American CRS Equipment

CRS Industrial Power Equipment

PRODUCT MANUAL

Vega

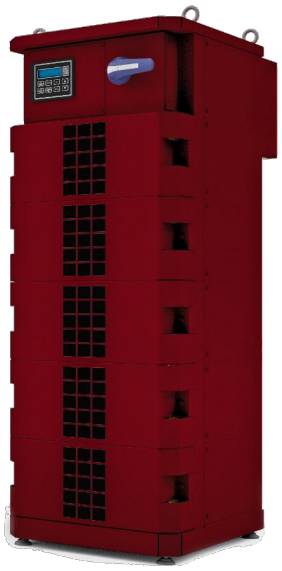
Manual for installation, use and maintenance

V700 model: Rev.A0x

AIR & WATER COOLED

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English



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1. INTRODUCTION

The present short form of manual for use and maintenance serves as a reference for a first guide and a quick identification of the machine and all its parts.

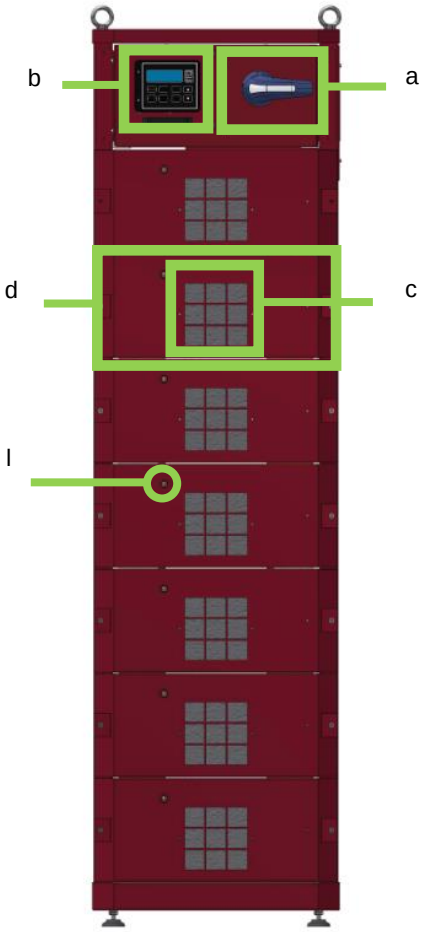
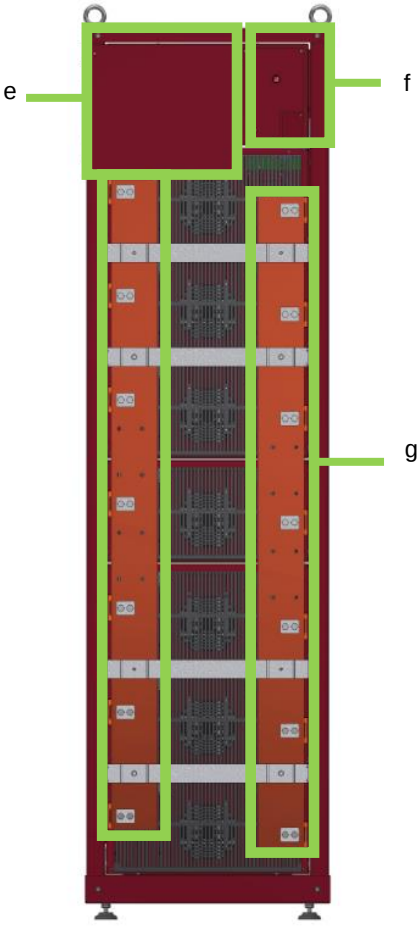
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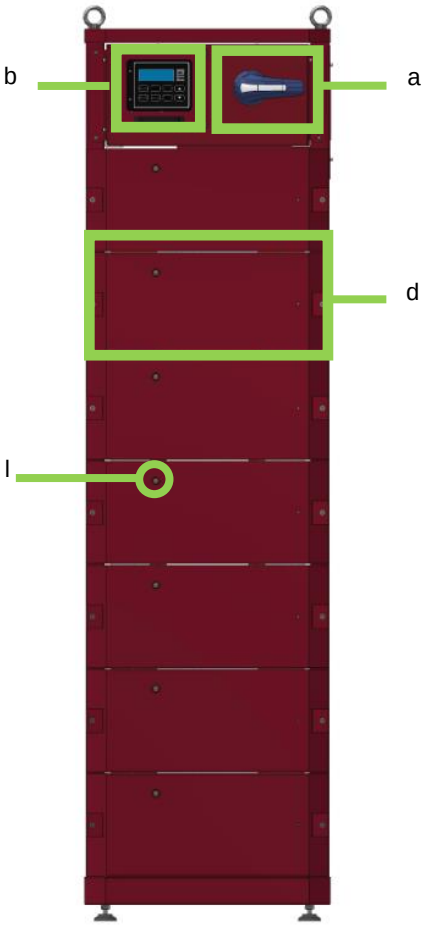
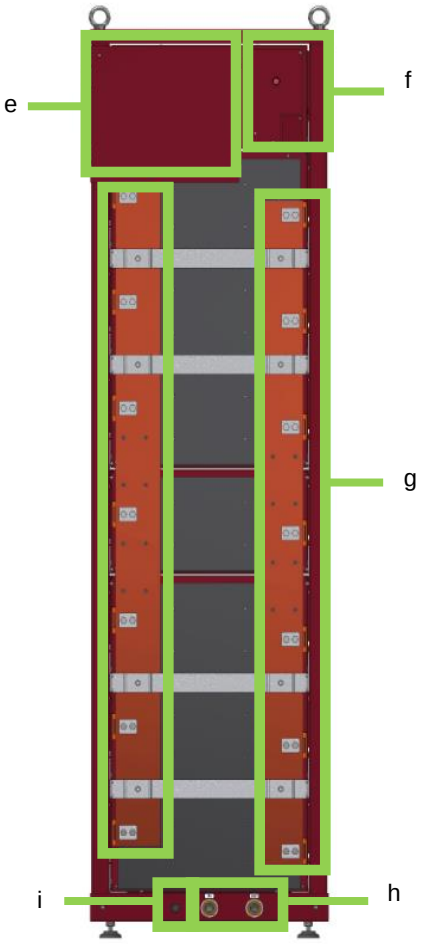
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2. GENERAL

2.1. Machine Parts

Model	Front view	Back view
V700 Air cooled	 *Fig. 2.1.a*	 *Fig. 2.1.b*

Model	Front view	Back view
V700 Water cooled	 *Fig. 2.1.c*	 *Fig. 2.1.d*

LEGEND

a Main I/O switch
b Operator panel
c Air filter
d Module front protection cover
e AC main input box
f Communication plate
g Module parallelization output bars
h Input/Output water circuit fittings
i Cable gland for solenoid connection
l Front window for LED status of the module

2.2. Configuration

All Vega rectifiers have a predefined configuration and they can be interconnected via multi-tower system to reach higher output power requirements. Each machine can be made up from 2 to 7 units, where the word “units” may refers to the following parts in dependence of machine configuration / type:

- DC full power modules
- DC half power modules
- Half DC power module / half reverse module

All Vega rectifiers are equipped with a header that occupies an additional position (at the top) to the units.

3. SAFETY REGULATIONS

Read and carefully abide by the rules which are listed here under before installing, wiring, using, working or transporting the machine.

WARNING!

The use of equipment for the power distribution in the galvanic plants, considering the high currents involved, involves dangers for oneself and other persons. The reading, knowledge and observance of the safety measures, here listed, are a must which the careful operator, aware and faithful to his own duty, must follow for the maximum safety against any accident.

WARNING!

Do not try to install, to switch on or carry out the servicing or maintenance of this machine if you are not qualified to do so and if you have not read and understood this manual. If you have doubts about the installation and the use of this machine ask the manufacturer (Customer care office).

WARNING!

Before installation, wiring, maintenance, service, inspection or reparation of this machine, be sure to turn OFF all input power with the main switch on the operator panel. Make sure whether the machine is powered ON or OFF.

Before setting-up the machine check that it has not any mechanical damages.

DO NOT REMOVE THE LOAD (BAR OR BARREL FROM THE BATH) BEFORE SETTING THE MACHINE IN STAND-BY MODE. This operation is extremely dangerous for the safety of the operators and the machine due to the voltage surge and could cause an explosion due to the development of hydrogen in proximity of the cathode element.

Make sure that gloves and protections are dry.

The accidental contact to ground can cause overheating and risks of fire.

Turn OFF the machine when is not being used and even in case of sudden suspension of electric power.

Do not touch the power connection lines when the machine is turned ON. Doing so may cause electric shock or burns.

WARNING!

RISK OF ELECTRIC SHOCK—High voltage warning—
Dangerous voltage is present on output bus bars. The professional installer must protect service personal from inadvertent contact with this dangerous voltage.



PROHIBITED

People having a pace maker are absolutely prohibited to get near this machine and to the connection bar.

LOCATION AND INSTALLATION

WARNING!

The installation of the machine must be in conformity with local regulations regarding safety measures.

Do not operate or store the machine in the following environments:

- Outdoors
- Exposed to direct sunlight
- Exposed to rain droplet
- Near equipment that produces sparks
- Subjected to vibration or shock
- In presence of conductive liquids (water solutions, acids, etc.)
- Near sources of heat

WARNING!

Select the input and output wires of diameters suitable for this machine. Not doing do may cause overheating or fire.

Install the machine in an area which can support the weight of it. Not doing so may cause the dropping of the machine, which can cause fire or injury.

The machine's output power bars are to be used only for the purpose of electrical connections and not as a mechanical support.

Avoid absolutely that the weight of the cables or copper plates of the bath starting from the machine create torsions on the machine's output power bars.

Make the output connections paying particular attention not to pass near the signal cables from/to other equipment. This is to avoid that the high currents involved may disturb the electronic equipment.

OPERATION

WARNING!

Do not operate or store the machine in adverse environments described in the present manual.

Do not remove the cover of the machine when the machine is turned ON. Doing so may cause electric shock or burns.

Before starting up the machine, ensure safety on the load side.

Do not operate for a long time with the CHECK LED flashing. Doing so may severely damage the machine.

Do not spray water or other liquids which could prejudice the safety against the machine.

Avoid absolutely direct contact to metallic parts under voltage with skin or wet clothes. Doing so may cause electric shock.

Do not leave the machine in operation unattended.

MAINTENANCE

WARNING!

The maintenance of the machine must be in conformity with local regulations regarding safety measures. Before carrying out any maintenance or replacement operation, it is of utmost importance that the machine is turned OFF from the main switch on the operator panel. After turning it OFF make sure to wait for at least 2 minutes until all residual voltage inside the machine is discharged. In addition pay attention to the cooling elements which can reach a temperature of 80°C. When performing maintenance, servicing or repairs make sure to wear suitable clothing.

4. TECHNICAL SPECIFICATIONS

4.1. Electrical specifications

			V700 model
Output	Power	DC	Up to 168 kW per tower
		DCR	Up to 84 kW per tower
	Voltage	DC	6 – 50 Vdc
	Operation mode		Current control or Voltage Control
	Resolution		$V_{out} \leq 25V$ / $I_{out} \leq 25A$ - Min. step: 0.01 - Display resolution: 2 decimal digits $25V < V_{out} \leq 50V$ / $25A < I_{out} \leq 250A$ - Min. step: 0.1 - Display resolution: 1 decimal digits $600A < I_{out} \leq 2000A$ - Min. step: 1 - Display resolution: No decimal digits $2000A < I_{out} \leq 5000A$ - Min. step: 2 - Display resolution: No decimal digits $I_{out} > 5000A$ - Min. step: 5 - Display resolution: No decimal digits
	Accuracy		1% on full scale
	Current regulation range		$6V \leq V_{out} < 50V$: 2 - 100% of max current
	Voltage regulation range		$6V \leq V_{out} < 50V$: 5 - 100% of max voltage
	Low frequency current ripple (RMS)		<2.0% of rated output current in current operation mode (<1.0% on request)
	Efficiency		90% (typ.) @ rated load
	Pole to be connected to ground		Positive or Negative
Main Supply	Line voltage		3x 208VAC ± 10% or 3 x 230VAC ± 10% or 3 x 400VAC ± 10% or 3 x 440VAC ± 10% or 3 x 480VAC ± 10% or 3 x 575VAC ± 10%
	Frequency		50 - 60Hz
	Neutral		NOT USED
	Power factor		> 0,95 @ rated load
	Primary current		Max 350A per tower (400A header)
	Earth leakage current		< 30mA

4.2. General specifications

		V700 model
Technology		Switching mode PWM, Full Bridge IGBT inverter
Cooling system		Air
		Water
Operation Conditions	Location	Indoor use only
	Ambient temperature	0 - 40°C
	Relative humidity	15 - 85% not condensing
	Filter obstruction - air	15% max
	Water input temp. - water	19 - 35°C
	Altitude	<= 2000m
Degree of protection	Air cooled	IP32
	Water cooled	IP42 (on request IP54 or IP65)
Enclosure color		RAL 3004
Conformity of EU directives		2014/35/UE - Low Voltage Directive
		2014/30/UE - EMC Directive

4.3. Serial interface

Communication Protocols

ACRS-ASCII	Included	RS485(1) network
Modbus-RTU	Included	RS485(1) network
Profibus-DP	Optional with additional board	Profibus-DP network
DeviceNet	Optional with additional board	CAN bus network
Modbus/TCP	Optional with additional board	Ethernet
Profinet	Optional with additional board	Ethernet
EthernetIP	Optional with additional board	Ethernet

Communication Ports

RS 485 (1)
RS 485 (2)

All the above protocols are managed by only one software for DC / DCR .

4.4. Protection

Burst & Surge
According to standard EN61000-4-11 (Burst)
According to standard EN61000-4-5 (Surge)

Output Short Circuit
Programmable limit from 1 to 100% of max. Iout
Detection time: 1ms

Thermal Protection
With PTC on each module

Phase Missing
In case of one of the 3 phases is missing, the Output Power is shut down to 0
Detection: half cycle (10 ms)

Under Voltage lookout
Under Voltage warning message is displayed when the main input voltage goes below 80% of the nominal value
Under Voltage error message is displayed when the main input voltage goes below 75% of the nominal value. The output power of the rectifier is shut down to 0

Over Voltage lookout
Over Voltage warning message is displayed when the main input voltage goes above 115% of the nominal value
Over Voltage error message is displayed when the main input voltage goes above 120% of the nominal value. The output power of the rectifier is shut down to 0

Under Voltage / Over Voltage lookout is detected every ms. The triggering of the warning or error message occurs if the under or over voltage event has a duration > 1s.
The output power is automatically restarted in case the main voltage comes back within the limits (undervoltage and overvoltage protections), for phase missing protection it's necessary to switch off and switch on the rectifier.

4.5. Total harmonic distortion of the absorbed current

The values reported in the table are referred to stable conditions of the mains three phase input line, properly sized (refer to short circuit ratio Rsce value according to the total installed power)

Harmonic	Freq. (Hz)	Absorbed Current Distortions
3	150	-
5	250	< 22.5%
7	350	< 12.5%
9	450	-
11	550	< 11.0%
13	650	< 7.6%
17	850	< 8.0%
19	950	< 4.8%
THD		MAX 30%

4.6. Mechanical Data

V700 model

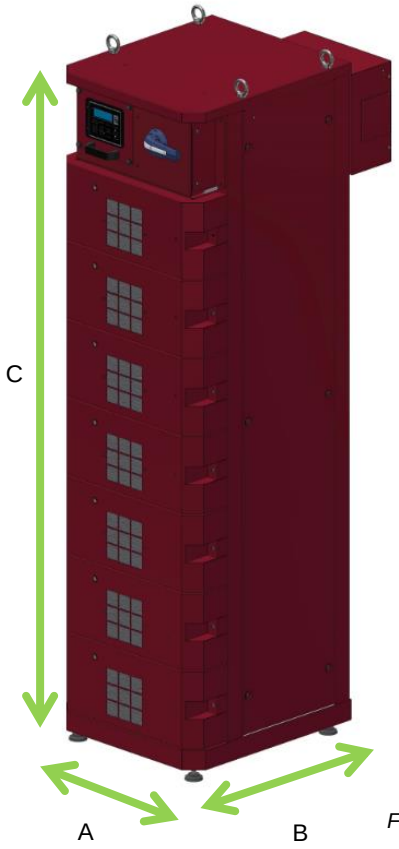


Fig. 4.6.a

- Each module position is 5U height (222,25mmm), 19 inches rack mountable
- Header is 5U height (222,25mm) regardless electrical sizing
- H – half DC module position (only for DC rectifiers)
- R – half reverse module + half DC module (only for DCR rectifiers)

DC/DCR Configurations

Config.	A (mm)	B (mm)	C (mm)	Max Weight (kg)	
				Air	Water
02-1H	530	603	765	148	152
02-2	530	603	765	156	160
02-2R	530	603	765	156	160
03-2H	530	603	989	197	203
03-3	530	603	989	205	211
03-3R	530	603	989	205	211
04-3H	530	603	1213	246	254
04-4	530	603	1213	254	262
04-4R	530	603	1213	254	262
05-4H	530	603	1437	308	318
05-5	530	603	1437	316	326
05-5R	530	603	1437	316	326
06-5H	530	603	1661	357	369
06-6	530	603	1661	365	377
06-6R	530	603	1661	365	377
07-6H	530	603	1885	406	420
07-7	530	603	1885	414	428
07-7R	530	603	1885	414	428

5. IDENTIFICATION DATA

A label placed at the rear of the machine indicates the machine type, serial number and the technical specifications of the machine:

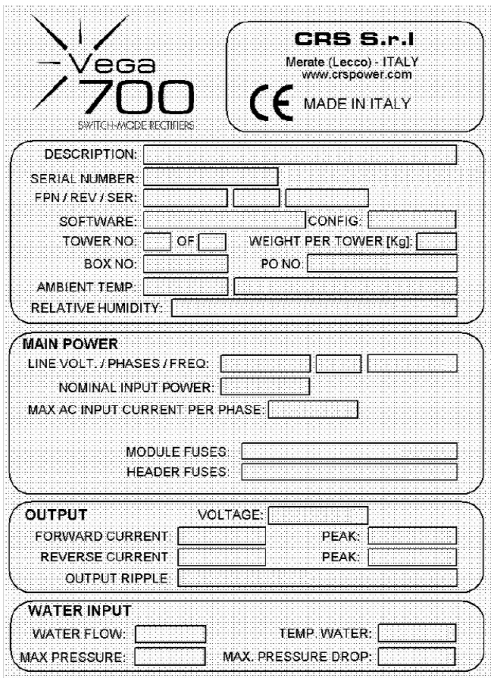


Fig. 5.a

SECTION 1 – GENERAL

DESCRIPTION:	Indicates the output current and voltage of the machine, type and cooling system
SERIAL NUMBER:	Identification number of machine
FPN / REV / SER:	ACRS Part Number / ACRS revision number / ACRS internal identification number
SOFTWARE:	Software installed on the machine
CONFIG.:	Machine configuration
TOWER NO. / OF:	Tower number and number of towers that compose the machine
WEIGHT PER TOWER (kg):	Weight per tower
BOX NO.:	ACRS internal box number
PO NO.:	Customer purchase order number
AMBIENT TEMP.:	Ambient temperature
DEGREE OF PROTECTION:	Degree of protection
RELATIVE HUMIDITY:	Relative humidity

SECTION 2 - MAIN POWER PER TOWER

LINE VOLT. / PHASES / FREQ.:	Line voltage / Number of phases / Frequency
NOMINAL INPUT POWER:	Nominal Input power
MAX. AC INPUT CURRENT PER PHASE:	Maximum input current
MODULE FUSES:	Type of fuses installed on module rack
HEADER FUSES:	Type of fuses installed on header

SECTION 3 - OUTPUT PER TOWER

VOLTAGE:	Output range of DC voltage
FORWARD CURRENT:	Output range of forward DC current
FORWARD CURRENT PEAK:	Output range of forward peak DC current (Only for PP & PPR type)
REVERSE CURRENT:	Output range of reverse DC current (Only for DCR & PPR type)
REVERSE CURRENT PEAK:	Output range of reverse peak DC current (Only for PPR type)
OUTPUT RIPPLE:	Output ripple

SECTION 4 - WATER INPUT PER TOWER	Water flow rate required
	Input water temperature range
	Maximun pressure of the water circuit
	Maximun pressure drop of the water circuit

6. INSTALLATION

WARNING!
The installation of the machine must be in conformity with local regulations regarding safety measures.

Ignoring the regulations listed in the present manual may severely damage the operation of the machine.

6.1. Transportation (Handling/Lifting)

All Vega rectifiers are wrapped in cellophane and positioned on a pallet or a wooden crate. The delicate transport of the machine is required to avoid abrupt hits to the structure; these can compromise the correct operation of the machine itself.

WARNING!
Before setting-up the machine check that it has not any mechanical damages.
To uplift the machine, hook the 4 eyebolts (M12) located at the top of the rectifier header with a small manual crane or use a forklift and place where needed. In the case where a forklift is used, the help on land of a second operator is necessary to keep the machine in balance during the movement.

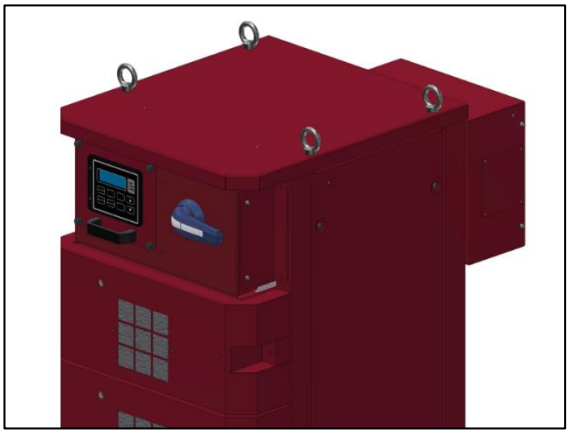


Fig. 6.1.a

6.2. Location

The machine must be installed:

1. Away from sources of heat.
2. Indoors in an area with enough natural airflow.
3. In the absence of the required aspiration of fumes, install the machine below the level of the height of the tank so that the fumes of the same do not affect the aspiration zone.
4. Surrounding space needs to be as shown in below picture, in order to favor the thermal dispersion and the maintenance operations.
5. According to the IP / NEMA protection degree declared by ACRS for the rectifier, and anyway absolutely avoid the use of the machine in the presence of conductive/aggressive liquids (watery solutions, acids and alkaline solutions, etc.).
6. Ensure that the operational surrounding zone is dry, as all the objects present in it, including the machine.
7. Place the machine in an environment with a maximum temperature of 40˚C
8. The machine/machines must be placed in the plant respecting the access to all its / their parts in the installation layout in order to perform service and maintenance operations
9. Distances indicated in the following picture are inteded as minimum recommended distances which in any case must be set in relation to the installation layout

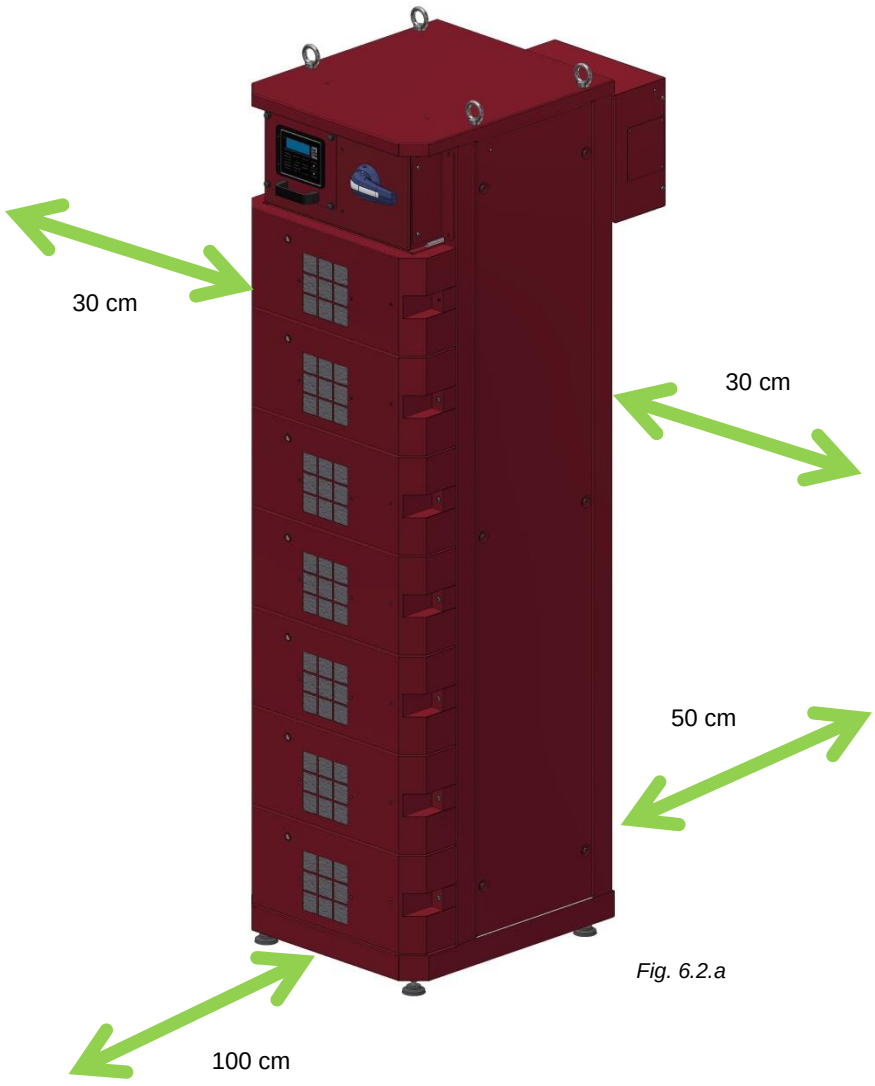


Fig. 6.2.a

6.3. Connection to the Main Line

Each V700 unit has to be protected with fuses properly sized according to the absorbed current of the rectifer / its main input voltage and placed in the electric cabinet of its branch circuit.

Fuses installed has to be NH gG type or equivalent as electrical intervention features.

The unit is provided with a mains input box for the connection to the three phase supply; it's located on the rear of its header.

To make the connection, remove the front plate of the box to have the access to the copper terminals.

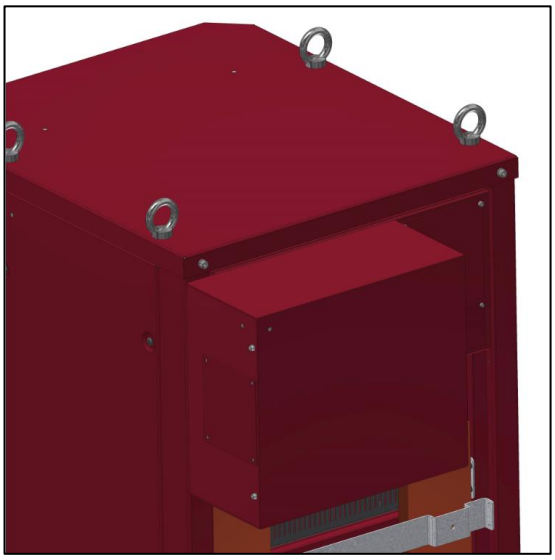


Fig. 6.3.a

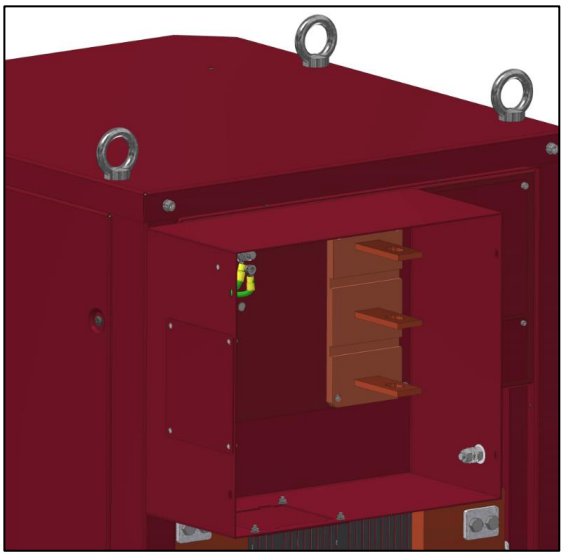


Fig. 6.3.b

The power supply cable must be passed through one of the openings available in the box, removing the cover plate and using an appropriate/sealed cable gland once the connections are done.

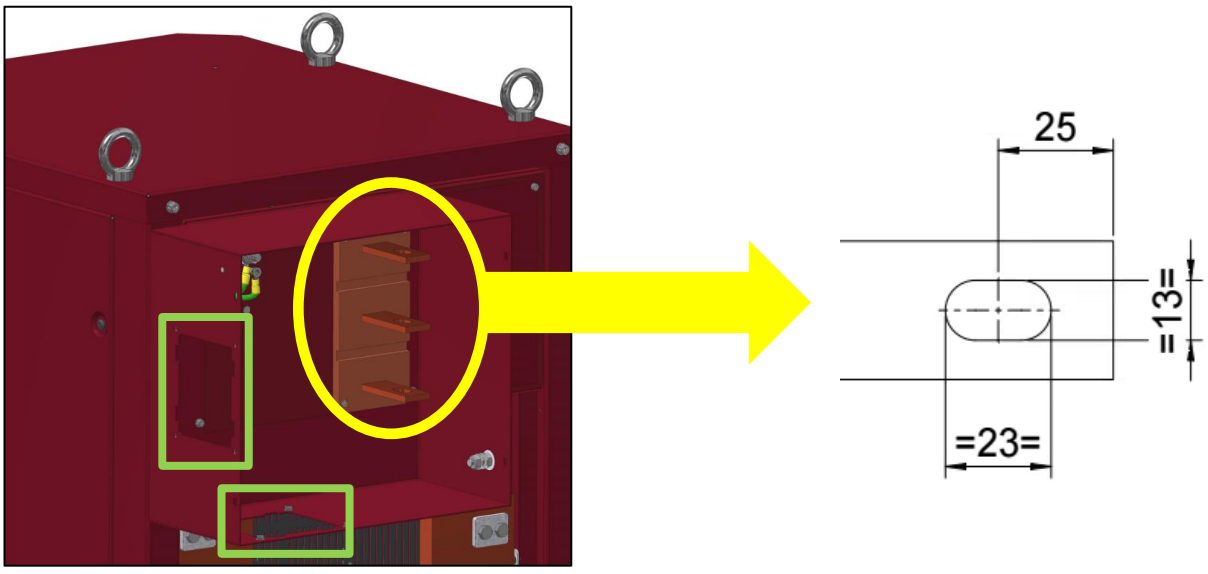


Fig. 6.3.c

6.4. EMC filter

The unit is provided with E.M.C. filter installed in each semi-module to meet the EMC European directive 2014/30/UE.

6.5. Accessible Fuses

- ***Semi-module protection fuses*** : 3 x XXA gG XXXV 10 x 38 (according to the semi-module absorbed current and input mains voltage)

Fig. 6.5.a



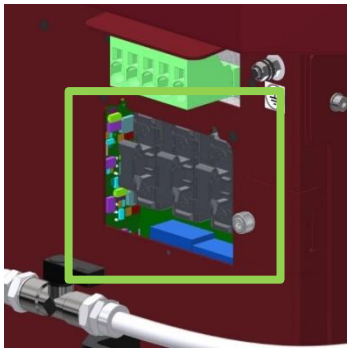


Fig. 6.5.b

Remove the front plate labelled with protection fuses installed, they can be easily and safely removed through the inside plastic extractors used for each one of them.

- ***Primary auxiliary transformer protection fuses***: 3 x 0,5A gG XXXV 10 x 38 (according to the mains input voltage)

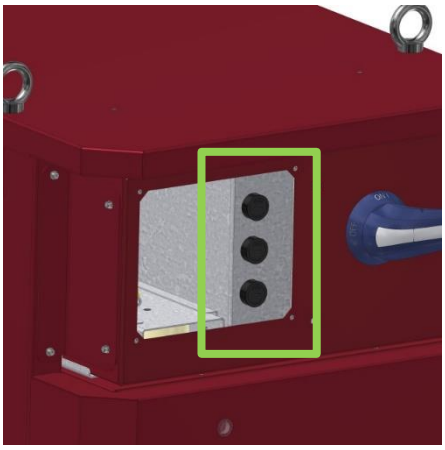


Fig. 6.5.c

6.6. Connection to the Treatment Tank

According to the output current, output voltage ,configuration and model, the rectifier is provided with suitable output copper and/or aluminum bars.

Connect the machine's output power bars (L shape) to the treatment tank with with a copper plate of appropriate dimensions, taking particular care on locking the screws, considering the currents involved.

Deoxidize the machine's output power bars with emery cloth and apply some ELECTROLITIC copper-based grease.

Size A/mm2 of the connection between rectifiers and tanks according to the material/cables used for the connection, number of bars paralleled and their orientation, ambient temperature, max. working temperature of the bars/cables accepted, max voltage drop accepted.

Both output poles of Vega rectifier (+ and -) are floatings.

Rectifier with double outputs + and -

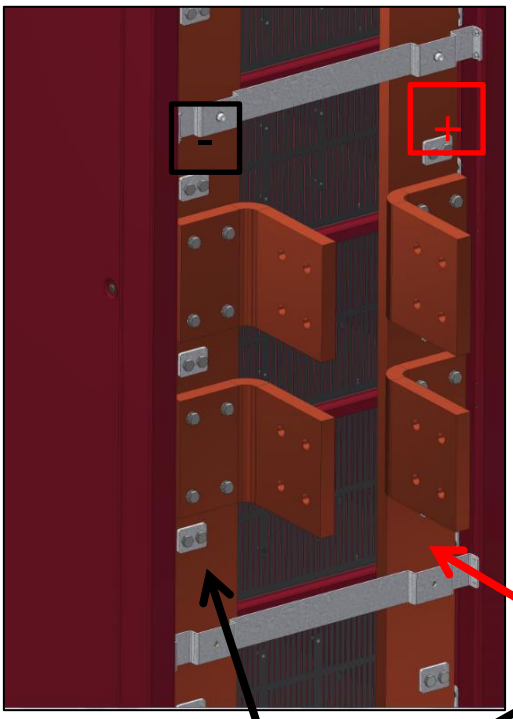


Fig. 6.6.a

Negative bar + output/s (L-shape)

Rectifier with single outputs + and -

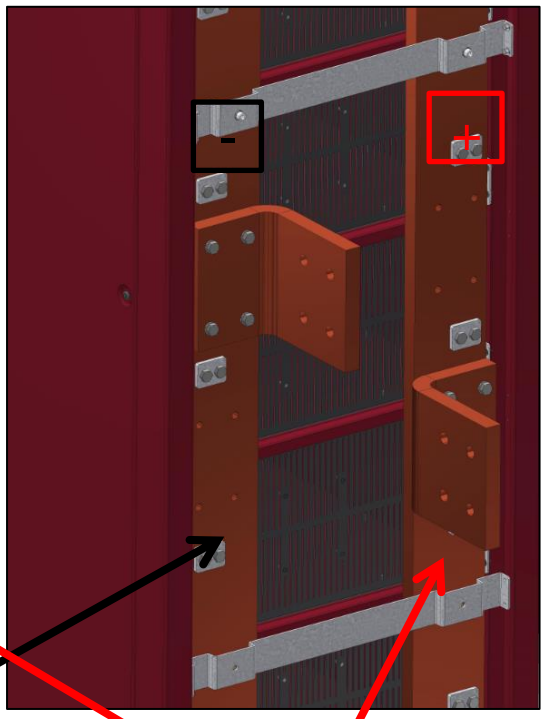


Fig. 6.6.b

Positive bar + output/s (L-shape)

6.7. Communication box connection

The communication box is contained in the overall dimensions of the header of the rectifier.

To make the connections, remove the front plate for the access to the inside connectors

Front plate of the communication

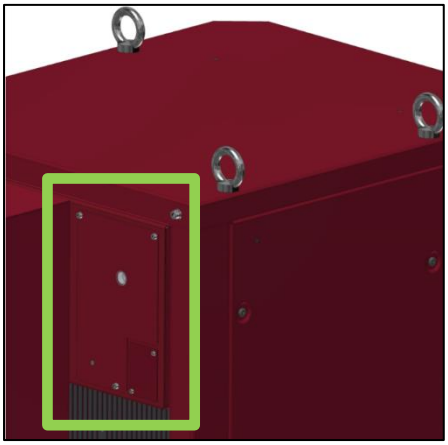


Fig. 6.7.a

Multitower option connectors

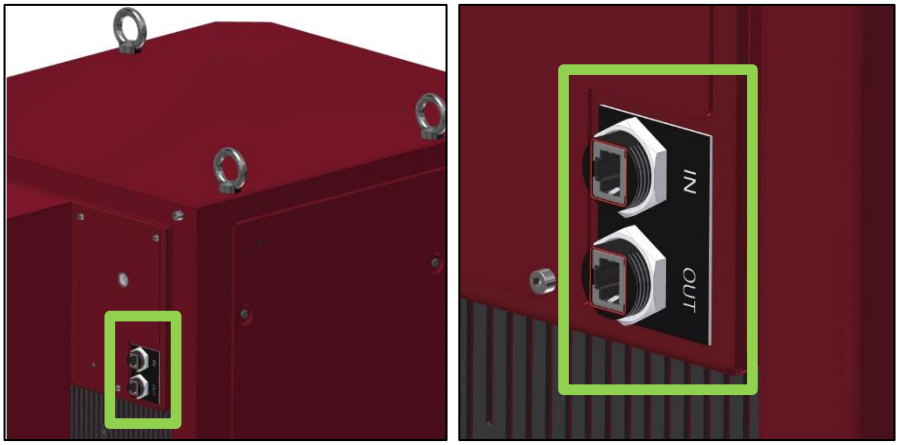


Fig. 6.7.b

6.8. Machines with Water Cooling System

		V700 model
NOMINAL TEMP. OF INPUT WATER	**T-NOM**	19 – 35 °C
MAX TEMP. OF INPUT WATER ADMITTED	**T-MAX**	40 °C
DERATING	**-**	-2% of I_{out} for every 1°C above 35 °C
ΔT OUTPUT WATER	**ΔT**	+7 °C of T-MAX
MAX. SEAL PRESSURE OF WATER SYSTEM	**P-MAX**	9 bar
WATER FLOW *	**Q**	See below method of calculation, depending of number of the modules
MAX. PRESURE DROP *	**ΔP**	2.1 bar
OPERATING AMBIENT TEMPERATURE	**T-AMBIENT**	40 °C

* Accurate values are supplied with quotation. Values are present on rectifier's identification label.

6.8.1. Water flow dimensioning

Each Vega module requires 6 L/minutes.
To get total requirement for a tower, multiply the number of its positions by 6L/minutes.

6.8.2. Conversion of PLoss in other units

To calculate the power loss ***P****Loss* in watts follow points 1, 2 and 3 of chapter 6.6.1.

In Fr/h (Frigorie per hour)
1 watt (W) = 0,860 Fr/h

In Btu/h (British thermal unit per hour).
1 watt (W) is approximately 3.413Btu/h
1 horsepower (hp) is approximately 2,544Btu/h
1 "ton of cooling" is 12,000Btu/h

6.8.3. Condensation parameters

Condensation will occur if the water input temperature (°C) is below or equal to the value indicated in the below table which is between the relative humidity (%) and the air temperature (°C):

Air Temp °C	Relative Humidity %														
	100	95	90	85	80	75	70	65	60	55	50	45	40	35	30
50	-	-	-	-	-	-	-	-	40	39	37	35	33	31	28
45	-	-	-	-	-	39	38	37	35	34	32	30	28	26	24
40	40	39	38	37	36	35	33	32	31	29	28	26	24	22	19
39	39	38	37	36	35	34	33	31	30	28	27	25	23	21	19
38	38	37	36	35	34	33	32	31	29	28	26	24	22	20	19
37	37	36	35	34	33	32	30	29	28	26	25	23	21	19	19
36	36	35	34	33	32	31	29	28	27	25	24	22	20	19	19
35	35	34	33	32	31	30	29	28	26	25	23	21	20	19	19
34	34	33	32	31	30	29	28	27	25	24	22	21	19	19	19
33	33	32	31	30	29	28	27	26	24	23	21	20	19	19	19
32	32	31	30	29	28	27	26	24	23	22	20	19	19	19	19
31	31	30	29	28	27	26	25	23	22	21	19	19	19	19	19
30	30	29	28	27	26	25	24	23	21	20	19	19	19	19	19
29	29	28	27	26	25	24	23	22	20	19	19	19	19	19	19
28	28	27	26	25	24	23	22	21	20	19	19	19	19	19	19
27	27	26	25	24	23	22	21	20	19	19	19	19	19	19	19
26	26	25	24	23	22	21	20	19	19	19	19	19	19	19	19
25	25	24	23	22	21	20	19	19	19	19	19	19	19	19	19
24	24	23	22	21	20	19	19	19	19	19	19	19	19	19	19
23	23	22	21	20	19	19	19	19	19	19	19	19	19	19	19
22	22	21	20	19	19	19	19	19	19	19	19	19	19	19	19
21	21	20	19	19	19	19	19	19	19	19	19	19	19	19	19

Safe operating area
(min. water input temperature to avoid condensation)
Max water temperature is 35 °C

Derating area
(min. water input temperature to avoid condensation)
Max water temperature is 40 °C, applying derating of -2% of I_{out} for every 1 °C above 35 °C

Not allowed area

Examples

1) Ambient conditions:
Air Temperature: 24 °C
Relative Humidity: 50%
→ Water input temperature:
Min: 19 °C
Max: 35 °C

2) Ambient conditions:
Air Temperature: 30 °C
Relative Humidity: 65%
→ Water input temperature:
Min: 23 °C
Max: 35 °C

3) Ambient conditions:
Air Temperature: 40 °C
Relative Humidity: 85%
→ Water input temperature:
Min: 37 °C
Max: 40 °C
(applying derating of -4% of I_{out})

6.8.4. Water specifications

The use of softened water, or even distilled or demineralized, is counterproductive and potentially aggressive, especially for amphoteric metals, and thus aggravating the problems related to corrosion. Therefore it is suggested the use of harder water, respecting the limits laid down in the table and sustain them with a proper chemical conditioning of the water.

VEGA COOLING CIRCUIT DOESN'T CONTAIN ANY ALUMINUM PART

Analytical parameters	***Unit of measure***	***Maximum values of recirculated water***			
		Starting water	***With Pragma Chimica additives for water cooling system (CWT171 and PRAGMABIO420)***	***With Cortec additives for water cooling system (VpCi-649 BD)***	***With Pragma Chimica additives for glycolated cooling system (SANOTHERM MC 500)***
pH (25°C)	pH	8-9.5	8-9.5	8-9.5	8-9.5
Conductivity	µS/cm	Max 500	Max 500	Max 500	Max 500
Chlorides	mg/l	Max 100	Max 100	Max 100	Max 100
Total hardness (french degrees)	°f	Max 14	Max 14	Max 14	Max 14
Total hardness (german degrees)	°d	Max 8	Max 8	Max 8	Max 8
Total hardness (english degrees)	°e	Max 10	Max 10	Max 10	Max 10
Ammonium (NH4)	mg/l	Max 0.5	Max 0.5	Max 0.5	Max 0.5
Bacterial contamination	cfu/ml	$\leq 10^4$	$\leq 10^4$	$\leq 10^4$	$\leq 10^4$
Glycol (if used *)	%	-	-	-	≥ 30
Molybdenum **	mg/l	-	-	≥ 30	-

* use glycole in case of potential freezing problems also associated to long inactivity periods.
** Molybdenum must be checked only in presence of corrotion inibhitors from Pragma or Cortec and their related concentration.

WARNING!
The use of water that contains foreign objects can cause problems such as pipe's obstructions of the water cooling system. Install a suitable filter (strainer) immediately upstream from the rectifier (or the solenoid, if present). As general rule, use 50 mesh. The starting water must have a maximum concentration of suspended solids less than 30 mg/l.

6.8.5. Conversion units of Total Hardness

1°f = 10 mg/l of $CaCO_3$ = 10 ppm
1°f = 1.78 °d
1°f = 1.42 °e

6.8.6. Required products

WARNING!
To protect the water cooling circuit the following products from either Pragma Chimica or Cortec are required. Not using these products (or other products previously approved by ACRS) will invalidate any warrantee related damages to the rectifier due to corrosion, deposit formation or fouling.

PRAGMA CHIMICA
Viale dell'Industria 48/b
36071 Arzignano - Vicenza - ITALY
Phone: +39 0444 451373
Fax: +39 0444 452153
Web page: www.pragmachimica.it

Reference : Ignazio Tonin - Ignazio@pragmachimica.it

Additives

WATER COOLING SYSTEM

- ***CWT 171***
  Recommended dosage of 1% (Kg) of the water contained in the system (L or m³).
- ***PRAGMABIO 420***
  Recommended dosage of 0,1% (Kg) of the water contained in the system (L or m³).
- ***PRAGMABIO 3600*** *(alternative to PRAGMABIO 420)*
  Recommended dosage of 1% (Kg) of the water contained in the system (L or m³).

NOTE: PRAGMA3600 is used as alternative to PRAGMABIO 420 if a product classified as non hazardous is required and therefore not subject to specific regulations for the transport

GLYCOLATED COOLING SYSTEM

- ***SANOTHERM MC 500***
  Recommended dosage of 35% (Kg) of the water contained in the system (L or m³).

NOTE: SANOTHERM MC 500 and CWT171 must not be used together

Cleaning

WATER COOLING SYSTEM

- ***PRAGMACLEAN 330***
  Recommended dosage of 10% (Kg) of the water contained in the system (L or m³).
- ***CWT 181***
  Recommended dosage of 1% (Kg) of the water contained in the system (L or m³).

GLYCOLATED COOLING SYSTEM

- ***SANOTHERM 700***
  Recommended dosage of 10% (Kg) of the water contained in the system (L or m³).

CORTEC CORPORATION
4119 White Bear Parkway - St. Paul, MN 55110 U.S.A.
Phone: +1 651-429-1100
Fax: +1 651-429-1122
Toll Free: 1-800-426-7832
Web page: www.cortecvci.com
Reference :
China - Michael Qiu - mqiu@cortecvci.com
India - P.K. Mathew - pk.mathew@cortec-india.com
Mexico - Monica Tarragona - mtarragona@aishouston.com
Europe - Ivana Radic Borsic - iborsic@cortecvci.com

Additives

- ***VpCI-649 BD***
  Recommended dosage of 0,5% of the water contained in the system.
- ***S-16***
  Recommended dosage: max 0,5% of the total volume of VpCI-649 BD.

Cleaning

- ***VCI-414***
  Recommended dosage of 5% of the water contained in the system.

Corrosion remover

- ***VpCI-426***
  Recommended dosage of 50% of the total volume (water 1:1 solution).
  OR
- ***VpCI-426 Powder***
  Recommended dosage of 28% of the water contained in the system.

6.8.7. Water cooling circuit connection

1. Input and output connections of the water cooling circuit are located at the rear in the base of the rectifier, indicated with appropriate labels.
2. Connect the machine's water cooling circuit to an installation of an appropriate capacity, follow the correct direction of the water flow indicated by the labels (Input water / Ouput water)
3. Vega water cooled rectifier is provided as standard with a flow sensor installed inside the base at the input of water cooling circuit
4. Check periodically if water quality is according to the specifications provided (See chapter 6.8.4) and replace water if needed.

WARNING!
The inversion of input and output water connections can severely damage the machine.



Fig. 6.8.7.a

Optional external cabling for solenoid





Fig. 6.8.7.b

The water flow sensor is integrated into the hydraulic circuit of the rectifier (input side of the cooling circuit) and it detects input water flow rate and temperature of the recirculating input cooling water.

Rectifer panel displays current water flow rate and temperature.

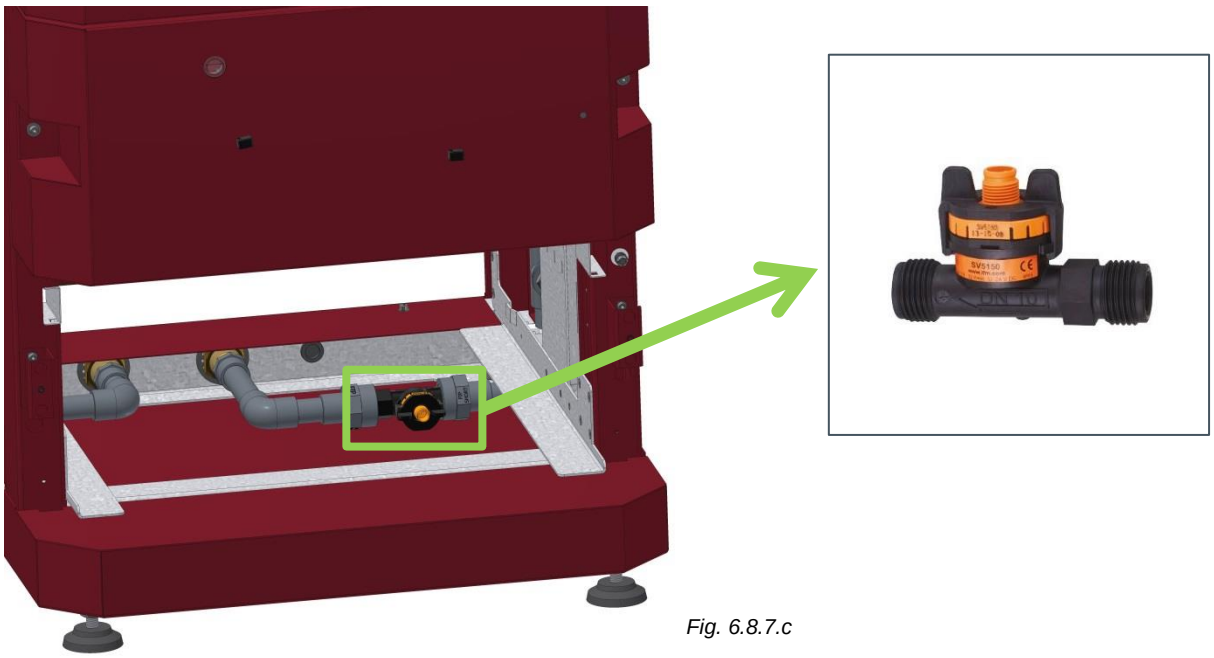


Fig. 6.8.7.c

7. RECTIFIER REAR CONNECTORS

All Vega machines are supplied with 2 male connectors Sub-D: CN5 and CN6 , located at the rear of the machine .

These connectors are used for different purposes: as interfaces with the daughter boards, to connect the rectifier to RS485 network and REM units, and to control some external devices by means of digital input / output ports.

The purpose of these connectors is different for every rectifier model, please refer to the firmware manual of your machine for more details.

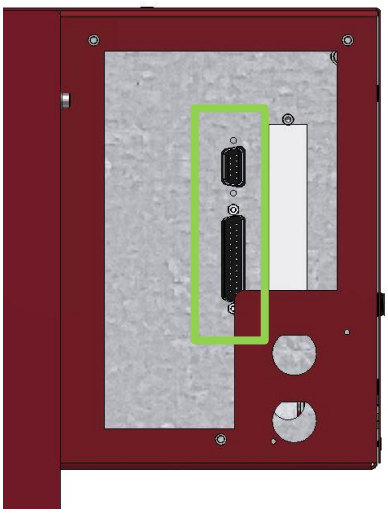


Fig. 7.a

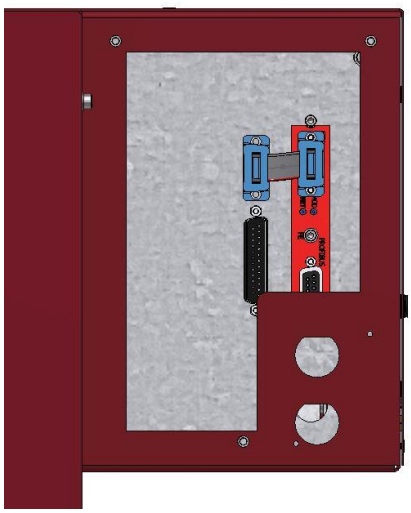


Fig. 7.b – Protocol option



Fig. 7.c – IOS option

8. OPERATION

8.1. Operator control panel, keys and indicators



Fig. 8.1.a

(1) RUN/MODIFY	Function1: Function2: LED ON: LED OFF:	Machine start in manual operation mode Permanent data modification on configuration menu Machine started Machine stopped (STAND-BY mode)
(2) STANDBY/MENU	Function: Function2:	Machine stop (STAND-BY mode) Access and Exit on main configuration Menu
(3) REMOTE	Function: LED ON: LED FLASHING:	Automatic mode selection Machine operating automatically Receiving data from serial communication ok
(4) LOCAL/SELECT	Function1: Function2: LED ON: LED FLASHING:	Manual mode selection Sub-menu selection on main configuration menu Data modification on configuration menu Data Modify and Save for WAVEFROM and PATTERN Machine operating manually Receiving data from serial communication ok
(5) VOLT	Function: LED ON:	Selection of voltage driving mode Machine in voltage driving mode
(6) AMPERE	Function: LED ON:	Selection of current driving mode Machine in current driving mode
(7) ▲	Function:	Increase value
(8) ▼	Function:	Decrease value
(9) LINE	LED ON:	Primary main voltage present
(10) CHECK	LED FLASHING:	Anomaly encountered, which could be: a) Fail on power module b) Under voltage c) Over voltage d) Thermal protection
(11) THERM	LED ON:	Thermal protection

8.2. LED module status

In normal operating condition the module has to display only the led green or blue.

LED COLOR	State of the Led	State of the Module	State of the rectifier
Green	fixed	Standby	The rectifier is in standby. The led LINE is On and the led RUN is Off in the OPP panel
Blue	The brightness of the led depends by the amount of the current delivered. Less brightness=low current delivered. High brightness=high current delivered.	The module delivers the output current	The rectifier is in run mode. The led RUN is ON in the display.

Note: When the rectifier changes from Standby to run, the led changes from green to blanck and from blank to blue. If the rectifier is in run mode, without any set point requested, the led is blank.

9. ERROR TRACING

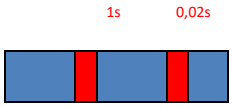
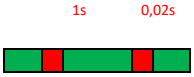
9.1. LED module status

The possible problems in the module are identified by the followings colors:

- The led yellow is used as warning indicator when a half module or the full module detects over temperature in an internal component.
  The half module or the module in over temperature doesn't provide output current; the module restarts to provide the output current after it is cooled down.
- The led red is used as alarm indicator when there is a failure in the half module or in the full module.
- The led blank means the module is off or the rectifier is not connected to the load.

LED COLOR	State of the Led	State of the module	Cause	Action/Observations
Blank	Off	Module does not provide any output current	The module is OFF.	- There could be a short circuit in the bridge rectifier and / or in the IGBT stage and the power fuses of the both half modules are blown. -the power input supply is disconnected in both side of the module. -the power supply of the CTRD card is failed. It is recommended to test the power input fuses and to perform the troubleshooting in the module.

Blue	The brightness of the led is lower than the brightness of the blue led of the others modules	Module is delivering output current	There is a problem in the feedback from the hall sensor. (cable disconnected or the hall sensor failed) The circuit that process the voltage drive is damaged.	In this case the rectifier shall report module issue and led check blinks in the OPP It is recommended to remove the module and to perform the troubleshooting in the Hall sensor and in the CTRD card.
Yellow/alternate Blu	Left half module: 1s 1s 1s 1s  Right half module: 0,2s 0,2s 0,2s 0,2s 	One half module has detected the thermal alarm. The half module in thermal alarm doesn't provide the output current. It restarts automatically and runs the output current after the half module is cooled down	One of the followings components can be overheated: IGBT stage. Output diodes. Power transformer	The rectifier shall report thermal alarm. Check the cooling system: -the fan and the air filter in the air cooled module. -the circulation of the water in the water cooled module and in the hydraulic circuit of the rectifier. Note: The rectifier can operate also with one half module in thermal alarm but it is recommended to solve the issue and don't operate in this condition for a long period of time.
Yellow	fixed	Thermal alarm in the full module. The module doesn't provide the output current. It restarts automatically and runs the output current after the module is cooled down	One of the followings components can be overheated: IGBT stage. Output diodes. Power transformer	The rectifier shall report thermal alarm. Check the cooling system: -the fan and the air filter in the air cooled module. -the circulation of the water in the water cooled module and in the hydraulic circuit. Note: The rectifier can operate also with one module in thermal alarm but it is recommended to solve the issue and don't operate in this condition for a long period of time.
Red/ alternate blu	Left half module: 1s 1s 1s 1s  Right half module: 0,2s 0,2s 0,2s 0,2s 	One half module has a failure and doesn't provide the output current. The error is cleared when the rectifier is turned in standby.	high peak current in the igbt of a half module.	The rectifier could report module issue and "led Check" in run mode. The half module can have the output diodes in short circuit. It is recommended to solve the issue.

Red/alternate blu	 Rectifier in run:	One of the half module has a failure and doesn't provide the output current. In standby the error is not cleared and the red color alternate with green color 	The voltage in the DC bus of one half module is low or OV.	The rectifier could report module issue and "led Check" in run mode. -There could be a short circuit in the bridge rectifier or in the IGBT stage and the power fuses of the half module are blown. -There could be an issue such us phase missing in the input supply cable of the half module. -Check the input fuses and try to solve the issue.
Red	fixed	The both half modules have a failure and don't provide the output current. The error is cleared when the rectifier is turned in standby.	a) low voltage level in the auxiliary power supply of the CTRD card. b) high peak current in the igbt of the module.	The rectifier could report module issue and "led Check" in run mode. -In a) there could be an issue in the auxiliary power supply of the CTRD card. -In b) the output diodes are in short circuit in the both half modules.

10. MAINTENANCE AND SERVICE

10.1. Replacement of power module

WARNING!
The maintenance and service of the machine must be in conformity with local regulations regarding safety measures. Before carrying out any maintenance operation, it is of utmost importance that the machine is turned OFF from the main switch on the operator panel. After turning it OFF make sure to wait for at least 2 minutes until all residual voltage inside the machine is discharged. In addition pay attention to the cooling elements which can reach a temperature of 80°C.

10.1.1. Air cooled sequence

- Identify the module that needs to be replaced and / or serviced
- Unscrew N.4 rear M8 hexagonal screws (N.2 for each output pole of the module) and remove the plates of the output connections that fix the vertical bars to the output blocks of the module.
- Remove the front module shield that protect the front of the module unscrewing N.2 M4 x 8 screws
- Disconnect earth cable of the module to the frame, mains input three phase connector (on the right side) and circular data connector (on the left side)
- Unscrew N. 4 M4 x 8 screws (N.2 for each side) that fix the side brackets of the module to frame carpentry
- Slide out the module, taking it by the front handles, carrying out the removal operation carefully, the weight of the air cooled module is 35Kg

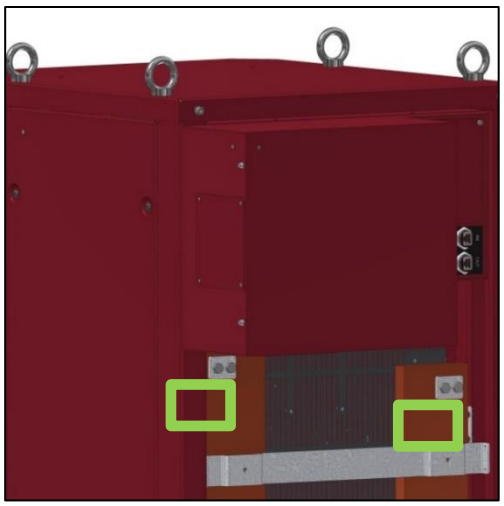


Fig. 10.1.1.a

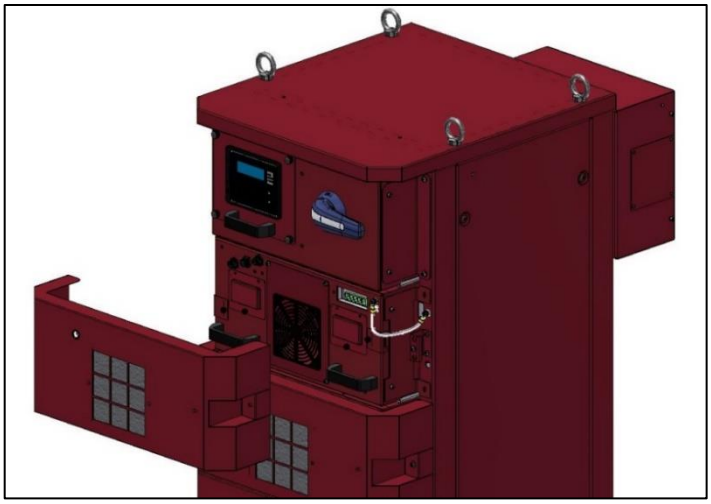


Fig. 10.1.1.b



Fig. 10.1.1.c

10.1.2. Water cooled sequence

For water cooled module, perform all operation for the replacement of air cooled module and in addition:

- The cooling circuit of the rectifier must not be emptied
- Close each one of the front taps of the module to be removed (IN and OUT taps)
- Disconnect the side connection pipes with closed taps to the water fittings of the module
- Empty the little water inside the module
- Slide out the module, taking it by the front handles, carrying out the removal operation carefully, the weight of the module is 37Kg

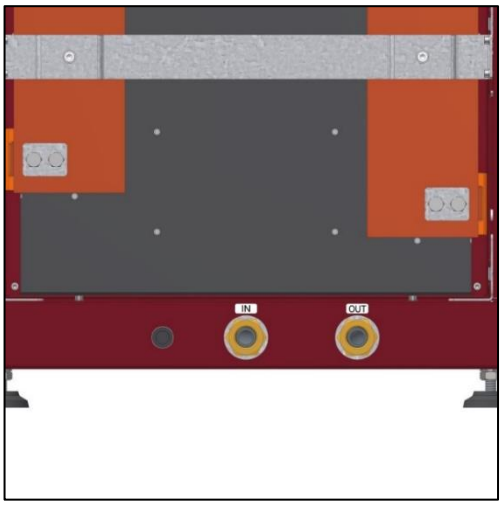


Fig. 10.1.2.a

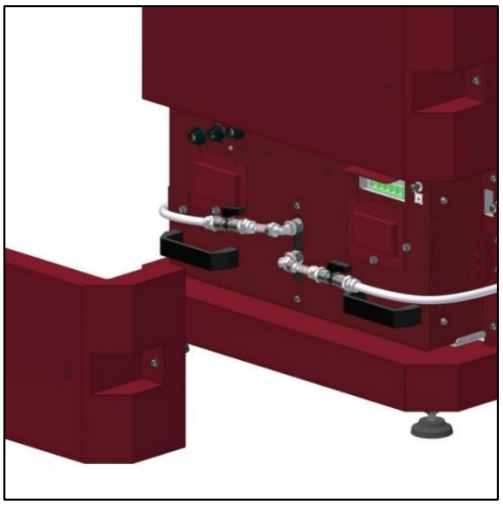


Fig. 10.1.2.b

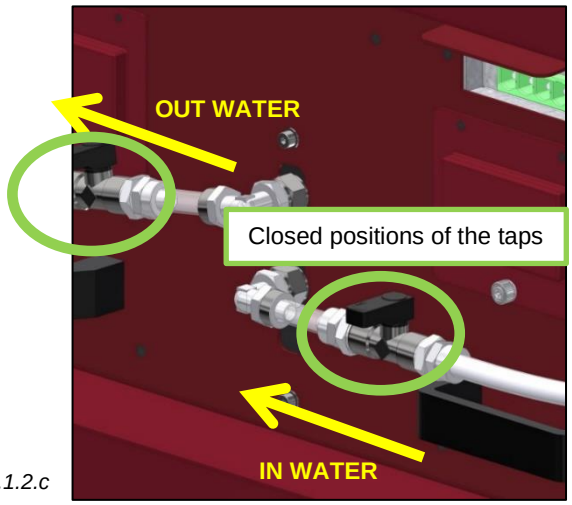


Fig. 10.1.2.c



Fig. 10.1.2.d

10.1.3. Front disconnection of the power bar of the module

If the unscrew operation of N.4 M8 rear hexagonal screws (N.2 for each output pole of the module) is not possible from the back of the rectifier for space matter, proceed as follow:

- After removing the front module shield, remove the side plates
- According to the deph of Vega module (540mm), compose an extension in lenght of a wrench equipped with socket 13 for M8 hex head screws
- Insert the wrench in each one of the front guides and make the disconnetion of the M8 unmissable screws (1 for each side)
- Remaining all other operation described in previous paragraphs for air and water cooled modules are the same ones.



Fig. 10.1.3.a

10.2. Replacement of the CPU card

- Unscrew N.4 knurled grip knob that fix the CPU drawer
- Slide out the CPU drawer to have the access to the board

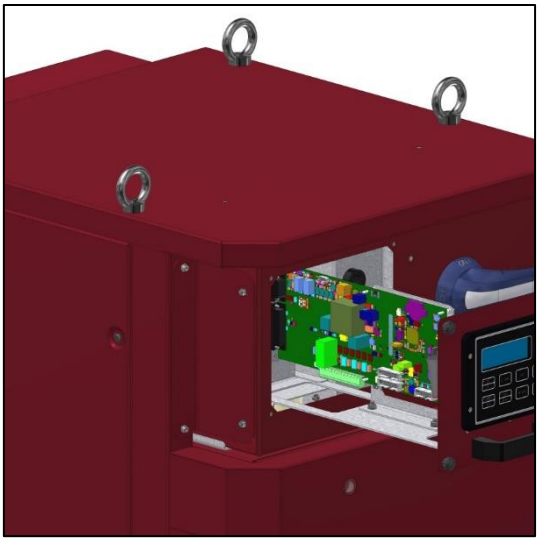


Fig. 10.2.a

10.3. PROGRAMMED MAINTENANCE

The machine does not need a programmed maintenance with regards to the operating functions. The only maintenance needed regards the cleaning of the filters and the cooling elements.

WARNING!
The maintenance of the machine must be in conformity with local regulations regarding safety measures.
Before carrying out any maintenance operation, it is of utmost importance that the machine is turned OFF from the main switch on the operator panel. After turning it OFF make sure to wait for at least 2 minutes until all residual voltage inside the machine is discharged. In addition pay attention to the cooling elements which can reach a temperature of 80°C.

10.3.1. Air Cooled Machine

The polyurethane filters need to be cleaned at least once every 3 months and be replaced with new filters once a year.

Remove the front air panel and procede to the filter cleaning and / or replacement according to the instructions showed in following picture

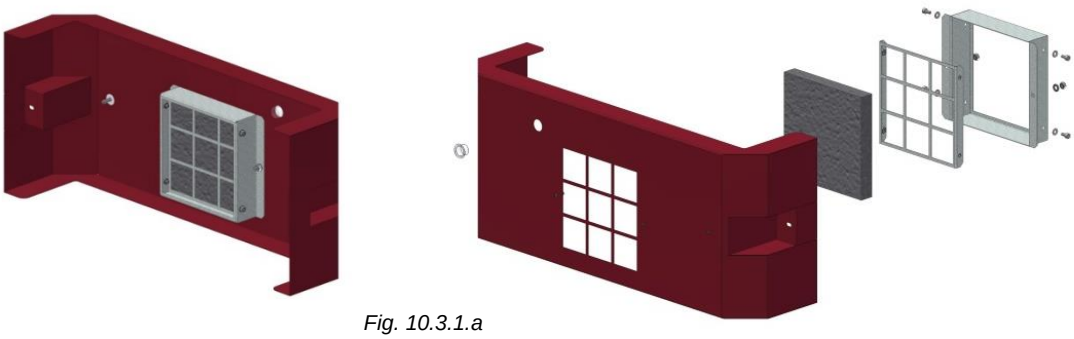


Fig. 10.3.1.a

The frequency on cleaning operation must be such as to prevent the presence of air polluting elements on the filters and on the cooling elements.

WARNING!
The lack of cleaning may cause irreparable damages to the machine.

10.3.2. Water Cooled Machine

The inspection of the required water parameters have to be performed every 6 months.
Please refer to paragraph 6.8.4. „Water specifications“ for further details.

10.3.3. State of Cables

Check periodically the state of the power cables from the busbars of the mains connections. Replace them if damaged.

10.3.4. Replacement of Components

WARNING!
Before replacing any component make sure to turn OFF the machine from the main I/O switch on the operator panel. After turning it OFF make sure to wait for at least 2 minutes until all residual voltage inside the machine is discharged. In addition pay attention to the cooling elements which can reach a temperature of 80°C.

11. STORAGE

In the case of a temporary stop of the machine, it is necessary to store it in a dry and aired environment to prevent the creation of condensation drops which would damage the electric parts.

12. APPENDICES

The appendices are found on the following pages.

12.1. Appendices documents

Contact ACRS S.r.l. customer care office to request any of the documents listed below.

No.	CONCEPT	REFERENCE FILE
1	Spare parts - V700 Air machine	V700-118-R01.pdf
2	Spare parts - V700 Water machine	V700-111-R01.pdf
3	Spare parts - V700 Air power module	V700-101-R02_01.pdf
4	Spare parts - V700 Air half power module	V700-101-R02_02.pdf
5	Spare parts - V700 Water power module	V700-102-R02_01.pdf
6	Spare parts - V700 Water half power module	V700-102-R02_02.pdf
7	Spare parts - V700 Header 400A	V700-106-R02.pdf
8	Spare parts - V700 Primary assembly	V600-142-R01.pdf
9	Spare parts - V700 Operator panel unit kit	Q200-080-R02_01.pdf
10	Spare parts - V700 Water cooling circuit	V700-111-R02.pdf
11	Vega Technical Documentation Book	ACRS_Vega_Tech_Doc_ENG.pdf
12	V700 configuration spec	ACRS_V700_Conf_Spec_ENG.pdf