



**Regione Sicilia**  
Provincia di Palermo  
Comune di Caccamo

**Impianto agrofotovoltaico  
"SERPENTANA"  
di potenza installata pari a 31 MW  
da realizzarsi nel  
Comune di Caccamo (PA)**

**PROGETTO DEFINITIVO**

REV.	DATA	DESCRIZIONE	REDATTO	VERIFICATO	APPROVATO
00	07/11/2022	Prima Stesura	Ing. Alessio Furlotti	Dott. G. Filiberto	Dott. F. Milio

**PROGETTISTA:**

**GREEN FUTURE Srl**

Sede Legale: Via U. Maddalena, 92  
Sede operativa: Corso Calatafimi, 421  
90100 - Palermo, Italia  
info@greenfuture.it



**Dott. Giuseppe Filiberto**  
**Ing. Alessio Furlotti**  
**Arch. Pianif. Giovanna Filiberto**  
**Ing. Ilaria Vinci**  
**Ing. Fabiana Marchese**  
**Ing. Daniela Chifari**

**Green Future s.r.l. Impersonale**  
L'Amministratore  
**Giuseppe Filiberto**



**CLIENTE:**

**BEE SERPENTANA SRL**

Anello Nord, 25 - Brunico (BZ)  
beeserpentanasrl@pec.it

**TITOLO ELABORATO:**

**SCHEDE TECNICHE**

**CODICE ELABORATO:**

**FV22\_SERPENTANA\_EL75\_REV00**

**SCALA:**

-

DATA:	TIPOLOGIA/ANNO	COD. PROGETTO	N.º ELABORATO	REVISIONE
<b>Novembre 2022</b>	<b>FV22</b>	<b>SERPENTANA</b>	<b>EL75</b>	<b>00</b>

E' vietata la copia anche parziale del presente elaborato

## Up to 3.8 MVA at 1,500 V

### TRANSFORMERLESS PV INVERTER WITH AN EXTRA THERMAL STABILITY AND A GREATER POWER DENSITY

#### Greater power density

This solar PV inverter achieves a market-leading power density of 492 kVA/m<sup>3</sup>, as it provides up to 3,825 kVA in just one power stack.

#### Latest generation electronics

The INGECON® SUN 3Power C Series PV inverter features an innovative control unit that performs a more efficient and sophisticated inverter control, as it uses a last-generation digital signal processor.

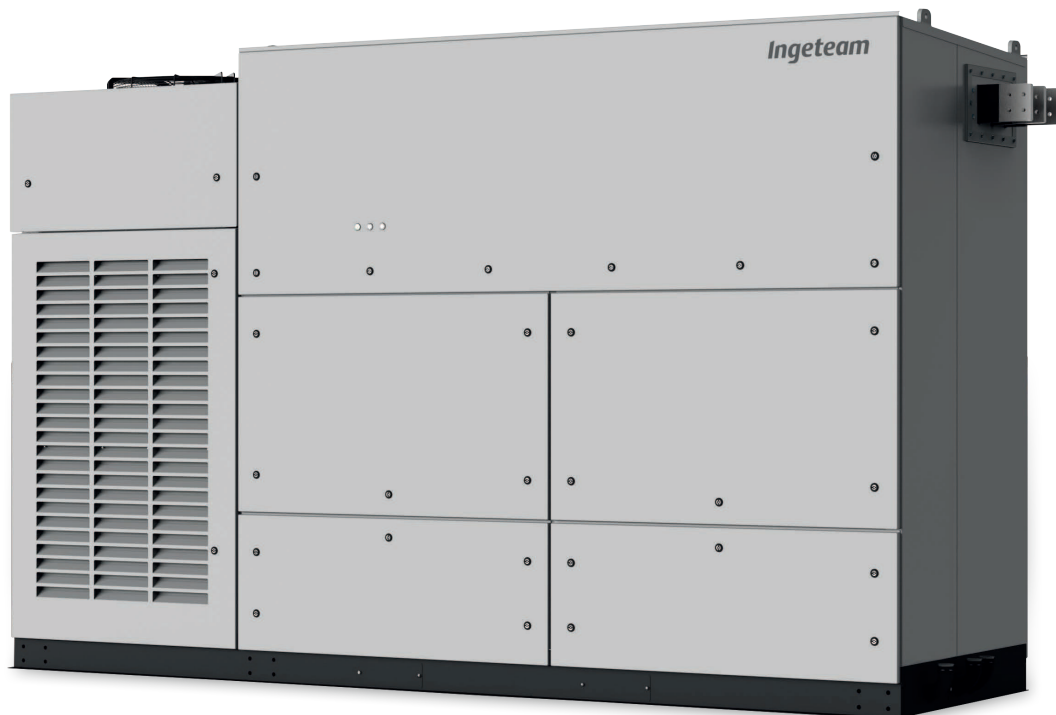
#### Liquid Cooling System (LCS)

Ingeteam has already supplied +52 GW of liquid-cooled wind power converters worldwide. It offers a greater thermal stability and a more optimized component usage. The LCS has been designed to refrigerate the IGBTs, the power phases and the IP65 compartment. It features less moving components, so it consumes a lower amount of power and it requires less maintenance works.

The LCS is a closed circuit supplied totally filled and purged, equipped with fast connectors with an anti-dripping system, so it offers zero risk of particle entrance. It has been designed to avoid siphons in order to easily purge it if necessary. The coolant used is a biodegradable glycol water mixture. There is no need of emptying the LCS in order to replace the phases, nor the sensors.

#### IP65 protection

A secondary liquid cooling system is used to refrigerate the air inside the IP65-protected compartment. A water-air heat exchanger is used for that. This compartment contains the power and control electronics, the DC fuses, the DC and AC protections, the busbars and the power phases.



**Monitoring and communication**

Dual Ethernet to communicate with the SCADA and the PPC (power plant controller). Moreover, it features Wi-Fi communication as access point to connect with the inverter during commissioning and O&M works. Ingeteam's advanced PV plant monitoring system INGECON® SUN Monitor is also available at no extra cost. The Smartphone application of the INGECON® SUN Monitor -available on the App Store and on the Play Store- makes it easier and more comfortable to monitor the PV plant.

**Standard 5 year warranty, extendable for up to 25 years.**

**Advanced grid support**



Low Voltage Ride Through



Fast Frequency Regulation



Reactive Power at Night



Voltage Droop Control



Active Power Reserve Without Batteries



Grid Following & Grid Forming



Black Start Capability



Automatic Voltage Regulation

PROTECTIONS

- DC Reverse polarity.
- Short-circuits and overloads at the output.
- Anti-islanding with automatic disconnection.
- Insulation failure DC.
- Up to 24 pairs of fuse-holders.
- Lightning induced DC and AC surge arresters, type II.
- Motorized DC switch to automatically disconnect the inverter from the PV array.
- Motorized AC circuit breaker.
- Hardware protection via firmware.
- Additional protection for the power stack, liquid cooled, IP65 rated and air cooled by a closed loop.

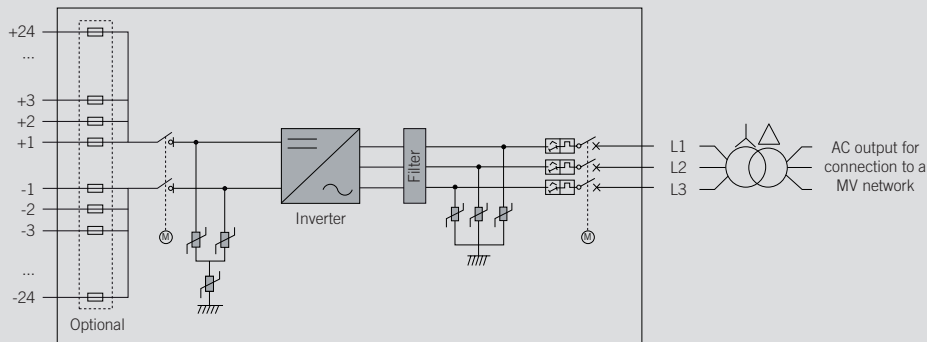
OPTIONAL ACCESSORIES

- Auxiliary services feeder.
- Grounding kit.
- Heating kit, for operating at an ambient temperature of down to -30 °C.
- DC surge arresters type I+II.
- AC surge arresters type I+II.
- DC fuses.
- Monitoring of the currents at the DC input.
- PID prevention kit (PID: Potential Induced Degradation).

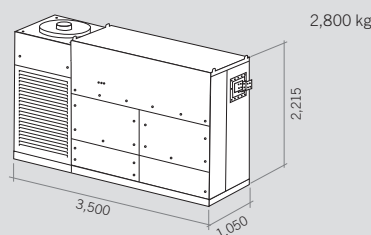
LIQUID COOLING SYSTEM

- LCS to refrigerate the IGBTs.
- More optimized component usage: greater thermal stability.
- Less moving components: lower power consumption and less maintenance works.
- No risk of particle entrance.
- Anti-corrosion protection with stainless steel components.
- LCS is used in many industries. Thus, it is very reliable, as its components are subject to many validation tests.
- Fast connectors with anti-dripping system
- Biodegradable glycol water mixture.
- No need of emptying the LCS in order to replace the phases, nor the sensors.

**INGECON® SUN 3825TL**



**Size and weight** (mm and kg)



INGECON® SUN 3825TL							
	C600	C615	C630	C645	C660	C675	C690
<b>Input (DC)</b>							
Recommended PV array power range <sup>(1)</sup>	3,144 - 4,188 kWp	3,222 - 4,293 kWp	3,301 - 4,398 kWp	3,379 - 4,502 kWp	3,458 - 4,607 kWp	3,537 - 4,712 kWp	3,615 - 4,816 kWp
Voltage Range MPP <sup>(2)</sup>	853 - 1,300 V	874 - 1,300 V	895 - 1,300 V	916 - 1,300 V	937 - 1,300 V	958 - 1,300 V	979 - 1,300 V
Maximum voltage <sup>(3)</sup>	1,500 V						
Maximum current	3,965 A						
N° inputs with fuse-holders	Up to 24						
Fuse dimensions	63 A / 1,500 V to 500 A / 1,500 V fuses (optional)						
Type of connection	Connection to copper bars						
Power blocks	1						
MPPT	1						
<b>Input protections</b>							
Overvoltage protections	Type II surge arresters (type I+II optional)						
DC switch	Motorized DC load break disconnect						
Other protections	Up to 24 pairs of DC fuses (optional) / Reverse polarity / Insulation failure monitoring / Anti-islanding protection / Emergency pushbutton						
<b>Output (AC)</b>							
Power @35 °C / @50 °C	3,326 kVA / 2,858 kVA	3,409 kVA / 2,929 kVA	3,492 kVA / 3,001 kVA	3,575 kVA / 3,072 kVA	3,658 kVA / 3,144 kVA	3,741 kVA / 3,215 kVA	3,824 kVA / 3,287 kVA
Current @35 °C / @50 °C	3,200 A / 2,750 A						
Rated voltage <sup>(4)</sup>	600 V IT System	615 V IT System	630 V IT System	645 V IT System	660 V IT System	675 V IT System	690 V IT System
Frequency	50 / 60 Hz						
Power Factor <sup>(5)</sup>	1						
Power Factor adjustable	Yes, 0 - 1 (leading / lagging)						
THD (Total Harmonic Distortion) <sup>(6)</sup>	<3%						
<b>Output protections</b>							
Overvoltage protections	Type II surge arresters (type I+II optional)						
AC breaker	Motorized AC circuit breaker						
Anti-islanding protection	Yes, with automatic disconnection						
Other protections	AC short-circuits and overloads						
<b>Features</b>							
Operating efficiency	98.9%						
CEC	98.5%						
Max. consumption aux. services	7,600 W						
Stand-by or night consumption <sup>(7)</sup>	< 180 W						
Average power consumption per day	2,500 W						
<b>General Information</b>							
Ambient temperature	-20 °C to +65 °C						
Relative humidity (non-condensing)	0-100% (Outdoor)						
Protection class	IP65 <sup>(8)</sup>						
Corrosion protection	External corrosion protection						
Maximum altitude	4,500 m (for installations beyond 1,000 m, please contact Ingeteam's solar sales department)						
Cooling system	Liquid cooling system and forced air cooling system with temperature control (400V 3 phase + neutral power supply, 50/60 Hz)						
Air flow range	0 - 18,000 m³/h						
Average air flow	12,000 m³/h						
Acoustic emission (100% / 50% load)	57 dB(A) at 10m / 49.7 dB(A) at 10m						
Marking	CE						
EMC and security standards	IEC 62920, IEC 61000-6-1, IEC 61000-6-2, IEC 61000-6-4, IEC 61000-3-11, IEC 61000-3-12, IEC 62109-1, IEC 62109-2, EN 50178, FCC Part 15, AS3100						
Grid connection standards	IEC 62116, EN 50530, IEC 61683, EU 631/2016 (EN 50549-2, P.O.12.2, CEI 0-16, VDE AR N 4120 ...), G99, South African Grid code, Mexican Grid Code, Chilean Grid Code, Ecuadorian Grid Code, Peruvian Grid code, Thailand PEA requirements, IEC61727, UNE 206007-1, ABNT NBR 16149, ABNT NBR 16150, IEEE 1547, IEEE1547.1, DEWA (Dubai) Grid code, Abu Dhabi Grid Code, Jordan Grid Code, Egyptian Grid Code, Saudi Arabia Grid Code, RETIE Colombia, Australian Grid Code						

**Notes:** <sup>(1)</sup> Depending on the type of installation and geographical location. Data for STC conditions <sup>(2)</sup> V<sub>mpp.min</sub> is for rated conditions (V<sub>ac</sub>=1 p.u. and Power Factor=1) and floating systems <sup>(3)</sup> Consider the voltage increase of the 'Voc' at low temperatures <sup>(4)</sup> Other AC voltages and powers available upon request <sup>(5)</sup> For P<sub>out</sub>>25% of the rated power <sup>(6)</sup> For P<sub>out</sub>>25% of the rated power and voltage in accordance with IEC 61000-3-4 <sup>(7)</sup> Consumption from PV field when there is PV power available <sup>(8)</sup> Except for the LC filter and the air-water heat exchanger, that are IP54.





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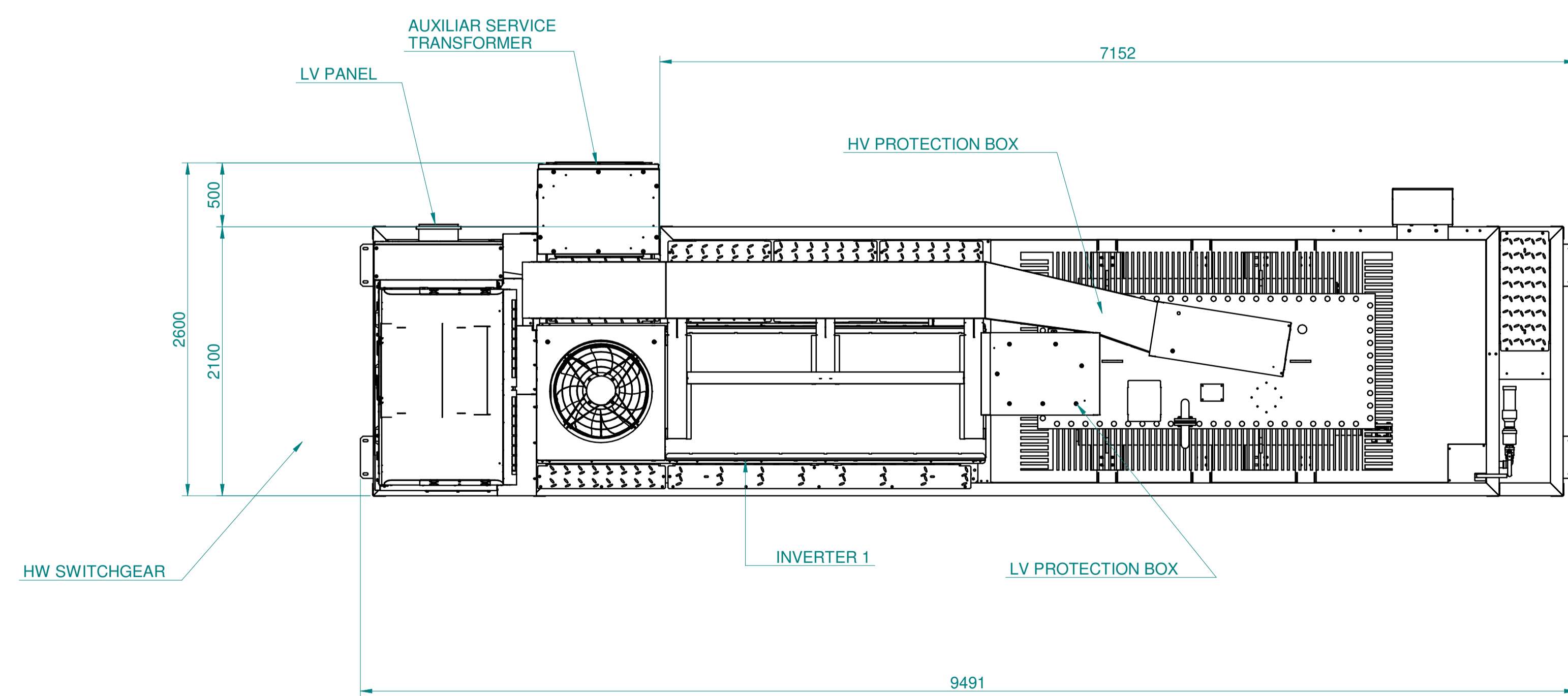
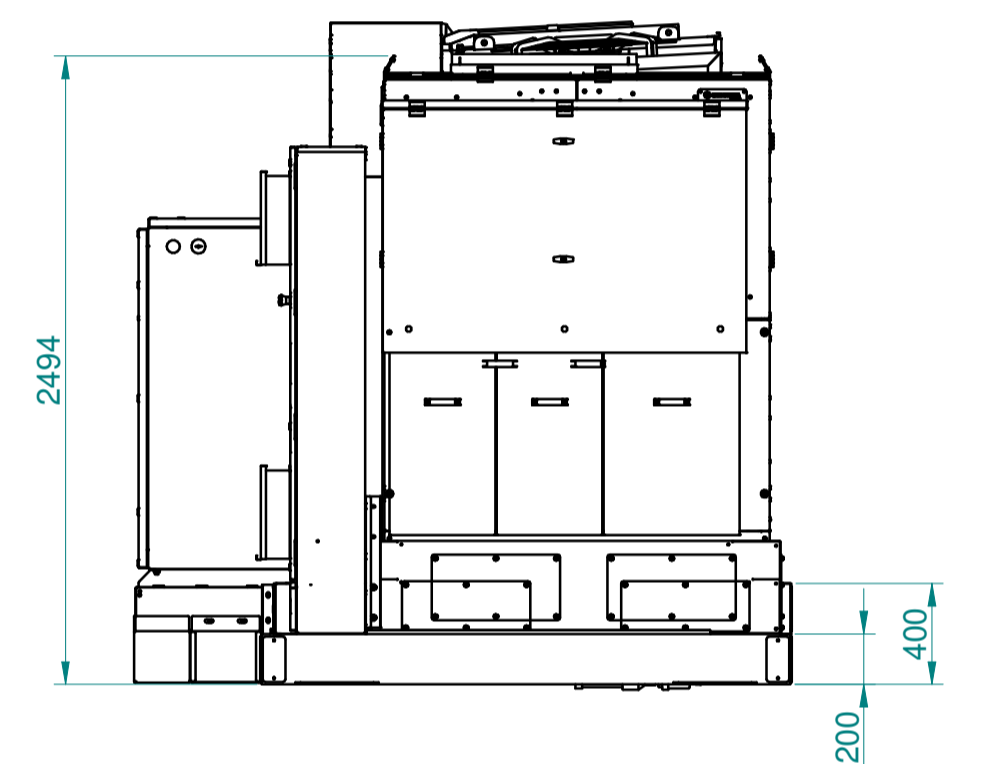
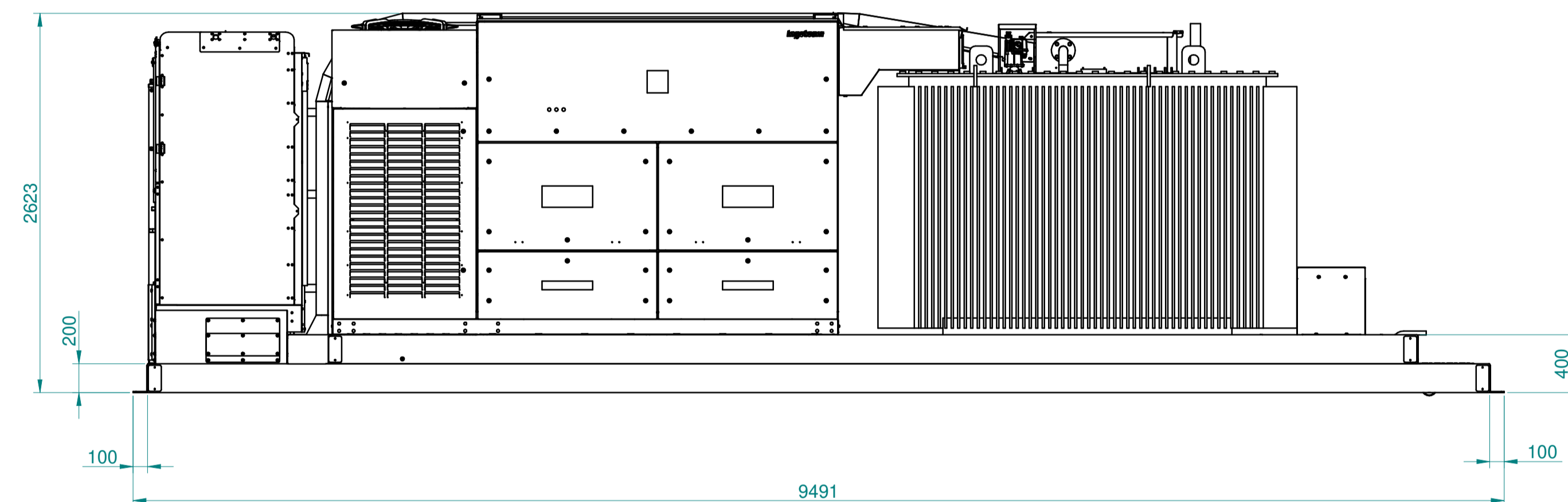
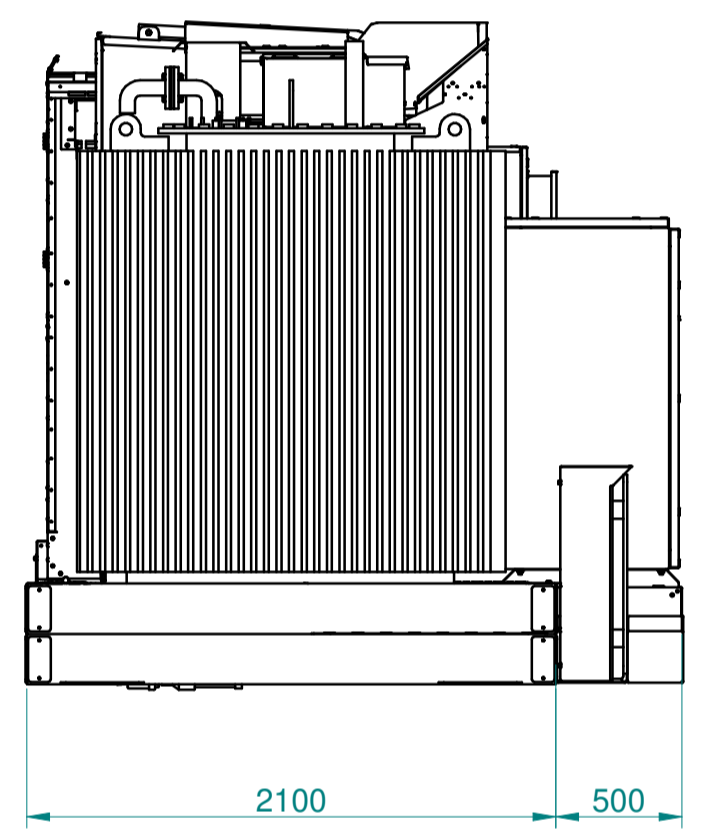
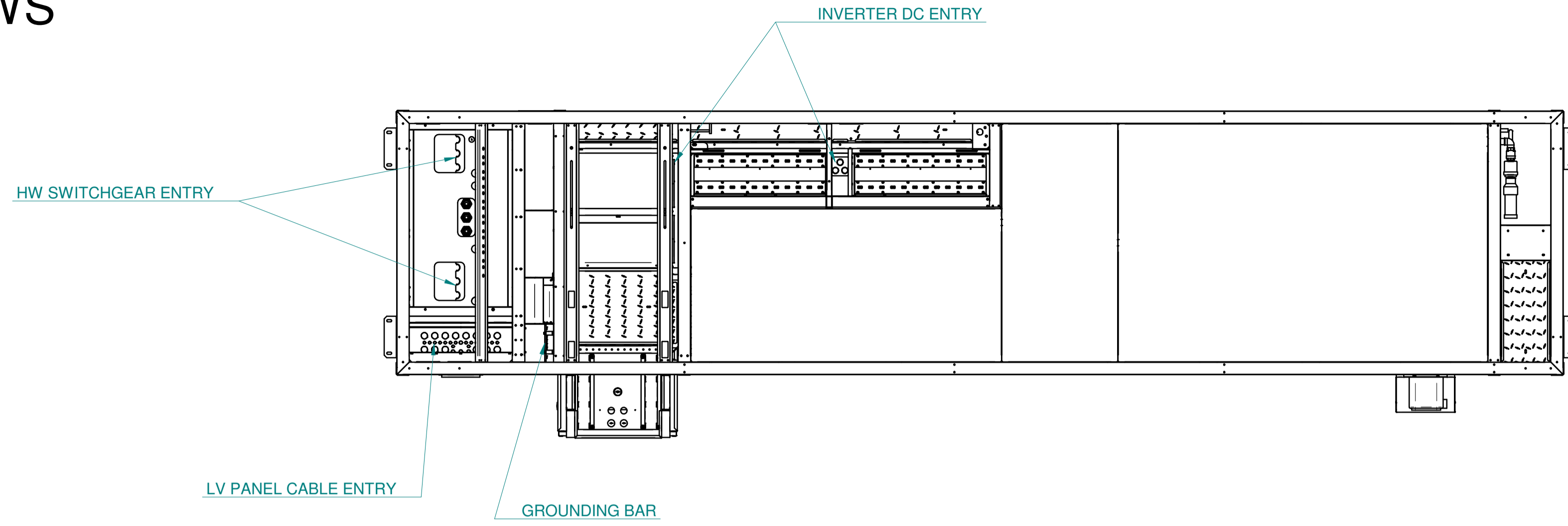
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# VISTAS GENERALES EN CAMPO FIELD GENERAL VIEWS

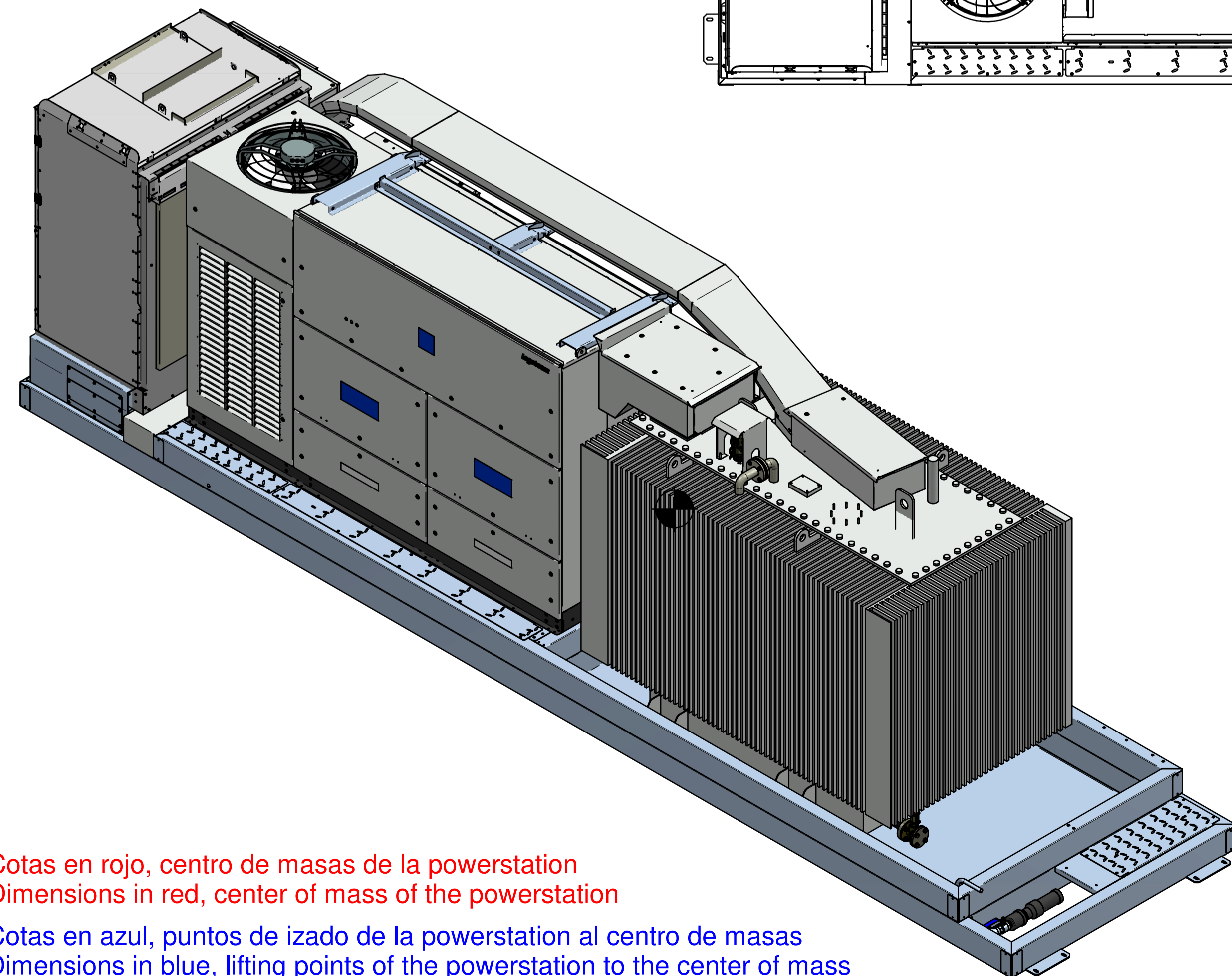
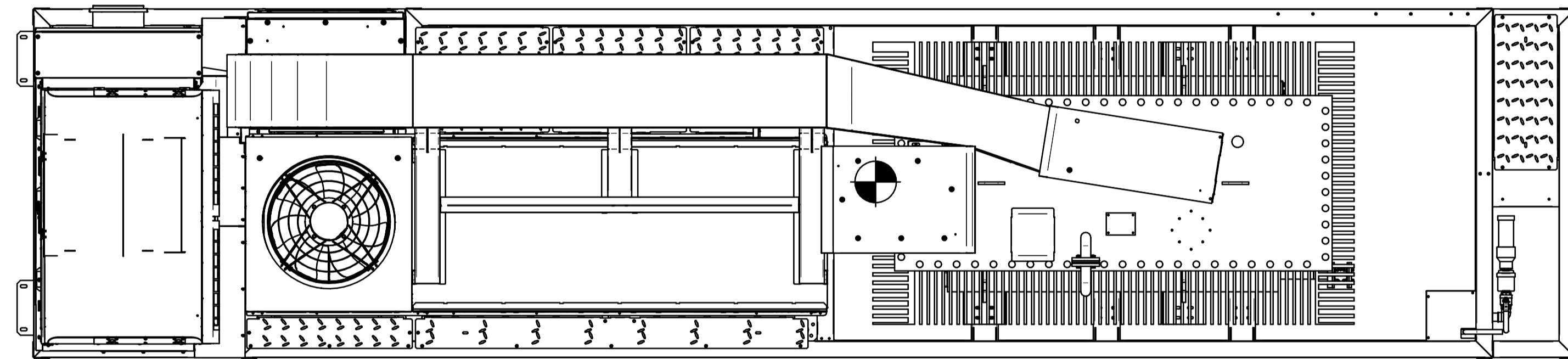
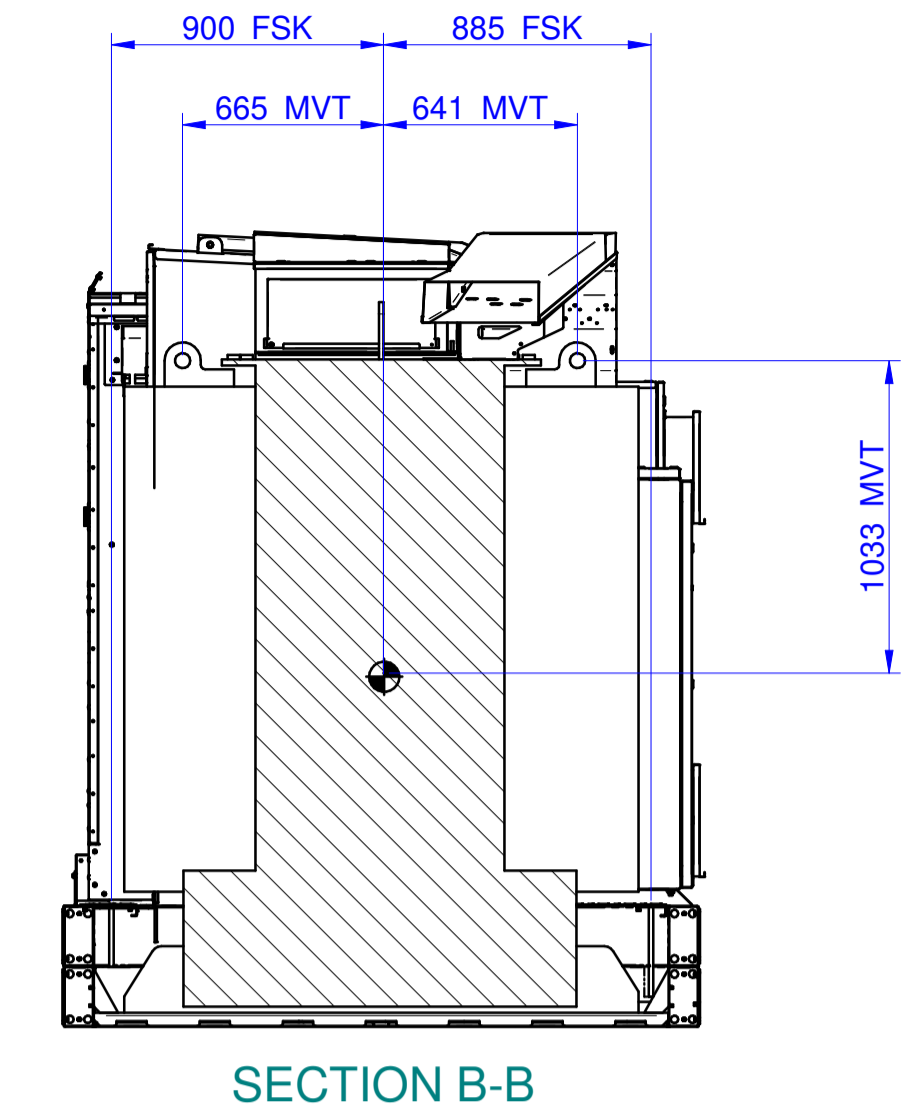
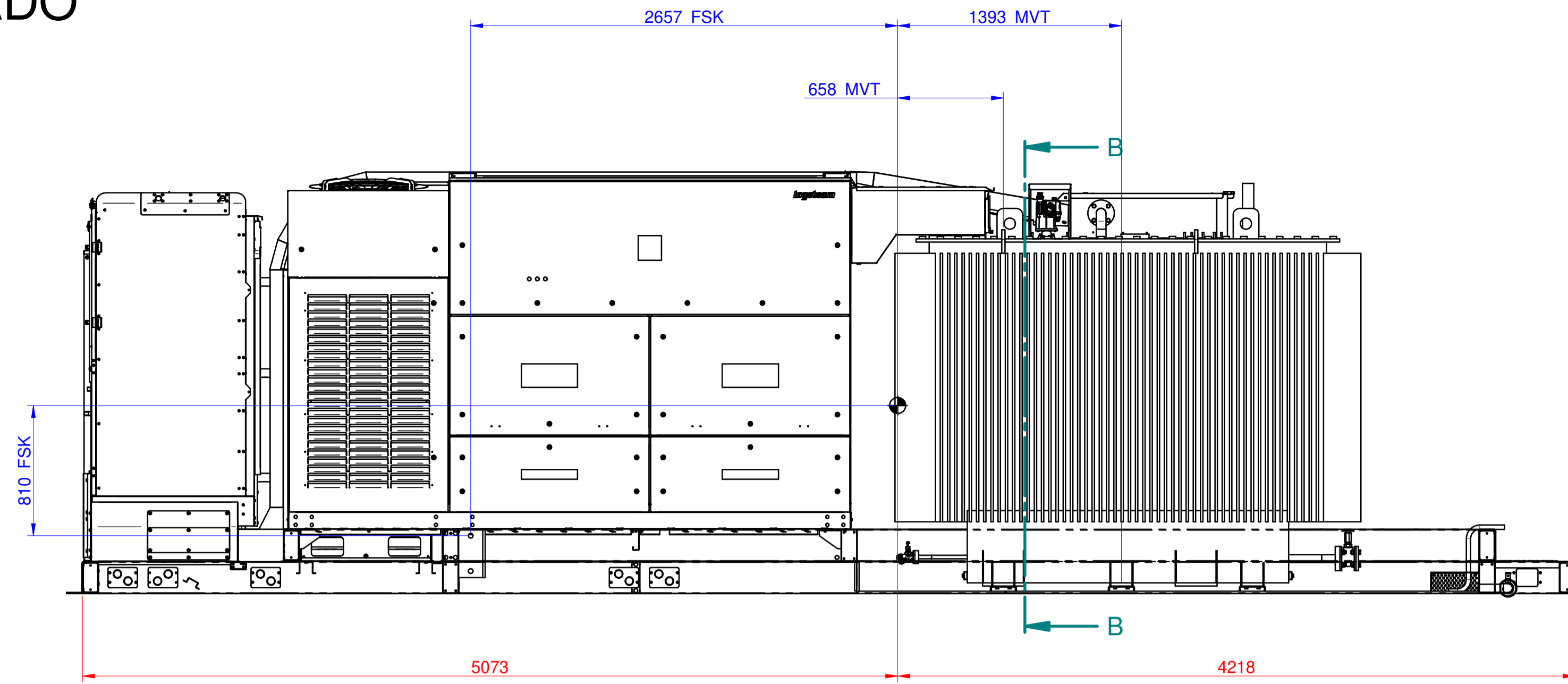
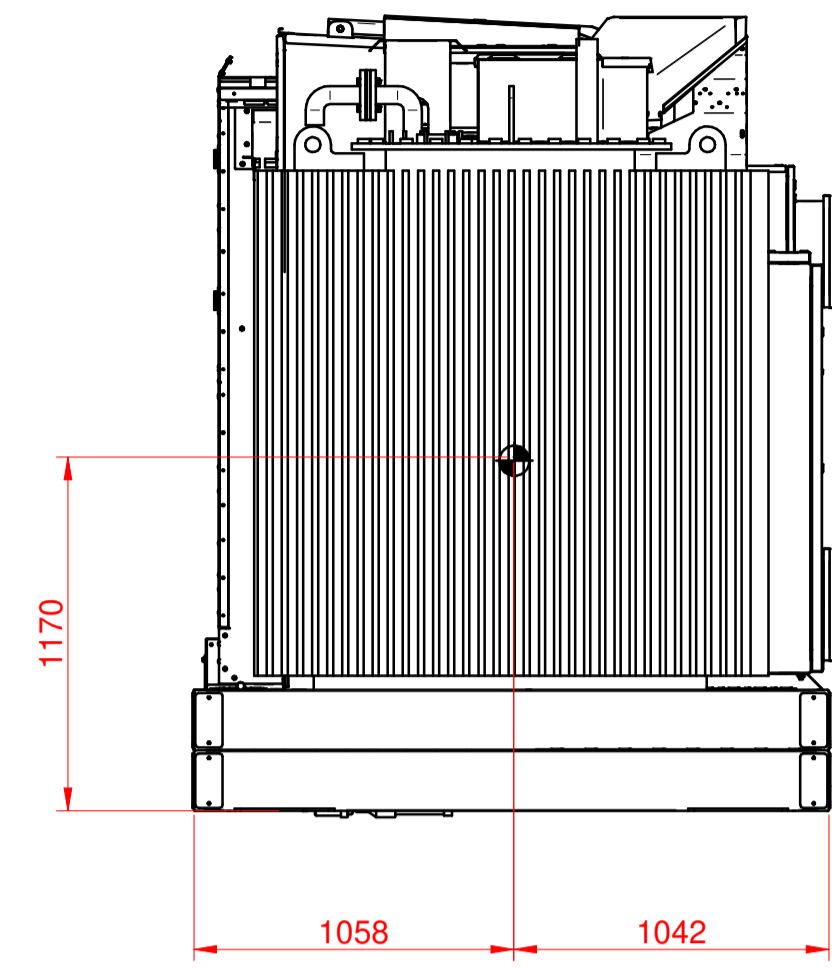


Rev.	Modification			Date	Dra.	Chk.	App.
	Surfaces ISO 1302	Material					Weight (kg.)
	Shape and position tolerances EN ISO 1101	Treatment					
	General tolerances EN 22768 mK Soldered parts EN ISO 13920 BF Moulded parts ISO 8062	Designation Ingecon Sun Power Station ENS FSK C SERIES IEC-UL ENS FSK C SERIES IEC-UL					
	<b>Ingeteam</b> Unidad Productiva Energy	Draw	S.I.	20/01/2022	Drawing Nr.	ACC8000IGA11	Rev. 0
		Checked	J.A.R.	11/03/2022	Code		Scale
		Approved	A.M.A.	15/03/2022			Sheet 1
	Ingeteam Power Technology S.A.	Dimensions in mm					DIN A1



# VISTAS GENERALES DE IZADO

## LIFTING GENERAL VIEWS



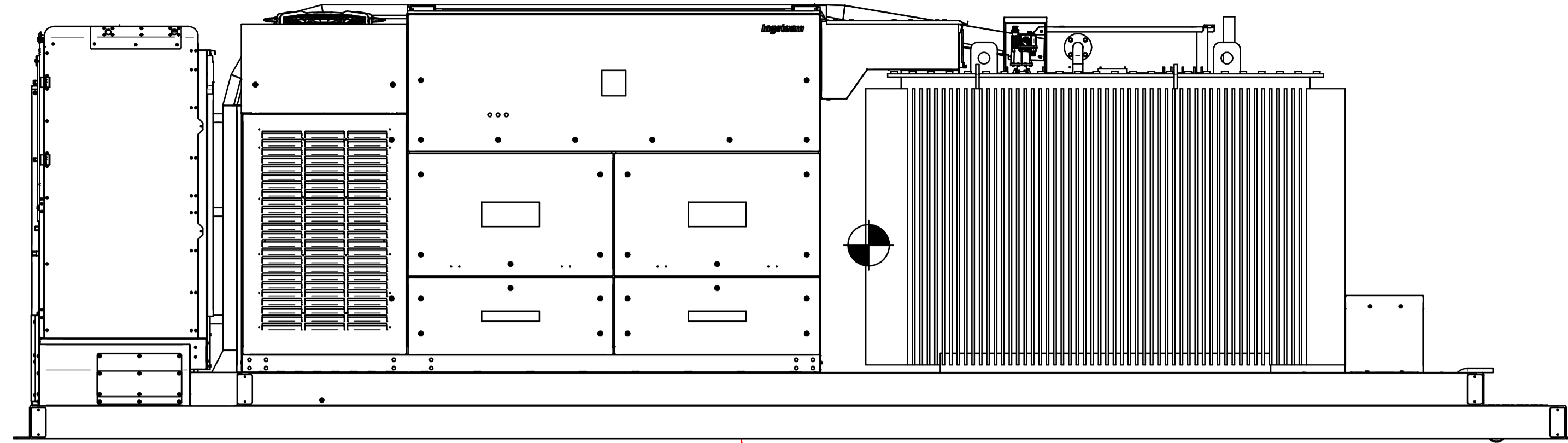
Cotas en rojo, centro de masas de la powerstation  
 Dimensions in red, center of mass of the powerstation

Cotas en azul, puntos de izado de la powerstation al centro de masas  
 Dimensions in blue, lifting points of the powerstation to the center of mass

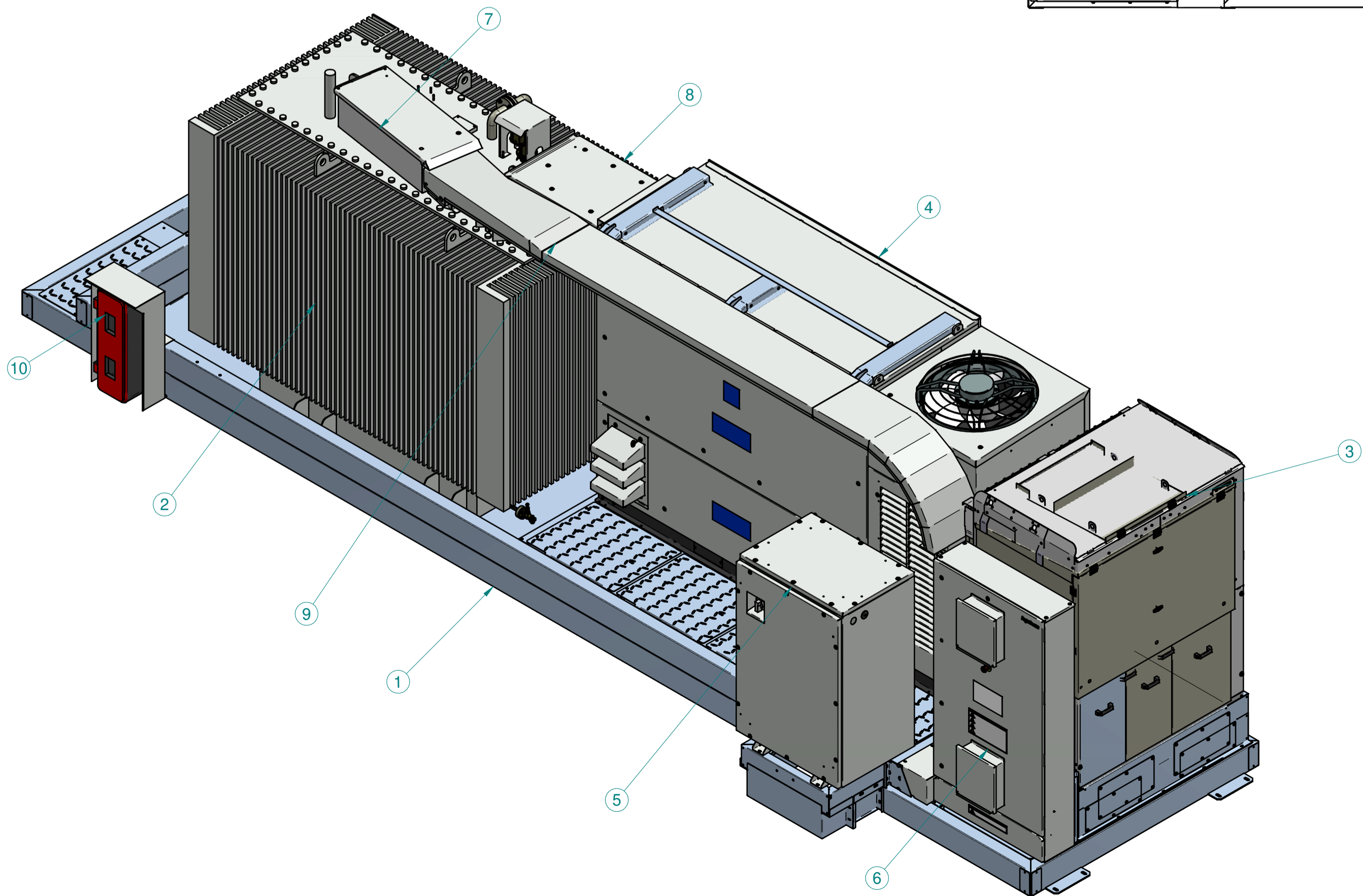
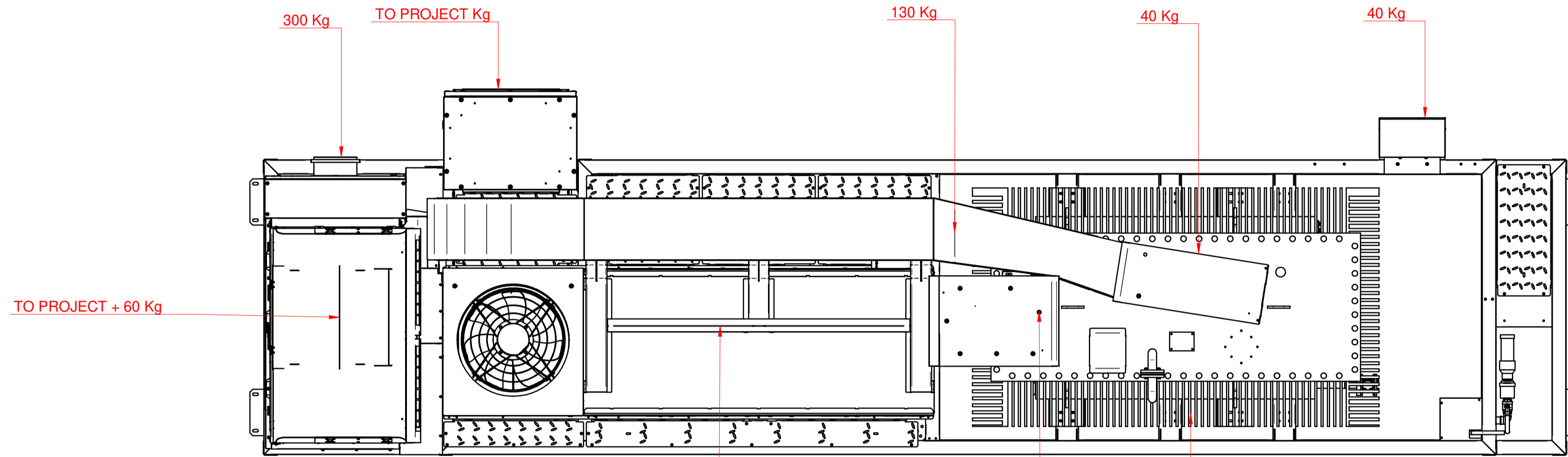
Rev.	Modification	Date	Dra.	Chk.	App.
	Superficies ISO 1302				Weight (kg.)
	Material				
	Shape and position tolerances EN ISO 1101				
	Treatment				
	Designation				
	General tolerances EN 22768 mK Soldered parts EN ISO 13920 BF Moulded parts ISO 8062				
					Ingecon Sun Power Station ENS FSK C SERIES IEC-UL
					ENS FSK C SERIES IEC-UL
	Draw	S.I.	20/01/2022	Drawing Nr.	Rev.
	Checked	J.A.R.	11/03/2022	ACC8000IGA11	0
	Approved	A.M.A.	15/03/2022	Code	Sheet
					DIN
	Ingeteam Unidad Productiva Energy				2 6 A1
	Ingeteam Power Technology S.A.	Dimensions in mm			



# PESOS WEIGHTS



1270 Kg



ITEM NUMBER	MAIN COMPONENTES	KG
1	FULLSKID	1270
2	TRANSFORMER	TO PROJECT
3	SWITCHGEAR + SUPPORT	TO PROJECT
4	INVERTER 1	2800
5	AUX. TRANSFORMER	TO PROJECT
6	LV PANEL	300
7	HV PROTECTION BOX	40
8	LV BARS + PROTEC. BOX L	50 + 30
9	MV WIRES SUPPORT	130
10	EXTINGUISER KIT	30
	OTHER COMPONENTS	#IVALOR!
	<b>TOTAL</b>	<b>~15362,5</b>

Rev.	Modification	Date	Dra.	Chk.	App.
	Superficies ISO 1302				
	Material				Weight (kg.)
	Shape and position tolerances EN ISO 1101				
	Treatment				
	Designation	Ingecon Sun Power Station ENS FSK C SERIES IEC-UL			
	General tolerances EN 22768 mK Soldered parts EN ISO 13920 BF Moulded parts ISO 8062	ENS FSK C SERIES IEC-UL			
	Draw	S.I.	20/01/2022	Drawing Nr.	Rev.
	Checked	J.A.R.	11/03/2022	ACC8000IGA11	0
	Approved	A.M.A.	15/03/2022	Code	Sheet
	Dimensions in mm				DIN
					3 6 A1

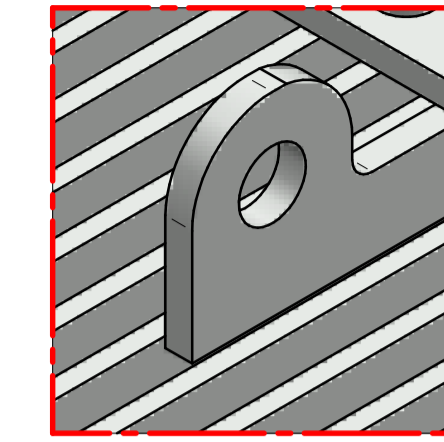
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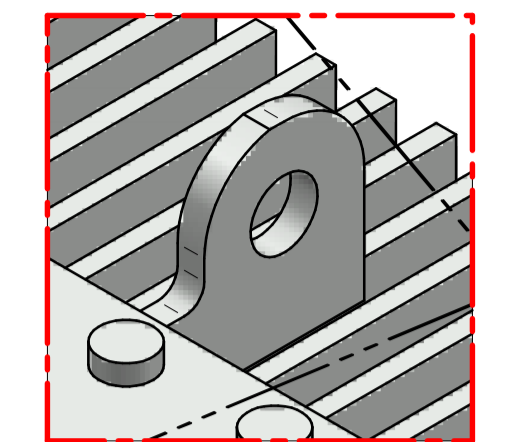
# IDENTIFICACION PUNTOS DE IZADO IDENTIFICATION OF LIFTING POINTS

**NOTA / NOTE:**  
EL PESO QUE SOPORTA CADA PUNTO DE IZADO ESTÁ CALCULADO TIRANDO EN VERTICAL.  
THE WEIGHT SUPPORTED BY EACH LIFTING POINT IS CALCULATED BY PULLING VERTICALLY.

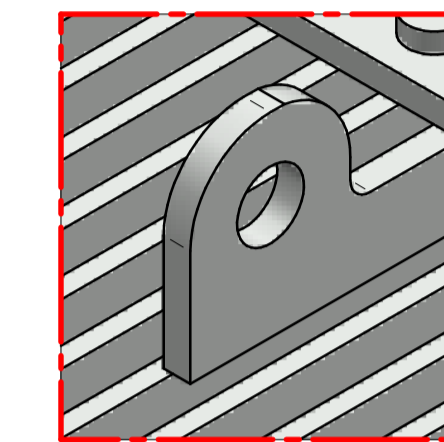
WEIGHT SUPPORTED BY LIFTING POINTS 3,4,5 AND 6 TOGETHER		
ITEM NUMBER	MAIN COMPONENTS	KG
2	TRANSFORMER	TO PROJECT
7	HV PROTECTION BOX	40
8	LV BARS + PROTEC. BOX L	80
10	FIRE EXTINGUISHER KIT	30
1	4/6 WEIGHT OF FSK	847
	4/6 OTHER COMPONENTS	
	TOTAL PESO A REPARTIR ENTRE LOS 4 PUNTOS	997
	<b>TOTAL</b>	<b>249,25</b>



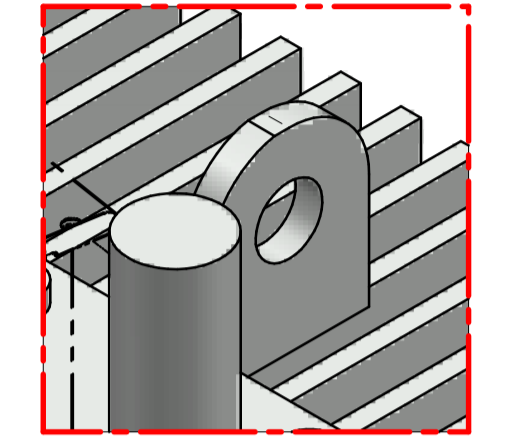
DETAIL 3 LIFTING POINT



DETAIL 4 LIFTING POINT

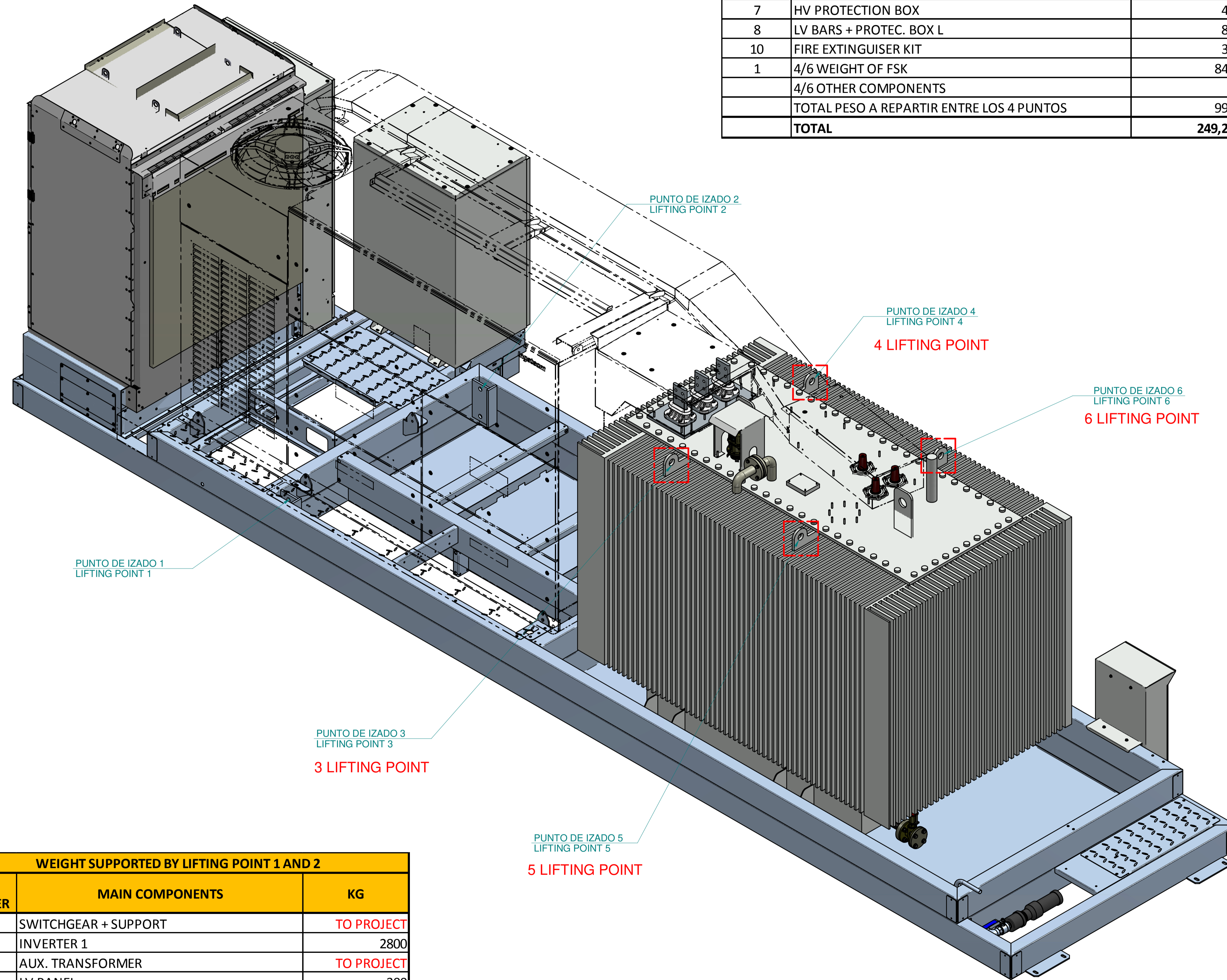


DETAIL 5 LIFTING POINT



DETAIL 6 LIFTING POINT

ITEM NUMBER	MAIN COMPONENTES	KG
1	FULLSKID	1270
2	TRANSFORMER	TO PROJECT
3	SWITCHGEAR + SUPPORT	TO PROJECT
4	INVERTER 1	2800
5	AUX. TRANSFORMER	TO PROJECT
6	LV PANEL	300
7	HV PROTECTION BOX	40
8	LV BARS + PROTEC. BOX L	50 + 30
9	MV WIRES SUPPORT	130
10	EXTINGUISHER KIT	30
	OTHER COMPONENTS	#¡VALOR!
	<b>TOTAL</b>	<b>~15362,5</b>



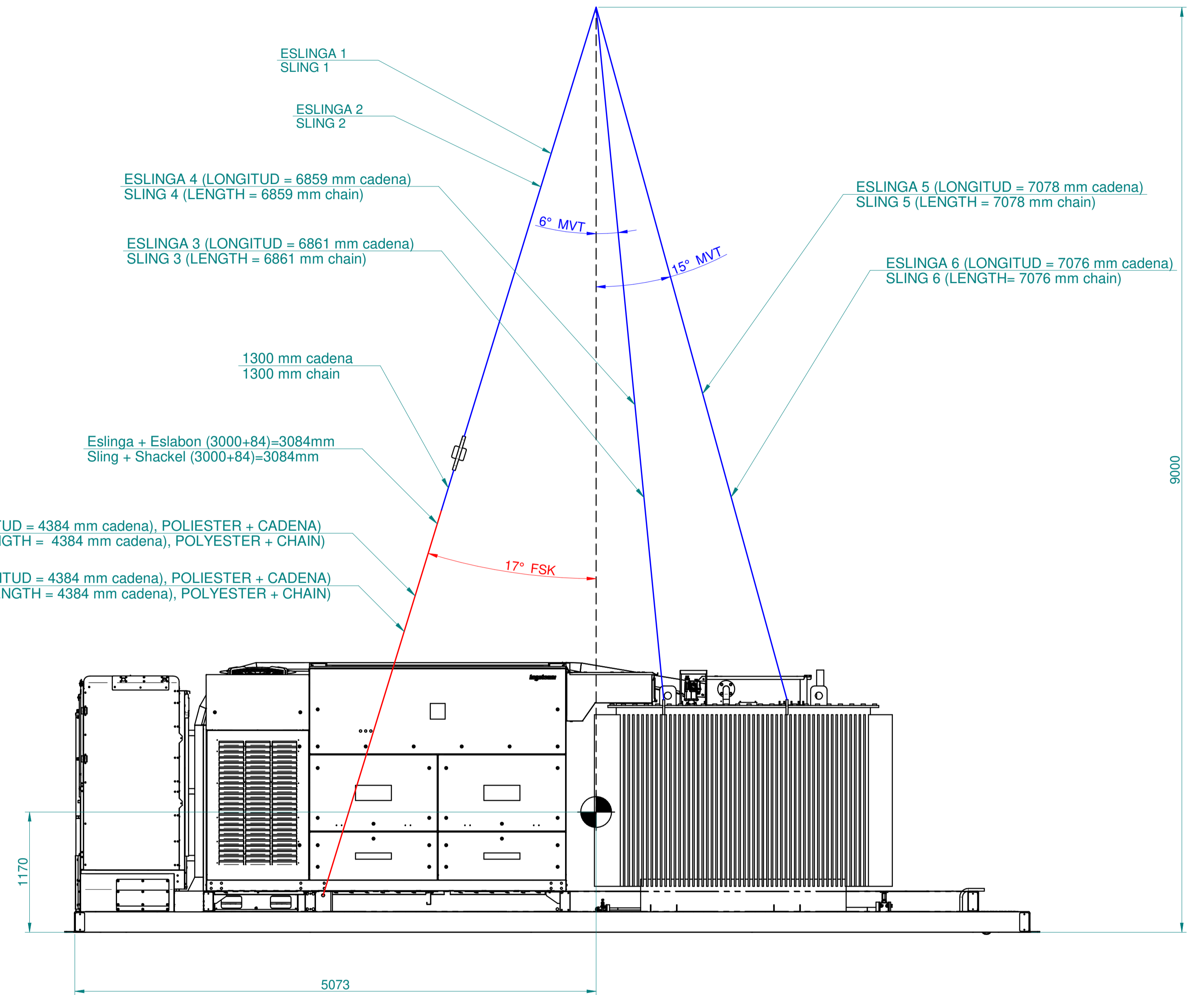
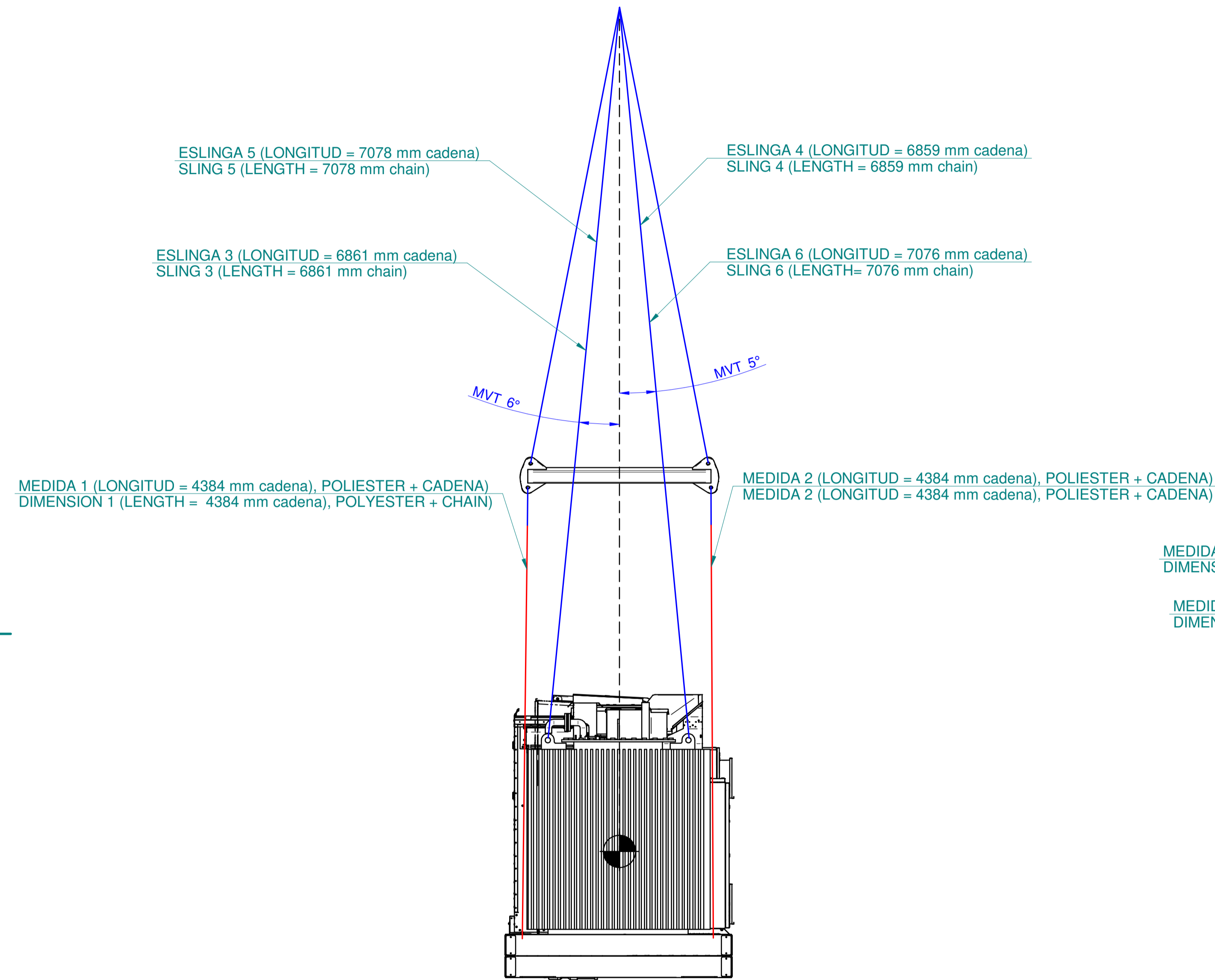
WEIGHT SUPPORTED BY LIFTING POINT 1 AND 2		
ITEM NUMBER	MAIN COMPONENTS	KG
3	SWITCHGEAR + SUPPORT	TO PROJECT
4	INVERTER 1	2800
5	AUX. TRANSFORMER	TO PROJECT
6	LV PANEL	300
9	MV WIRES SUPPORT	130
1	2/6 WEIGHT OF FSK	423
	2/6 OTHER COMPONENTS	
	TOTAL PESO A REPARTIR ENTRE LOS 2 PUNTOS	3653
	<b>TOTAL</b>	<b>1826,5</b>

Rev.	Modification	Date	Dra.	Chk.	App.
	Superficies ISO 1302				
	Material				Weight (kg.)
	Shape and position tolerances EN ISO 1101				
	Treatment				
	Designation				
	General tolerances EN 22768 mK				
	Soldered parts EN ISO 13920 BF				
	Moulded parts ISO 8062				
	Draw	S.I. 20/01/2022	Drawing Nr.	Rev.	Scale
	Checked	J.A.R. 11/03/2022	ACC8000IGA11	0	
	Approved	A.M.A. 15/03/2022	Code	Sheet	DIN
	Dimensions in mm			4	A1

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# SISTEMA DE IZADO Y POSICION CENTRO DE GRAVEDAD LIFTING SYSTEM AND CENTER OF GRAVITY POSITION



Nº DE ESLINGA N. OF SLING	LONGITUD LENGHT	TOLERANCIA TOLERANCE
MEDIDA 1 DIMENSION 1	4384 mm	± 30 mm
MEDIDA 2 DIMENSION 2	4384 mm	± 30 mm
ESLINGA 3 SLING 3	6861 mm	± 30 mm
ESLINGA 4 SLING 4	6859 mm	± 30 mm
ESLINGA 5 SLING 5	7078 mm	± 30 mm
ESLINGA 6 SLING 6	7076 mm	± 30 mm

Líneas en rojo representan las eslingas de poliester  
Red lines represent polyester slings

Líneas en azul representan las eslingas de cadenas  
Blue lines represent chains slings

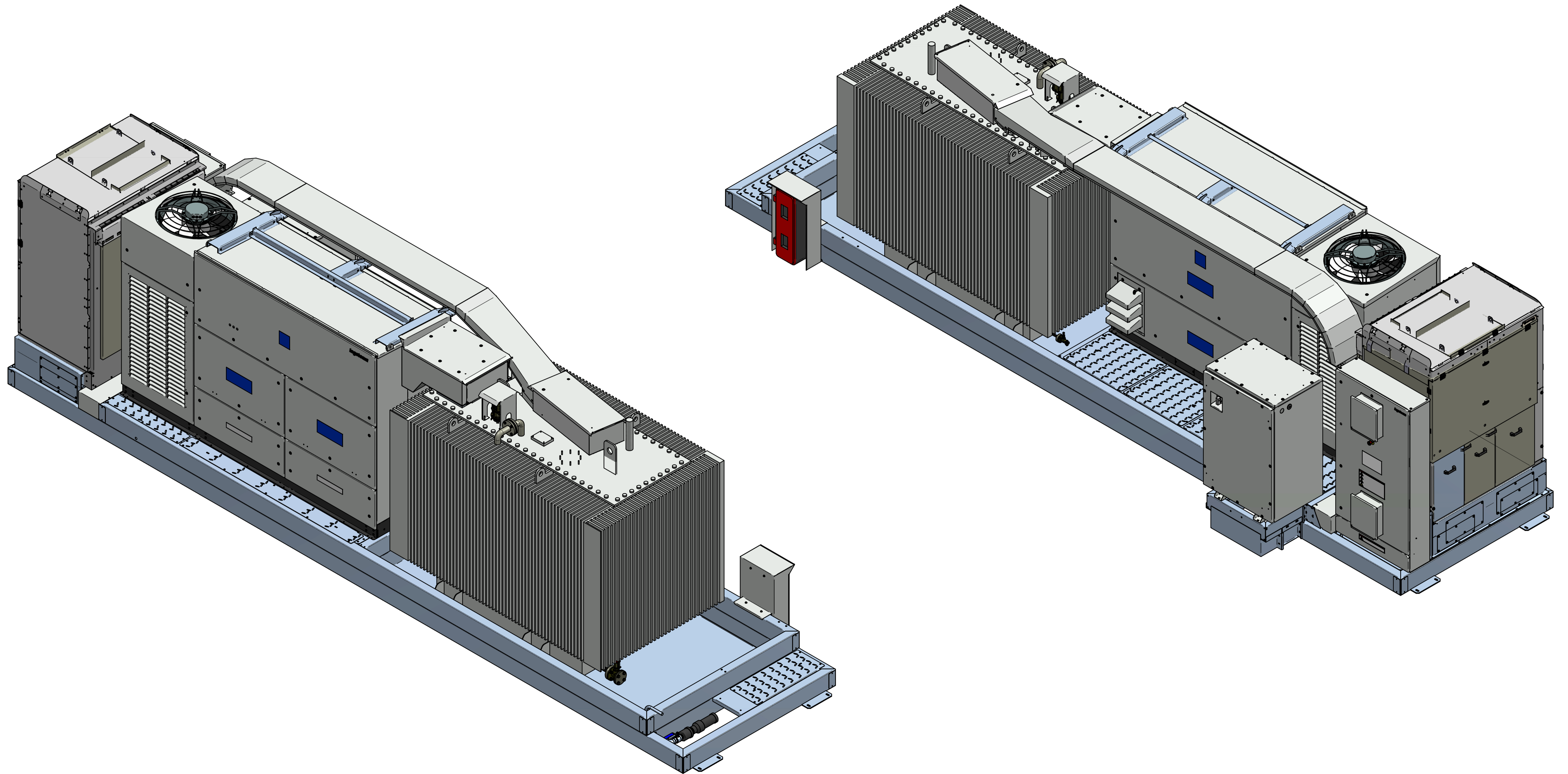
Color	Number of inverters in the Power Station
Red	1
White	2

Rev.	Modification	Date	Dra.	Chk.	App.
	Superficies ISO 1302				
	Material				Weight (kg.)
	Shape and position tolerances EN ISO 1101				
	Treatment				
	Designation				
	General tolerances EN 22768 mK Soldered parts EN ISO 13920 BF Moulded parts ISO 8062				
			Ingecon Sun Power Station ENS FSK C SERIES IEC-UL		
			ENS FSK C SERIES IEC-UL		
	Draw	S.I. 20/01/2022	Drawing Nr.	Rev.	Scale
	Checked	J.A.R. 11/03/2022	ACC8000IGA11	0	
	Approved	A.M.A. 15/03/2022	Code	Sheet	DIN
	Dimensions in mm			5 6	A1

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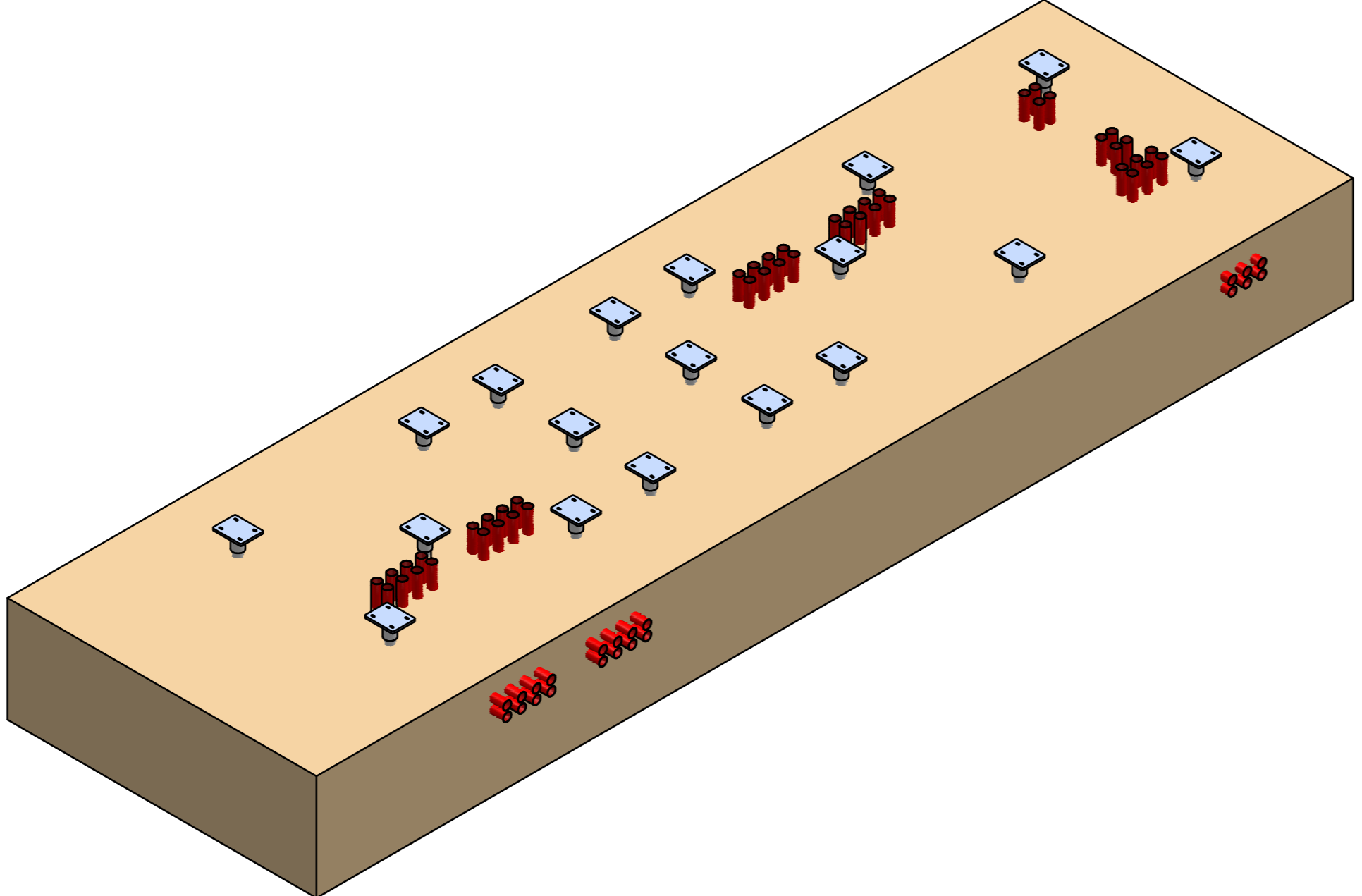
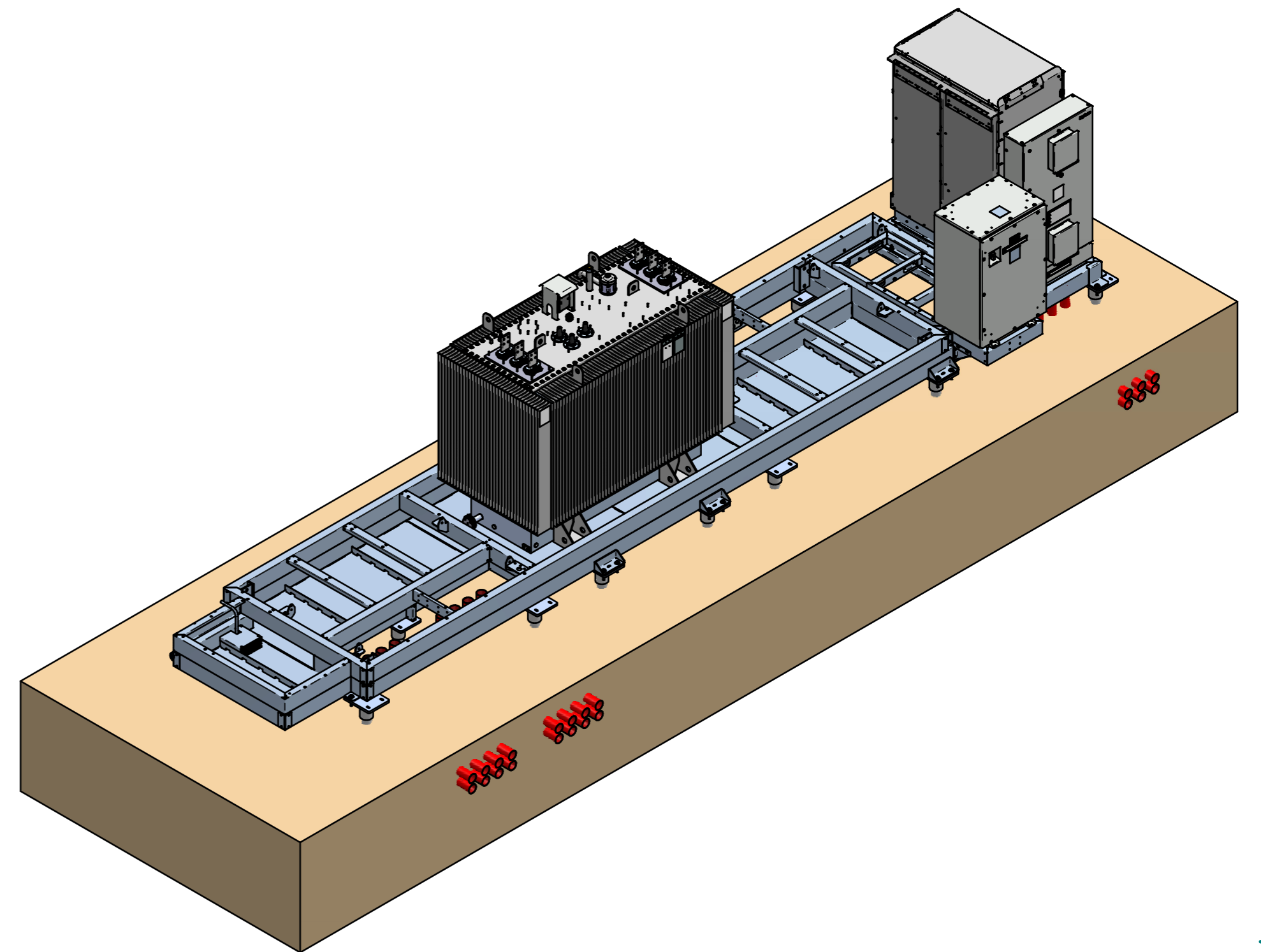
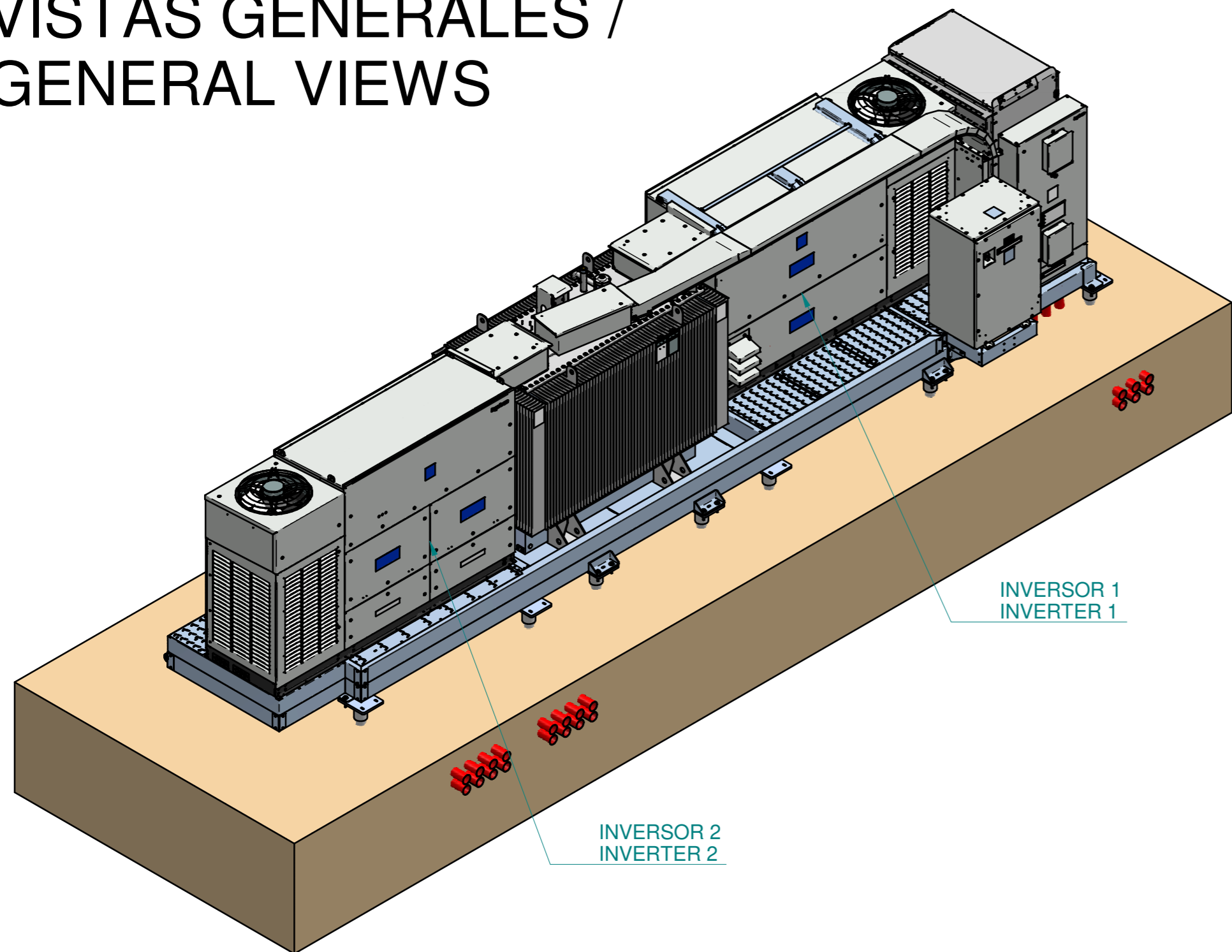
# VISTAS GENERALES GENERAL VIEWS



Rev.	Modification			Date	Dra.	Chk.	App.
	Superficies ISO 1302	Material					Weight (kg.)
	Shape and position tolerances EN ISO 1101	Treatment					
	General tolerances EN 22768 mK Soldered parts EN ISO 13920 BF Moulded parts ISO 8062	Designation		Ingecon Sun Power Station ENS FSK C SERIES IEC-UL ENS FSK C SERIES IEC-UL			
	<b>Ingeteam</b> Unidad Productiva Energy	Draw	S.I.	20/01/2022	Drawing Nr.	ACC8000IGA11	Rev. 0
		Checked	J.A.R.	11/03/2022			Scale
		Approved	A.M.A.	15/03/2022	Code		Sheet 6 of 6
	Ingeteam Power Technology S.A.		Dimensions in mm				A1



# VISTAS GENERALES / GENERAL VIEWS



La elección y construcción de la base de cimentación, de los conductos subterráneos, la elección de los cables apropiados y su conexión y aislamiento, **son responsabilidad única del cliente.**  
The choice and construction of the foundation base, of the underground conduits, the choice of the appropriate wires and their connection and insulation **are responsibility of the client only.**

No incluidos en el suministro estándar  
Footings not included in standard supply

Rev.	Modification			Date	Dra.	Chk.	App.
	Superficies ISO 1302	Material					Weight (kg.)
	Shape and position tolerances EN ISO 1101	Treatment					
	General tolerances EN 22768 mK Soldered parts EN ISO 13920 BF Moulded parts ISO 8062	Designation Ingecon Sun Power Station ENS FSK C SERIES IEC-UL IGA - VISTAS EXTERIORES ENS FSK C SERIES IEC-UL					
	<b>Ingeteam</b> Unidad Productiva Energy	Draw Checked Approved	J.A.R. J.A.R. A.M.A.	03/02/2022	Draw Checked Approved	J.A.R. J.A.R. A.M.A.	Rev. Scale Sheet DIN
	Ingeteam Power Technology S.A.	Dimensions in mm					1 8 A2

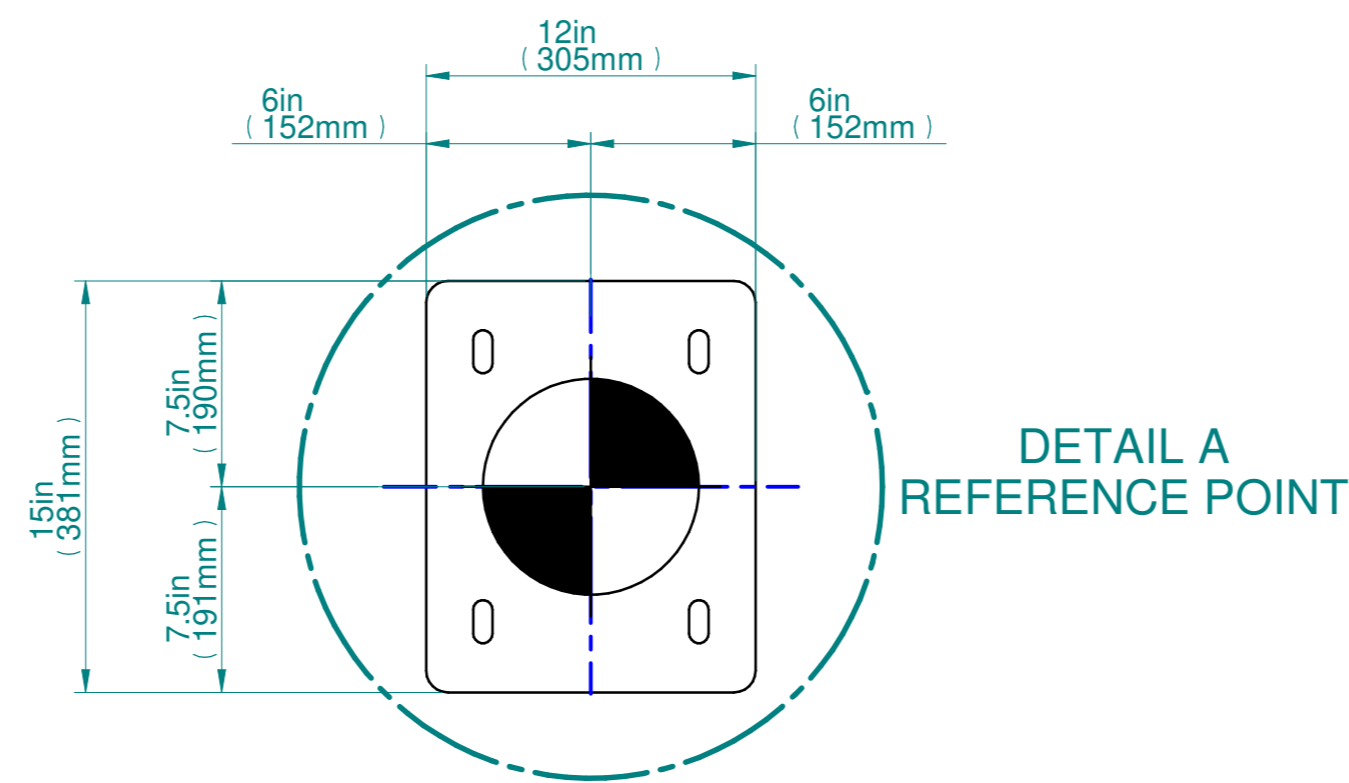
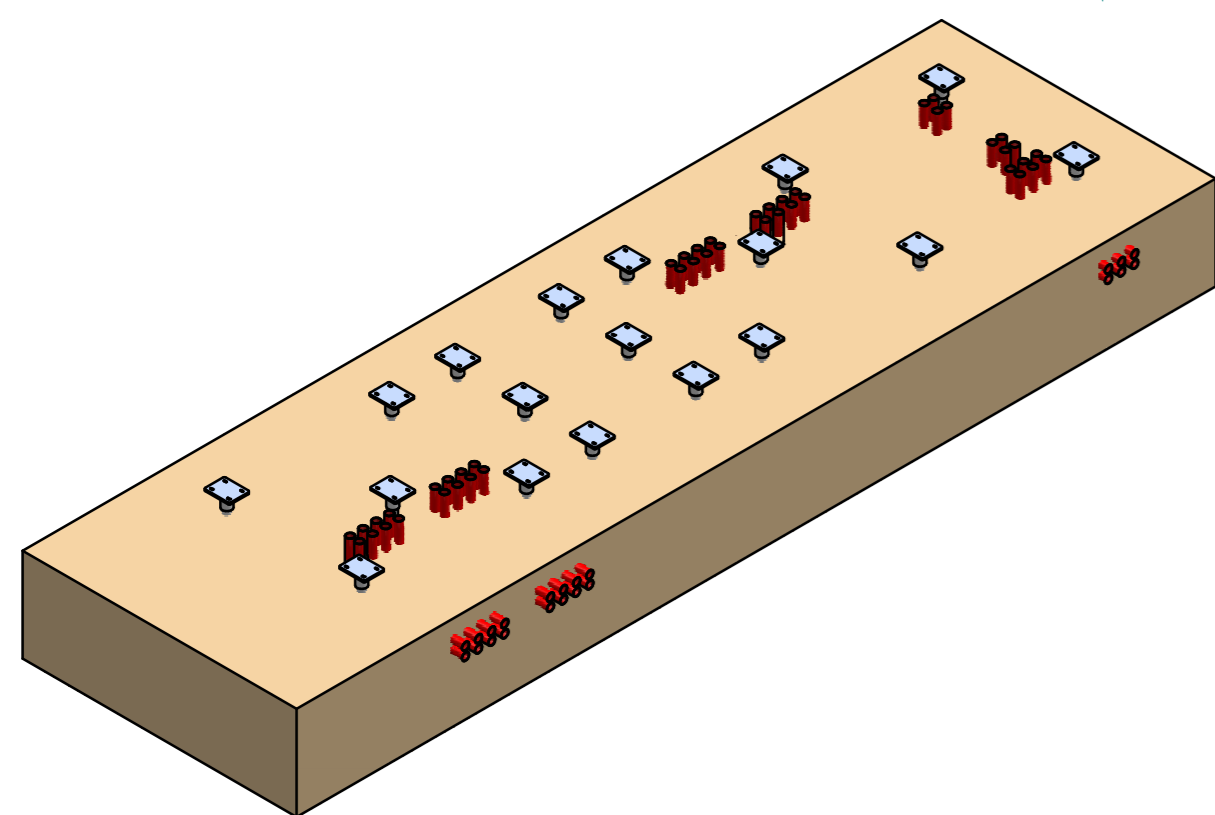
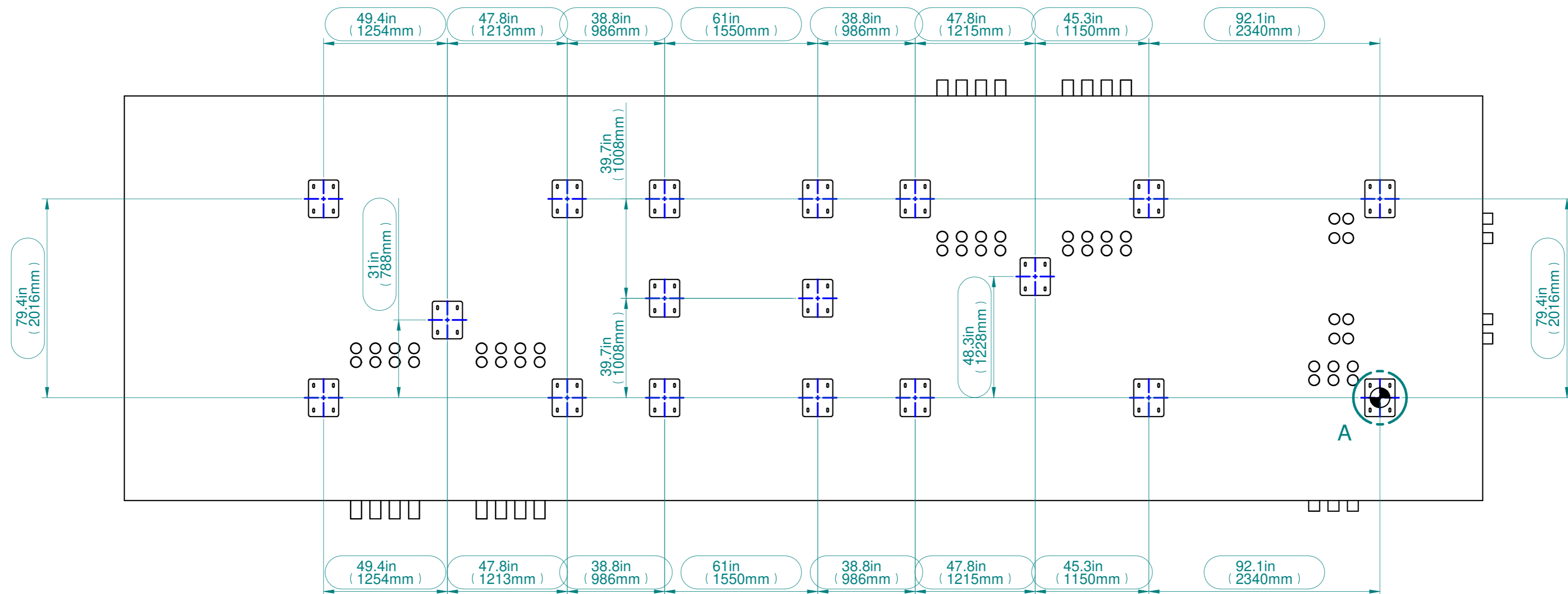
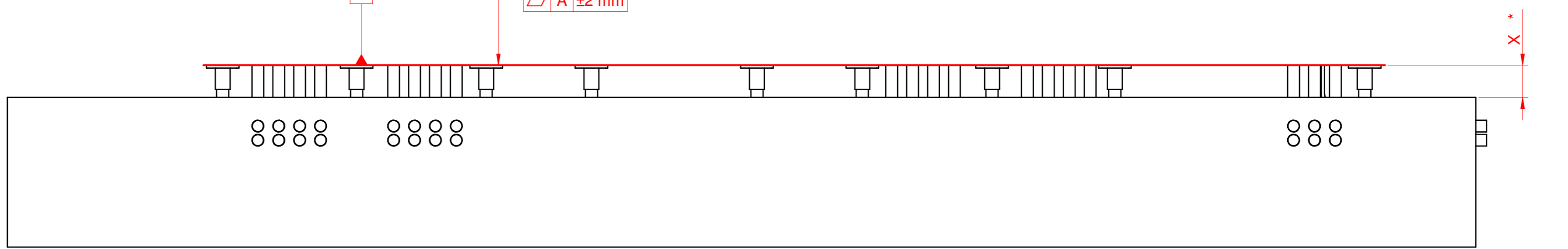
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# DISPOSICIÓN PILOTES METÁLICOS / STEEL PILE LAYOUT

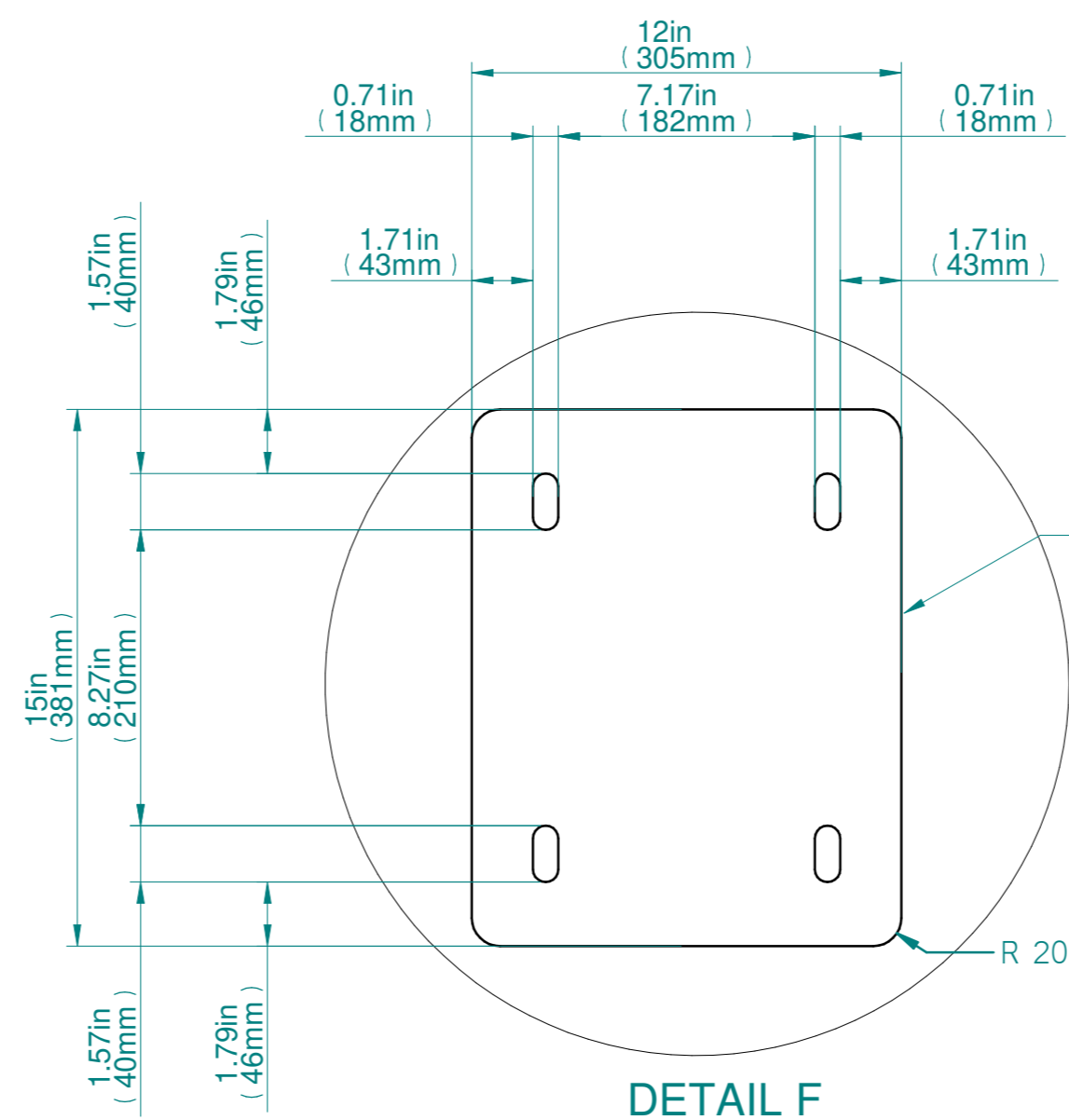
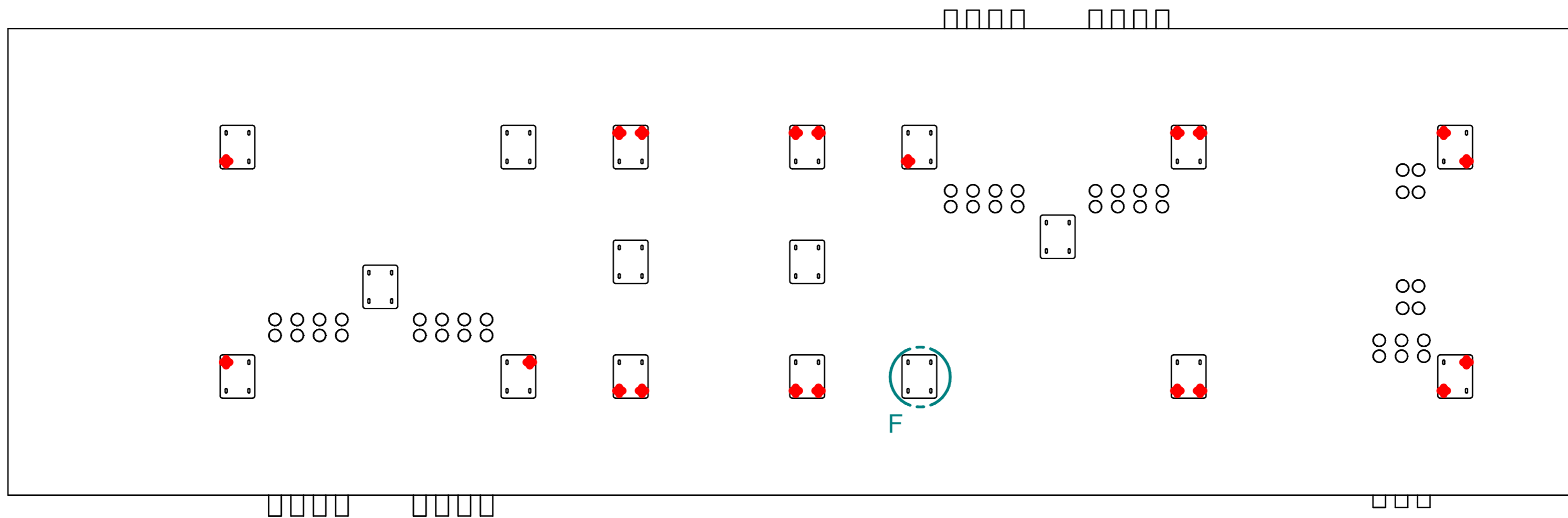
\* ALTURA DESDE EL PLANO DE LOS PILOTES AL NIVEL DEL SUELO  
(A DEFINIR POR EL CLIENTE)  
\* HEIGHT FROM PILES PLANE TO GROUND LEVEL  
(TO BE DEFINED BY CUSTOMER)

All piles head should be in the same plane / Todas las cabezas de los pilotes deben estar sobre el mismo plano  
A ±2 mm



Rev.	Modification	Date	Dra.	Chk.	App.
	Superficies ISO 1302				
	Shape and position tolerances EN ISO 1101				Weight (kg.)
	General tolerances EN 22768 mK Soldered parts EN ISO 13920 BF Moulded parts ISO 8062				
					Ingecon Sun Power Station ENS FSK C SERIES IEC-UL IGA - VISTAS EXTERIORES ENS FSK C SERIES IEC-UL
	Draw	J.A.R.	03/02/2022	Drawing Nr.	Rev.
	Checked	J.A.R.		ACC8000IGA25	0
	Approved	A.M.A.		Code	Sheet
	Ingeteam Power Technology S.A.			Dimensions in mm	2 8
					DIN A2

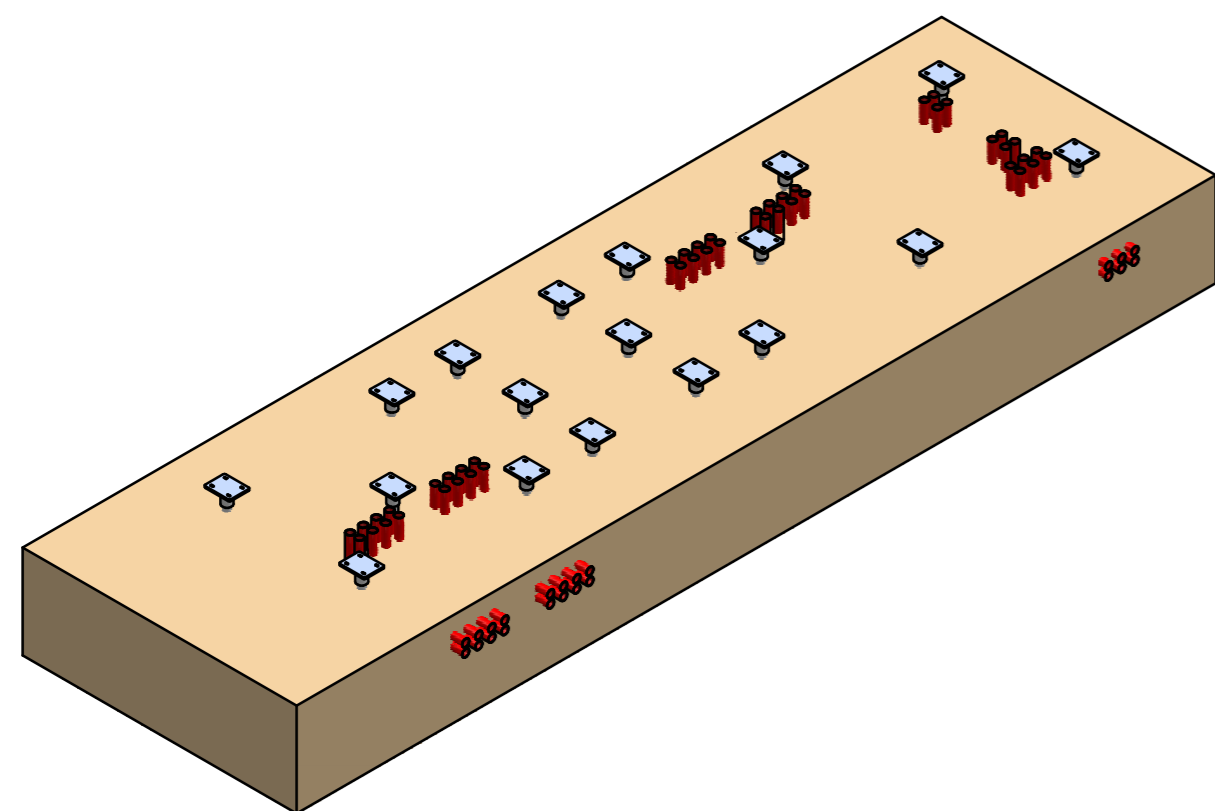
# DISPOSICIÓN PILOTES METÁLICOS / STEEL PILE LAYOUT



PATRÓN EN LA CABEZA DEL PILOTE /  
PILES HEAD PATTERN

Todos los pilotes deben tener el mismo patrón de agujeros /  
All piles must have the same hole pattern

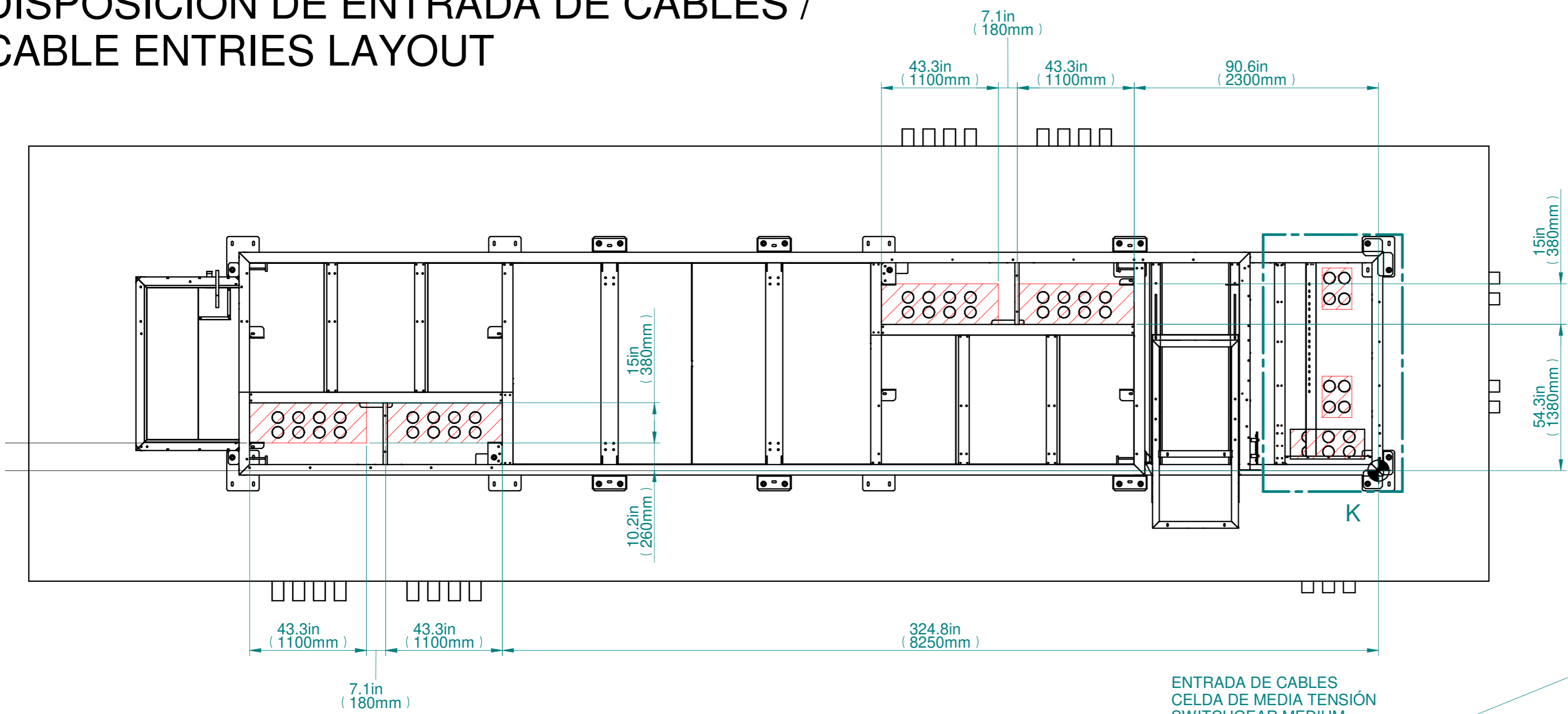
Espesor mínimo de la chapa 15mm /  
Minimum plate thickness 15mm



Rev.	Modification	Date	Dra.	Chk.	App.
	Superficies ISO 1302				Weight (kg.)
	Shape and position tolerances EN ISO 1101				
	General tolerances EN 22768 mK Soldered parts EN ISO 13920 BF Moulded parts ISO 8062				
			Designation Ingecon Sun Power Station ENS FSK C SERIES IEC-UL IGA - VISTAS EXTERIORES ENS FSK C SERIES IEC-UL		
	<b>Ingeteam</b> Unidad Productiva Energy	Draw J.A.R. 03/02/2022	Checked J.A.R.	Approved A.M.A.	Rev. 0 Scale
	Ingeteam Power Technology S.A.	Dimensions in mm	Code ACC8000IGA25		Sheet 3 of 8 DIN A2

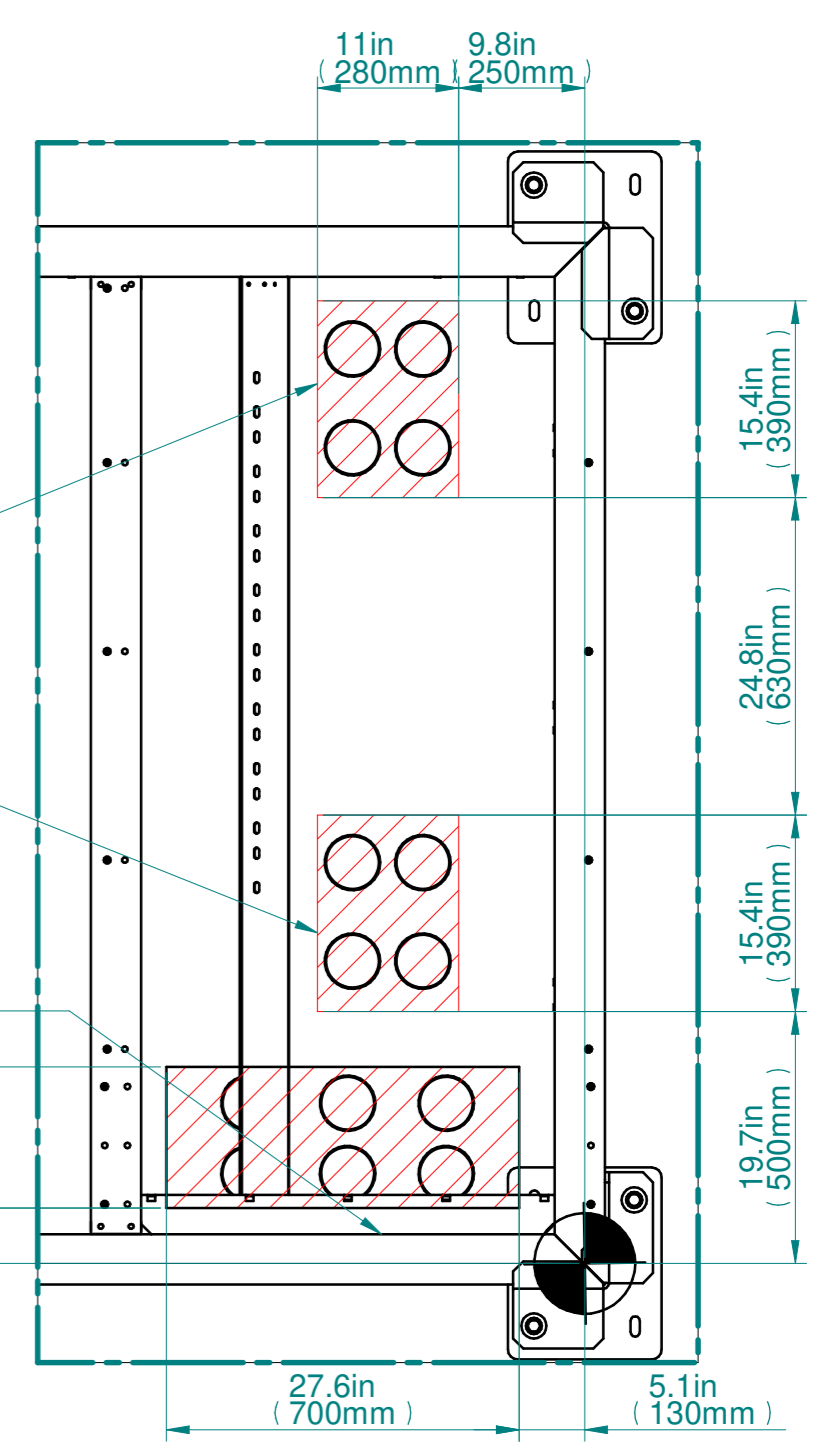
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# DISPOSICIÓN DE ENTRADA DE CABLES / CABLE ENTRIES LAYOUT

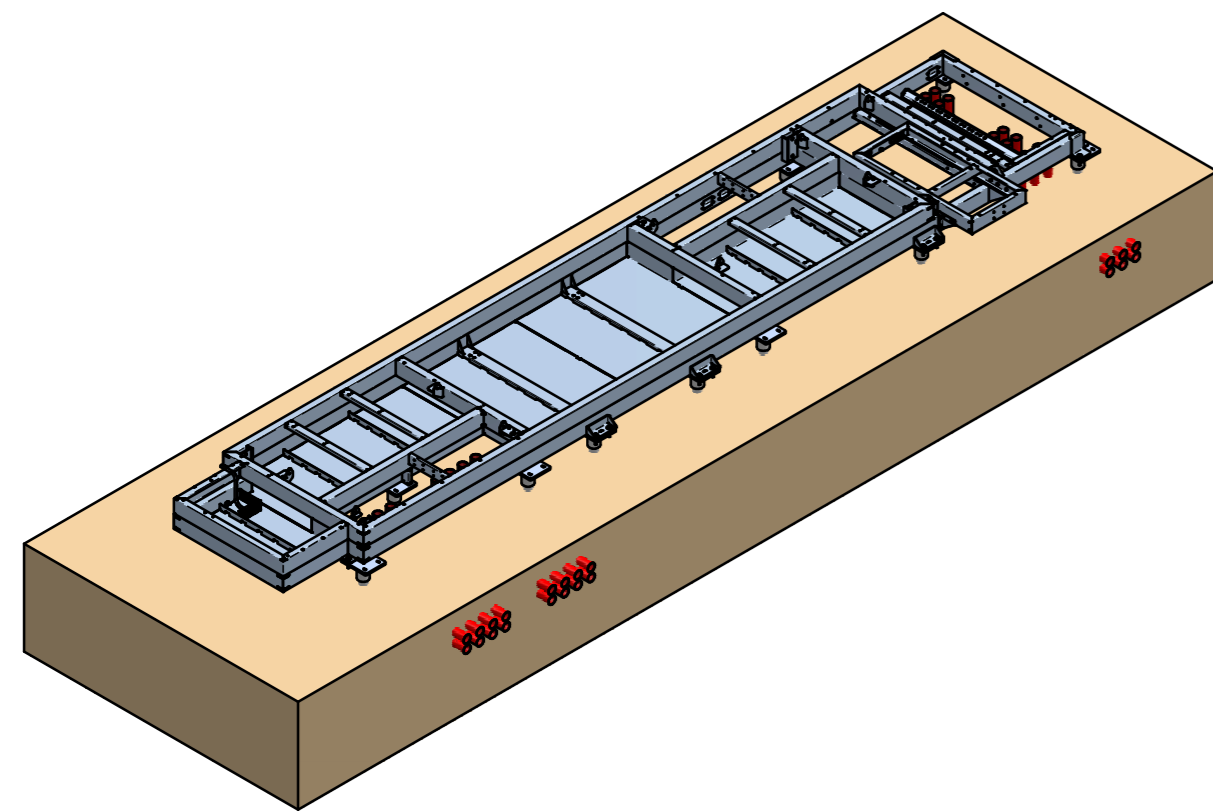


ENTRADA DE CABLES  
CELDA DE MEDIA TENSIÓN  
SWITCHGEAR MEDIUM  
VOLTAGE CABLE ENTRANCE

ENTRADA DE CABLES  
LV PANEL  
CABLE ENTRANCE



DETAIL K

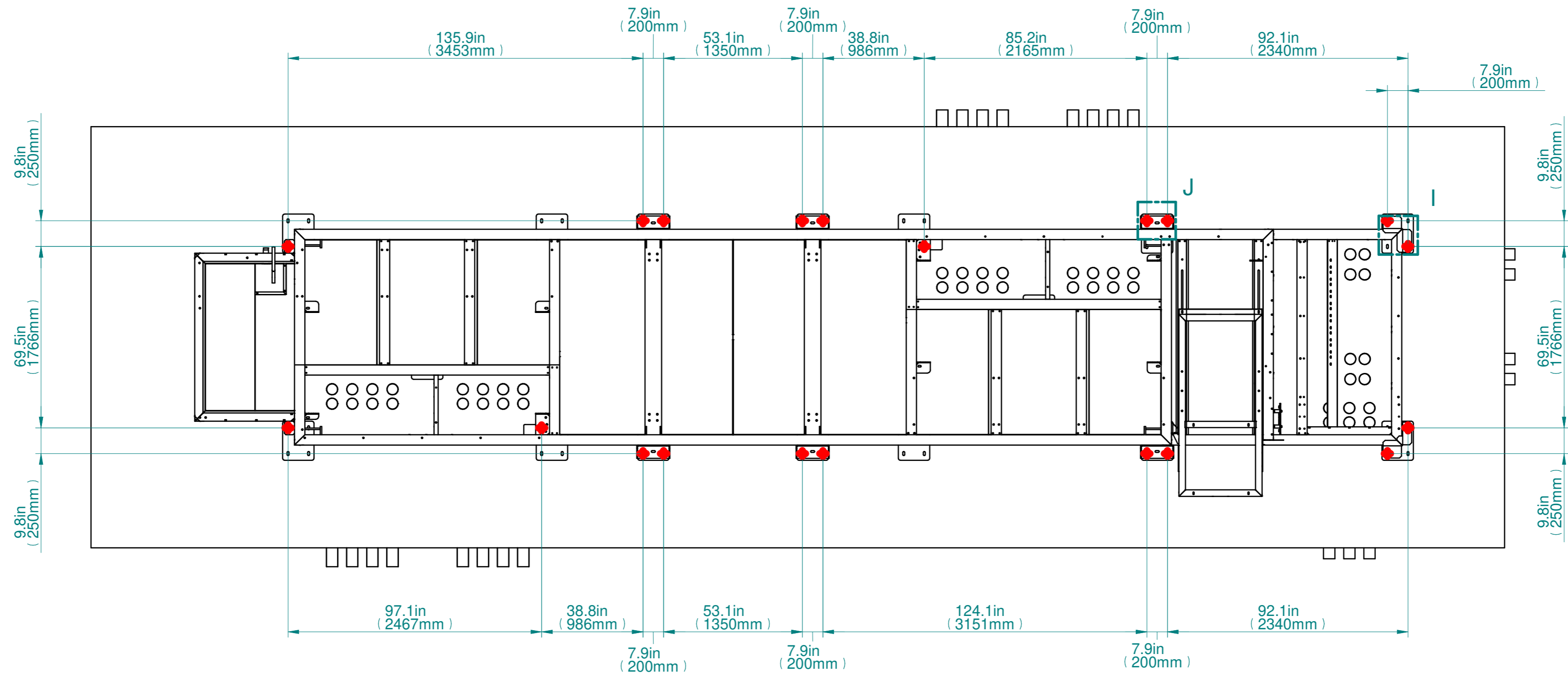


Rev.	Modification	Date	Dra.	Chk.	App.
	Superficies ISO 1302				Weight (kg.)
	Shape and position tolerances EN ISO 1101				
	General tolerances EN 22768 mK Soldered parts EN ISO 13920 BF Moulded parts ISO 8062				Ingecon Sun Power Station ENS FSK C SERIES IEC-UL IGA - VISTAS EXTERIORES ENS FSK C SERIES IEC-UL
	<b>Ingeteam</b> Unidad Productiva Energy	Draw J.A.R. 03/02/2022	Checked J.A.R.	Approved A.M.A.	
	Ingeteam Power Technology S.A.				Rev. 0 Scale Sheet 4 of 8 DIN A2

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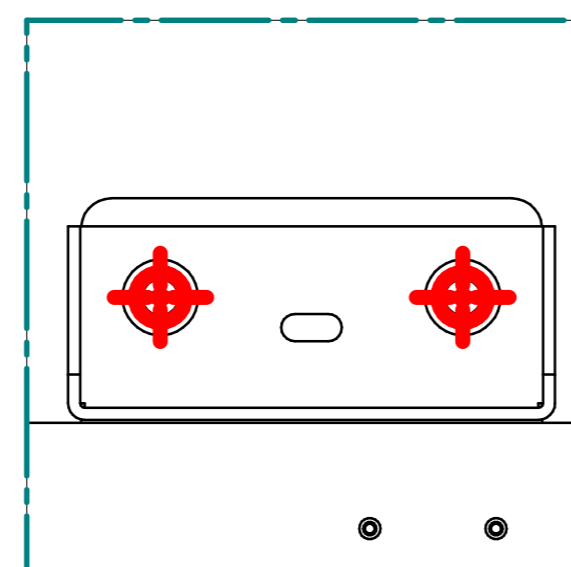
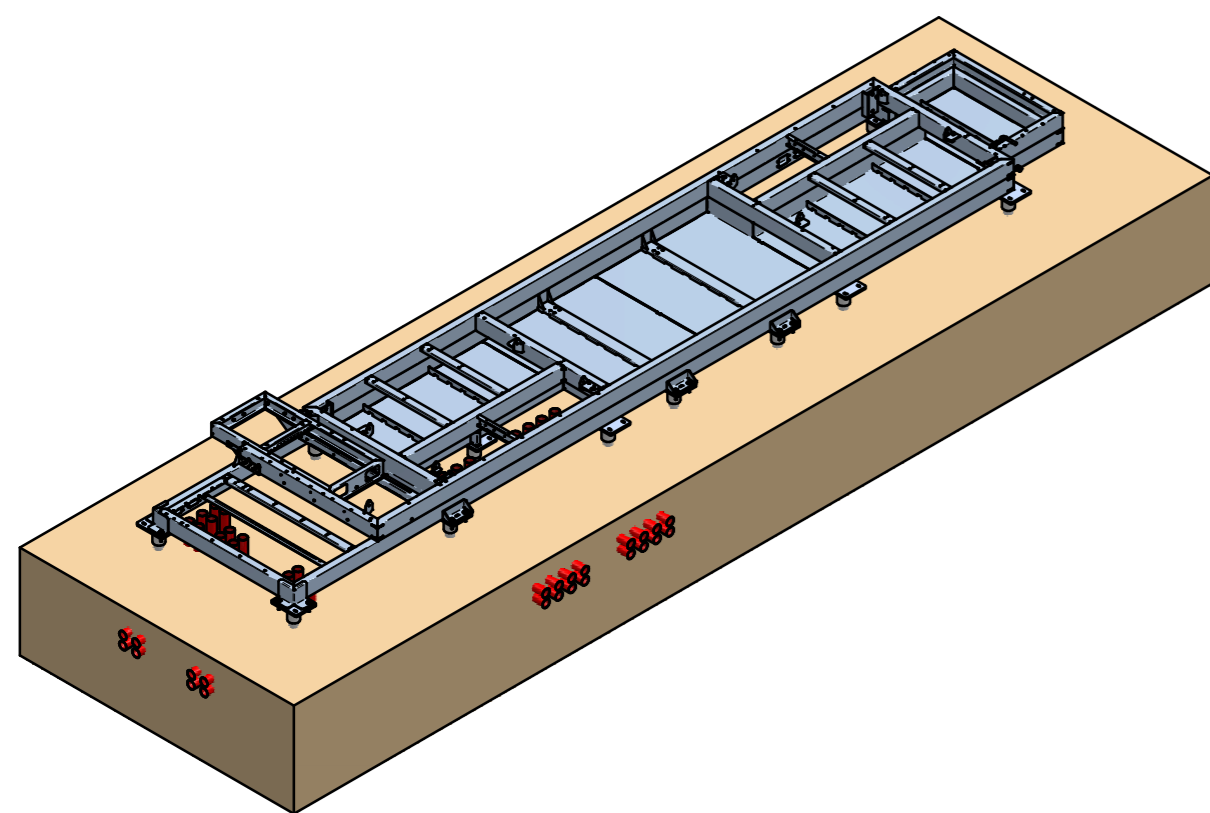
# DISPOSICIÓN DE PUNTOS DE ANCLAJE / EQUIPMENT ANCHORING LAYOUT



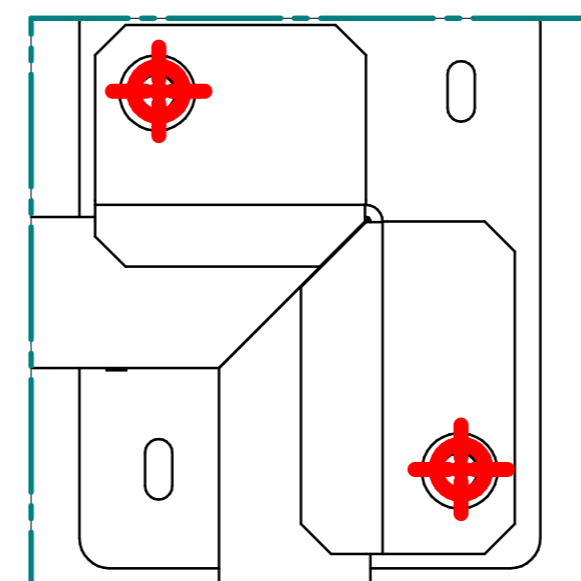
**+** REFERENCIA DE PUNTO DE FIJACIÓN DE FULLSKID  
REFERENCE FIXING POINT OF FULLSKID

## TORNILLERÍA DE FIJACIÓN / FIXING SCREWS

- 1x TORNILLO / BOLT: DIN933 M16x120 A2-70 STAINLESS STEEL
- 2x ARANDELA / WASHER: NFE-25 511 M M16 A2-70 STAINLESS STEEL
- 2x ARANDELA / WASHER: DIN9021 M16 A2-70 STAINLESS STEEL
- 1x TUERCA / NUT: DIN985 M16 A2-70 STAINLESS STEEL



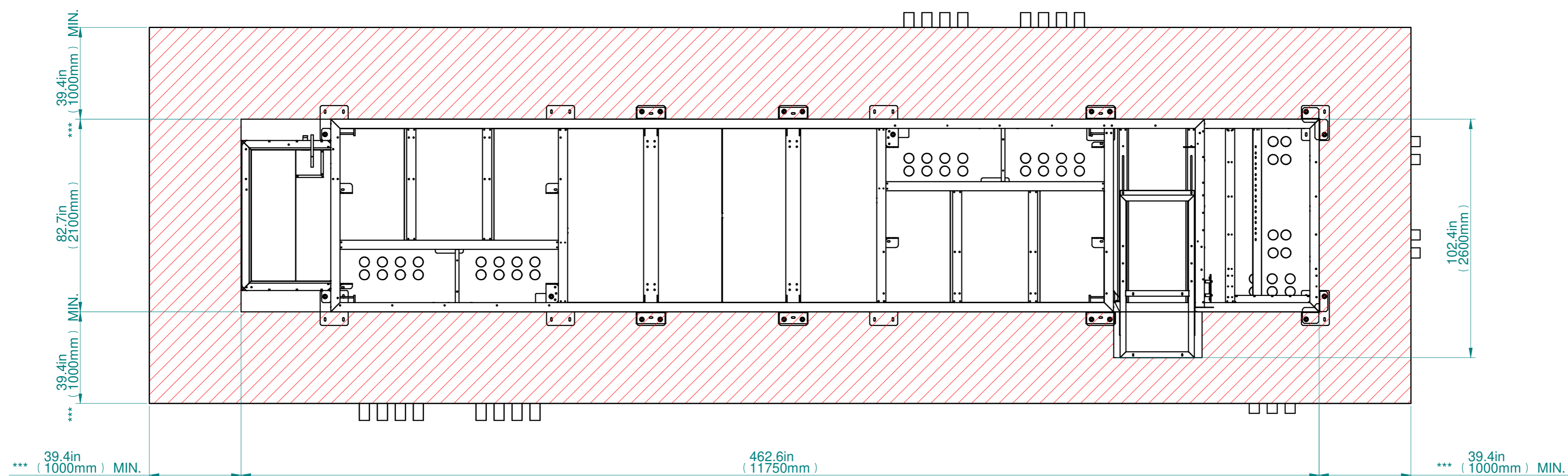
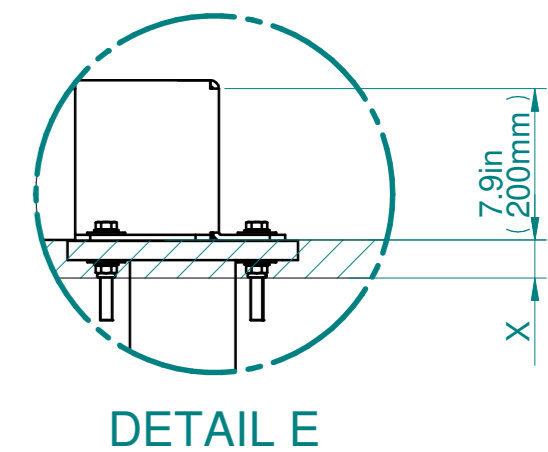
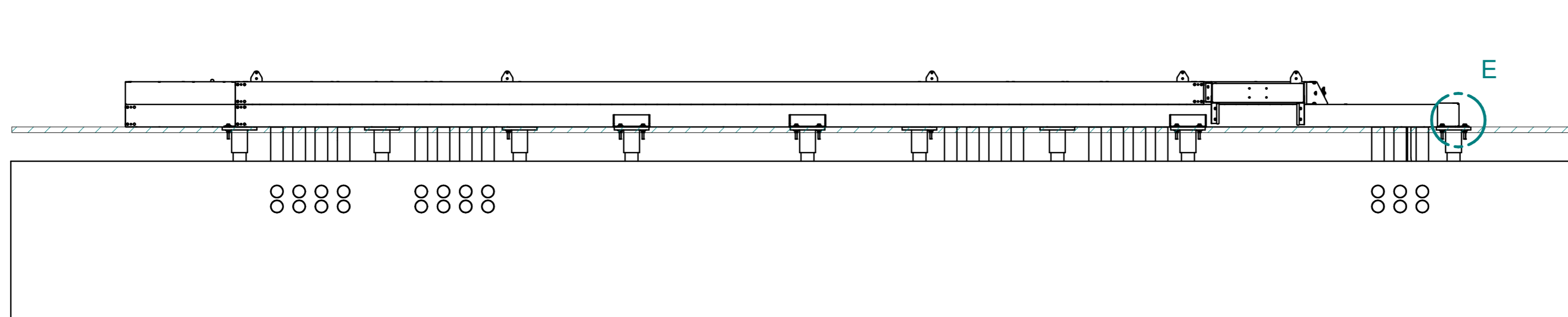
DETAIL J



DETAIL I

Rev.	Modification	Date	Dra.	Chk.	App.
	Superficies ISO 1302				
	Shape and position tolerances EN ISO 1101				Weight (kg.)
	General tolerances EN 22768 mK Soldered parts EN ISO 13920 BF Moulded parts ISO 8062				
					Ingecon Sun Power Station ENS FSK C SERIES IEC-UL IGA - VISTAS EXTERIORES ENS FSK C SERIES IEC-UL
	<b>Ingeteam</b> Unidad Productiva Energy	Draw J.A.R.	J.A.R.	03/02/2022	Drawing Nr. ACC8000IGA25
	Ingeteam Power Technology S.A.	Checked J.A.R.	A.M.A.		Rev. 0
		Approved A.M.A.			Scale DIN
		Dimensions in mm			Sheet 5 8
					A2

# DISPOSICIÓN PLATAFORMA DE OPERACIONES Y MANTENIMIENTO / OPERATIONS AND MAINTENANCE PLATFORM LAYOUT

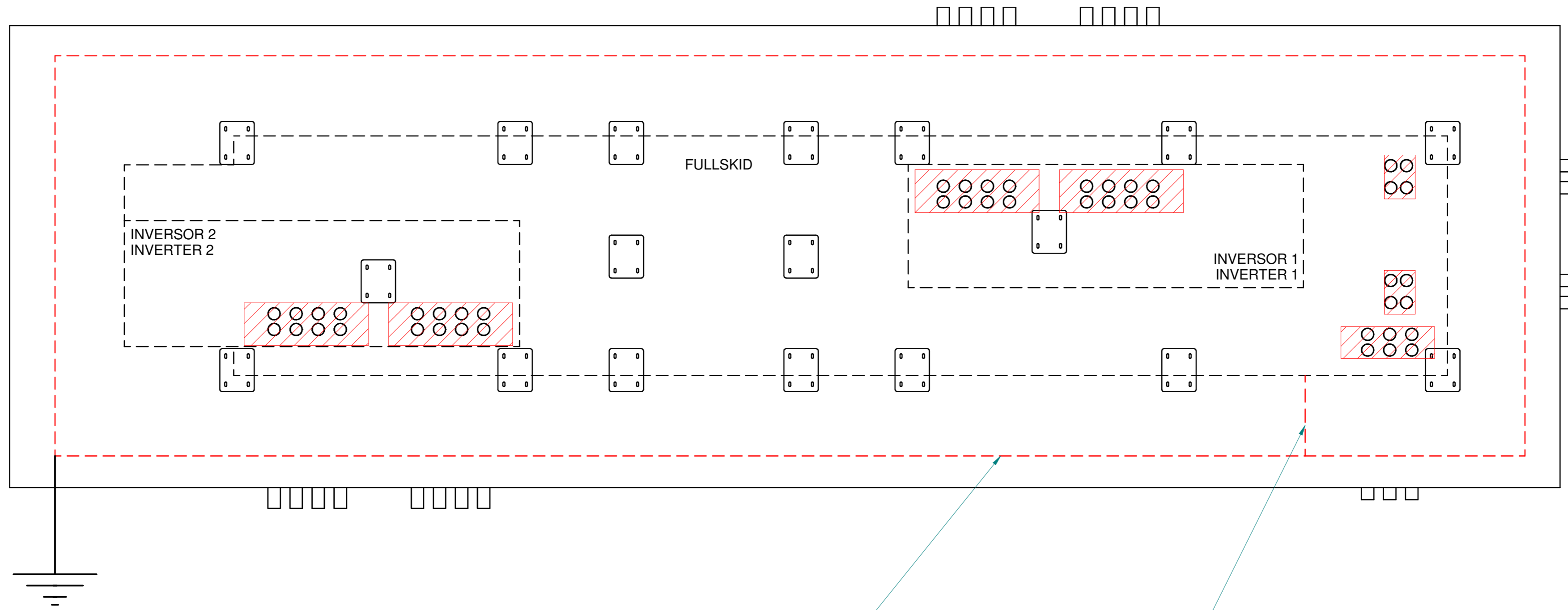


RECOMENDACIÓN DE INCLUIR PLATAFORMA PARA OPERACIONES Y MANTENIMIENTO.  
LA PLATAFORMA NO SE SUMINISTRARÁ POR INGTEAM, ES RESPONSABILIDAD DEL CLIENTE INCLUIRLA.  
RECOMMENDATION TO INCLUDE PLATFORM FOR OPERATIONS AND MAINTENANCE.  
PLATFORM WILL NOT BE SUPPLIED BY INGTEAM, IT IS THE CLIENT'S RESPONSIBILITY TO INCLUDE IT.

(\*\*\*) POR TEMAS DE OPERACIONES Y MANTENIMIENTO, SE RECOMIENDA RESPETAR 1000 MM. MIN. EN LAS ZONAS DE ACCESO DE INVERSORES Y SKID, INCLUYENDO UNA PLATAFORMA POR DEBAJO DE LA ESTRUCTURA  
(\*\*\*) FOR OPERATIONS AND MAINTENANCE, IT IS RECOMMENDED TO RESPECT 1000MM. MIN. IN ACCESS AREAS OF INVERTERS AND SKID, INCLUDING A PLATFORM UNDERNEATH THE STRUCTURE

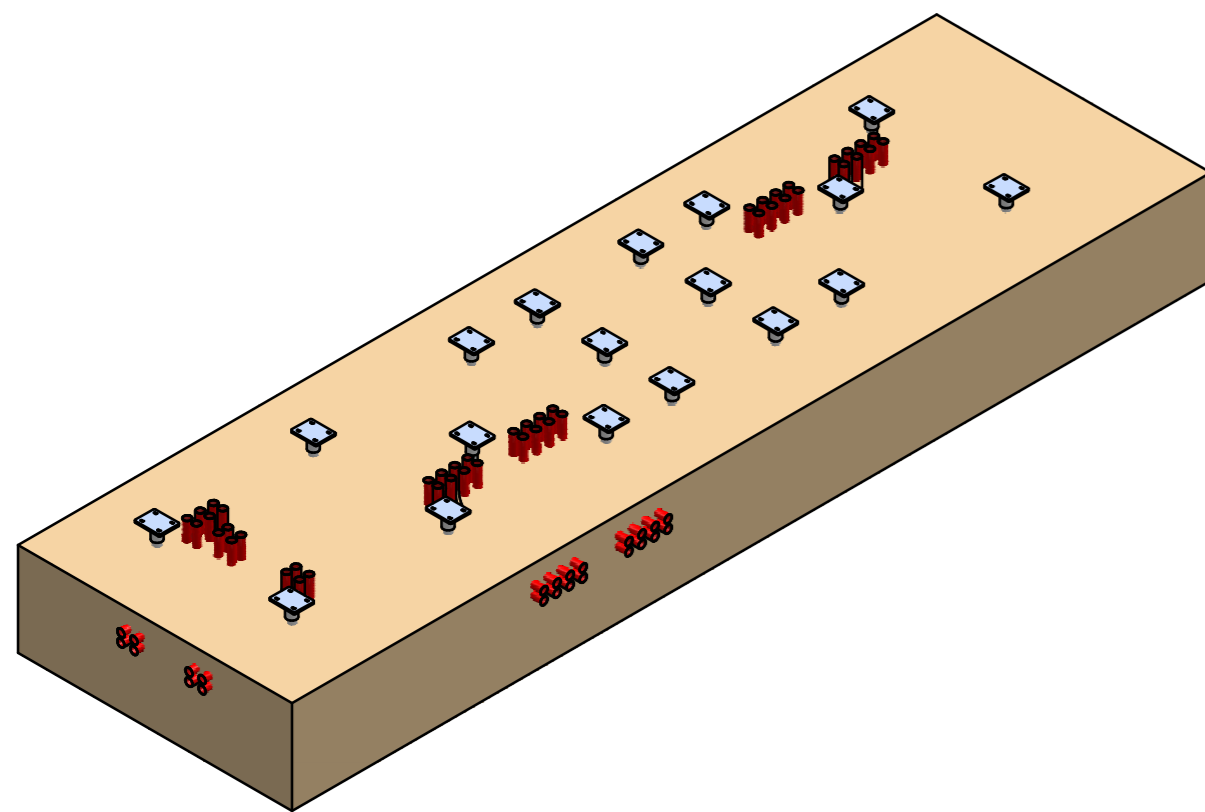
Rev.	Modification	Date	Dra.	Chk.	App.
	Superficies ISO 1302				
	Shape and position tolerances EN ISO 1101				Weight (kg.)
	General tolerances EN 22768 mK Soldered parts EN ISO 13920 BF Moulded parts ISO 8062				
					Ingecon Sun Power Station ENS FSK C SERIES IEC-UL IGA - VISTAS EXTERIORES ENS FSK C SERIES IEC-UL
	<b>Ingeteam</b> Unidad Productiva Energy	Draw J.A.R.	03/02/2022	Rev. 0	Scale A2
	Ingeteam Power Technology S.A.	Checked J.A.R.		Code ACC8000IGA25	Sheet 6 8
		Approved A.M.A.			DIN
		Dimensions in mm			

# CONEXIÓN A TIERRA / GROUNDING



ANILLO DE TIERRA  
GROUNDING RING IS NOT INGATEAM'S SCOPE

CONEXIÓN ENTRE ANILLO DE TIERRA Y PLETINA DE TIERRA  
CONNECTION BETWEEN GROUNDING RING AND GROUNDING BAR IS NOT INGATEAM'S SCOPE



Rev.	Modification			Date	Dra.	Chk.	App.
	Superficies ISO 1302	Material					Weight (kg.)
	Shape and position tolerances EN ISO 1101	Treatment					
	General tolerances EN 22768 mK Soldered parts EN ISO 13920 BF Moulded parts ISO 8062	Designation Ingecon Sun Power Station ENS FSK C SERIES IEC-UL IGA - VISTAS EXTERIORES ENS FSK C SERIES IEC-UL					
	<b>Ingeteam</b> Unidad Productiva Energy	Draw	J.A.R.	03/02/2022	Drawing Nr.	ACC8000IGA25	Rev. 0
		Checked	J.A.R.				Scale
		Approved	A.M.A.		Code		Sheet 7 of 8
	Ingeteam Power Technology S.A.	Dimensions in mm					DIN A2

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**MEDIUM VOLTAGE  
POWER STATION  
CUSTOMIZED UP  
TO 7.65 MVA,  
WITH ALL THE  
COMPONENTS  
SUPPLIED ON TOP  
OF THE SAME  
SKID PLATFORM**

## From 2500 up to 7650 kVA

This medium-voltage solution integrates all the necessary elements to develop a large-scale solar PV plant.

### **Maximize your investment with a minimal effort**

Ingeteam's FSK power station is a compact, customizable and flexible solution that can be configured to suit each customer's requirements. It is supplied together with up to two photovoltaic inverters. All the equipment is suitable for outdoor installation, so there is no need of any kind of housing.

### **Higher adaptability and power density**

This power station is now more versatile, as it presents the MV transformer integrated into a steel platform together with the LV and MV components, including the PV inverters. Moreover, it features one of the market's greatest power densities.

### **Plug & Play technology**

This MV solution integrates power conversion equipment (up to 7.65 MVA), liquid-filled hermetically sealed transformer up to 36 kV and

provision for low voltage equipment. The MV Skid is delivered pre-assembled for a fast on-site connection with up to two PV inverters from Ingeteam's INGECON® SUN 3Power C Series inverter family.

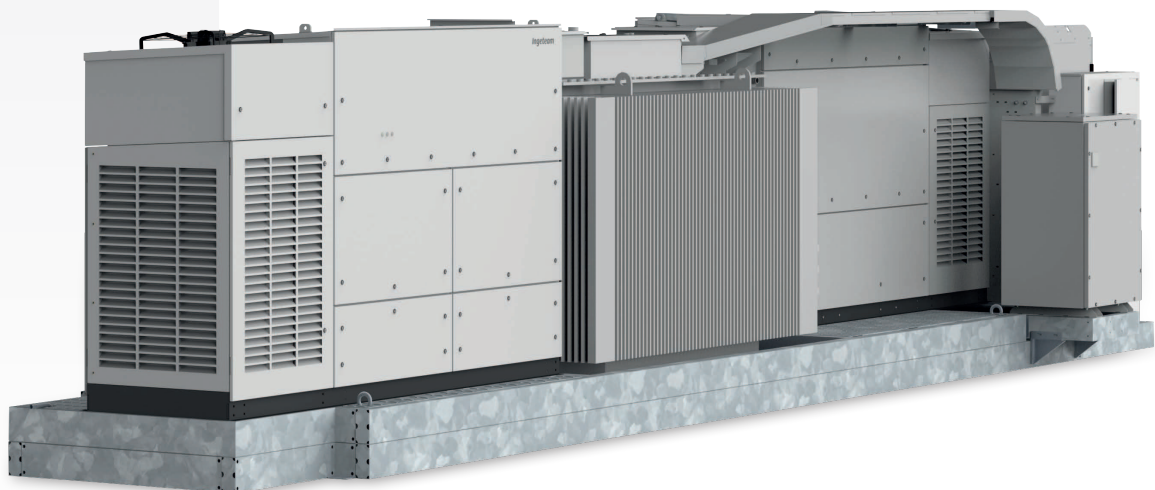
### **Complete accessibility**

Thanks to the lack of housing, the inverters, the switchgear and the transformer can have immediate access. Furthermore, the design of the 3Power C Series central inverters has been conceived to facilitate maintenance and repair works.

### **Maximum protection**

Ingeteam's 3Power C Series central inverters feature an IP65 protection class for their power stacks thanks to a combined water and air cooling system that optimises the operating temperature of the power electronics.

Apart from that, they feature the main electrical protections and they deploy grid support functionalities, such as low voltage ride-through capability, reactive power deliverance and active power injection control.





CONSTRUCTION

- Steel base frame.
- Suitable for slab or piers mounting.
- Compact design, minimising freight costs.
- Minimum installation at project site.

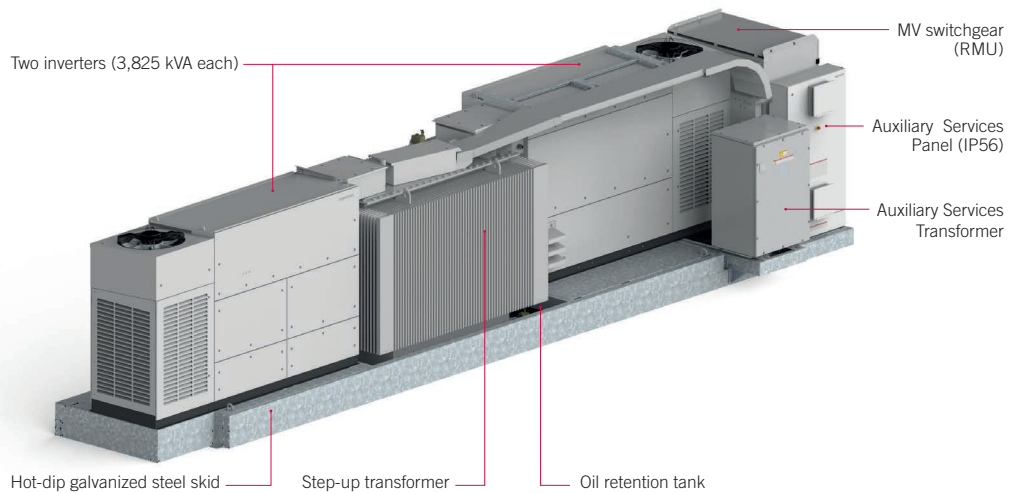
OPTIONAL ACCESSORIES

- Auxiliary services transformer (up to 60 kVA, Dyn11).
- MV Surge arresters.
- Auxiliary services panel (IP56)
- Power plant commissioning.
- High-speed Ethernet / fibre optic communication infrastructure for Plug & Play connection to the Power Plant Controller and/or SCADA systems.
- INGECON® SUN StringBox with 16 / 24 / 32 input channels. Intelligent or passive string combiner box.
- Energy meter for auxiliary services and/or energy production.
- Insulation monitoring relay for continuous monitoring of IT systems insulation.
- Reactive power regulation when there is no PV power available.
- Ground connection of the PV array.

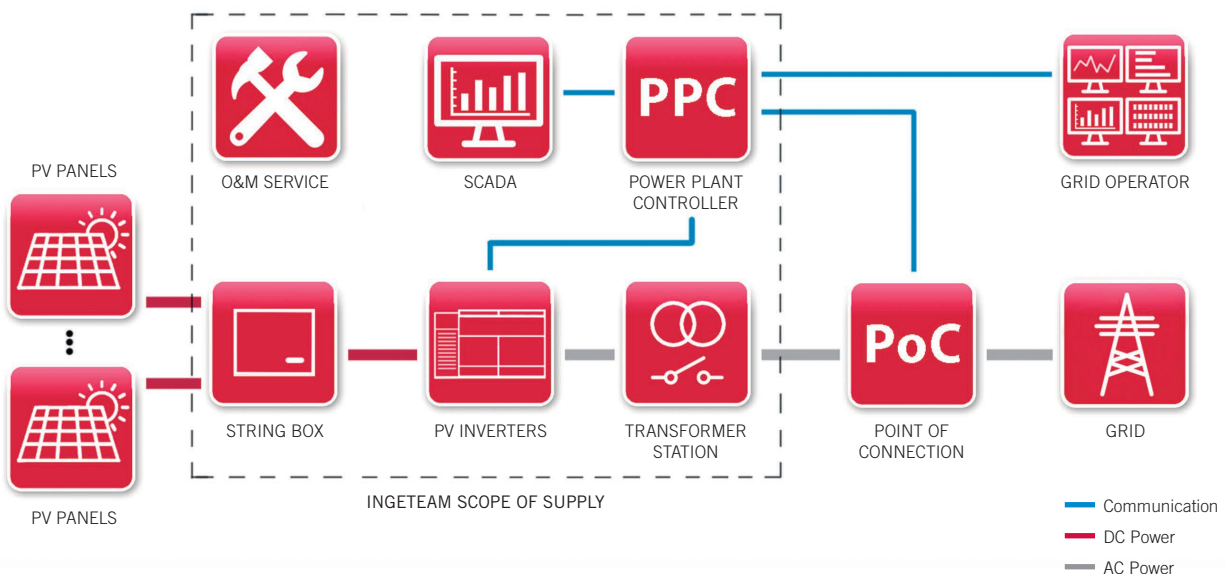
STANDARD EQUIPMENT

- Up to two inverters with an output power of 7.65 MVA.
- Liquid-filled hermetically-sealed transformer up to 36 kV.
- 1L1A MV switchgear (2L1A optional).
- Oil-retention tank.
- Metal frame for installation of LV equipment.

COMPONENTS



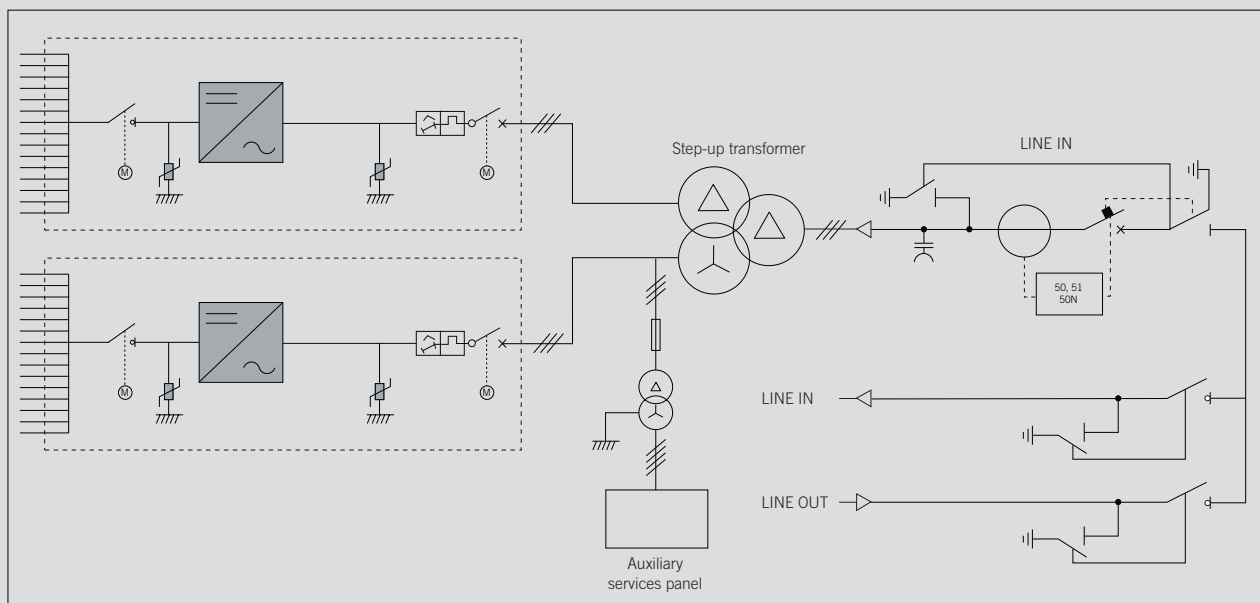
PLANT CONFIGURATION



	3825 FSK C Series	7650 FSK C Series
<b>General information</b>		
Number of inverters	1	2
Max. power. @35 °C / 95 °F <sup>(1)</sup>	3,824 kVA	7,648 kVA
Operating temperature range	from -5 °C to +50 °C	
Relative humidity (non condensing)	0 - 100%	
Maximum altitude	3,000 masl (power derating starting at 1,000 masl)	
<b>LV/MV Transformer</b>		
Medium voltage	From 10 kV up to 36 kV, 50-60 Hz	
Cooling system	ONAN (KNAN optionally)	
Minimum PEI (Peak Efficiency Index) <sup>(2)</sup>	99,50%	
Protection degree	IP54	
<b>MV Switchgear (RMU)</b>		
Medium voltage	24 kV / 36 kV / 40.5 kV	
Rated current	630 A	
Cooling system	Natural air ventilation	
Protection degree	IP54 (IP55 optionally)	
<b>Equipment</b>		
Auxiliary services panel	Standard version (optional monitoring system)	
Step-up transformer	Oil-immersed hermetically sealed transformer	
MV Switchgear	1L1A cells (2L1A optional)	
<b>Mechanical information</b>		
Structure type	Hot dip galvanized steel skid	
Dimensions Full Skid (W x D x H)	11,390 x 2,100 x 2,460 mm	11,390 x 2,100 x 2,460 mm
Full Skid	16 T	25 T
Standards	IEC 62271-212, IEC 62271-200, IEC 60076, IEC 61439-1	

**Notes:** <sup>(1)</sup> Maximum power calculated with the inverter model INGECON® SUN 3825TL C690. For other inverter models, please contact Ingeteam's Solar sales department <sup>(2)</sup> For European installations, ECO design according to the EU 548/2014 and EU 2019/1783 standards.

**Configuration with two C Series solar inverters**





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# RG7H1RFR EPRO-SETTE™



**Unipolare da 1,8/3 kV a 26/45 kV**  
**Single core from 1,8/3 kV to 26/45 kV**

**Norma di riferimento**  
**CEI 20-13 (IEC 60840 per 26/45 kV)**

**Descrizione del cavo**

**Anima**

Conduttore a corda a fili di rame in accordo alla norma CEI 20-29, classe 2

**Semiconduttivo interno**

Elastomerico estruso (solo per cavi con tensione ≥ 3,6/6 kV)

**Isolante**

Mescola di gomma ad alto modulo G7

**Semiconduttivo esterno**

Elastomerico estruso (solo per cavi con tensione ≥ 3,6/6 kV) pelabile a freddo

**Schermo metallico**

Fili di rame e nastro equalizzatore di rame

**Guaina di separazione**

Mescola PVC

**Armatura**

Fili di alluminio

**Guaina esterna**

Mescola PVC, colore rosso

**Marcatura**

**PRYSMIAN (\*) RG7H1RFR <tensione>**  
**<sezione> <anno>**

(\*) Sito produttivo

Marcatura in rilievo ogni metro  
 Marcatura metrica progressiva ad inchiostro

**Applicazioni**

I cavi possono essere forniti con caratteristiche di:  
 - non propagazione dell'incendio e ridotta emissione di sostanze corrosive  
 - ridottissima emissione di fumi opachi e gas tossici e assenza di gas corrosivi (AFUMEX).

**Standard**  
**CEI 20-13 (IEC 60840 for 26/45 kV)**

**Cable design**

**Core**

Conductor: annealed stranded copper wires, according to IEC 60228, class 2

**Inner semi-conducting layer**

Extruded elastomeric compound (only for rated voltage ≥ 3,6/6 kV)

**Insulation**

High module rubber compound, G7 type

**Outer semi-conducting layer**

Extruded cold strippable elastomeric compound (only for rated voltage ≥ 3,6/6 kV)

**Metallic screen**

Copper tapes

**Separation sheath**

PVC compound

**Armour**

Aluminium wires

**Over sheath**

PVC compound, red colour

**Marking**

**PRYSMIAN (\*) RG7H1RFR <rated voltage>**  
**<cross-section> <year>**

(\*) Plant of production

Embossed marking each meter  
 Meter marking by ink

**Applications**

Cables can be supplied with the following characteristics:  
 - fire retardant and with low emission of corrosive substances  
 - low emission of opaque smoke and toxic gases and without corrosive gases (AFUMEX).

TEMPERATURA FUNZIONAMENTO / OPERATING TEMPERATURE	TEMPERATURA CORTOCIRCUITO / SHORT-CIRCUIT TEMPERATURE	CEI 20-35 EN 60332	RIGIDO / RIGID

**Condizioni di posa / Laying conditions**

TEMPERATURA MIN. DI POSA 0 °C / MINIMUM INSTALLATION TEMPERATURE 0 °C	CANALE INTERRATO / BURIED TROUGH	TUBO INTERRATO / BURIED DUCT	ARIA LIBERA / OPEN AIR	DIRETTAMENTE INTERRATO / DIRECTLY BURIED

## RG7H1RFR EPRO-SETTE™

Unipolare da 1,8/3 kV a 26/45 kV  
Single core from 1,8/3 kV to 26/45 kV

### Unipolare - conduttore di rame / Single core - copper conductor - RG7H1RFR

sezione nominale	diametro indicativo conduttore	spessore isolante	diametro esterno massimo	peso indicativo del cavo	raggio minimo di curvatura
<i>conductor cross-section</i>	<i>approximate conductor diameter</i>	<i>insulation thickness</i>	<i>maximum outer diameter</i>	<i>approximate weight</i>	<i>minimum bending radius</i>
(mm <sup>2</sup> )	(mm)	(mm)	(mm)	(kg/km)	(mm)

sezione nominale	posa in aria a trifoglio	posa interrata a trifoglio p= 1° C m/w
<i>conductor cross-section</i>	<i>open air installation trefoil</i>	<i>underground installation trefoil p= 1° C m/w</i>
(mm <sup>2</sup> )	(A)	(A)

#### Dati costruttivi / Construction charact. - 1,8/3 kV

10	3,8	2,0	21,4	600	280
16	4,7	2,0	22,4	680	300
25	6,0	2,0	23,7	810	310
35	7,0	2,0	24,7	920	330
50	8,1	2,0	25,8	1080	340
70	9,8	2,0	27,5	1310	370
95	11,4	2,0	29,2	1600	400
120	12,9	2,0	30,8	1860	410
150	14,2	2,0	32,4	2170	440
185	15,8	2,0	34,0	2540	450
240	18,2	2,0	36,7	3160	490
300	20,5	2,0	39,3	3810	520
400	22,9	2,0	42,0	4650	560
500	26,2	2,2	46,0	5820	620
630	30,0	2,4	52,2	7570	700

#### Caratt. elettriche / Electrical charact. - 1,8/3 kV

10	95	95
16	124	123
25	162	157
35	117	188
50	234	221
70	294	269
95	353	320
120	405	361
150	456	401
185	512	443
240	603	510
300	680	563
400	767	620
500	863	682
630	921	709

#### Dati costruttivi / Construction charact. - 3,6/6 kV

10	3,8	2,5	24,4	730	330
16	4,7	2,5	25,3	820	340
25	6,0	2,5	26,6	950	350
35	7,0	2,5	27,7	1070	370
50	8,1	2,5	28,8	1230	380
70	9,8	2,5	30,8	1490	410
95	11,4	2,5	32,5	1790	440
120	12,9	2,5	34,2	2080	450
150	14,2	2,5	35,6	2380	470
185	15,8	2,5	37,5	2780	510
240	18,2	2,6	40,5	3440	540
300	20,5	2,8	43,7	4150	590
400	22,9	3,0	47,1	5080	630
500	26,2	3,2	52,4	6470	700
630	30,0	3,2	57,7	8140	770

#### Caratt. elettriche / Electrical charact. - 3,6/6 kV

10	96	94
16	125	121
25	163	156
35	197	186
50	235	219
70	292	266
95	353	317
120	405	357
150	456	397
185	517	443
240	602	504
300	670	554
400	765	616
500	843	658
630	934	710

#### Dati costruttivi / Construction charact. - 6/10 kV

10	3,8	3,4	26,3	830	350
16	4,7	3,4	27,3	920	370
25	6,0	3,4	28,6	1060	380
35	7,0	3,4	29,7	1190	400
50	8,1	3,4	31,0	1350	410
70	9,8	3,4	32,8	1610	440
95	11,4	3,4	34,7	1930	470
120	12,9	3,4	36,2	2220	480
150	14,2	3,4	37,8	2540	510
185	15,8	3,4	39,5	2930	520
240	18,2	3,4	42,2	3570	560
300	20,5	3,4	45,2	4280	610
400	22,9	3,4	49,3	5330	660
500	26,2	3,4	54,9	6510	700
630	30,0	3,4	58,1	8180	770

#### Caratt. elettriche / Electrical charact. - 6/10 kV

10	96	93
16	125	120
25	163	155
35	198	185
50	235	217
70	292	265
95	353	315
120	405	355
150	456	395
185	517	441
240	601	503
300	678	556
400	753	601
500	844	658
630	937	711

# RG7H1RFR EPRO-SETTE™

Unipolare da 1,8/3 kV a 26/45 kV  
Single core from 1,8/3 kV to 26/45 kV

## Unipolare - conduttore di rame / Single core - copper conductor - RG7H1RFR

sezione nominale	diametro indicativo conduttore	spessore isolante	diametro esterno massimo	peso indicativo del cavo	raggio minimo di curvatura
conductor cross-section	approximate conductor diameter	insulation thickness	maximum outer diameter	approximate weight	minimum bending radius
(mm <sup>2</sup> )	(mm)	(mm)	(mm)	(kg/km)	(mm)

sezione nominale	posa in aria a trifoglio	posa interrata a trifoglio $\rho=1^\circ \text{C m/w}$
conductor cross-section	open air installation trefoil	underground installation trefoil $\rho=1^\circ \text{C m/w}$
(mm <sup>2</sup> )	(A)	(A)

### Dati costruttivi / Construction charact. - 8,7/15 kV

16	4,8	4,5	29,6	1040	400
25	6,0	4,5	31,1	1200	410
35	7,0	4,5	32,2	1330	420
50	8,1	4,5	33,5	1500	450
70	9,8	4,5	35,3	1780	470
95	11,4	4,5	37,1	2100	490
120	12,9	4,5	38,7	2390	520
150	14,2	4,5	40,3	2720	540
185	15,8	4,5	42,0	3130	560
240	18,2	4,5	44,7	3780	590
300	20,5	4,5	47,7	4500	630
400	22,9	4,5	50,8	5570	690
500	26,2	4,5	55,8	6820	750
630	30,0	4,5	60,6	8480	820

### Caratt. elettriche / Electrical charact. - 8,7/15 kV

16	125	120
25	164	154
35	198	184
50	236	216
70	292	263
95	353	313
120	404	353
150	455	393
185	516	438
240	600	500
300	676	553
400	752	598
500	839	653
630	933	707

### Dati costruttivi / Construction charact. - 12/20 kV

35	7,0	5,5	34,5	1480	470
50	8,1	5,5	35,6	1650	480
70	9,8	5,5	37,6	1930	510
95	11,4	5,5	39,2	2260	520
120	12,9	5,5	41,0	2570	550
150	14,2	5,5	42,4	2880	560
185	15,8	5,5	44,3	3320	590
240	18,2	5,5	47,0	3990	630
300	20,5	5,5	51,3	4900	690
400	22,9	5,5	54,5	5850	730
500	26,2	5,5	58,1	7070	770
630	30,0	5,5	63,1	8770	840

### Caratt. elettriche / Electrical charact. - 12/20 kV

35	198	183
50	236	215
70	292	262
95	353	311
120	404	351
150	455	391
185	515	437
240	599	497
300	667	540
400	749	595
500	839	651
630	931	701

## RG7H1RFR EPRO-SETTE™

Unipolare da 1,8/3 kV a 26/45 kV  
Single core from 1,8/3 kV to 26/45 kV

### Unipolare - conduttore di rame / Single core - copper conductor - RG7H1RFR

sezione nominale	diametro indicativo conduttore	spessore isolante	diametro esterno massimo	peso indicativo del cavo	raggio minimo di curvatura	sezione nominale	posa in aria a trifoglio	posa interrata a trifoglio p= 1° C m/w
<i>conductor cross-section</i>	<i>approximate conductor diameter</i>	<i>insulation thickness</i>	<i>maximum outer diameter</i>	<i>approximate weight</i>	<i>minimum bending radius</i>	<i>conductor cross-section</i>	<i>open air installation trefoil</i>	<i>underground installation trefoil p= 1° C m/w</i>
(mm <sup>2</sup> )	(mm)	(mm)	(mm)	(kg/km)	(mm)	(mm <sup>2</sup> )	(A)	(A)

#### Dati costruttivi / Construction charact. - 18/30 kV

50	8,1	8,0	41,2	2060	550
70	9,8	8,0	43,0	2350	580
95	11,4	8,0	44,8	2710	610
120	12,9	8,0	46,6	3040	620
150	14,2	8,0	49,6	3570	660
185	15,8	8,0	51,2	4110	690
240	18,2	8,0	54,4	4760	730
300	20,5	8,0	57,3	5530	770
400	22,9	8,0	60,3	6500	800
500	26,2	8,0	63,9	7750	860
630	30,0	8,0	68,9	9500	940

#### Caratt. elettriche / Electrical charact. - 18/30 kV

50	235	212
70	292	259
95	352	380
120	402	348
150	451	383
185	510	427
240	590	484
300	663	534
400	745	589
500	836	646
630	930	701

#### Dati costruttivi / Construction charact. - 26/45 kV

70	9,8	10,0	48,5	2860	650
95	11,4	10,0	50,3	3240	680
120	12,9	10,0	51,9	3580	690
150	14,2	9,0	51,3	3720	690
185	15,8	9,0	53,2	4190	720
240	18,2	9,0	56,1	4910	750
300	20,5	9,0	59,0	5680	790
400	22,9	9,0	61,9	6670	830
500	26,2	9,0	65,5	7940	870
630	30,0	9,0	70,1	9630	940

#### Caratt. elettriche / Electrical charact. - 26/45 kV

70	291	256
95	351	304
120	401	343
150	451	382
185	510	426
240	591	484
300	665	535
400	747	590
500	839	647
630	934	702



**BIFACIAL DUAL GLASS MONOCRYSTALLINE MODULE**

PRODUCT: TSM-XXXDEG21C.20

POWER RANGE: 640-665W

**665W**

MAXIMUM POWER OUTPUT

**0~+5W**

POWER SELECTION

**21.4%**

MAXIMUM EFFICIENCY



**High customer value**

- Lower LCOE (Levelized Cost Of Energy), reduced BOS (Balance of System) cost, shorter payback time
- Lowest guaranteed first year and annual degradation;
- Designed for compatibility with existing mainstream system components



**High power Mono Perc up to 665W**

- Up to 21.4% module efficiency with high density interconnect technology
- Multi-busbar technology for better light trapping effect, lower series resistance and improved current collection



**High reliability**

- Minimized micro-cracks with innovative non-destructive cutting technology
- Ensured PID resistance through cell process and module material control
- Resistant to harsh environments such as salt, ammonia, sand, high temperature and high humidity areas
- Mechanical performance up to 5400 Pa positive load and 2400 Pa negative load

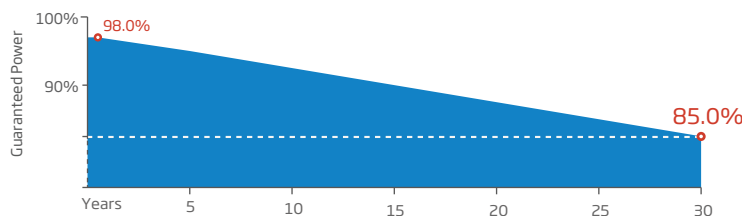


**High energy yield**

- Excellent IAM (Incident Angle Modifier) and low irradiation performance, validated by 3rd party certifications
- The unique design provides optimized energy production under inter-row shading conditions
- Lower temperature coefficient (-0.34%) and operating temperature
- Up to 25% additional power gain from back side depending on albedo



**Trina Solar's Vertex Bifacial Dual Glass Performance Warranty**



**Comprehensive Products and System Certificates**

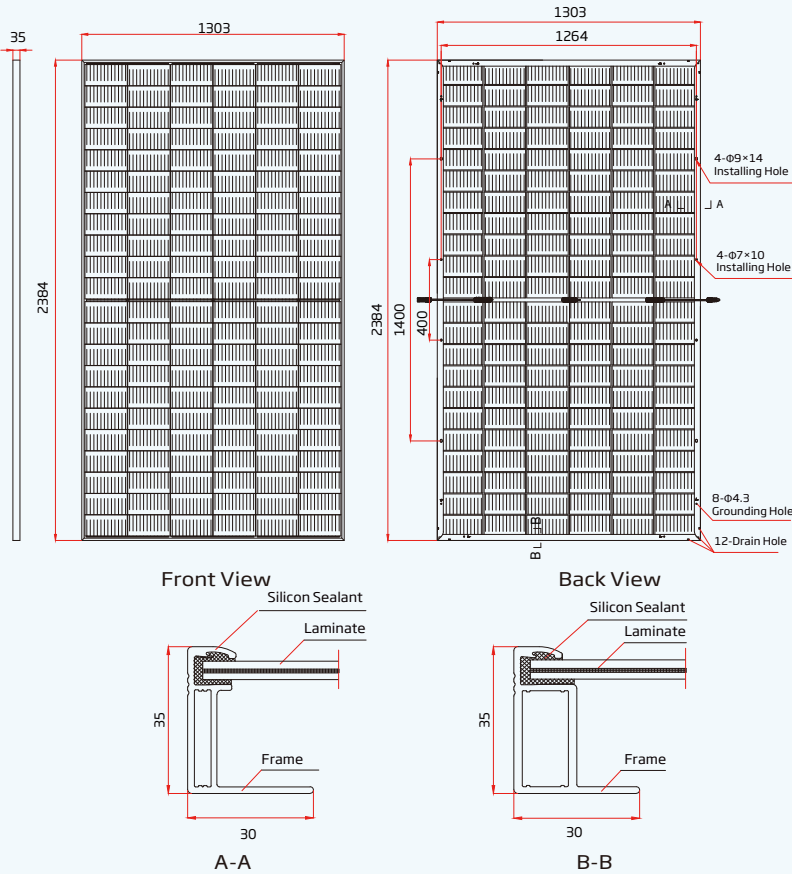


IEC61215/IEC61730/IEC61701/IEC62716/UL61730  
 ISO 9001: Quality Management System  
 ISO 14001: Environmental Management System  
 ISO14064: Greenhouse Gases Emissions Verification  
 ISO45001: Occupational Health and Safety Management System

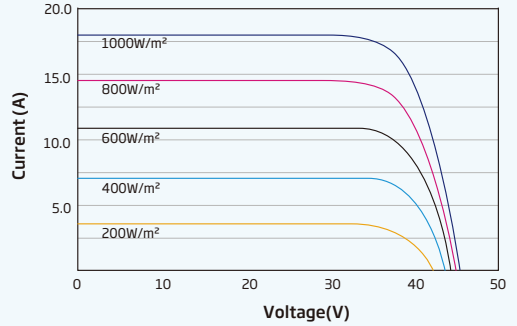




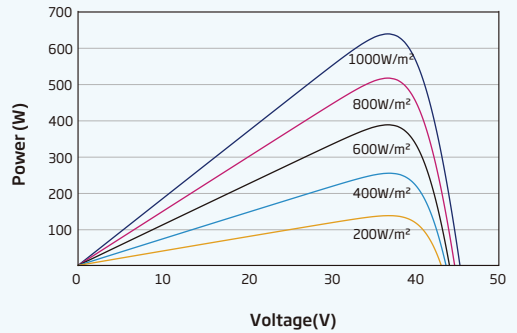
### DIMENSIONS OF PV MODULE(mm)



### I-V CURVES OF PV MODULE(645 W)



### P-V CURVES OF PV MODULE(645 W)



### ELECTRICAL DATA (STC) TSM-XXXDEG21C.20(XXX=640-665)

Peak Power Watts - P <sub>MAX</sub> (Wp)*	640	645	650	655	660	665
Power Selection - P <sub>MAX</sub> (W)	0 ~ +5					
Maximum Power Voltage - V <sub>MPP</sub> (V)	37.3	37.5	37.7	37.9	38.1	38.3
Maximum Power Current - I <sub>MPP</sub> (A)	17.19	17.23	17.27	17.31	17.35	17.39
Open Circuit Voltage - V <sub>OC</sub> (V)	45.1	45.3	45.5	45.7	45.9	46.1
Short Circuit Current - I <sub>SC</sub> (A)	18.26	18.31	18.35	18.40	18.45	18.50
Module Efficiency η <sub>m</sub> (%)	20.6	20.8	20.9	21.1	21.2	21.4

STC: Irradiance 1000W/m<sup>2</sup>, Cell Temperature 25°C, Air Mass AM1.5. \*Measuring tolerance: ±3%.

### Electrical characteristics with different power bin (reference to 10% Irradiance ratio)

Total Equivalent power - P <sub>MAX</sub> (Wp)	685	690	696	701	706	712
Maximum Power Voltage - V <sub>MPP</sub> (V)	37.3	37.5	37.7	37.9	38.1	38.3
Maximum Power Current - I <sub>MPP</sub> (A)	18.39	18.44	18.48	18.52	18.56	18.60
Open Circuit Voltage - V <sub>OC</sub> (V)	45.1	45.3	45.5	45.7	45.9	46.1
Short Circuit Current - I <sub>SC</sub> (A)	19.54	19.59	19.63	19.69	19.74	19.79
Irradiance ratio (rear/front)	10%					

Power Bifaciality: 70±5%.

### ELECTRICAL DATA (NOCT)

Maximum Power - P <sub>MAX</sub> (Wp)	484	488	492	495	499	504
Maximum Power Voltage - V <sub>MPP</sub> (V)	34.7	34.9	35.1	35.2	35.4	35.6
Maximum Power Current - I <sub>MPP</sub> (A)	13.94	13.98	14.01	14.05	14.10	14.16
Open Circuit Voltage - V <sub>OC</sub> (V)	42.5	42.7	42.9	43.0	43.2	43.4
Short Circuit Current - I <sub>SC</sub> (A)	14.71	14.75	14.79	14.83	14.87	14.91

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

### MECHANICAL DATA

Solar Cells	Monocrystalline
No. of cells	132 cells
Module Dimensions	2384×1303×35 mm (93.86×51.30×1.38 inches)
Weight	38.7 kg (85.3 lb)
Front Glass	2.0 mm (0.08 inches), High Transmission, AR Coated Heat Strengthened Glass
Encapsulant material	POE/EVA
Back Glass	2.0 mm (0.08 inches), Heat Strengthened Glass (White Grid Glass)
Frame	35mm(1.38 inches) Anodized Aluminium Alloy
J-Box	IP 68 rated
Cables	Photovoltaic Technology Cable 4.0mm <sup>2</sup> (0.006 inches <sup>2</sup> ), Portrait: 280/280 mm(11.02/11.02 inches) Length can be customized
Connector	MC4 EVO2 / Trina Solar TS4

### TEMPERATURE RATINGS

NOCT (Nominal Operating Cell Temperature)	43°C (±2°C)
Temperature Coefficient of P <sub>MAX</sub>	-0.34%/°C
Temperature Coefficient of V <sub>OC</sub>	-0.25%/°C
Temperature Coefficient of I <sub>SC</sub>	0.04%/°C

### MAXIMUM RATINGS

Operational Temperature	-40~+85°C
Maximum System Voltage	1500V DC (IEC) 1500V DC (UL)
Max Series Fuse Rating	35A

### WARRANTY

12 year Product Workmanship Warranty  
30 year Power Warranty  
2% first year degradation  
0.45% Annual Power Attenuation

(Please refer to product warranty for details)

### PACKAGING CONFIGURATION

Modules per box: 31 pieces  
Modules per 40' container: 558 pieces