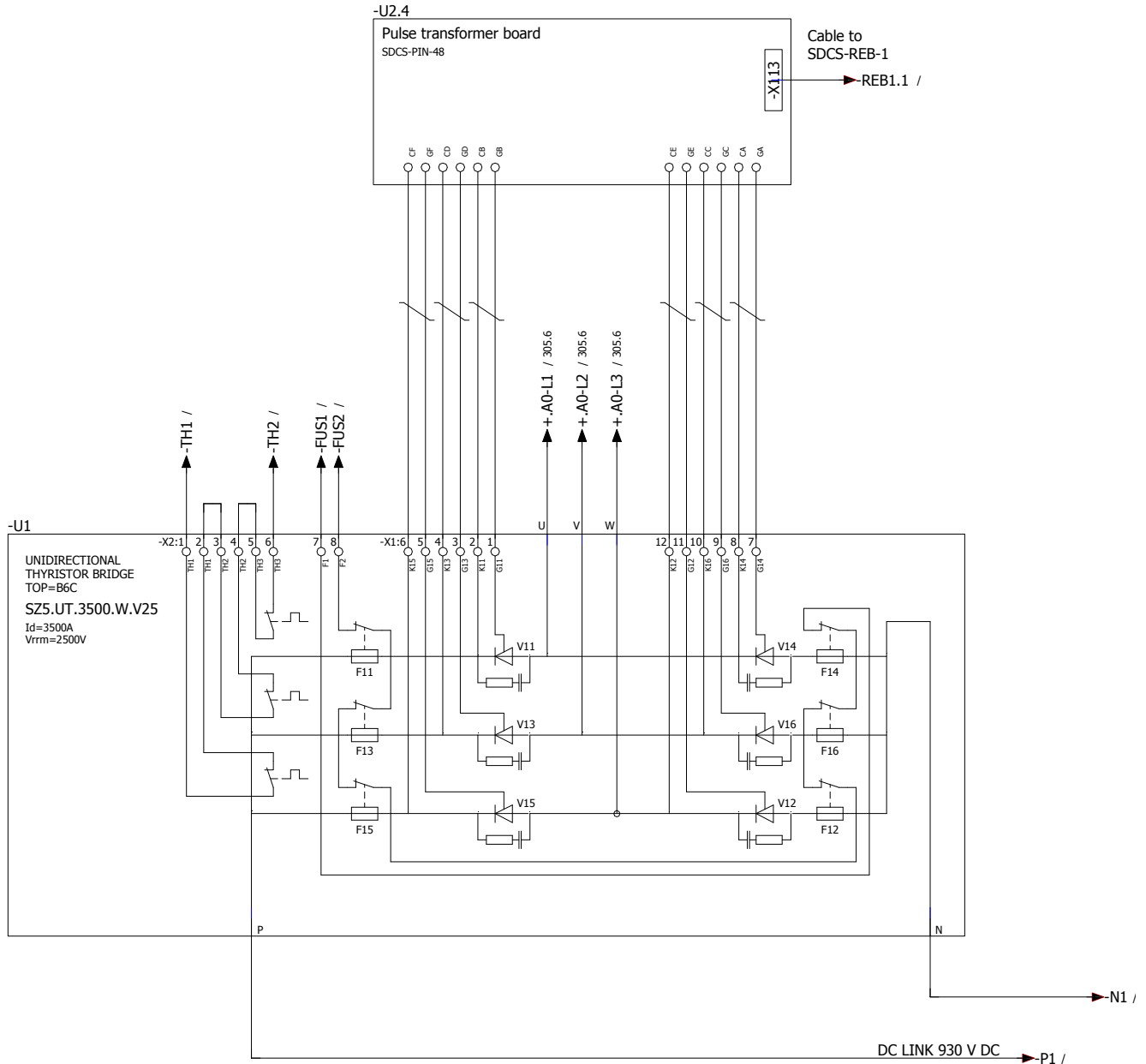


PRODUCT DESCRIPTION

The three phase controlled rectifier SZ5 unit is a power device for convert the three phase ac input voltage in a continuous rectifier output voltage with a three phase bridge thyristor rectifier. The topology of the converter is a B6C type in the code designation according to IEC, the maximum dc link output voltage is $1.35 \times V_{ac}$ line (rms line-line), but is possible to modify the dc link output value controlling the 6 thyristor pulses.

The external control system can modify the thyristor pulse in order to have an output voltage time ramp depending on the selected value in the control side.

A typical connection of the AC/DC three phase rectifier SZ5 unit is showed below:

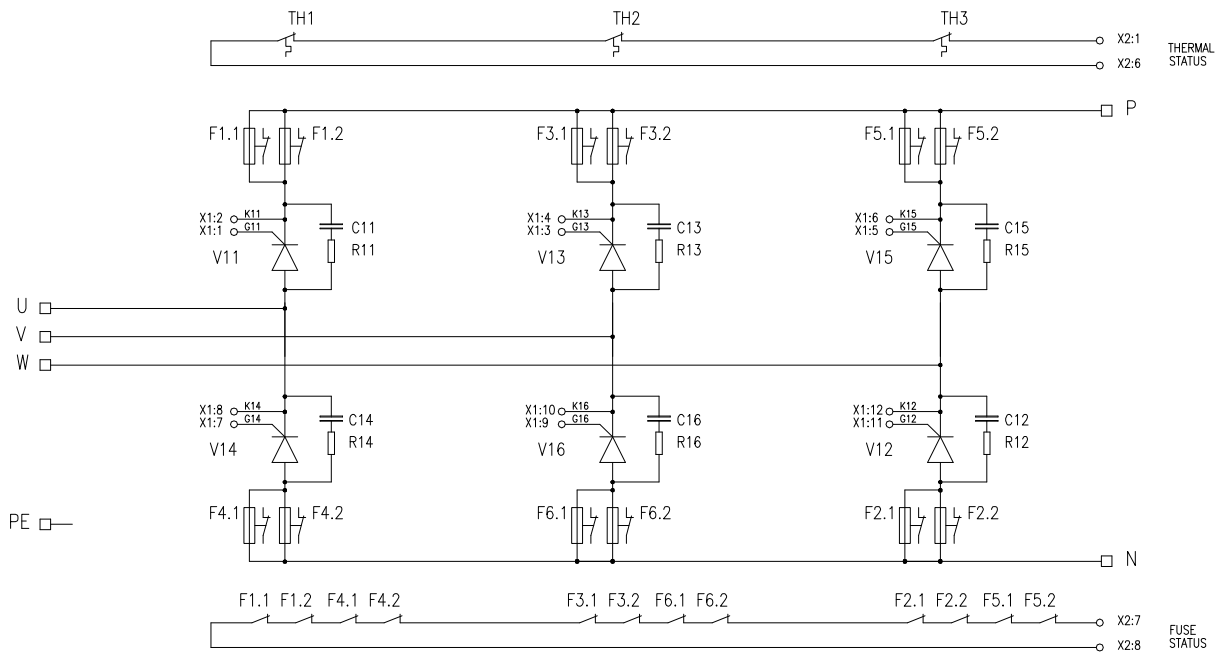


Three phase controlled rectifier SZ5 unit, external connection

The input ac bars U, V, W of the AC/DC converter are connected to the incoming line section, the DC output voltage is connected to the DC link bars for the inverters input connections.

The input thyristor pulses are given by an external electronic board with 6 isolated transformer pulse (for example the ABB PIN-48 board). All the thyristor pulses are available in the terminal strip X1.

In the figure below is possible to see the internal connection of the power module: the power thyristors are series connected with 2 fast aR fuses (2 in parallel) for protect them from the shortcircuit at the dc link side. Each power thyristor is double sided cooled by 2 different water cooled heatsink. Each thyristor heatsink is water cooled with a water pipe parallel connected to a water collector.



Three phase controlled rectifier SZ5 unit, internal connection

Each thyristor is thermal protected by a thermal contact, in this way all the thermal contacts are series connected and a thermal contact status is available at X2:1 and X2:6 terminal strip output.

Using the thermal contact is possible to protect the semiconductors from an over temperature condition, when this output contact will be open, the external control must disable the thyristor pulses and then open the main circuit breaker.

Each fast fuse is mounted with a contact status, all the fuse status are series connected and a fuse status is available at a X2:7-8 terminal strip output. When a fuse is broken the fuse output contact will be open and the external control must disable the thyristor pulses and then open the main circuit breaker.

The cooling of the power diodes is performed with an internal water circuit with a 2 external quick water link of 1/2" diameter, inside the converter, an input and an output water collector perform all the water distribution to the 12 internal heatsinks.



Three phase controlled rectifier SZ5 unit

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TECHNICAL FEATURES

The following technical features are valid for the three phase controlled rectifier SZ5 unit.

MODEL	I _{N,DC} A	I _{FAV} THYRISTOR 85°C A	Max Ac voltage V	V _{RRM} THYRISTOR V	Fuse Type for each thyristor	Fuse Amp Volt	Power loss W
SP.SZ5.UT.1500.W.V22	1500	1035	780	2200	1x 2078132.1100	1x1100 1000	5000
SP.SZ5.UT.2500.W.V22	2500	1385	780	2200	2 x 170M6347	2x900 1000	9000
SP.SZ5.UT.3000.W.V22	3000	1385	780	2200	2 x 170M6348	2x1000 1000	11600
SP.SZ5.UT.3500.W.V22	3500	1644	780	2200	2 x 170M6349	2x1100 1000	11700
SP.SZ5.UT.4000.W.V22	4000	1940	780	2200	2 x 170M6500	2x1250 1000	13400
SP.SZ5.UT.4500.W.V22	4500	3250	780	2200	2 x 2078152	2x1400 1000	16000

MODEL	I _{N,DC} A	Ac bar Size mm	DC bar Size mm	Temp. Water °C	Nom. water flow l/min	Water Pressure drop bar (at 48 l/min)	Weight Kg	Dimension (WxDxH) mm
SP.SZ5.UT.1500.W.V22	1500	80x10	80x10	10÷43	48	3.2	80	310 x 490 x 850
SP.SZ5.UT.2500.W.V22	2500	80x10	150x10	10÷43	48	3.2	107	375 x 490 x 850
SP.SZ5.UT.3000.W.V22	3000	100x15	150x10	10÷43	48	3.2	115	375 x 490 x 850
SP.SZ5.UT.3500.W.V22	3500	100x15	150x10	10÷43	48	3.4	119	375 x 490 x 850
SP.SZ5.UT.4000.W.V22	4000	100x15	150x10	10÷43	48	3.4	120	375 x 490 x 850
SP.SZ5.UT.4500.W.V22	4500	100x15	150x15	10÷43	48	3.4	120	375 x 490 x 850

The maximum AC input voltage is equal to 780 Vac (690Vac + 13%),

The DC output voltage at no load condition is equal to 1.35 x V_{input_ac} (line-line rms value),

the DC output current indicated in the previous table are valid for continuous duty, without overloads, at maximum water temperature of 43°C, with a minimum water flow indicated in the previous data.

The cooling water has to be deionized water, with a maximum conductivity of 250 uS/cm.

The maximum permissible water pressure is 8 bar.

The dimensions of each three phase controlled rectifier unit, SZ5 type are reported in the previous table, the degree of protection is IP00.

The climatic installation conditions are: Pollution 2 or better (out of direct sunlight, free from vibration, dust, corrosive or inflammable gases, mist, oil, vapor),

The ambient temperature during operation are from 0 to 40 °C during operation (without derating),

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The permissible humidity rating is $\leq 85\%$ (without condensation) during the operation.

The AC/DC converter unit are supplied with:

- thermal switch and fuse micro-switch available at the terminal strip X2,
- RC snubber across each semiconductor for protection again overvoltage spikes.

Below is possible to see all the connection details.

INPUT BAR

Input bar, material: copper

Connection	Description	Bar dimension mm	Bolts type and number
U	Incoming line input, phase U	80 x 10 *	M8 x 4 *
V	Incoming line input, phase V	80 x 10 *	M8 x 4 *
W	Incoming line input, phase W	80 x 10 *	M8 x 4 *

* VALID FOR SIZE 1500 A AND 2500 A

OUTPUT BAR

output bar, material: copper

Connection	Description	Bar dimension mm	Bolts type and number
P	Positive output bar	150 x 10 *	M12 x 8 **
N	Negative output bar	150 x 10 *	M12 x 8 **

* 80 x10 for SP.SZ5.UT.1500.W.V22 type, ** M8x4 for SP.SZ5.UT.1500.W.V22 type

TERMINAL INPUT STRIP X1

Input terminal strip, max wire section: 2.5mmq

Terminal/ Cable	Description	Max voltage, max current
X1-1	Gate connection of thyristor V11 (phase U top)	24Vac, 2A
X1-2	Cathode connection of thyristor V11 (phase U top)	24Vac, 2A
X1-3	Gate connection of thyristor V13 (phase V top)	24Vac, 2A
X1-4	Cathode connection of thyristor V13 (phase V top)	24Vac, 2A
X1-5	Gate connection of thyristor V15 (phase W top)	24Vac, 2A
X1-6	Cathode connection of thyristor V15 (phase W top)	24Vac, 2A
X1-7	Gate connection of thyristor V14 (phase U bot)	24Vac, 2A
X1-8	Cathode connection of thyristor V14 (phase U bot)	24Vac, 2A
X1-9	Gate connection of thyristor V16 (phase V bot)	24Vac, 2A
X1-10	Cathode connection of thyristor V16 (phase V bot)	24Vac, 2A
X1-11	Gate connection of thyristor V12 (phase W bot)	24Vac, 2A
X1-12	Cathode connection of thyristor V12 (phase W bot)	24Vac, 2A

Use twisted cable for thyristor gate-cathode pulses, max lenght 1.5 meter.

TERMINAL INPUT STRIP X2

Output terminal strip, max wire section: 2.5mmq

(Note: from terminal strip X2:1 and X2:6 is available the total thermal protection of AC/DC unit, from X2:1 and X2:2 is available the thermal protection of phase U, from X2:3 and X2:4 is available the thermal protection of phase V, from X2:5 and X2:6 is available the thermal protection of phase W).

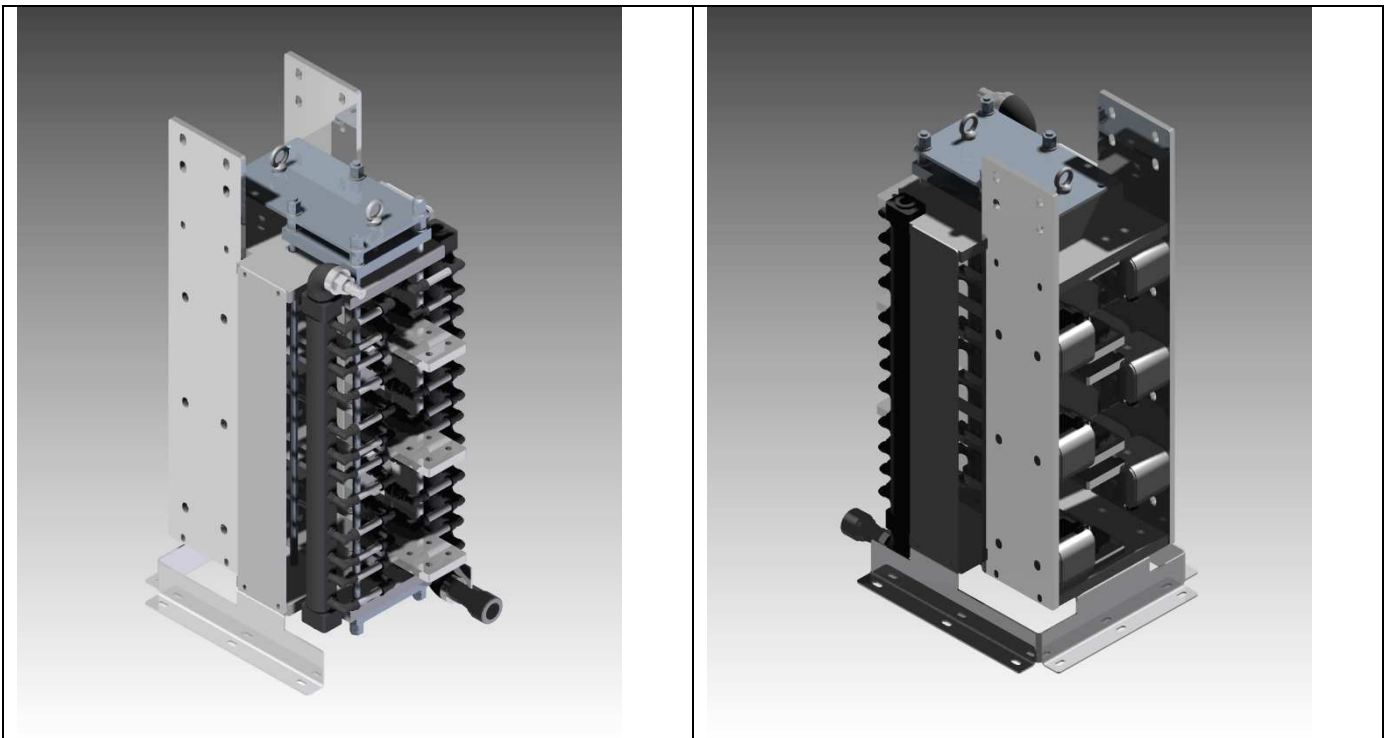
Terminal/ Cable	Description	Voltage level / note
X2-1	Thermal protection, free contact, 1st pole (phase U)	250 Vac, 2A
X2-2	Thermal protection, free contact, 2nd pole (phase U)	250 Vac, 2A
X2-3	Thermal protection, free contact, 3rd pole (phase V)	250 Vac, 2A
X2-4	Thermal protection, free contact, 4th pole (phase V)	250 Vac, 2A
X2-5	Thermal protection, free contact, 5th pole (phase W)	250 Vac, 2A
X2-6	Thermal protection, free contact, last pole (phase W)	250 Vac, 2A
X2-7	Fuse protection, free contact, pole1	250 Vac, 2A
X2-8	Fuse protection, free contact, pole2	250 Vac, 2A

WATER CONNECTION

½" male and female water plug profiles conform to ISO Standard 7241-1 series B, type 74SBIW21RVX of Parker Rectus manufacturer (www.rectus.de).

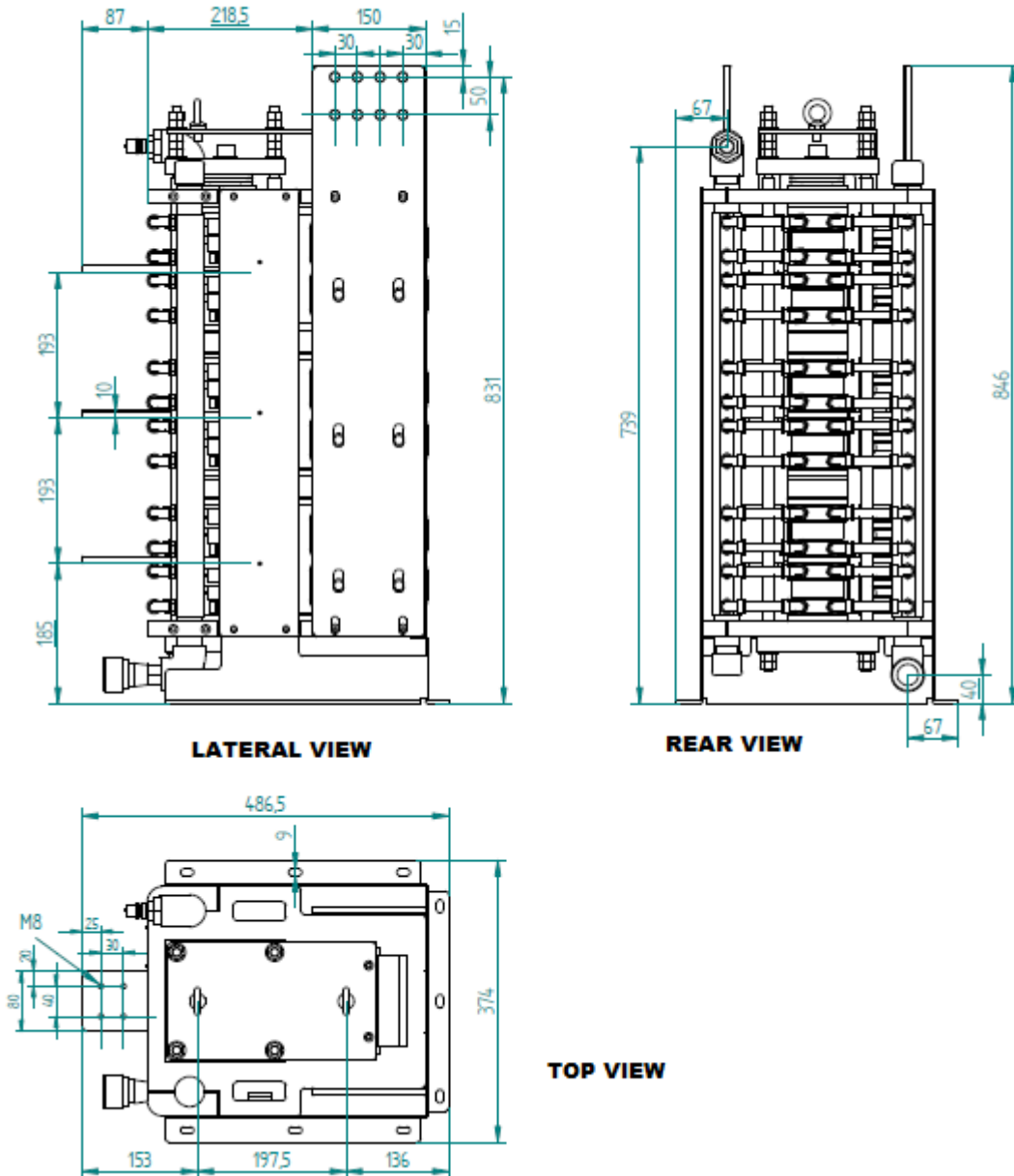
Note: inside the converter, the input and output internal water plug fixing are done with stainless steel supports against the absorption of shocks.

Is possible to see the external layout in the figure below, the AC input bars are located in the lateral part of the converter, then is possible to see the 6 power thyristors assembled in a vertical stack In the top part of the device is possible to see the DC output bar, in the top part are also present the X1 and X2 terminal strip.

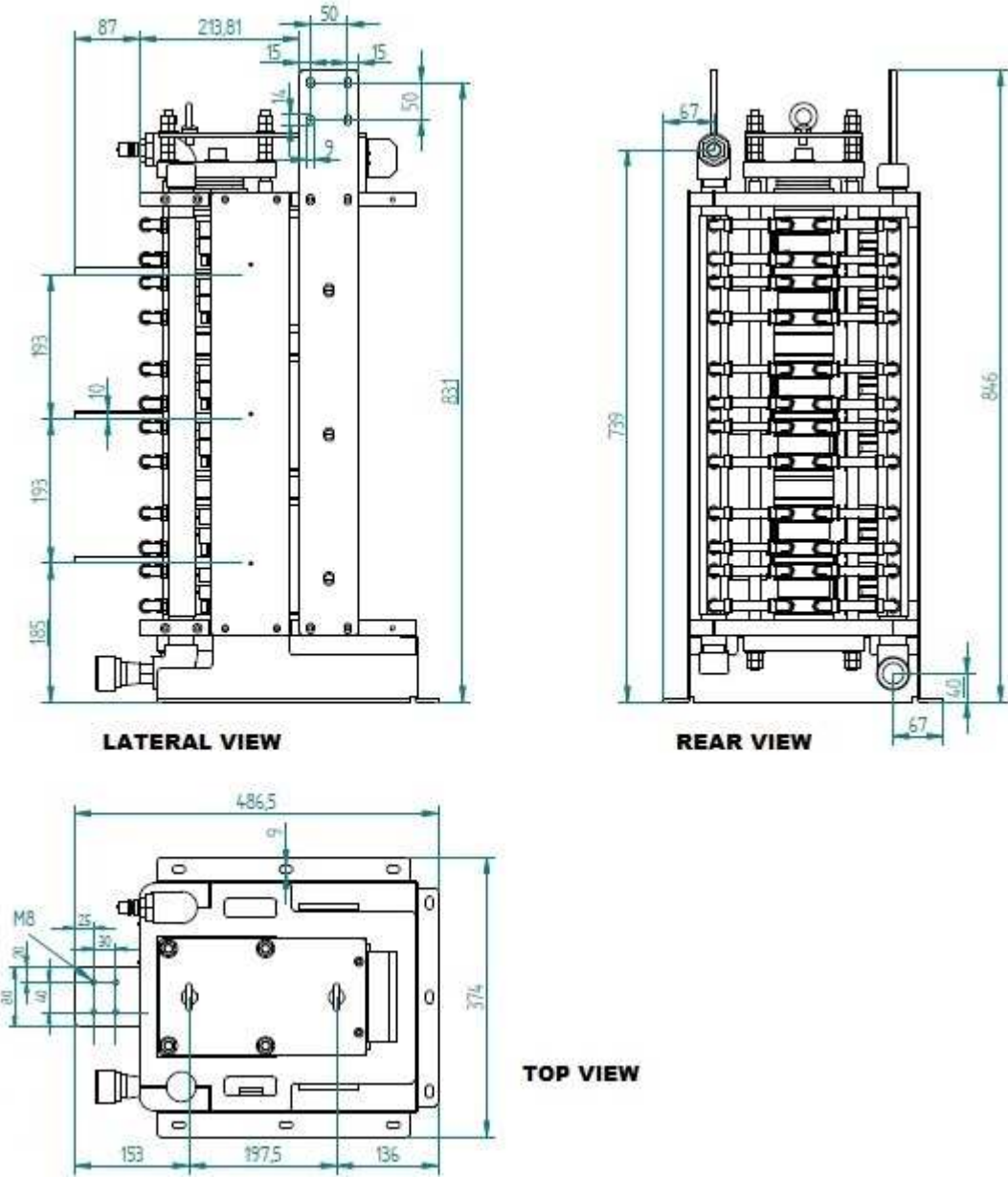


Three phase controlled rectifier SZ5 unit, external layout

As is possible to see in the previous figure, the three phase controlled rectifier SZ5 unit, has to be installed in vertical position, the main ac input bars are positioned in the lateral part of the device, and the dc output bars are positioned in the top part of the device. The input water connection is present in the bottom part of the device, the output water connection is present in the top part of the device.



Three phase controlled rectifier SZ5 unit, external dimension (size 2500A)



Three phase controlled rectifier SZ5 unit, external dimension (size 1500A)