

N. ELABORATO	DATA EMISSIONE	DESCRIZIONE	ESEGUITO	CONTROLLATO	APPROVATO
21_30_PV_9PE_RMC_AU_B1RE_3_00	GENNAIO 2022	SCHEDE TECNICHE COMPONENTI IMPIANTO FV	Ing. Massimiliano Pacifico	Arch. Paola Pastore	Ing. Martina Romeo

**OGGETTO:**

Progetto dell'impianto agro-fotovoltaico denominato "Impianto Agro-Fotovoltaico Giumenta" della potenza di 116.027,10 kWp da realizzare nel comune di Ramacca (CT)

**COMMITTENTE:**



**9PIU' ENERGIA s.r.l.**  
Via Aldo Moro, 28  
25043 Breno (BS)

**TITOLO:**

**RS06REL0012A0**  
**B1. PARTE SPECIALISTICA IMPIANTO FOTOVOLTAICO**  
**Schede tecniche componenti impianto FV**

  
**direttore tecnico**  
**Ing. MARTINA ROMEO**  
Sede Legale: Via camazza, 81  
95030 Tremestieri Etneo (CT)  
cell. 340.0844798  
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P.IVA: 05760710870



NOME FILE  
21\_30\_PV\_9PE\_RMC\_AU\_B1RE\_3\_00

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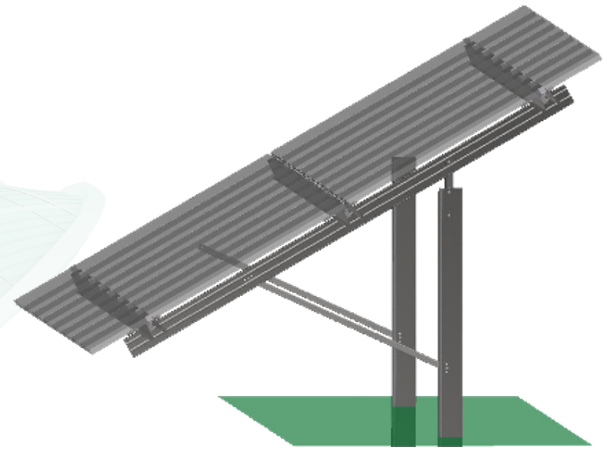
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**ELAB.**  
**RE.03**

# G-Max



- ▶ **Innovative fixed-tilt ground mount system**
- ▶ **Certified to LTR AE-001**
- ▶ **Four major components: post, girder assembly, purlin, and splice (as needed)**
- ▶ **25% increase in girder strength\***
- ▶ **40% increase in purlin spans\***
- ▶ **Standardized hardware, reduces installation time**



Unlike any steel PV mounting system on the market, the **G-Max** design is a direct result of customer and installer feedback, combined with years of engineering and manufacturing experience. G-Max pulls from Schletter's legacy FS System for unbeatable ease-of-assembly and applies that concept to a steel system. The G-Max design principals include; increased adjustment capability, larger spans between foundations, and hardware standardization to reduce the number of part variables.

### Reduction of Piles Means Reduction of Costs

Based on initial findings, the average utility- scale layout will experience a pile (foundation) quantity reduction of 20% and capture the following cost efficiencies:

- Reduced manufacturing time/cost savings
- Reduced freight time, weight/cost savings
- Site deployment time/cost savings
- Installation time/cost savings

### Factory Pre-Assembly

In order to speed installation time in the field, Schletter pre-assembles 30% of the G-Max components in-house. Benefits include:

- Fewer touch points in the field reduces install time, saving installation costs
- Less loose hardware in field reduces material loss on site
- Partially pre-assembled support kits
- Ease-of-assembly
- Optimum price: performance ratio
- Attractive design



Girder Assembly: Factory pre-assembled to unfold in field for incredible ease-of-assembly, reducing touch points, increasing assembly speed



Factory pre-assembled purlin mounting clips, reduces touch points in the field, installation time, and margin of error

### Combined Purlin Design

A major design feature integrated into G-Max is a reduction of purlins required to secure PV modules. Traditional mounting systems use four purlins, while G-Max requires only three without the need for additional cross bracing or cross rails. The result is a reduction of material handling by 25%, increase in spans, reduction of foundations (piles), and consequently lower project installation costs.

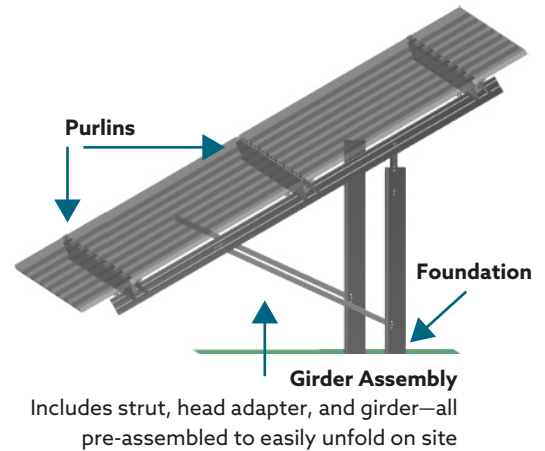
<sup>1</sup>Grounding & Bonding (UL 2703), identified with ETL Listed Mark and tested with specific modules. See G-Max installation manual for complete list. See Intertek© ETL Listed Directory for more information.

\* Compared to previous steel products offered by Schletter.

### Intuitive Design Features

Through the years, Schletter has taken customer and installer feedback seriously. Within the G-Max design are visual quality assurance measures incorporated during manufacturing into the system. What this means for our customers is:

- Part identification numbers on every major component to clearly identify the part and the location for installation
- Embedment depth call-out (score line) on piles—provides a clear visual quality control indicator, increasing installation efficiency and reducing margin of error
- Torque check clips provides a simplified visual quality control check during installation reducing the need for manual torque checks



### Safety and Ergonomic Improvements

It is well known that falls from elevated surfaces, such as from ladders, are one of the leading causes of occupational fatalities and injuries (OSHA). Schletter has designed the G-Max system to allow the option of module installation either from the top-down or bottom-up, reducing the necessity for ladders or scaffolding, and thereby reducing the likelihood of injuries during installation.

### TECHNICAL DATA

<b>Foundation Options (Current)</b>	Hat channel: Galvanized steel, G210 coating, ASTM A653
<b>Fixed Tilt Angles</b>	10 – 35 °
<b>Purlin and Mounting Superstructure</b>	Galvanized steel, ASTM A653
<b>Module Layout</b>	Portrait
<b>Module Compatibility</b>	See installation manual for approved module list for UL Ed.1 requirements
<b>Cable Management</b>	Purlin integrated component materials available
<b>Structural Design Standards</b>	IBC 2006, 2009, 2012, or 2015 (ASCE 7-05, ASCE 7- 10) with local amendments National Building Code of Canada compliant; PE Wet Stamps available
<b>Testing and Certifications</b>	Wind Tunnel, Validation Conforms to UL 2703 (pending), Certified to ULC/ORD STD C1703 (pending)
<b>Warranty</b>	20 year standard limited manufacturer warranty
<b>Country of Manufacture</b>	United States of America



For more information, visit [www.schletter-group.com](http://www.schletter-group.com) or send us an email to [fixedtiltNA@schletter-group.com](mailto:fixedtiltNA@schletter-group.com).

# TRACKER Vanguard™-2P

Single-Row / Multidrive System



## About TrinaTracker

### Excellent Bankability

Trina Solar was ranked top in the list of "Top Bankable Module Supplier" released by Bloomberg New Energy Finance (BNF) for five consecutive years

### Multiple Product Lines For All Applications

Multiple product lines developed by experienced International R&D team for meeting market demands in all application scenarios

### Superb Reliability and High Quality

Leading quality management system and over 20 years product quality control experience in the industry

### Efficient Engineering Design Expert

Systematic and high efficient workflow for presales service to guarantee prompt engineering design

### Unified Products Delivery Management

Global supply chain management of core equipments in solar farm (modules and trackers) with unified delivery channel



## Compatible with Larger Modules

Vanguard™-2P is designed to reduce LCOE with larger modules. Compatible with modules up to 670W+.



## Upgraded Multidrive System

Better wind tolerance, high adaptability and synchronization, greatly improving the stability of the system.



## Innovative SuperTrack Technology

According to real-time weather and actual terrain conditions, smart algorithm dynamically optimizes tracking angle, increases receiving radiation and reduces shading loss.

UP TO 8% yield gain



## More Modules Per Tracker

Designed with two-in-portrait configuration (2P), up to 4 strings of 1500V system per row.

UP TO 120 modules per tracker



## Fewer Piles Per MW

7 piles per row (standard configuration), number of piles per MW has been optimized.

UP TO 45% fewer piles

## OPTIMIZED BEARING DESIGN

- Global patented spherical bearings, up to 30% angle adjustability.
- Alleviate the damage caused by uneven foundation settlement during operation.
- Release the extra stress caused by the deformation of the tracker system, reduce the load and failure rate of each component.



## WIND TUNNEL TESTED BY RWDI

Static load + dynamic load dual test  
3D flutter stability analysis and shock response  
Evaluation of precise wind load distribution on tracker system.



Full aeroelastic model test.



# TECHNICAL SPECIFICATIONS

## GENERAL FEATURES

Solar tracker type	Single row Single-Axis
Tracking range	±55° (110°)
Driver	Multiple linear actuator
Configuration	Two modules in portrait (2P) up to 4 strings per tracker (1500V string)
Solar module supported	Framed
Foundation options	Direct ramming / Pre-drilling + ramming / Micropile / PHC piles
Pile section	W, compatible with IPE, IPEA
Modules attachment	Bolts, Rivets and Clips
Piles per MW (550Wp module)	~106 piles/MW <sup>(1)</sup> (120 modules per row)
(670Wp module)	~102 piles/MW <sup>(1)</sup> (102 modules per row)
Terrain adaptability	15% N-S <sup>(2)</sup>
Wind and snow loads tolerance	Tailored to site requiriement
Rear shading factor	0.8%
Critical wind speed	47m/s

## STRUCTURE

Material	High Yield Strength Steel
Coating	HDG, Pregalvanized & ZM <sup>(3)</sup>

## CONTROLLER

Controller	Electronic board with microprocessor
Ingress protection marking	IP65
Tracking method	Astronomical algorithms + SuperTrack technology <sup>(4)</sup>
Advanced wind control	Customizable
Anemometer	Cup/Ultrasonic
Night-time stow	Configurable
Communication with the tracker	Wired option: RS485 Wireless option: LoRa/Zigbee
Operating conditions	Altitude < 4000m <sup>(5)</sup> Temperature: -30°C to 60°C <sup>(5)</sup>
Sensors	Digital inclinometer
Power (motor drive)	DC motor: 0.2kW
Power supply	Grid connection / String powered / Self-powered with battery

## WARRANTY

Structure	10 years
Driver and control components	5 years

(1) Depending on layout

(2) For scenarios beyond the scope of use, please consult TrinaTracker

(3) Standard configuration. Other coating under request

(4) Includes smart tracking algorithm and smart backtracking algorithm

(5) Standard configuration. Different conditions under reques, please consult TrinaTracker

CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.

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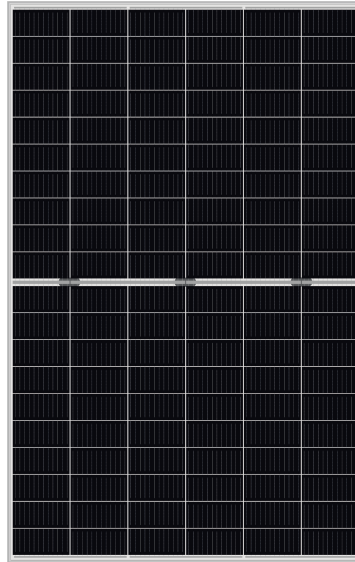
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# JW-HD120N

N-type Bifacial High Efficiency Mono Silicon Half-Cell Double Glass Module

**605-630W**

Cell Type: 12BB



**630W**

Maximum Power Output

**22.26%**

Maximum Module Efficiency

**0~+5W**

Power Output Tolerance



### Additional Power Generation Gain

At least 30-year product life, more than 10%- 30% additional power gain comparing with conventional module



### ZERO LID (Light Induced Degradation)

N-type solar cell has no LID naturally, can increase power generation



### Lower LCOE

High bifaciality, high power output, saving BOS cost



### Better Weak Illumination Response

Wide spectral response, higher power output even under low-light settings like smog or cloudy days



### Better Temperature Coefficient

Higher power generation under working conditions, thanks to passivating contact cell technology



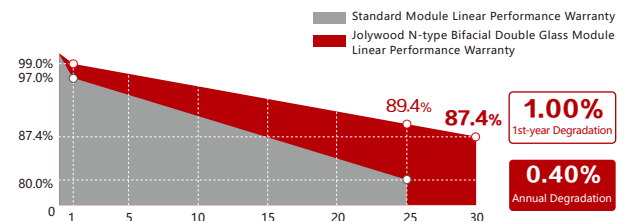
### Wider Applicability

BIPV, vertical installation, snowfield, high-humid area, windy and dusty area

## Jolywood Delivers Reliable Performance Over Time

- Leader of N-type bifacial technology
- Fully automatic facility and world-class technology
- Long term reliability tests passed
- 100% EL tests

## Linear Performance Warranty



12 Years Product Material & Workmanship 30 Years Linear Performance Warranty

## Additional Insurance Backed by Munich Re



# JW-HD120N Series

## N-type Bifacial High Efficiency Mono Silicon Half-Cell Double Glass Module

### Electrical Properties | STC\*

Testing Condition	Front Side	Front Side	Front Side	Front Side	Front Side	Front Side
Peak Power (Pmax) (W)	605	610	615	620	625	630
MPP Voltage (Vmp) (V)	34.7	34.9	35.1	35.3	35.5	35.7
MPP Current (Imp) (A)	17.45	17.49	17.53	17.58	17.62	17.66
Open Circuit Voltage (Voc) (V)	41.5	41.7	41.9	42.1	42.3	42.5
Short Circuit Current (Isc) (A)	18.45	18.50	18.55	18.60	18.65	18.70
Module Efficiency (%)	21.38	21.55	21.73	21.91	22.08	22.26

\*STC: Irradiance 1000 W/m<sup>2</sup>, Cell Temperature 25°C, AM1.5  
The data above is for reference only and the actual data is in accordance with the practical testing

### Electrical Properties | NOCT\*

Testing Condition	Front Side	Front Side	Front Side	Front Side	Front Side	Front Side
Peak Power (Pmax) (W)	458	461	465	469	473	477
MPP Voltage (Vmp) (V)	32.5	32.7	32.9	33.1	33.3	33.5
MPP Current (Imp) (A)	14.07	14.10	14.13	14.17	14.21	14.24
Open Circuit Voltage (Voc) (V)	39.7	39.9	40.0	40.2	40.4	40.6
Short Circuit Current (Isc) (A)	14.88	14.92	14.96	15.00	15.04	15.08

\*NOCT: Irradiance at 800 W/m<sup>2</sup>, Ambient Temperature 20°C, Wind Speed 1 m/s

### Operating Properties

Operating Temperature (°C)	-40°C~+85°C
Maximum System Voltage (V)	1500V (IEC)
Maximum Series Fuse Rating(A)	30
Power Tolerance	0~+5W
Bifaciality*	75%

\*Bifaciality= $\frac{P_{max\text{rear}}(\text{STC})}{P_{max\text{front}}(\text{STC})}$ , Bifaciality tolerance:±5%

### Temperature Coefficient

Temperature Coefficient of Pmax*	-0.320%/°C
Temperature Coefficient of Voc	-0.260%/°C
Temperature Coefficient of Isc	+0.046%/°C
Nominal Operating Cell Temperature (NOCT)	42±2°C

\*Temperature Coefficient of Pmax±0.03%/°C

### Mechanical Properties

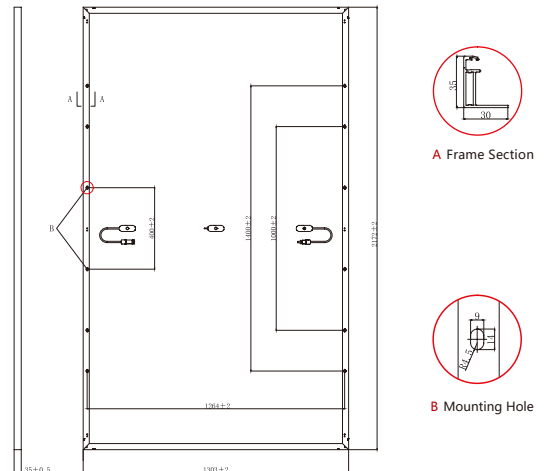
Cell Type	210.00mm*105.00mm
Number of Cells	120pcs(12*10)
Dimension	2172mm*1303mm*35mm
Weight	35.5kg
Front /Rear Glass*	2.0mm/2.0mm
Frame	Anodized Aluminium
Junction Box	IP68 (3 diodes)
Length of Cable*	4.0mm <sup>2</sup> , 300mm
Connector	MC4 Compatible

\*Heat strengthened glass  
\*Cable length can be customized

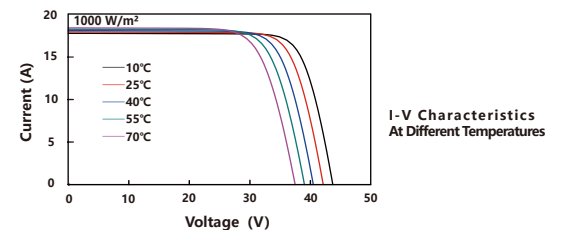
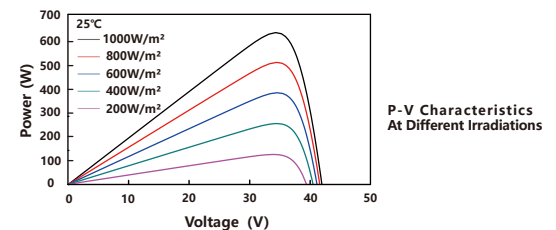
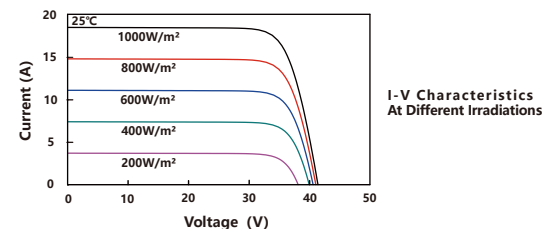
### With Different Power Generation Gain (regarding 620W as an example)

Power Gain (%)	Peak Power (Pmax) (W)	MPP Voltage (Vmp) (V)	MPP Current (Imp) (A)	Open Circuit Voltage (Voc) (V)	Short Circuit Current (Isc) (A)
10	670	35.3	18.97	42.1	20.07
15	694	35.3	19.66	42.1	20.80
20	719	35.3	20.36	42.1	21.54
25	744	35.3	21.05	42.1	22.27
30	769	35.4	21.75	42.2	23.01

### Engineering Drawing (unit: mm)



### Characteristic Curves | HD120N-620



### Packaging Configuration

Packing Type	40'HQ
Piece/Pallet	31
Pallet/Container	18
Piece/Container	558

\*The specification and key features described in this datasheet may deviate slightly and are not guaranteed. Due to ongoing innovation, R&D enhancement, Jolywood (Taizhou) Solar Technology Co., Ltd. reserves the right to make any adjustment to the information described herein at any time without notice. Please always obtain the most recent version of the datasheet which shall be duly incorporated into the binding contract made by the parties governing all transactions related to the purchase and sale of the products described herein.



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# SUNWAY STATION 1500 1500V 640 LS

Fully Integrated Solar Power Station



Designed for large utility scale applications, **SUNWAY STATIONS** feature best-in-class technology without compromises providing the highest power density and reliability.

**With all the technical advantages and flexibility of SUNWAY TG inverters, SUNWAY STATIONS** allow optimum configuration of medium and large PV plants providing the lowest system cost and the maximum efficiency.

## **BENEFITS**

- Based on SUNWAY TG solar inverters
- Pre-assembled substations, fully fitted out and tested to reduce the plant costs to a minimum, ensuring easy laying and wiring
- Built with sandwich sheet panels and integrated vibrated reinforced concrete foundations for easy transport (structure fully made of concrete optionally available, LC version)
- High efficiency MV distribution transformer
- Extended configurability of the MV section to adapt to any specific plant requirement
- Full access to inverters and accessories for optimum reliability and serviceability
- Grid Code integrated features (LVRT, Reactive Power Control, Frequency and Voltage control) in compliance with the most advanced European, North American and WW standards
- Integrated DC-side protection provided by DC fuses and disconnect switch with release coil
- Integrated Ground Fault Detection system and miswiring protection on DC side
- Integrated Modbus on RS485 and TCP/IP on Ethernet data connection, integrated fiber optic ports
- Remote monitoring optionally available via Santerno Web Portal ([www.sunwayportal.it](http://www.sunwayportal.it))
- Integrated inputs for environmental sensors
- Possibility to install photovoltaic modules requiring one grounded pole, both positive and negative pole
- Thorough manufacture with first class materials

Main features	
Model	SUNWAY STATION 1500 1500V 640 LS
Inverter	1 x SUNWAY TG 1800 1500V TE 640 STD
Number of independent MPPT	2
Rated output frequency	50 Hz / 60 Hz
Power Factor @ rated power	1 - 0.9 lead/lag
Maximum operating altitude <sup>(2)</sup>	4000 m a.s.l.
Maximum value for relative humidity	100% condensing
Input (DC)	
Max. Open-circuit voltage	1500 V
PV Voltage Ripple	< 1%
Maximum DC inputs fuse-protected	7 (with DC fuses on both poles)
Maximum short circuit PV input current	1500 A
Output (AC)	
Rated output current, LV side	1353 A
Rated output power, LV side	1500 kVA
Power threshold	< 1% of Rated AC inverter output power
Total AC current distortion	≤ 3 %
Rated AC voltage, MV side	6 to 24 kV (up to 30 kV on request)
Connection phases, MV side	3Ø3W
Inverter efficiency - LV side <sup>(3)</sup>	
Maximum / EU/ CEC efficiency	98.5% / 98.2 % / 98.0%
MV transformer	
Type	Cast resin (standard) / Oil (available as option)
Transformer rated power	1500 kVA
Fuse protection	Yes
Temperature control	Yes
Oil pressure control <sup>(4)</sup>	Yes
MV Cabinet	
Type	Compact SF6 for secondary distribution
Standard Configuration <sup>(6)</sup>	R+CB (Input Line + Transformer Protection by Circuit Breaker)
Insulation Class	17.5 / 24 / 36 kV (Others available)
Dimensions and weight <sup>(5)</sup>	
Cabinet Dimensions (WxHxD)	8250 x 3230 x 2400 mm (for reference)
Overall Weight	23000 kg (for reference)

#### NOTES

<sup>(1)</sup> At rated Vac and Cos φ =1

<sup>(2)</sup> Up to 1000 m without derating

<sup>(3)</sup> Auxiliary consumptions are not considered when calculating the conversion efficiency

<sup>(4)</sup> Only for oil type transformers

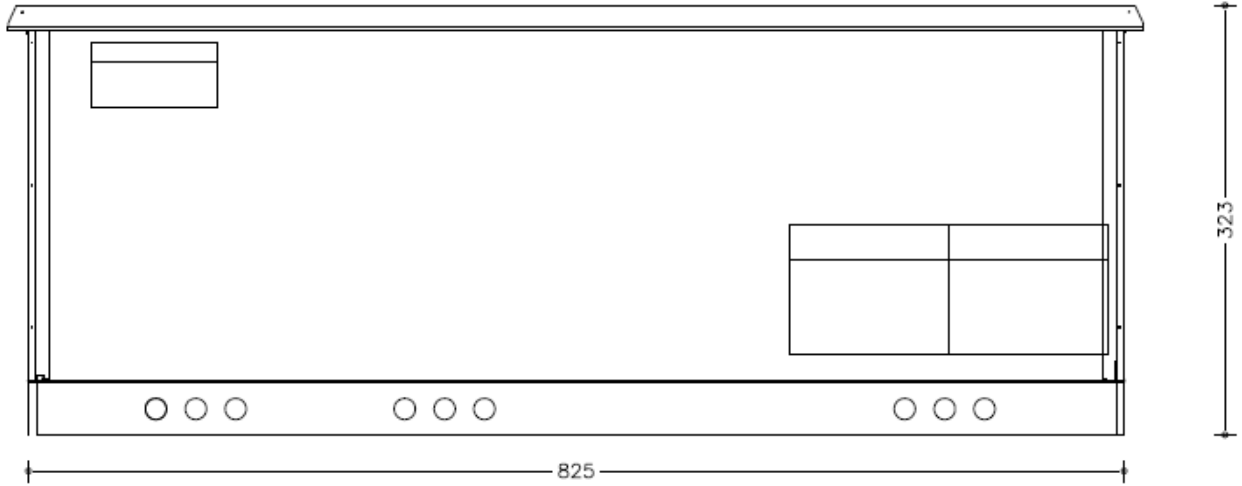
<sup>(5)</sup> Dimensions and weight not applicable to Sunway Station LC version with structure fully made of concrete

<sup>(6)</sup> The MV cabinet composition can be customized

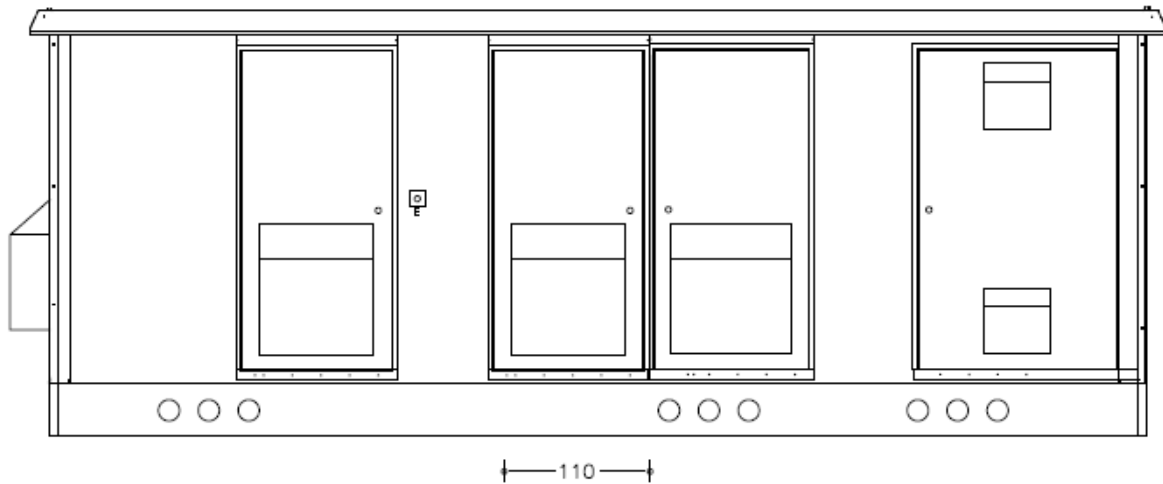
Protective devices	
Protection against overvoltage (SPD), DC side	Yes
DC input current monitoring	Optional (Zone Monitoring)
DC side disconnection device	DC disconnect switch
Ground fault monitoring	Yes
AC disconnection device, LV side	AC circuit breaker
AC disconnection device, MV side	AC disconnect switch
AC ground fault monitoring, LV side	Optional
Grid fault monitoring	Yes
Compartment temperature control	Yes
Emergency stop switch	Yes
Safety key distribution system	Yes
Communication Interfaces	
Power modulation	Via Remote Control (RS485, Ethernet)/analog inputs
PV plant monitoring	Optional (via Santerno Web Portal)
Protocols	Modbus RTU/Modbus TCP/IP
Ethernet/RS485/Optical fiber	Yes/Yes/Optional
Premium Remote Monitoring	Optional
Additional features	
Ethernet switch	Yes
Anticondensation heater	Optional
Environmental sensors	Up to 6 per Inverter
Cooling system	Forced air ventilation
UPS, LV side	Optional 4/6/10 kVA
Fiscal meter	Optional
Grid interface device protection	Optional
Self-consumption meter	Optional
Kit for earthed negative/positive pole	Optional
Fire sensors	Optional
Personal protective kit: fire extinguisher, dielectric gloves and insulating rubber mat	Yes

**Layout**

PROSPETTO POSTERIORE / BACK VIEW

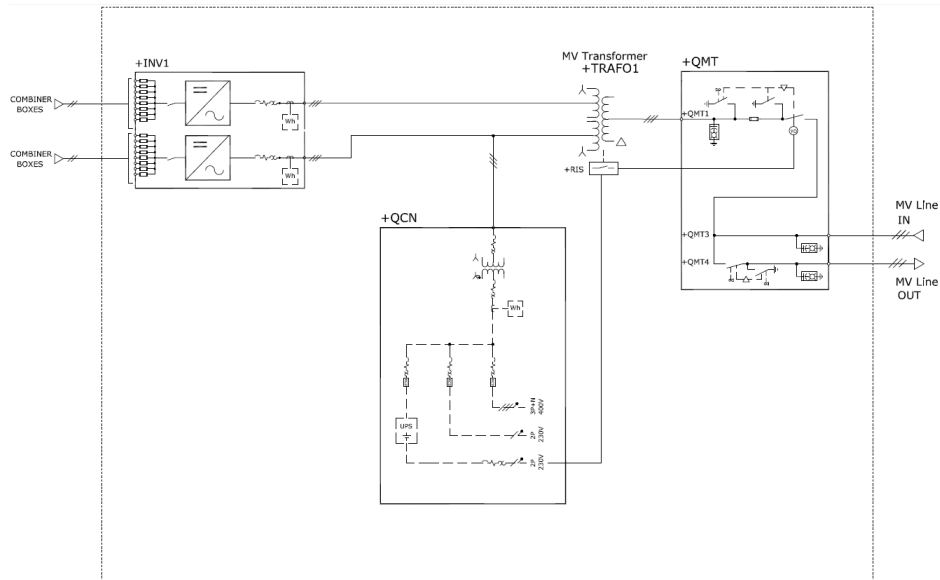


PROSPETTO FRONTALE / FRONT VIEW



## Block Diagram

The Sunway Station is supplied complete with internal wiring (power wiring and auxiliary wiring). Standard supply does NOT include outgoing cables and wiring. Medium Voltage cabinet composition can be customized.



## Main Normative References

**SANTERNO SUNWAY STATIONS** have been developed, designed and manufactured in accordance with the latest requirements of the Low Voltage directives, Electromagnetic Compatibility directives and Grid Connection standards.

Standards <sup>(7)</sup>	
Compliance	IEC 61000-6-4, IEC 61000-6-2 IEC 61000-6-3, IEC 61000-6-1
MV Cabinet	IEC 62271-200, CEI EN 62271-102
LV/MV Transformer	IEC 62271-200, CEI EN 62271-102
Cabinet structure/internal wiring	CEI 64-8, CEI 11-35, CEI EN 61330
Grid connection	CEI 0-16, A.70, BDEW, Arrêté du 23 Avril 2008, RD 1699/2011, RD 661/2007, CQC, IEEE 1547 RD 1633/2000, RD 661/2007

### NOTES

<sup>(7)</sup> Additional certificates available on request

Electronica Santerno S.p.A. reserves the right to make any technical changes to this document without prior notice.

## Riferimento Normativo/Standard Reference

CEI 20-91	Costruzione e requisiti/Construction and specifications
EN 60332-1-2	Propagazione incendio/Fire propagation
EN 50267-2-1	Emissione gas/Gas emission
EN 50267-2-2	Emissione fumi/Smoke emission
2006/95/CE	Direttiva Bassa Tensione/Low Voltage Directive
2011/65/CE	Direttiva RoHS/RoHS Directive
CA01.00546	Certificato IMQ/IMQ Certificate



## DESCRIZIONE

Cavo unipolare flessibile stagnato per collegamenti di impianti fotovoltaici. Isolamento e guaina realizzati con mescola elastomerica senza alogeni non propagante la fiamma.

### Conduttore

Corde flessibile di rame stagnato, classe 5

### Isolante

Mescola LSOH di gomma reticolata speciale di qualità G21  
LSOH = Low Smoke Zero Halogen

### Guaina esterna

Mescola LSOH di gomma reticolata speciale di qualità M21

### Colore anime

Nero

### Colore guaina

Blu, rosso, nero

## CARATTERISTICHE TECNICHE

**Tensione massima:** 1800 V c.c. - 1200 V c.a.

**Temperatura massima di esercizio:** 90°C

**Temperatura minima di esercizio:** -40°C

**Temperatura minima di posa:** -40°C

**Temperatura massima di corto circuito:** 250°C

**Sforzo massimo di trazione:** 15 N/mm<sup>2</sup>

**Raggio minimo di curvatura:** 4 volte il diametro esterno massimo

### Condizioni di impiego

Per l'interconnessione di elementi di impianti fotovoltaici. Adatti per l'installazione fissa all'esterno e all'interno, entro tubazioni in vista o incassate o in sistemi chiusi similari.

Adatti per la posa direttamente interrata o entro tubo interrato.

## DESCRIPTION

Flexible single-core cable for connection in photovoltaic installations. Insulation and sheath made of elastomeric compound, halogen free and flame retardant.

### Conductor

Tinned copper flexible wire, class 5

### Insulation

Special LSOH cross-linked rubber compound, G21 quality  
LSOH = Low Smoke Zero Halogen

### Outer sheath

Special LSOH cross-linked rubber compound, M21 quality

### Cores colour

Black

### Sheath colour

Blue, red or black

## TECHNICAL CHARACTERISTICS

**Maximum voltage  $U_0/U$ :** 1800 V d.c. - 1200 V a.c.

**Maximum operating temperature:** 90°C

**Minimum operating temperature:** -40°C

**Minimum installation temperature:** -40°C

**Maximum short circuit temperature:** 250°C

**Maximum tensile stress:** 15 N/mm<sup>2</sup>

**Minimum bending radius:** 4 x maximum external diameter

### Use and installation

For interconnection of photovoltaic elements. Suitable for fixed installation indoor and outdoor, in pipes exposed or embedded or in similar closed systems. Suitable for laying directly underground or in pipe underground.

Formazione <i>Formation</i>	Ø indicativo conduttore  <i>Approx. conductor Ø</i>	Spessore medio isolante  <i>Average insulation thickness</i>	Spessore medio guaina  <i>Average sheath thickness</i>	Ø indicativo produzione  <i>Approx. production Ø</i>	Peso indicativo cavo  <i>Approx. cable weight</i>	Resistenza elettrica max a 20°C  <i>Max. electrical resistance at 20°C</i>	Portata di corrente in aria libera <i>Current rating free in air</i>	
							Singolo cavo <i>Single cable</i> 60°C	2 cavi adiacenti <i>2 adjacent cables</i> 60°C
n° x mm <sup>2</sup>	mm	mm	mm	mm	kg/km	ohm/km	A	A
1 x 1,5	1,5	0,7	0,8	4,7	34	13,7	30	25
1 x 2,5	2,1	0,7	0,8	5,2	47	8,21	40	35
1 x 4	2,5	0,7	0,8	5,8	58	5,09	55	47
1 x 6	3,0	0,7	0,9	6,5	80	3,39	70	59
1 x 10	4,0	0,7	1,0	7,9	127	1,95	95	81
1 x 16	5,0	0,7	1,0	8,8	180	1,24	130	110
1 x 25	6,2	0,9	1,1	10,6	270	0,795	180	153
1 x 35	7,6	0,9	1,1	12,0	360	0,565	220	187
1 x 50	8,9	1,0	1,2	14,1	515	0,393	280	238
1 x 70	10,5	1,1	1,2	15,9	720	0,277	350	297
1 x 95	12,5	1,1	1,3	17,7	915	0,210	410	348
1 x 120	13,7	1,2	1,3	19,8	1160	0,164	480	408

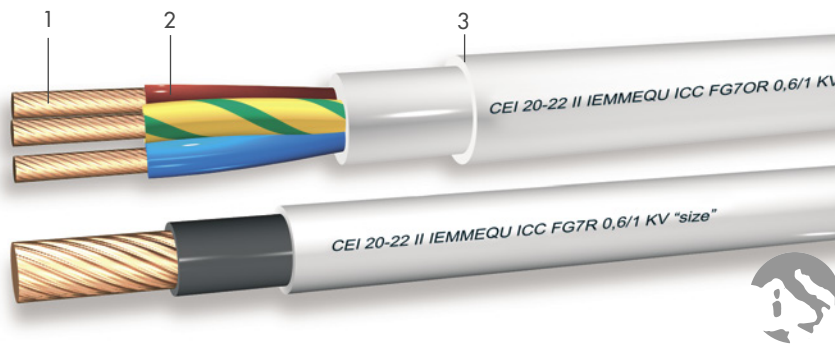





# FG7R / FG7OR

Cavi per energia, comandi e segnalazioni, isolati con mescola elastomerica alto modulo di qualità G7, sotto guaina di pvc, non propaganti l'incendio e a ridotta emissione di gas corrosivi. Cavi con conduttori flessibili per posa fissa.

Fire retardant, LSF power, control and signalling cables, insulated in type G7 elastomeric compound and pvc sheathed with flexible conductors for fixed installation.










 Codice colori / Colours code  
CEI UNEL 00722/ HD 308

1 - Rame flessibile Classe 5 CEI EN 60228  
2 - Mescola elastomerica G7  
3 - PVC Rz

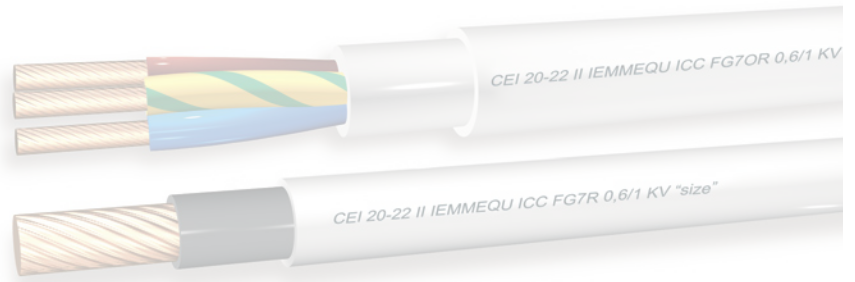
1 - Flexible copper class 5 CEI EN 60228  
2 - Elastomeric compound G7  
3 - PVC Rz



NORME / STANDARDS		APPROVAZIONI / APPROVALS		CONFEZIONAMENTO / PACKAGING	
CEI 20-13 UNEL 35375 UNEL 35377 (FG7OR over 7 cond.)	 		 		
<b>CARATTERISTICHE</b>	<b>-25°C + +90° C sul conduttore</b>	<b>CHARACTERISTICS</b>		<b>-25°C + +90° C on the conductor</b>	
Temperatura di esercizio:	<b>0,6/1 KV</b>	Operating temperature:		<b>0,6/1 KV</b>	
Tensione nominale:	<b>250° C sul conduttore</b>	Rated voltage:		<b>250° C on the conductor</b>	
Temp. max di corto circuito:	<b>(durata max. 5 secondi)</b>	Max temp. of short circuit:		<b>(max duration 5 seconds)</b>	
Raggio min di curvatura:	<b>UNEL 35375: 4 x diam. esterno</b>	Min bending radius:		<b>UNEL 35375: 4 x outer diam.</b>	
	<b>UNEL 35377: 6 x diam. esterno</b>			<b>UNEL 35377: 6 x outer diam.</b>	
<b>APPLICAZIONI</b>	Cavi energia per uso interno anche in ambienti umidi, installazione esterna, posa fissa su pareti nude o strutture in acciaio, in tubi o in sottoterraneo. Resistenti ai raggi UV, adatti per uso esterno permanente.	<b>APPLICATIONS</b>		Power cables, indoor use also in wet environments, outdoor installation, fixed laying on bare walls or steel structures, in pipes or in underground. UV resistant, suitable for permanent external use.	
					

Sezione nominale mm <sup>2</sup> Nominal size mm <sup>2</sup>	Diametro max fili mm Max diameter of wires mm	Diametro esterno mm Outer diameter mm	Peso cavo Kg/Km Cable weight Kg/Km
1x1,5	0,26	5,7	50
1x2,5	0,26	6,2	65
1x4	0,31	6,7	80
1x6	0,31	7,3	105
1x10	0,41	8,2	155
1x16	0,41	9,1	220
1x25	0,41	10,7	320
1x35	0,41	11,9	420
1x50	0,41	13,6	560
1x70	0,51	15,7	785
1x95	0,51	17,3	1050
1x120	0,51	19,2	1305
1x150	0,51	21,3	1610
1x185	0,51	23,3	1985
1x240	0,51	26,2	2610
1x300	0,51	28,6	3225
1x400	0,51	32,6	4005
1x500	0,51	37,1	5060
1x630	0,51	42,7	6760
2x1,5	0,26	9,7	145
2x2,5	0,26	10,6	185
2x4	0,31	11,7	235
2x6	0,31	12,9	300
2x10	0,41	15,0	460
2x16	0,41	16,8	635
2x25	0,41	20,0	930
2x35	0,41	22,4	1220
2x50	0,41	26,2	1665
2x70	0,51	30,4	2320
2x95	0,51	33,6	3025
2x120	0,51	38,1	3845
2x150	0,51	42,1	4720
2x185	0,51	46,8	5910
2x240	0,51	52,6	7665

# FG7R / FG7OR



Sezione nominale mm <sup>2</sup> Nominal size mm <sup>2</sup>	Diametro max fili mm Max diameter of wires mm	Diametro esterno mm Outer diameter mm	Peso cavo Kg/Km Cable weight Kg/Km
3x1,5	0,26	10,2	165
3x2,5	0,26	11,2	210
3x4	0,31	12,3	275
3x6	0,31	13,6	355
3x10	0,41	15,9	560
3x16	0,41	17,8	780
3x25	0,41	21,2	1160
3x35	0,41	23,8	1535
3x50	0,41	27,9	2090
3x70	0,51	32,6	2945
3x95	0,51	36,3	3925
3x120	0,51	40,6	4905
3x150	0,51	45,1	6055
3x185	0,51	50,1	7570
3x240	0,51	56,3	9865
3x300	0,51	61,4	12120
4x1,5	0,26	10,9	190
4x2,5	0,26	12,0	250
4x4	0,31	13,3	325
4x6	0,31	15,1	445
4x10	0,41	17,3	685
4x16	0,41	19,4	970
4x25	0,41	23,3	1450
4x35	0,41	26,6	1960
4x50	0,41	30,9	2640
4x70	0,51	36,6	3790
4x95	0,51	40,2	4985
4x120	0,51	45,2	6255
4x150	0,51	50,5	7775
4x185	0,51	55,7	9640
4x240	0,51	62,6	12585
4x300	0,51	68,3	15475
3x35+1x25	0,41	25,9	1835
3x50+1x25	0,41	29,0	2320
3x70+1x35	0,51	34,3	3310
3x95+1x50	0,51	38,2	4385
3x120+1x70	0,51	43,2	5600
3x150+1x95	0,51	48,4	7065
3x185+1x95	0,51	52,2	8410
3x240+1x150	0,51	59,8	11305
3x300+1x150	0,51	64,2	13430
5x1,5	0,26	11,8	215
5x2,5	0,26	13,0	285
5x4	0,31	14,8	390
5x6	0,31	16,4	515
5x10	0,41	18,8	810
5x16	0,41	21,3	1150
5x25	0,41	26,0	1760
5x35	0,41	29,2	2345
5x50	0,41	34,2	3175
5x70	0,51	40,6	4560
5x95	0,51	44,8	6035
<b>FG7OR - multi</b>			
7x1,5	0,26	14,1	300
10x1,5	0,26	16,6	390
12x1,5	0,26	17,7	440
16x1,5	0,26	19,8	550
19x1,5	0,26	20,9	620
24x1,5	0,26	23,0	760
7x2,5	0,26	12,8	390
10x2,5	0,26	15,0	520
12x2,5	0,26	16,9	590
16x2,5	0,26	17,8	750
19x2,5	0,26	18,7	850
24x2,5	0,26	20,6	1040

I dati e le illustrazioni della presente pubblicazione non sono impegnativi e possono essere variati a seguito di modifiche e/o perfezionamenti ritenuti opportuni dal costruttore. The data and sketches of this technical leaflet are not binding and can be varied as a consequence of modifications and/or improvements deemed necessary by the manufacturer.

# ARE4H5E(X) 12/20(24)kV SK1 (SHOCK PROOF 1)

Contatto  
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**CAVI A 20 kV UNIPOLARI O TRIPOLARI A SPIRALE VISIBILE CON ISOLAMENTO XLPE A SPESSORE RIDOTTO, GUAINA DI ALLUMINIO E GUAINA A SPESSORE MAGGIORATO DI PE, A TENUTA D'ACQUA E RESISTENTI ALL'IMPATTO.**

## STANDARDS

**Internazionale** EN 60228;  
HD 620; IEC 60502-2

**Nazionale** CEI 20-68

## DESCRIZIONE

### APPLICAZIONI

Nelle reti di distribuzione energia, per sistemi di tensione fino a 20 kV (Um 24 kV). Per installazioni fisse interne o esterne, posato in aria o direttamente o indirettamente interrato, anche in ambienti bagnati.

### CARATTERISTICHE

Il cavo **SK1 (SHOCK PROOF 1)** si basa sull'uso di una guaina a spessore maggiorato di uno speciale composto termoplastico che migliora notevolmente la resistenza allo schiacciamento e all'impatto. Esso è progettato per sostituire i pesanti e rigidi cavi armati con metallo, nelle situazioni dove è fondamentale la protezione contro i danneggiamenti. Per la presenza della guaina a spessore maggiorato, conformemente alla norma CEI 11-17 punto 4.3.11 b, questo cavo è equivalente ad un cavo armato e può essere direttamente interrato senza alcuna protezione meccanica esterna.

Il metodo tradizionale per ridurre i danneggiamenti meccanici è proteggere il cavo con armatura metallica, generalmente a nastri, o utilizzare protezioni esterne durante l'installazione. Entrambe queste soluzioni hanno numerosi svantaggi se comparate ai cavi non armati:

- nei cavi armati risultano maggiori il peso, la rigidità e il tempo di installazione;
- le protezioni esterne (tubi, canaline coperte, ecc.) non proteggono il cavo durante il trasporto e le fasi di installazione e comportano extra costi e aumento dei tempi di installazione.

### BENEFICI DEI CAVI SK1

- ottimo comportamento all'impatto e allo schiacciamento
- costi di installazione più bassi
- assenza di corrosione per mancanza dell'armatura metallica
- maneggevolezza, flessibilità, leggerezza
- a tenuta d'acqua radiale e longitudinale

### MARCATURA (a getto d'inchiostro)

Unipolari ARE4H5E



Temp. max di servizio del conduttore  
**90 °C**



Minima temperatura d'installazione  
**-20 °C**



Fattore di curvatura durante l'installazione  
**20 (xD)**



Fattore di curvatura per installazione fissa  
**15 (xD)**



Tenuta d'acqua radiale  
**Yes**



Tenuta d'acqua longitudinale  
**Yes**

Tutte le illustrazioni, i disegni, le specifiche, i programmi e particolari di vario genere su pesi, formato e dimensioni contenuti nella documentazione tecnica o commerciale di Nexans e' puramente indicativa.

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# ARE4H5E(X) 12/20(24)kV SK1 (SHOCK PROOF 1)

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NEXANS B "ANNO" ARE4H5E 12/20 kV 1x"S" SK1 "marcatura metrica"

Tripolari a spirale visibile ARE4H5EX

Fase 1: NEXANS B "ANNO" ARE4H5EX 12/20 kV 3x1x"S" SK1 FASE 1 "marcatura metrica"

Fase 2: FASE 2

Fase 3: FASE 3

## NOTE

Le portate di corrente sono calcolate considerando:

- schermi metallici connessi tra loro e a terra ad entrambe le estremità
- resistività termica del terreno  $1,0 \text{ }^\circ\text{C m/W}$
- profondità di posa 1,2 m
- cavi unipolari disposti a trifoglio
- cavo singolo per i cavi tripolari a spirale visibile

D = diametro esterno del cavo (diametro della fase per cavi a spirale visibile)

Per i cavi unipolari:

- raggio minimo di piegatura durante l'installazione  $20 \times D$
- raggio minimo di piegatura in installazione fissa  $15 \times D$

Per i cavi tripolari a spirale visibile:

- diametro circoscritto: moltiplicare il diametro esterno in tabella per 2,16
- peso del cavo: moltiplicare il peso in tabella per 3
- raggio minimo di piegatura durante l'installazione  $1,5 \times 20 \times D$
- raggio minimo di piegatura in installazione fissa  $1,5 \times 15 \times D$
- soluzione a spirale visibile fino al  $400 \text{ mm}^2$

Su richiesta è possibile il conduttore di rame



Temp. max di servizio del conduttore  
**90 °C**



Minima temperatura d'installazione  
**-20 °C**



Fattore di curvatura durante l'installazione  
**20 (xD)**



Fattore di curvatura per installazione fissa  
**15 (xD)**



Tenuta d'acqua radiale  
**Yes**



Tenuta d'acqua longitudinale  
**Yes**

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# ARE4H5E(X) 12/20(24)kV SK1 (SHOCK PROOF 1)

Contatto  
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## CARATTERISTICHE

### Caratteristiche di costruzione

Materiale del conduttore	Aluminum
Tipo di conduttore	Corda rotonda compatta classe 2
Materiale del semi-conduttore interno	Mescola semiconduttrice
Isolamento	XLPE
Materiale del semi-conduttore esterno	Mescola semiconduttrice
Materiale per la tenuta dell'acqua	Semiconducting swelling tape
Schermo	Longitudinal aluminium tape
Guaina esterna	PE
Colore guaina esterna	Rosso

### Caratteristiche d'utilizzo

Massima forza di tiro durante la posa	50.0 N/mm <sup>2</sup>
Temperatura massima di servizio del conduttore	90 °C
Temperatura massima di cortocircuito del conduttore	250 °C
Temperatura d'installazione minima	-20 °C
Fattore di curvatura durante l'installazione	20 (xD)
Fattore di curvatura per installazione fissa	15 (xD)
Tenuta d'acqua radiale	Yes
Tenuta d'acqua longitudinale	Yes

# ARE4H5E(X) 12/20(24)kV SK1 (SHOCK PROOF 1)

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## CARATTERISTICHE DIMENSIONALI

Nome	Diametro del conduttore [mm]	Diametro sull'isolante [mm]	Diametro esterno [mm]	Peso approssimativo [kg/km]
ARE4H5E(X) 12/20 kV 50 mm <sup>2</sup> SK1	8,2	18,6	30,9	740
ARE4H5E(X) 12/20 kV 70 mm <sup>2</sup> SK1	9,8	20,2	32,6	850
ARE4H5E(X) 12/20 kV 95 mm <sup>2</sup> SK1	11,5	21,9	34,3	970
ARE4H5E(X) 12/20 kV 120 mm <sup>2</sup> SK1	13,1	23,5	36	1090
ARE4H5E(X) 12/20 kV 150 mm <sup>2</sup> SK1	14,3	24,7	37,3	1200
ARE4H5E(X) 12/20 kV 185 mm <sup>2</sup> SK1	16,0	26,4	39,1	1350
ARE4H5E(X) 12/20 kV 240 mm <sup>2</sup> SK1	18,5	28,9	41,7	1590
ARE4H5E(X) 12/20 kV 300 mm <sup>2</sup> SK1	20,7	31,1	44	1810
ARE4H5E(X) 12/20 kV 400 mm <sup>2</sup> SK1	23,5	34,1	47,1	2140
ARE4H5E(X) 12/20 kV 500 mm <sup>2</sup> SK1	26,5	37,1	50,3	2540
ARE4H5E(X) 12/20 kV 630 mm <sup>2</sup> SK1	30,0	41,2	54,6	3090

## CARATTERISTICHE ELETTRICHE

Nome	Capacità nominale [ $\mu$ F / km]	Reattanza di fase a 50 Hz a trifoglio [Ohm/km]	Massima resistenza el. del cond. a 20°C in c.c. [Ohm/km]	Resistenza el. del cond. a 90°C in c.a. - trifoglio [Ohm/km]	Portata di corrente cavi in aria a 30°C - trifoglio [A]	Portata di corrente cavi interrati a 20°C - trifoglio [A]	Corrente di corto circuito nel conduttore 1s [kA]
ARE4H5E(X) 12/20 kV 50 mm <sup>2</sup> SK1	0,21	0,141	0,641	0,822	188	167	4,7
ARE4H5E(X) 12/20 kV 70 mm <sup>2</sup> SK1	0,235	0,133	0,443	0,568	231	205	6,6
ARE4H5E(X) 12/20 kV 95 mm <sup>2</sup> SK1	0,262	0,126	0,32	0,411	281	245	9
ARE4H5E(X) 12/20 kV 120 mm <sup>2</sup> SK1	0,288	0,121	0,253	0,325	325	279	11,3
ARE4H5E(X) 12/20 kV 150 mm <sup>2</sup> SK1	0,307	0,117	0,206	0,265	366	312	14,2
ARE4H5E(X) 12/20 kV 185 mm <sup>2</sup> SK1	0,333	0,113	0,164	0,211	421	353	17,5

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# ARE4H5E(X) 12/20(24)kV SK1 (SHOCK PROOF 1)

Contatto  
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Nome	Capacità nominale [µF / km]	Reattanza di fase a 50 Hz a trifoglio [Ohm/km]	Massima resistenza el. del cond. a 20°C in c.c. [Ohm/km]	Resistenza el. del cond. a 90°C in c.a. - trifoglio [Ohm/km]	Portata di corrente cavi in aria a 30°C - trifoglio [A]	Portata di corrente cavi interrati a 20° C - trifoglio [A]	Corrente di corto circuito nel conduttore 1s [kA]
ARE4H5E(X) 12/20 kV 240 mm <sup>2</sup> SK1	0,372	0,108	0,125	0,161	498	410	22,7
ARE4H5E(X) 12/20 kV 300 mm <sup>2</sup> SK1	0,407	0,104	0,1	0,13	571	463	28,3
ARE4H5E(X) 12/20 kV 400 mm <sup>2</sup> SK1	0,442	0,101	0,0778	0,102	667	530	37,8
ARE4H5E(X) 12/20 kV 500 mm <sup>2</sup> SK1	0,487	0,097	0,0605	0,08	776	605	47,2
ARE4H5E(X) 12/20 kV 630 mm <sup>2</sup> SK1	0,53	0,094	0,0469	0,063	902	689	59,5

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