
| --- | --- | --- |
|  |  | Inverter  20 kVA |
| Nominal Input Power DC [Wp] | : | 20440 (±5%) |
| MPP detection voltage range [V] | : | 320 - 800 (±5%) |
| Max Input Current DC [A] | : | ≥33A ανά ανιχν. MPP |
| Number of inputs per detector MPP | : | ≥3 |
| Nominal Output Power AC [VA] | : | ≥20000 |
| Nominal Output Current [Α] | : | 29 (±5%) |
| Max Efficiency [%] | : | ≥ 98,4 |
| European Efficiency [%] | : | ≥98,0 |
| THD [%] | : | ≤ 3,00 |

**Indicative Inverter Type 20kVA: SMA Sunny Tripower 20000TL**

## PV Frame Mounts

The mounts will be made of aluminum, suitable for installation on industrial roof. The mounting system will allow the proper hold of the photovoltaic. It will be possible to mount the frames in both portrait and landscape mode.



They will be made from aluminum alloy 6005Τ6 and stainless steel screws.

The mounts should be certified by ISO 9001 and ISO 14001.

**Indicative Mount Type: Alumil AS410L H2400 Helios Industrial Roof**

## Tubes - Grates – Branches’ boxes - Plastic channels

### Flexible Plastic Heavy Duty Electrical Spirals Ø16mm, Ø63mm

According to applying Technical Specification about plastic pipes for electrical installations.

### Heavy Duty Metal Perforated Grates with Lid 100x60mm / 300x60mm / 400x60mm

According to applying Technical Specification about cable grates.

## Strong Current Cables

### DC Cables

Single-pole cable with polyclonal copper conductor (Cu) and elastic polymer insulation (XLPO or EM8) suitable for DC nominal voltage of at least 1000 VDC, solar radiation resistance and ambient temperatures from -40°C to +90°C. The cable should be suitable for operation at an outdoor, humid, acidic and alkaline environment. It should have CE certification, EN 60228. It should be halogen free. The cable should be suitable for PV frame applications.

**Indicative Type: HIKRA SolarKabel H1Z2Z2-K or TOP Cable Solar ZZ-F**

### AC Cables - FG7OR type

Flexible power cable for alternating current and voltage applications. Suitable for permanent indoor and outdoor installations in humid or moist environment. The cable conductors will be polyclonal, made of flexible copper wires, according to DIN VDE 0295. The insulation will be made of G7-type ethylpropylene polymer. It will have an inner coating made of waterproof, fireproof material. The cable will have an outer cloak of Rz type thermoplastic PVC, it will be fireproof, CEI 20-22 / 1-5. The operating voltage shall be at least 0.6/1.0kV (Uo/U). The maximum operating temperature of the cable should be at least 90°C. The cable should have IEC 60502-1, EN 60332 and Directive 2014/35 / EU certifications.

**Indicative Type: La Triveneta Cavi FG7OR.**

### Polyclonal Conductors Cu 25mm² (ground)

According to applying Technical Specification.

## Low Voltage Electrical Boards

### Waterproof thermoplastic boards IP66

Low voltage electrical equipment will be placed on boards suitable for outdoor installation with IP66 protection that comply with the requirements of the standards: IEC 62208, EN 60439-1, IEC 61439-1-2, IEC 60670 and EN 50298.

The boards will be made of thermoplastic material without glass fibers, that will be formed by the co-injection molding technique. This technique will form a two-layer “sandwich”, one of which will be the compact integument and the other the expanded core, to ensure maximum mechanical impact resistance reaching grade IK 10. The boards should be 100% recyclable, highly resistant to UV, to corrosion by chemical and environmental factors and accompanied by a manufacturer's guarantee that their exterior surface will not change color or composition for at least 15 years. The nominal operating voltage of the equipment to be placed on the board shall be 690 V with a nominal current up to 400 A.

The thermoplastic boards to be used should have resistance to fire 750oC (GWT-glow wire test according to IEC / EN 60695-2-1), resistance to external impacts IK 10 (according to IEC / EN 50102) and operating temperature: -25… + 100°C. The insulation class of the boards should be 1000 V AC and 1500 V DC.

Tables with different exterior dimensions, up to one meter high, with a capacity of 24 to 216 elements, shall be available. The board doors are opaque and have an opening angle of 180o to achieve easy access to the interior. In addition to rail materials within the board, industrial low-voltage materials should also be able to be placed using standard assembling kits. For complete compatibility between the board assembling kits and the industrial equipment (automatic power switches, load switches, etc.) as well as the guarantee of the good quality of the installation and operation of the board, the electrical equipment installed inside must be from the same manufacturer.

The boards to ensure maximum flexibility, scalability and quick recovery in the event of a component failure should be fully assembling (separate components: cabinet, door, assembly kits, etc.). Assembling all these components, as well as the assembly kits for the electrical equipment should be possible without the use of tools.

#### Components

The thermoplastic outside placed boards should be able to accept the following components: industrial material metal mounting bases, interior doors, standard horizontal perforated cable passages, wall mounting brackets, column mounting brackets, column mounting brackets, dehumidification kit that retains the degree of protection in IP 54, two-cabinet vertical joining kit for vertical extension of the utility area, thermoplastic base stand for floor placing, metal base stand for embedding in concrete, thermoplastic pedestal for embedding to the ground without the need to build a cement base, cover for protection from the rain.

#### Quality Certification

The supplier should maintain an acceptable quality assurance system for products and services and demonstrate compliance with ISO 9001 certification, provided by an independent certified body. Boards should be accompanied by a CE declaration of conformity, a RoHS environmental statement, and their compliance with the standards should be certified by a recognized organization (VDE, IMQ, etc.). In addition, they must have a manufacturer's written warranty stating a lifetime warranty of at least 15 years, stating that the board material is 100% recyclable as well as being resistant to chemical and environmental factors (temperature, humidity, water, acids, oils, etc.).

**Indicative Type: ABB GEMINI or similar**

### Strong Current Metal Distribution Boards

|  |  |  |
| --- | --- | --- |
|  | | |
| Description | : | Assembled power distribution boards with metal base, back, ceiling and side sections. The board will have a metal opaque door to provide protection of IP43.  It will be possible to install multiple front covers, in order to place DIN 35mm rail materials and, if required, front covers for installing measuring instruments.  It will be possible to install an internal grate for the wiring path.  The board will be ready, assembled with all its accessories, suitable for use.  Depending on the number of materials it will have to host it will be placed on wall or on floor. |
| Rated Operation Voltage, Un | : | 690V |
| Rated Insulation Voltage, Ui | : | 1000V |
| Rated Frequency | : | 50...60Hz |
| Rated Impulse Withstand Voltage, Uimp | : | 6 kV (boards on wall) / 8 kV (boards on floor) |
| Rated Operating Current, In | : | 400Α (boards on wall) / 800Α (boards on floor) |
| Short-time (1 s) withstand current, Icw | : | 25 kΑ (boards on wall) / 35 kΑ (boards on floor) |
| Maximum peak current, Ipk | : | 52,5 kΑ (boards on wall) / 74 kΑ (boards on floor) |
| Degree of Protection | : | IP43 |
| Dimensions | : | 690 x 650 x 204 (boards on wall)  690 x 850 x 204 (Β) (boards on wall)  690 x 1.050 x 204 (boards on wall)  690 x 1.250 x 204 (boards on wall)  690 x 1.550 x 240 (boards on floor)  690 x 1.750 x 240 (boards on floor)  690 x 1.950 x 240 (boards on floor)  690 x 2.150 x 240 (boards on floor) |
| Standards | : | CE, IEC 60439-1 |

**Indicative Type: ΑΒΒ line ArTu L IP43/IK08**

## Low Voltage Distribution Boards’ Components

### Miniature Circuit Breakers (MCB)

The MCBs will comply with European Standards IEC/EN 60898 and IEC/EN 60947-2 as well as with the German DIN VDE 0641 and DIN VDE 0660 Regulations. The MCBs will have type B characteristics. They will have a rated voltage of 400 V (AC), with a disconnection power of at least 6 kA and shall be equipped with thermal elements to protect from overcurrent and electromagnetic elements to protect from short circuit, which shall be induced by currents equal to 3 - 5 times over the rated for MCB type B. The width of their cover should not exceed 17,5 mm, while their attachment on the boards will be on special rails with a suitable latch.

MCBs are used to protect circuits of max current up to 125A

Their technical characteristics will be as follows:

* Manufactured according to standards: EN 60698, EN 60947-2
* Number of Poles: 1P, 2P, 3P, 4P, 1P+N, 3P+N
* Rated Voltage: 230-240V for (1Ρ, 1Ρ+Ν), and 230/400V for 2P, 3P, 4P, 3P+N
* Characteristic: B, C, D, K, Z
* Insulation Voltage: 500 V
* Max Operating Voltage: 440 Vac
* Min Operating Voltage: 12 V
* Frequency: 50-60 Hz
* Rated Short-circuit Capacity - ΕΝ60898: 4.5kA, 6kA, 10kA
* Rated Impulse Withstand Voltage: 4kV
* Dielectric test voltage: 2.5 kV
* Overvoltage Category: III

**Indicative Type: ABB S200**

### Miniature Circuit Breaker PV indicative type ΑΒΒ

Miniature circuit breaker PVs should be suitable for photovoltaic strings. They should be IEC / EN 60947-2 certified.

Their technical characteristics will be as follows:

* Manufactured according to standards: EN 60947-2
* Number of Poles: 2P, 4P
* Rated Operating Voltage: 1000 VDC
* Insulation Voltage: 1500 VDC
* Rated Short-circuit Capacity - ΕΝ60898: 5kA,
* Characteristic: Β
* Rated Impulse Withstand Voltage: 8kV
* Overvoltage Category: III

**Indicative Type: ABB S800PV**

### ABB indicative lamps

The indicative lamps on the panels will be low-power (<1.5W) LEDs and will be connected by inserting suitable fuses. The lamp cover will be red (unless otherwise noted in the drawings).

### Network analyzer, placed on the door of the board

#### Description

The network analyzers are electronic devices that are used for the measurement of the main electrical parameters of the installation: voltage, current, frequency, power factor, active and reactive power, active and reactive energy. They should be placed on a board door and the depth inside the panel should be less than 58 mm, in order to save space at the total depth of the board. They should be complied to international standards IEC 61554, IEC 60529, IEC 60688, IEC 61326-1, IEC 62053-21, IEC 62053-23, IEC 62053-31 and IEC 61010-1. Their rated voltage is 24-240 V AC/DC.

Analyzers should have an illuminated LCD screen for easy and readable display of the measured electrical characteristics, control and programming buttons on their front side, and wiring to the back side of the instrument via removable terminals. The network analyzer should have a self-diagnostic function that will inform the user of any errors in the operation: check of voltages and currents sequence, check of consistency between wiring and set configuration, check of uniformity of current signs. In addition, for security reasons and to prevent any interference and change of the instrument's configured parameters, it should be possible to lock it with a safety password.

The analyzers shall be able to be placed in low and medium voltage electrical panels. The current will be measured indirectly using transformers (from 1 to 10000 A) and it will be possible to programme in the analyzer transform ratio (/ 1 or / 5 transform ratio). The voltage measurement for low voltage applications will be made directly for values up to 500 V AC while for medium voltage networks through voltage transformers (primary: 60 V to 60 kV, secondary: 60 to 190 V). They should also have 2 digital outputs programmed as an alarm or pulse output.

The electrical quantities to be measured shall be:

• Voltage

• Current

• Power factor (PF)

• Frequency

• Active, reactive power

• Maximum demand on active and reactive power

• Harmonic distortion factor (of voltage and current) expressed as a percentage (%) and absolute value

#### Technical characteristics

|  |  |  |
| --- | --- | --- |
| Measurement Type |  | Sampling TRMS |
| **Measurement Accuracy** | | |
| Voltage |  | ±0,5% F.S. ±1 digit |
| Current |  | ±0,5% F.S. ±1 digit |
| Frequency |  | 40,0 - 99,9 Hz: ± 0,2% ± 0,1  100 - 500 Hz: ± 0,2% ± 1 |
| Power factor |  | ± 1% ± 1 digit |
| Active power |  | ± 1% ± 0,1% F.S (from cosφ= 0,3 inductive to cosφ= 0,3 capacitive) |
| Active energy |  | Class 1 |
| **Measurement Range** | | |
| Voltage | [V] | From 10 to 500 approx. TRMS VL-N. |
| Current |  | From 50 mA to 5 A TRMS approx. |
| Frequency | [Hz] | From 40 to 500 approx. |
| Power factor |  | 2 decimal places displayed |
| **Installation** |  | Low and medium voltage.  Single-phase connection  Three-phase with neutral - Three-phase without neutral |
| Current inputs | [A] | Always use external CT |
| Primary from 1 to 10,000 A AC approx. |
| Secondary 5 A and 1 A AC approx.  N.B.: in case of CT secondary at 1 A the accuracy class is reduced to 2.5% F.S. ±1 digit, in the range 5-100% F.S. |
| Voltage inputs | [V] | Direct insertion up to 500 AC approx.. |
| Indirect insertion with VT: |
| **Climatic Conditions** | | |
| Operation | [°C] | from -5 to +55 |
| Relative humidity |  | Max. 93% ((non-condensing) at 40°C |
| **Protection Degree** | | |
| Frontal |  | IP 50 |
| At terminals |  | IP 25 |

The supplier of network analyzers should maintain an acceptable quality assurance system for products and services and demonstrate compliance with ISO 9001 certification, provided by an independent certified body. Analysts should be accompanied by a CE declaration of conformity.

**Network Analyzer Indicative Type: ABB M2M or similar**

### Surge Protective Devices SPD T2

#### General

SPDs are devices used to protect electrical equipment and in particular electronic devices and devices containing electronic components from short-term surges up to a few milliseconds and in the size of thousands of volts, in accordance with IEC 62305 international standard. They should be installed near the beginning of the installation or on the general low voltage board, with the shortest possible cable length. However, when the distance from the general lightning protection device to the next distribution panel is long (> 10 m), additional lightning protection equipment (SPDs) shall be used both at the beginning of the cable and at the end (distribution sub-panel). SPDs, for the sake of uniformity in the appearance of the panel, must be of a known manufacturer and look similar to the MCBs and other rail materials.

Class 2/Type T2 SPDs (8/20 µs) will be used to protect the equipment from indirect lightning strikes. Depending on the grounding system, they can be connected in a common way to a TNC system or in a common and differential way to a TNS and TT system.

The protection element for Class T2 SPDs is the metal-oxide varistor (MOV). 2 pcs are required for the protection of single phase (phase and neutral) and 4 pcs are required for the protection of three phase (3 phases + neutral).

The SPDs branch must be secured with a separate miniature circuit breaker of the same manufacturer to ensure safe isolation of the branch in the event of a short circuit due to the end of life of the lightning protection element. The coordination/co-operation of the SPD with the disconnector is certified by the manufacturer with a specific proposed type.

#### Operation Characteristics

SPDs should consist of detachable cartridges with a maximum discharge current of 15, 40 or 70 kA, depending on the application. They should also limit the voltage that will occur at the edges of the electrical equipment (voltage or protection threshold UP) so as not to exceed 1, 1.4 and 1.5 kV respectively between phase and ground. The rated operating voltage should be 230/400 V and the maximum TOV-temporary overvoltage that may occur at the ends of the SPD is 334 V between phase and neutral. They must have a test certificate in accordance with international and European standards IEC 61643-1 and EN 61643-11.

The surge arrestors should be placed in such a way as to ensure that the length of the grounding cable from the SPD to the grounding spot is less than 15 cm.

**Technical Characteristics**

|  |  |
| --- | --- |
| Number of Poles | 1 |
| Grounding system | TNS-TNC |
| Nominal Voltage, UN (L-N/L-L) | 230/400 V, 50 Hz |
| Max operating voltage, Uc | 275 V, 50 Hz |
| Max discharge current  Imax, "class II" test, (8/20 μs), 1P | 15, 40 or 70 kA |
| Nominal discharge current  In, "class II" test, (8/20 μs), 1P | 5, 20 or 30 kA accordingly |
| Voltage protection level UP | 1, 1,4 or 1,5 kV accordingly |
| Protection element | MOV |
| Reserve | Yes |
| Wire range | 25 mm² and 16 mm² |
| Degree of protection | IP 20 |
| Standards | EN 61643-11, IEC 64643-1 |

**Indicative Type: ABB OVR T2 …(15/40/70) 275 s P or similar**

### Switch Disconnectors 0-1

#### General

Appropriate 0-1 load switches should be used to control and isolate DC loads. They will be sorted according to the Utilization Category required by the application. Their rated operating voltage should be 1000 VDC. They must also comply with the requirements of IEC/EN 60947-1 and IEC/EN 60947-3.

The operating mechanism of the load switches shall be quick make-quick break, they must have compact construction, tightly closed to prevent access to the detachment mechanism. The surface of the power contacts should be silver coated, both to minimize their impedance and to protect them from corrosion. The coating should be made of insulating plastic material, designed to withstand demanding use without the risk of cracking or permanent deformation and with high impact resistance, for protection against falls. Terminals and exposed bare parts should be protected against accidental contact and have a degree of IP 20 protection.

The load switches must operate with manual closing and opening, with locking capability and local control on their front. They should also have the capability of placing a controller and shaft to control the switch from the panel door (the panel door should only be opened if the load switch is OFF). All poles must be switched on and off at the same time. In the OFF position it should be ensured that all switch contacts are open and have a visual indication of the position of the contacts via the control (ON, OFF).

The switches shall have the following characteristics:

|  |  |
| --- | --- |
| Rated Operating Voltage | 1000 VDC |
| Rated Insulating Voltage | 1500 VDC |
| Insulation Voltage (dielectric resistance) | 12 kV |
| Short-circuit Current | 10kA (for 0,1sec) |
| Number of Poles | 4 |

#### Components

The switches shall be capable of receiving the following components: 4th pole for tripolar switches, auxiliary contacts, controls with locking, extension shafts and controls for control from panel board.

**Indicative Type: ABB OTDC100E22 & ΑΒΒ OESAZW1**

### PV Energy Metering Device

According to approved materials and communication devices.

### Rectifier diode

Rectifier diode with a repetitive peak reverse voltage (VRRM) of at least 1000VDC. The diodes should be capable of carrying a current of at least 20A. They should be suitable for placement inside the electrical panel. Their full electrical characteristics are presented in the following table:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Max. values | | | | |
| Repetitive peak reverse voltages | Tvj = -40°C... Tvj max | VRRM | ≥1000 | V |
| Maximum RMS on-state current |  | IFRMSM | ≥20 | A |
| Average on-state current | TC = 130 °C | IFAVM | ≥20 | A |
| Average on-state current | TC = 55 °C, θ = 180°sin, tP = 10 ms | IFAVM | ≥20 | A |
| RMS on-state current | IFRMS | ≥32 | A |
| Surge current | Tvj =25 °C, tP = 10 ms  Tvj = Tvj max tP = 10 ms | IFSM | ≥200 | A |
| I²t-value |  | I²t | ≥32 | A |
| Typical values | | | | |
| On-state voltage | Tvj = Tvj max , iF = 5,0 kA  Tvj = Tvj max , iF = 1,0 kA | VF | ≤ 1,76  ≤ 1,00 | V |
| Threshold voltage | Tvj = Tvj max | V(TO) | ≥ 0,81 | V |
| Slope resistance | Tvj = Tvj max | rT | 0,17 | mΩ |
| On-state characteristic | Tvj = Tvj max | A=  B=  C=  D= | -6,685E-01  2,114E-04  2,752E-01  -1,385E-02 |  |
| Reverse current | Tvj = Tvj max , VR = VRRM | iR | max. 60 | mA |
| Thermal qualities | | | | |
| Thermal resistance, junction to case | beidseitig / two-sided, θ = 180°sin  beidseitig / two-sided, DC  Anode / anode, θ = 180°sin  Anode / anode, DC  Kathode / cathode, θ = 180°sin  Kathode / cathode, DC | RthJC | ≤ 0,038  ≤ 0,035  ≤ 0,064  ≤ 0,061  ≤ 0,085  ≤ 0,082 | °C/W  °C/W  °C/W  °C/W  °C/W  °C/W |
| Thermal resistance, case to heatsink | two-sided  single-sided | RthCH | ≤ 0,005  ≤ 0,010 | °C/W  °C/W |
| Maximum junction temperature |  | Tvj max | 180 | °C |
| Operating temperature |  | Tc op | -40...+180 | °C |
| Weight |  |  | ≤ 280 | g |
| Creepage distance |  |  | 25 | mm |
| Vibration resistance |  |  | 50 | m/s² |
|  | | | | |

**Indicative Type: INFINEON D1050N14T**

# Installation of weak currents

## Cables

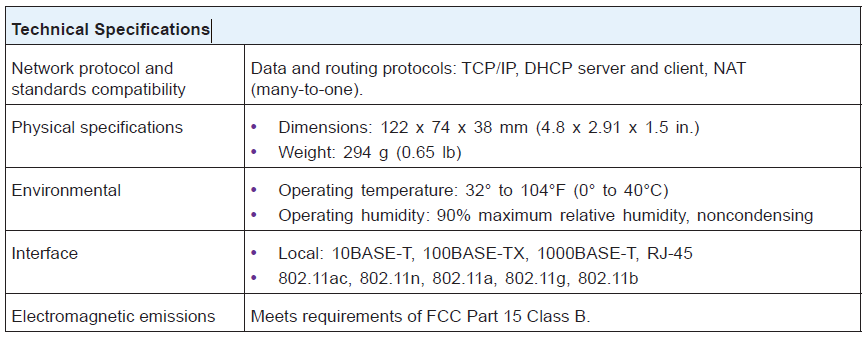
### FTP cat6 data cables

|  |  |  |
| --- | --- | --- |
|  | | |
| Conductor material | : | Copper |
| Number of conductors | : | 8 (4 pairs of 2) |
| Conductor cross-section | : | 23 AWG (0,258mm²) |
| Cable category under EIA/TIA 568 | : | Category 6 |
| Rated outer cross-section | : | 7,0mm |
| Insulation diameter | : | 1,36mm |
| Shielding | : | Yes |
| Outer sheath | : | LSZH |
| Operating capacity | : | 45nF/km |
| Impedance | : | 100 Ω |
| Max. transfer impedance (Ω/km) | : | 120 Ω/km |
| Maximum conductor resistance in dc current | : | 190 Ω/km |
| Signal depreciation (250MHz) | : | 37,2dB/100m |
| Asymmetry | : | 30ns/100m |
| Transmission speed | : | 82% |
| Transmission delay, max 100 MHz | : | 536ns/100m |
| Standards | : | CE,  EIA/TIA 568 Β  ISO 11801 |

**Indicative Type: DATA CABLE S/FTP Cat.6 AWG23 CU 6002 4P Datwyler Cables**

## Switch

The following table shows some indicative technical specifications of the router.

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**Indicative Type: NETGEAR** **AC1200 WiF Range Extender Model EX6150**



# Other Installations

## Charging Station

The charging station to be installed must allow two cars to be charged simultaneously. It will have a three-phase supply with a maximum current of 32A per phase and a maximum power of 2x22kW, or a single-phase supply of a maximum current of 32A and a maximum output of 2x7.4kW. The voltage will be alternating (AC) 400V (230V for single-phase supply) at a frequency of 50Hz.

It will have two IEC 62196-2 Type 2 Mode 3 Mennekes sockets with communication and security electronics IEC 61851. It will be possible to share the available power between the two sockets if two cars are simultaneously being charged.

It should have an LCD display screen for station status, charge evolution, power consumption etc., as well as charging cable protection system when the electric cars are being charged.

The station will be self-propelled with stainless steel Inox housing, anti-vandal protection and anti-graffiti coating. It will be accessible with an RFID card reader (ISO/IEC 14443A and ISO/IEC 15693) and will be free to access/connect and charge (plug & charge).

The station will have built-in MID power analyzers and a C5 remote control. There will be overvoltage protection on each socket (40A - Type C) and differential protection relay on each socket (RCD Type A 30mA, according to IEC 61008).

The installed charging station will be compliant with OCPP 1.6 communication protocol and with IEC 61851 standard. Direct communication with the power analyzers will be performed and, moreover, protection operation monitoring. It will also be possible to communicate either through a GSM network (with a SIM card) or via an Ethernet cable and an existing LAN / WAN network. Users will be identified by RFID cards or NFC smartphones.

Voltage monitoring and charging socket activation will be performed, as well as automatic restarting in the event of a power failure.

The operating temperature range is -30˚C to + 50˚C and the permissible ambient humidity is up to 99%. The station's waterproof degree is IP 54 and the external impact protection is IK 10.

In addition, the station will include the following add-ons:

* Integrated Teltonika RUT240 router for the communication of the station via GPRS mobile network with the back-office management and monitoring system
* Additional metal foundation base (for foundation on floors that cannot be attached to with screws)
* Station branding with two- or four-sided stickers
* Integrated Type B Protection - RCD, Type B 30mA, one per socket (optional instead of Type A RCDs)
* Extension of warranty per year (extension of warranty is provided up to three years in addition to the basic 2 + 3 warranty)

## System installation

The electrical installation will be carried out in accordance with the following standards. Testing and commissioning will be carried out in accordance with IEC62446. In addition, system design and design and equipment installation work in accordance with IEC60364-7-712.

The contractor has to submit a project study for approval, including single-line diagrams and plans.

# Detailed Documentation Statement

The Contractor undertakes to submit a detailed Documentation Statement, including the following:

• Data sheets of the basic equipment parts.

• Certificates of equipment offered.

• Flash Reports of the offered PV panels with serial number recognition and technical characteristics measurements per frame.

• Factory guarantees of the manufacturers of the equipment offered.

• Complete plans (As Build) of the PV station.

• Portal and Mobile Application Manual.

# Reliability-Guarantee-Delivery

The supplier to whom the commission is awarded shall be required to guarantee the proper functioning of the products as follows:

-Photovoltaic modules 10 years for construction and 25 years for efficiency

-Electronic inverter 5 years

-Support base 25 years

-Installer warranty for the proper operation and performance of the systems, at least 3 years. This warranty will cover any other accessories and work not covered by any of the previous warranties.

The warranty period starts on the date of delivery of each material.

During the period of guaranteed operation, the contractor is responsible for the proper functioning of the object of supply. Also, during the guaranteed period of time the contractor is required to perform the required maintenance and to repair any defects in a manner and at a time specified in the Technical Specifications and the other issues of the contract.