Base Load Power Hub (BLPH)

NER Installation, operating and maintenance manual

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ROSETTI MARINO

1	NO COMMENTS - APPROVED - WORK MAY PROCEED
2	MINOR COMMENTS - REVISE AND RESUBMIT - WORK MAY PROCEED
3	MAJOR COMMENTS – REJECTED – DO NOT PROCEED
4	APPROVAL NOT REQUIRED

NOTE: Approval doesn't relieve the supplier from mandatory compliance with contractual documents and specifications. Comments made do not imply acceptance of any cost or delivery impact.

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Rev.	Date	Description	Prepared	Reviewed	Approved

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Revision / Change Log

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02	Issue for Information (IFI)

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No.	Description
1	
2	
3	
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1 INTRODUCTION

1.1 PROJECT OVERVIEW

Crosswind, a Shell and Eneco joint venture, was awarded the tender to develop the offshore Hollandse Kust Noord (HKN) wind farm, located 18.5km off the coast of Netherlands near the town of Egmond aan Zee. The consortium plans to have HKN operational in 2023 with an installed capacity of 759MW generating at least 3.3TWh per year. This is sufficient renewable power to supply more than 1 million Dutch households with green electricity.

Offshore wind farms produce intermittent electricity and balancing these dips and peaks and integrating this electricity into the national energy system requires new technologies. For this reason, the offshore wind farm will include several new technologies that could be implemented at full-scale in the future. The new technologies being explored include a floating solar park, a short-duration battery storage as well as long-term storage via green hydrogen produced by water electrolysis and subsequently consumed in a fuel cell. The combination of these individual measures, herein referred to as the Base Load Power Hub (BLPH) will ensure a continuous power supply regardless of the wind situation.

1.1.1 Project Location

The Hollandse Kust Noord (HKN) wind farm is located 18.5km off the coast of the Netherlands near the town of Egmond aan Zee.

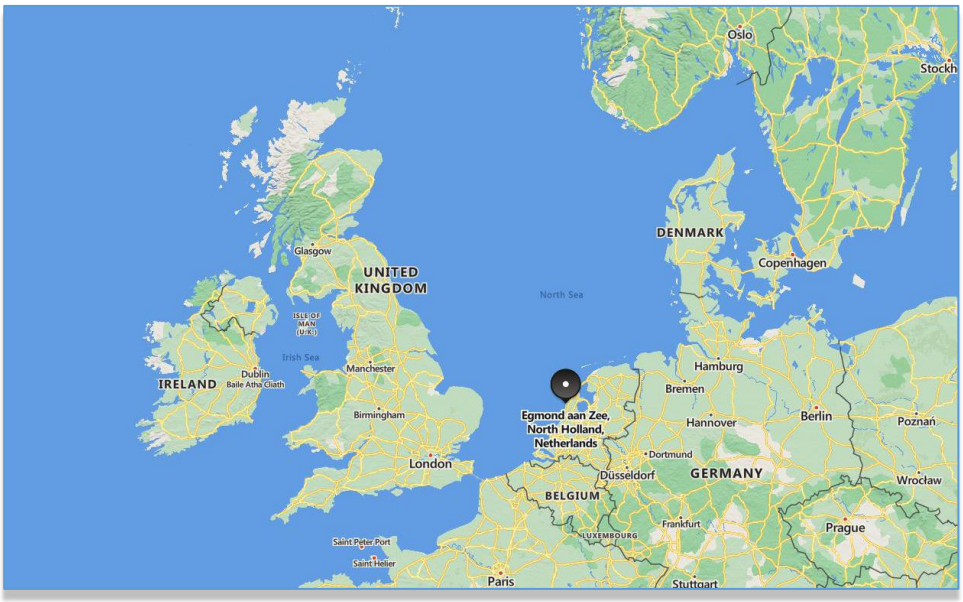


Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map



Figure 2 - Wind Park Details

The wind farm will consist of No. 69 x 11.5MW wind turbine generators each to be installed on a dedicated monopile structure. A 70th monopile located on coordinates E 590719.1, N 5841602.3 is reserved for installing the platform accommodating the BLPH. The monopile structure was designed and installed by Van Oord Offshore Wind (VooW) and therefore not part of the BLPH scope.

1.1.2 Project Concept

All components included in the BLPH will be integrated onshore on a topsides and installed in an offshore location within the boundaries of the HKN wind farm. At its simplest, the BLPH will store energy during periods of high electricity generation from renewable sources (a wind turbine generator and the floating solar PV farm) and release it during periods of low generation. In practice. It is expected that the energy stored will supplement generation from renewable sources to ensure that at least 1.0MW of power is exported to the electrical grid regardless of wind/solar availability.

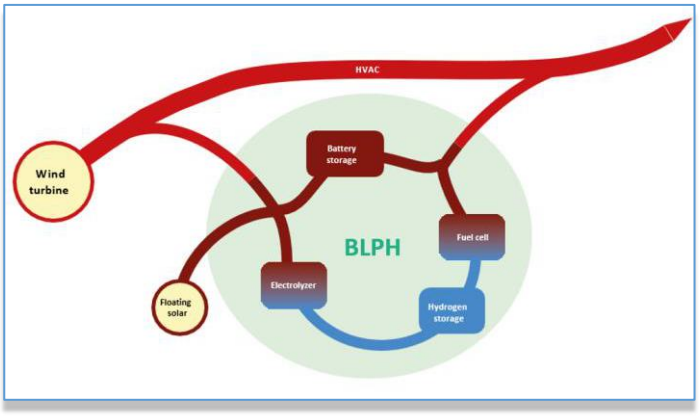


Figure 3 – BLPH Concept

Electricity in the BLPH will be stored in the form of electrons in a battery energy storage system (BESS) as well as converted into green hydrogen via water electrolysis. When the power output from the connecting wind turbine drops to below 1 MWe, the BLPH will return its stored energy to supplement the remaining power output. This will be by discharging the BESS, while stored hydrogen will be converted back into electricity using a fuel cell to extend the discharge duration.

The purpose of the BLPH s to function as a testbed for the integration of energy storage technologies with renewable generation. It is expected that equipment installed on the BLPH will operate as Normally Unmanned Installation for at least two (2) years with no or minimal maintenance and it will have its own independent control room with the ability to communicate with Crosswind's control room.

2 DOCUMENT SCOPE

The purpose of this document is to give information about installation and maintenance of the NER supplied for this project when it will arrive on site.

NEUTRAL GROUNDING (EARTHING) RESISTOR

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

VENDOR : MF TRASFORMATORI s.r.l.

VENDOR PURCHASE ORDER Nr. : 77/24 of 25-Jan-2024

PROJECT : HOLLANDSE KUST NOORD WIND PARK PROJECT
BASE LOAD POWER HUB (BLPH)

TAG Nr. : RR-100D1

MANUFACTURER SERIAL Nr. : R240214-1A

MANUFACTURER : TELEMA S.P.A.

MANUFACTURER JOB Nr. : CO 240214

CONSTRUCTION SITE : TELEMA S.P.A.
Frazione Quarto – Via Salvoni, 60 - 29122 Piacenza – Italy
Tel +39 0523 557.226 - Fax +39 0523.557.386

TEST (FAT) SITE : TELEMA S.P.A.
Frazione Quarto – Via Salvoni, 60 - 29122 Piacenza – Italy
Tel +39 0523 557.226 - Fax +39 0523.557.386

1	Changed TAG Nr. from TR-100AD1-NER to RR-100D1	10/04/2024	R. Senes	S. Rodriguez
0	IFR – Issue for review	13/02/2024	R. Senes	S. Rodriguez
REV.	DESCRIPTION	DATE	ISSUED BY	CHECKED BY

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1. OVERVIEW

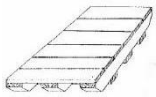
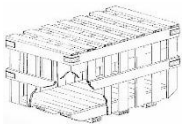
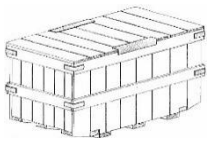
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2. DOCUMENT CROSS REFERENCE

Document title	**Manufacturer Document Nr.**	**Contractor Document Nr.**	**Owner / Company Document Number**
General Arrangement Drawing (complete with front view, side's view, top view, internal view, and sections, fixing details, connection details etc.)	DS240214-1	//	//
Schematic diagram	DS240214-1	//	//
Name Plate drawing	DS240214-3	//	//
Data Sheet	TD240214-1	//	//
Inspection & Test Plan	ITP240214-1	//	//
Test Report	TC240214-1		

3. TRANSPORTATION

NER equipment(s) are normally supplied completely assembled (except for parts indicated at point 9.2 and 9.6) and packed as specified in the Purchase Order (or its attachments)

			
Euro pallet	Pallet	Wooden crate	Wooden case (seaworthy)
YES	NO	NO	NO
anc could be tramnsport to site as follow:			
			
Road – truck / ferry	Railway	Airfreight	Sea freight
YES	YES	NO	NO

The forces imposed on packages during transit and handling and the environmental conditions encountered during storage, has been considered in the design of the equipment and in the selection of packaging methods.

Packing is robust enough to ensure protection against rough handling during loading / unloading, extremes of temperature, ingress of moisture, grit, dirt, and dust and protect against condensation and corrosion.

NER equipment(s) must be transported only in the assembly position.

For the Country where it is required, wood used for packing material shall be certified heat treated and / or pressure treated against the possibility of importation of infestation of wood boring insects etc.

Packing is designed to allow for lifting by forklift truck.

Where boxes or crates are not capable of supporting the weight of other packages is clearly marked on the outside of the package.

Packing materials are non-hygroscopic.

Inner or outer packing will not be returned, unless otherwise specified in the Purchase Order.

Packing materials are suitable for re-cycling.

If necessary, the transport will be treated as special transport.

The material supplied by TELEMA SPA is a NO HAZARDOUS cargo.

Any visible damage must be ready communicated to the conveyor.

According to the requirements indicated in the Purchase Order (or its attachments), small items, like accessories, commissioning spare parts, tools etc. (if present) could be packed as follow:

- with an individually domestic packing and place with main equipment in the same packaging.

- packaged together to form a larger single package.

If required by the Purchase Order (or its attachments), packing is completed with Marking and Packing List to full identify the material inside (main equipment, spare parts, accessories, tools etc.).

If required by the Purchase Order (or its attachments), n° 1 copy of Technical Documentation as well as Test Report is placed inside the packing – in a waterproof envelope. Evidence of it is indicated on the Packing List.

4. LIFTING AND HANDLING



The greatest caution is recommended for any handing here below described in order not to damage NER equipment(s).

Pallets, crates, or cases has been designed for handling by fork lift truck, therefore they are providing with battens which allow the forks to pass at right angles.

Always maintain the NER equipment(s) in a NOT inclined plane.

It is strictly forbidden the transit of personnel under the loading / handling zone.



The operations of lifting, handling and transportation must be done by qualified personnel (slingers, crane operators etc.) instructed in the proper use of the means of loading and handling.

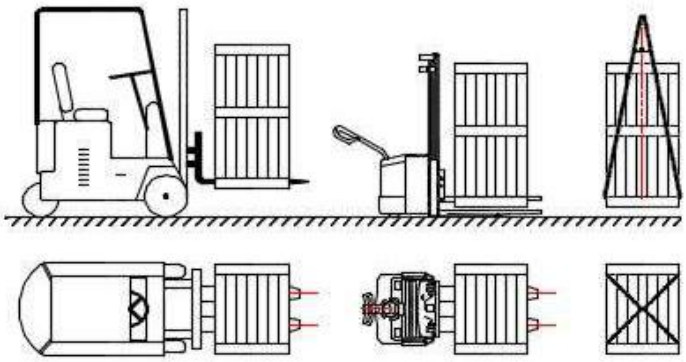
They must be aware of specific risks they are exposed and may expose other people.

They must enforce prohibition signs to third persons.

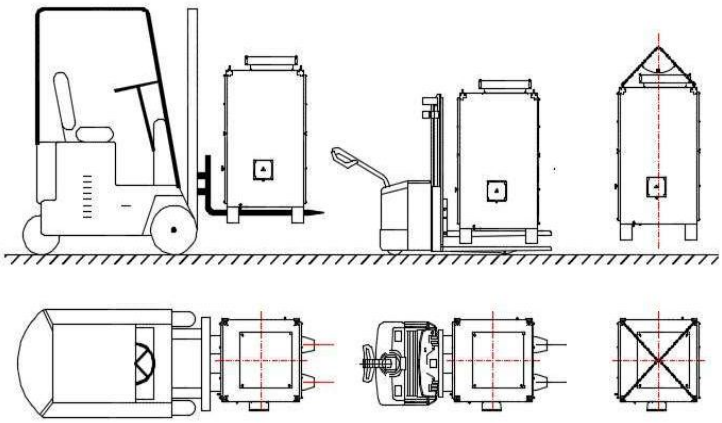


They must wear individual means of protection such helmets, gloves, safety shoes.

Lifting and hadling of packing



Lifting and handling of equipment



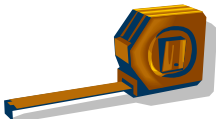
5. PACKING DIMENSIONS AND WEIGHT – CENTRE OF GRAVITY

Estimated packing dimension and weight

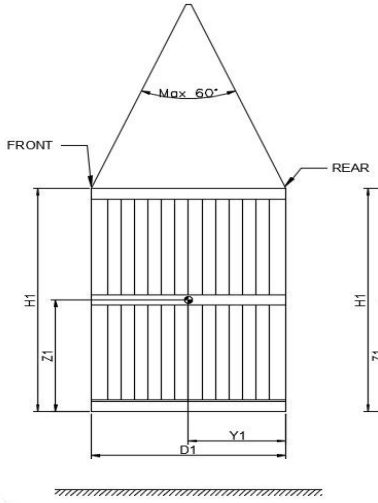
W1 (Width)	:	1350	mm
D1 (Depth)	:	1200	mm
H1(Height)	:	2430	mm
Weight	:	520	kg

Estimated Centre of Gravity

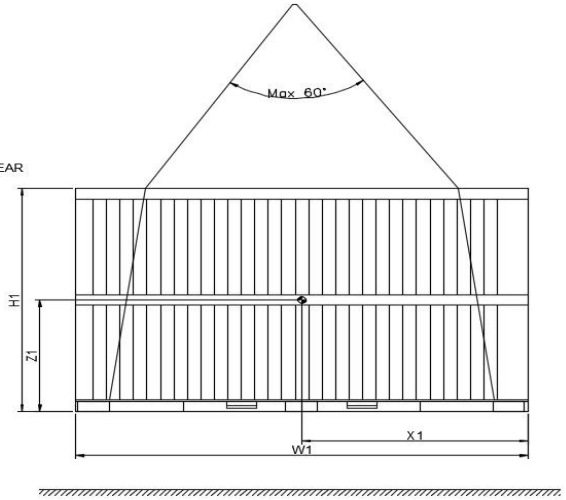
X1 : ½ W1
Y1 : ½ D1
Z1 : ½ H1



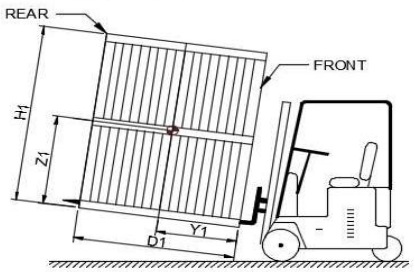
RIGHT VIEW



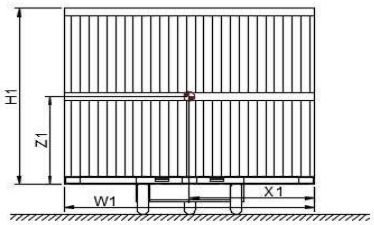
FRONT VIEW



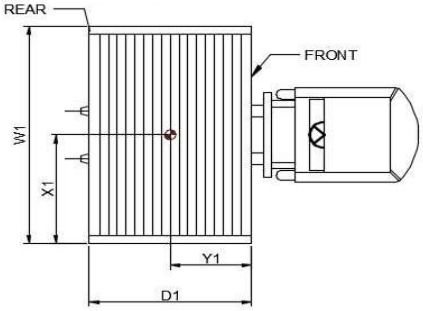
LEFT VIEW



REAR VIEW



TOP VIEW



6. STORAGE

STORAGE CONDITIONS

Maximum storage temperature:	+ 80 °C
Minimum storage temperature:	- 25 °C
Maximum humidity:	95 %
Maximum altitude:	≤ 1.000 m on sea level
Maximum storage time:	6 months
Type of packing:	pallet
Packing stackable:	NO
NOTE:	No anti-condensation heater to be energized during storage

When the material arrives at site, check as follow.

- Visual check to verify if the packing is damaged.

To preserve materials, when it is required to store the NER equipment(s) before their installation, they must be stored with their delivered packing inside building or under shed in ambient without dirt, humidity, or polluted agents, with adequate temperature and circulating air.

Periodical check of the good condition of the packing is recommended.

TELEMA is not responsible of eventual damages of the stored NER equipment(s) after their delivering at cause of bad store conditions not in accordance with the above mention instructions.

7. UNPACKING

The greatest caution is recommended for any handing here below described in order not to damage NER equipment(s).



They must be aware of specific risks they are exposed and may expose other people.

They must enforce prohibition signs to third persons.

They must wear individual means of protection such helmets, gloves, safety shoes.



The operations of lifting, handling and transportation must be done by qualified personnel (slingers, crane operators etc.) instructed in the proper use of the means of loading and handling.



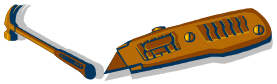
All lifting equipment's must be rated and certified more than the maximum expected load.



All personnel not involved in lifting, loading, and offloading must keep out from the working area.



To open the packing use the proper tools.



- Jimmy
- Hammer
- Cutter
- Scissor

It is recommended do not overturn the packing during the unpacking operations.

Before remove the equipment(s) from the packing, be sure that it is not locked to the basement.



After the un-packing, the material shall be checked:



- Visual check if bushings and insulators are in perfect conditions.
- Visual check if the nameplate corresponds to the equipment, you need

NER equipment has been designed to be lifting and handling with crane.

Nr. 4 forged eyebolts are provided for this purpose (see Tab. A).



Before hoisting or lifting the equipment(s), be sure that ropes, if any, do not damage the projecting parts.

Be also sure that the board panels are closed.

Always maintain the NER equipment(s) in a NOT inclined plane.

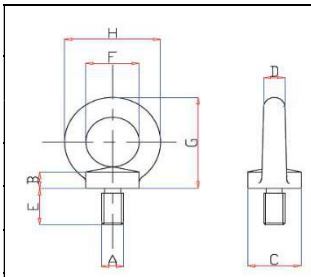


It is strictly forbidden the transit of personnel under the loading / handling zone.



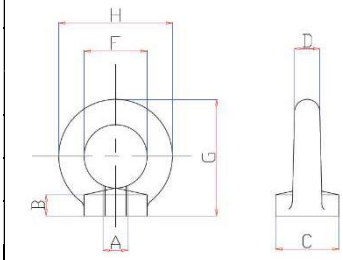
FORGED EYEBOLTS

Tab.A



DIN 580:2010 Material C15E+AL as UNI EN 10084 or A4 as UNI EN USO 3506-1

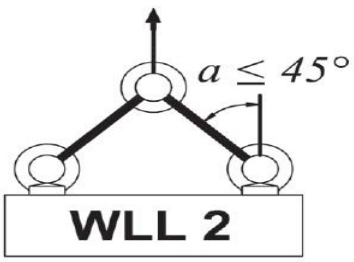
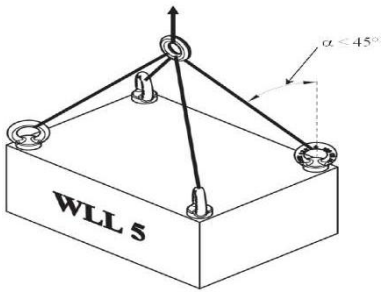
A	Pitch [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]	H [mm]
M12	1,75	10	30	12	20,5	30	53	54
M16	2	12	35	14	27	35	62	63
M20	2,5	14	40	16	30	40	71	72
M24	3	18	50	20	36	50	90	90



DIN 582:2010 Material C15E+AL UNI EN 10084 or A4 as UNI EN USO 3506-1

A	Pitch [mm]	B [mm]	C [mm]	D [mm]		F [mm]	G [mm]	H [mm]
M12	1,75	11	30	12		30	53	54
M16	2	13	35	14		35	62	63
M20	2,5	16	40	16		40	71	72
M24	3	20	50	21		50	90	90

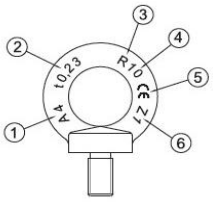
WORKING LOAD LIMITIS

	WLL1 - use one eyebolt		WLL2 - use 2 eyebolsts		WLL5 - use 4 eyebolsts	
						
	C15E+AL	A4	C15E+AL	A4	C15E+AL	A4
M12	340	600**	340	600		900
M16	700	1200**	700	1200		1800
M20	1200	2000**	1200	2000		3000
M24	800	2400**	800	2700		4050

** Value not considered in DIN 580

Safe coefficient: 6

Operating temperature range between -20 °C and +200 °C. The working load limit will not be guaranteed outside this range.



Marking:

1 – Material

2 – Working load (WLL1)

3 – Manufacturer's mark

4 – Thread size

5 – CE marking

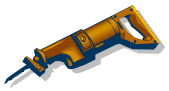
6 – Production lot identification (alphanumeric code)

8. INSTALLATION

8.1. Foundation

To obtain a good installation, resistors are provided with n° 4 fixing holes

(see general arrangement drawing DS 240214-1 attached)



for proper anchor bolts M12 (out of TELEMA S.P.A. scope of supply)



If NER equipment(s) has been despatched with legs removed, please proceed as follow.

- Removed legs have been secured inside the packing (sometimes inside the NER equipment(s) panel.
- Open the front door(s) or panel(s)



In case of panels be careful to the internal grounding plait.

- Remove the packing containing the legs, and bolts-and-nuts. They are despatched in the same packing of the main equipment, sometimes inside the NER equipment(s) panel
- Lift the enclosure with appropriate crane using lifting eyebolts for a height that permit to place under the enclosure the legs.
- It is required to use stainless steel M8x25 screws + plane washers, growers and nuts included in the supply.





8.2. Power cables connections

WARNING!!! BE SURE THAT THE FOLLOWING OPERATIONS WILL BE DONE BEFORE ENERGIZE THE EQUIPMENT(S)



Cables entry is from bottom via removable AISI 316 (non-magnetic) plates

(See points general arrangement drawing DS 240214-1 attached



Plates must be removed to fit cable glands

Appropriate drills must be used for stainless steel AISI 316 plates



Clean the contact surface between cable terminations and equipment(s) terminals. Apply a suitable clamping torque to avoid anomalous stresses on the equipment(s) terminals

INCOMING CABLE CONNECTION

Incoming stand-off insulator complete with tinned copper bar 40 x 6 mm with a Ø 13 mm hole for incoming cable terminal has been provided

(see general arrangement drawing DS 240214-1 attached)



OUTGOING CABLE CONNECTION

Outgoing stand-off insulator complete with tinned copper bar 40 x 6 mm with a Ø 13 mm hole for incoming cable terminal has been provided

(see general arrangement drawing DS 240214-1 attached)



GROUNDING CABLE CONNECTION

Connect the M12 grounding bolt placed on the external side of the enclosure

(see general arrangement drawing DS 240214-1 attached)



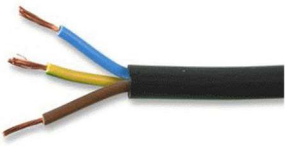
8.3. Auxiliary cables connections



The auxiliary terminal-board is located inside an external terminal-box placed on aside of the enclosure.

Appropriate drills must be used for PVC, aluminium, or metal terminal-boxes

(see general arrangement drawing DS 240214-1 attached)



Terminal characteristics:

see Table below

For more details concerning the connections, see general arrangement drawing and electric diagram DS 240214-1 attached

AUXILIARY TERMINAL-BLOCKS CHARACTERISTICS

Circuit	Rated voltage IEC 60947-7-1 / UL	Rated current IEC 60947-7-1 / UL	Cable section	Tightening Torque (UL)	Picture
Auxiliary power supply 220-240 V a.c.	1000 V 600 V	57 A – A5 50 A	0,2 -10 mm^2 20 - 8 AWG	1,7 Nm	
Grounding terminal	/	76 A – B7	1,5 -16 mm^2 20 – 3 AWG	1,5 Nm	

8.4. Temporary removed copper bar connections

If copper bars connecting in series the resistor banks and/or copper bars connecting the resistor bank(s) to the bushing or in/out stand-off insulators has been removed to save equipment from vibration during transport, please proceed as follow:

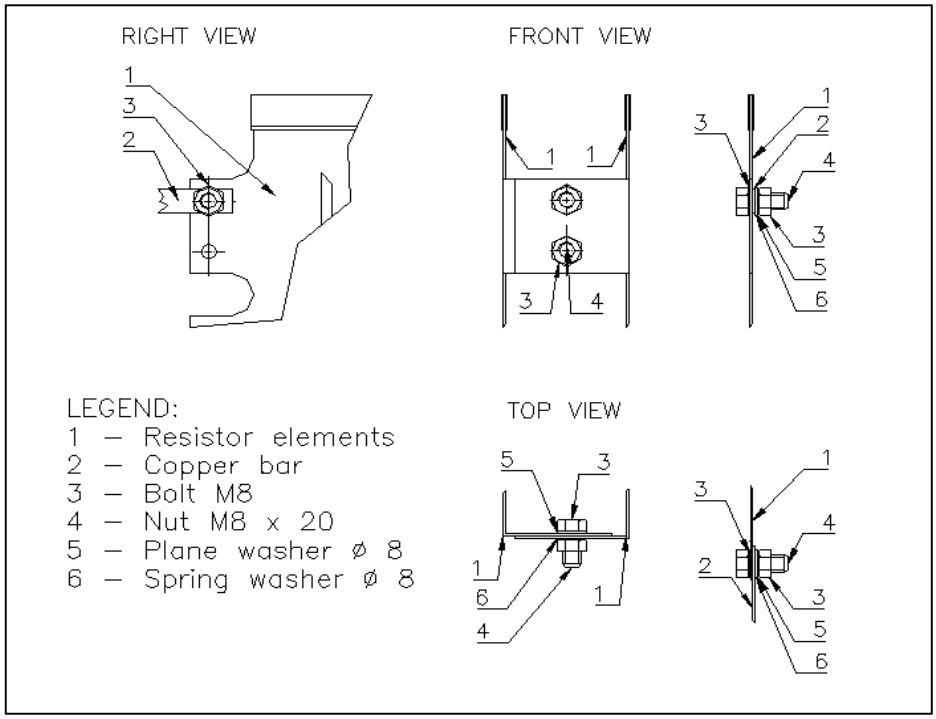
Removed copper bar(s), bolts-and-nuts have been secured inside the packing (sometimes inside the NER equipment(s) panel)

Re-connect the copper bars with bolts, nuts, washers etc

Attention!!! Copper bars MUST be placed always externally to the bank as indicated in the below sketch

Tighten the joint using two combination wrenches to avoid damaging of the resistive elements

Remove the warning label from the equipment



8.5. Suggested workspace



9. START-UP

Check that the rated values of the nameplate correspond to the rated value of the plant

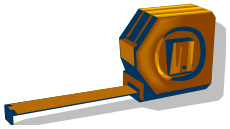


Check that cables are correctly braced

Check the electrical connections remain securely fastened



Check the creepage distance of cables



Check the correct functioning of all auxiliary devices / circuits



Check the earthing connection(s)

Pay attention that no tools, metallic object, or equipment will be forgotten inside the equipment enclosure



When initially energised this product emits a small amount of smoke for a short period

On subsequent operations this effect will gradually disappear



In case of earth fault, resistor elements and enclosure become hot



10. MAINTENANCE

WARNING!!! BE SURE THAT NO VOLTAGE IS APPLIED
BEFORE WORKING ON THE EQUIPMENT





Every 48 months or after an earth fault within a system, the equipment must be checked.

Do not climb up to the equipment

Use lifting platforms or adequate letters




Sharp edges are present. Approach with caution and wear individual means of protection such helmets, gloves, safety shoes



No special tools are required

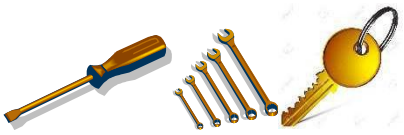
Tools and test equipment required for routine checking are as follows:

- Insulation (Megger) Tester 1.000 volt
- A set of Screwdrivers, Spanners and Sockets

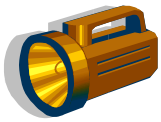
10.1 CHECK LIST FOR PERIODIC MAINTENANCE

Remove access covers with spanners or open the doors with keys

In case of panels be careful to the internal grounding plait



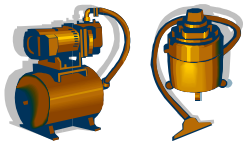
Visually inspect the resistor elements and the insulating components checking their integrity



Change every component showing signs of damage

Remove with compressed air, dry cloth, or brush every dust accumulation on the insulating parts and (if present) on the metallic filter

Please note that any cleaning equipment must not be forced into the resistor bank assembly



Check that all electrical connections remain securely fastened

If resistor is subject to vibration tightness of connection could be avoided

With Digital Multimeter, check the correct ohmic value
Using a 1.000-volt Megger instrument check that the insulation level between the resistor and the enclosure earth stud is greater than 400 MΩ



Close the door(s) or panel(s).
In case of panel, please remember to re-connect the grounding plait

11. TIGHTENING TORQUE TABLE

	STAINLESS STEEL FASTENINGS		OTHER MATERIALS	FASTENINGS IN GALVANIZED STEEL		
THREAD	-A2 70 -A2 80 -A4 70 -A4 80 -DOWELS -HEX INSERTS -CAGE NUTS -WELDING STUD	-STEATITE INSULATORS -LOW NUTS CLASS 035 AND 040 Not used with other nuts -A2 50 -TIE RODS	-BRASS -COPPER -RESIN INSULATORS	8.8	10.9	12.9
M05	5 Nm	2 Nm	2 Nm	6 Nm	8 Nm	10 Nm
M06	9 Nm	4 Nm	3 Nm	11 Nm	14 Nm	16 Nm
M08	22 Nm	11 Nm	7 Nm	26 Nm	33 Nm	39 Nm
M10	44 Nm	22 Nm	13 Nm	52 Nm	65 Nm	78 Nm
M12	76 Nm	37 Nm	23 Nm	91 Nm	113 Nm	136 Nm
M14	120 Nm	60 Nm	36 Nm	144 Nm	180 Nm	216 Nm
M16	188 Nm	94 Nm	56 Nm	225 Nm	281 Nm	338 Nm
M20	367 Nm	183 Nm	110 Nm	439 Nm	549 Nm	659 Nm
M24	633 Nm	316 Nm	190 Nm	759 Nm	949 Nm	1139 Nm

Note 1: RESISTANCE CLASS IS MARKED ON HEXAGONAL AND CYLINDRICAL SCREW'S HEAD AND ON NUTS

Note 2: TIGHTENING TORQUES IN THE TABLE ARE RELATED TO THE JOINT MATERIAL AND NOT TO THE METAL SHEET MATERIALS. THE VALUES DO NOT CHANGE IN FUNCTION OF THE MATERIALS TO BE COUPLED

Note 3: EYE BOLTS ARE NOT SUBJECTED TO CONTROLLED TIGHTENING TORQUES. THIS COMPONENTS ARE TO BE TIGHTENED UNTIL IT IS SIGNIFICANTLY FELT THE FRICTION ON ITS BASE

12. TROUBLE SHOOTING

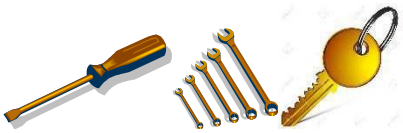
In the event of damage to the resistor grids:

Put the resistor out of service



Be sure that the plant is de-energized and earthed.

Remove access covers with spanners or open the doors with keys



Remove the electrical connections between the bank and the other parts of the circuit.

Remove the damaged banks

Replace the damaged grids losing the bolts on side of the bank and enlarging the steatite bushings on the same side of the damaged grid(s)

Tighten the bolts by means of proper key



Restore electric connections with other banks

Re-check the total ohmic value of the resistor



Close the enclosure by fixing again the access panel



In event of damage of other instruments or equipment, change them and re-check the wiring

13. HOW TO CONTACT US

For any further clarification, do not hesitate to contact our sales Department:

TELEMA S.p.A.
Sales Offices
Via Carlo D'Adda 9A - 20143 Milano
Tel +39 02 83382.1 - Fax +39 02 83382.206
Mail info@telemait.com
Web www.telemait.com