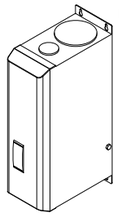
WEST Control Solutions

SHORT MANUAL Rev. 04/2019

Relay S 1PH

from 300A - 800A


PMA-S1-300-800A_s

Important warnings for safety

⚠	This icon is present in all the operational procedures where the Improper operation may result in serious personal injury or death by Electrical Shock Hazard Symbol (a lightning bolt in a triangle) precedes an electric shock hazard CAUTION or WARNING safety statement.
⚠	Warning or Hazard that needs further explanation than the label on unit can provide. Consult User's Guide for further information.
CE	Unit is compliant with European Union directives. See Declaration of Conformity for further details on Directives and Standards used for Compliance.
c UL us LISTED	If available, unit is a Listed device per Underwriters Laboratories. It has been investigated to ANSI/ UL® 508 standards for Industrial Control Switches and equivalent to CSA C22.2 #14. For more detail search for File E505847 on www.ul.com
	ESD Sensitive product, use proper grounding and handling techniques when installing or servicing product.
	Do not throw in trash, use proper recycling techniques or consult manufacturer for proper disposal.

Safety notes

⚠ WARNING! To avoid damage to property and equipment, injury and loss of life, adhere to applicable electrical codes and standard wiring practices when installing and operating this product. Failure to do so could result in damage, injury and death.

⚠ AVERTISSEMENT! Pour éviter d'endommager la propriété et l'équipement, les blessures et la perte de vie, respecter les codes électriques en vigueur et les pratiques de câblage standard au moment de l'installation et de l'utilisation de ce produit. Dans le cas contraire, cela peut entraîner la mort, des blessures graves ou des dommages.

⚠ WARNHINWEIS! Um Sach- und Personenschäden, Verletzungen und den Verlust von Leben zu vermeiden, halten Sie sich bei der Installation und dem Betrieb dieses Produkts an die geltenden Elektrovorschriften und Standardverfahren für die Verdrahtung. Andernfalls kann es zu Schäden, Verletzungen und Tod führen.

⚠ WARNING! All service including inspection, installation, wiring, maintenance, troubleshooting, fuse or other user serviceable component replacement must be performed only by properly qualified personnel. Service personnel must read this manual before proceeding with work. While service is being performed un-qualified personnel should not work on the unit or be allowed in the immediate vicinity.

⚠ AVERTISSEMENT! Tous les services, y compris l'inspection, l'installation, le câblage, l'entretien, le dépannage, le remplacement de fusibles ou d'autres composants pouvant être réparés par l'utilisateur, doivent être effectués uniquement par un personnel diment qualifié. Le personnel de service doit lire ce manuel avant d'effectuer tout travail. Pendant que l'entretien est exécuté, tout personnel non qualifié ne doit effectuer de travail sur l'appareil ni se trouver a proximité.

⚠ WARNHINWEIS! Alle Wartungsarbeiten, einschließlich Inspektion, Installation, Verdrahtung, Wartung, Fehlersuche, Sicherung oder anderer vom Benutzer zu wartenden Komponenten, dürfen nur von qualifiziertem Fachpersonal durchgeführt werden. Das Wartungspersonal muss dieses Handbuch lesen, bevor es mit der Arbeit fortfährt. Während der Wartung darf nicht qualifiziertes Personal nicht an diesem Gerät oder in unmittelbarer Nähe arbeiten.

⚠ WARNING! When in use the power controller is connected to dangerous voltages. Do not remove the protective covers without first disconnecting and preventing power from being restored while servicing the unit.

⚠ AVERTISSEMENT! Au moment de l'utilisation, le régulateur de puissance est connecté a des tensions dangereuses. Ne retirer aucun couvercle de protection sans d'abord débrancher l'appareil et ainsi empêcher l'alimentation d'être rétablie pendant l'entretien.

⚠ WARNHINWEIS! Während dem Betrieb ist der Thyristor Leistungssteller an gefährlichen Spannungen angeschlossen. Entfernen Sie die Schutzabdeckungen nicht, ohne vorher die Spannungsversorgung unterbrochen zu haben und die Anlage gegen Wiederherstellung der Stromversorgung zu sichern, während Sie das Gerät warten.

⚠ WARNING! Do not use in aerospace or nuclear applications.

⚠ AVERTISSEMENT! Ne pas utiliser pour les applications aérospatiales ou nucléaires.

⚠ WARNHINWEIS! Nicht in Luft-, Raumfahrt- oder Nuklearanwendungen verwenden.

⚠ WARNING! Electric Shock Hazard: when the power controller has been energized, after shutting off the power, wait at least one minute for internal capacitors to discharge before commencing work that brings you in to contact with power connections or internal components.

⚠ AVERTISSEMENT! Risque de décharges électriques: lorsque le régulateur de puissance est mis sous tension, après avoir été éteint, attendre au moins une minute pour que les condensateurs internes se déchargent avant de commencer tout travail incluant le contact avec les connexions électriques ou les composants internes.

⚠ WARNHINWEIS! Stromschlaggefahr: Warten Sie nach dem Ausschalten des Leistungsstellers mindestens eine Minute, bis sich die internen Kondensatoren entladen haben, bevor Sie mit Arbeiten beginnen, die Sie mit den elektrischen Anschlüssen oder internen Komponenten in Kontakt kommen.

⚠ WARNING! The installation must be protected by electromagnetic circuit breakers or by fuses. The semiconductor fuses located inside the power controller are classified for UL as supplementary protection for semiconductor devices. They are not approved for branch circuit protection.

⚠ AVERTISSEMENT! L'installation doit être protégée par des disjoncteurs électromagnétiques ou des fusibles. Les fusibles pour semi-conducteurs situés a l'intérieur du régulateur de puissance sont classés UL comme protection supplémentaire pour les dispositifs pour semi-conducteurs. Ils ne sont pas approuvés pour la protection des circuits de dérivation.

⚠ WARNHINWEIS! Die Installation muss durch elektromagnetische Schutzschalter oder Sicherungen abgesichert sein. Die Halbleitersicherungen, die sich innerhalb des Leistungsstellers befinden, sind als zusätzlicher Schutz für Halbleitervorrichtungen für UL klassifiziert. Sie sind nicht für den Nebenstromkreisschutz (branch circuit protection) zugelassen.

⚠ CAUTION: Install an appropriately sized RC filter across contactor coils, relays and other inductive loads.

⚠ ATTENTION: Installer un filtre RC de dimensions appropriées sur les bobines du contacteur, les relais et autres charges par induction.

⚠ VORSICHT: Installieren Sie einen geeigneten RC-Filter an den Schützspulen, Relais und anderen induktiven Lasten.

⚠ CAUTION: The thyristor units here described have been designed for use with sinusoidal networks with nominal frequency 50-60 Hz. Any application with NON-SINUSOIDAL, distorted or disturbed networks could compromise the correct operation of the unit.

⚠ ATTENTION: Les unités de thyristors décrites ici ont été conçues pour être utilisées avec des réseaux NON SINUSOÏDAUX, déformés ou perturbés peut compromettre le bon fonctionnement de l'appareil.

⚠ VORSICHT: ACHTUNG: Die hier beschriebenen Thyristor-Einheiten sind für den Einsatz in Sinusnetzen mit einer Nennfrequenz von 50 bis 60 Hz ausgelegt. Jede Anwendung mit NICHT SINUSFÖRMIGER Wellenform, verzerrten oder gestörten Netzwerken kann den korrekten Betrieb des Geräts beeinträchtigen.

⚠ NOTE: The nominal current is specified for ambient temperatures at or below 40° C. Ensure the application design allows for adequate cooling of each power controller. The power controller must be mounted vertically. The cooling design must prevent air heated by one power controller from causing power controllers mounted above to exceed the ambient operating temperature limit. When power controllers are mounted side by side allow a minimum spacing of 15mm between them.

⚠ REMARQUE: Le courant nominal est précisé pour des températures ambiantes égales ou inférieures a 40°C. S'assurer que la conception de l'application permette le refroidissement adéquat de chaque régulateur de puissance. Le régulateur de puissance doit être monté verticalement. La conception de refroidissement doit empêcher l'air chauffé par le régulateur de puissance de dépasser la limite de température de fonctionnement ambiante de la part des régulateurs de puissance montés au-dessus. Lorsque les régulateurs de puissance sont montés côte a côte, il faut conserver un espacement minimal de 15 mm entre les deux.

⚠ HINWEIS! Der Nominalstrom ist für Umgebungstemperaturen von maximal 40 °C spezifiziert. Stellen Sie sicher, dass in Ihrer Anwendung eine ausreichende Kühlung für jeden Leistungssteller ermöglicht. Der Leistungssteller muss vertikal montiert werden. Das Kühlkonzept muss verhindern, dass die von einem Leistungssteller erwärmte Luft dazu führt, dass die darüber montierten Leistungssteller die zulässige Umgebungstemperatur überschreiten. Wenn Leistungssteller nebeneinander montiert werden, muss ein Mindestabstand von 15 mm eingehalten werden.

⚠ NOTE: Use only copper cables and wires rated for use at 90°C or greater.

⚠ REMARQUE: N'utiliser que des cables et des fils en cuivre pour l'utilisation a 90°C ou plus.

⚠ HINWEIS! Verwenden Sie nur Kupferkabel und Leitungen, die für den Gebrauch bei 90 °C oder höher ausgelegt sind.

1. Identification of the unit

⚠ Caution: Before to install, make sure that the Thyristor unit have not damages. If the product has a fault, please contact the dealer from which you purchased the product.

The identification's label give all the information regarding the factory settings of the Thyristor unit, this label is on the side of the unit. Verify that the product is the same thing as ordered.

Mod.: RS1120-45V800I2021
Ser NO.:050420-153762-001
50/2018 Made in Italy
PMA GmbH

2. Technical specifications

2.1 General features

Cover and Socket material:	PolymericV2
Utilization Category:	AC-51 AC-55b AC-56a
IP Code:	20
Method of Connecting:	Single Phase Load
Auxiliary voltage:	
Order code RS1_ _ _ -_1 = line voltage 100/120V voltage range 90:135V (8 VA Max)	
Order code RS1_ _ _ -_2 = line voltage 200/208/220/230/240V voltage range 180:265V (8 VA Max)	
Order code RS1_ _ _ -_3 = line voltage 277 voltage range 238:330V (8 VA Max)	
Order code RS1_ _ _ -_5 = line voltage 380/400/415/440/480V voltage range 342:528V (8 VA Max)	
Order code RS1_ _ _ -_6 = line voltage 600V voltage range 540:759V (8 VA Max)	
Order code RS1_ _ _ -_7 = line voltage 690V voltage range 540:759V (8 VA Max)	
Relay output for Heater Break Alarm (only with HB option):	0.5A a 125Vac

2.2 Input features

Analogic Input V:	0 ÷ 10Vdc impedance 15 K ohm
Analogic Input A:	4 ÷ 20mA impedance 100 ohm
POT:	10 K ohm min.
Digital Input:	4 ÷ 30Vdc 5mA Max (ON >4Vdc OFF <1Vdc) 3HZ Max duty cycle min. 100 ms

2.3 Output features (power device)

Current	Nominal Voltage range (Ue)	Repetitive peak reverse voltage (Uimp)		Latching current	Max peak one cycle	Leakage current	FUSE I2T value Suggested A2s (at500V)	Frequency range	Power loss Thyristor + Fuse	Isolation Voltage (Ui)
(A)	(V)	(480V)	(600V)	(mAeff)	(10 msec.) (A)	(mAeff)	tp=10msec	(Hz)	I=Inom (W)	Vac
300	24÷600	1200	1600	200	7800	15	73500	47÷70	443	3000
400	24÷600	1200	1600	200	7800	15	150500	47÷70	547	3000
500	24÷600	1200	1600	1000	17800	15	294000	47÷70	591	2500
600	24÷600	1200	1600	1000	17800	15	246400	47÷70	832	2500
700	24÷600	1200	1600	1000	17800	15	246400	47÷70	945	2500
800	24÷600	1200	1600	1000	15000	15	246400	47÷70	1144	2500

2.4 Fan Specification

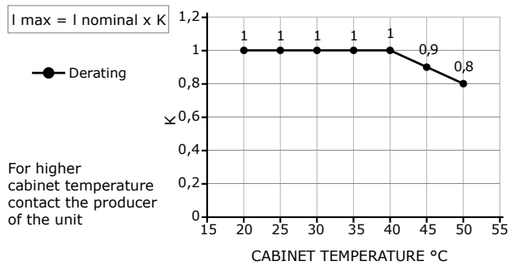
Supply	Size		Number of fans CE	Number of fans cULus
230Vac Standard	S12	300A, 400A, 500A, 600A	One Fan - 16W	Two Fans - (16W x 2) 32W
	S12	700A	Two Fans - (16W x 2) 32W	Two Fans - (16W x 2) 32W
	S15	800A	Two Fans - (16W x 2) 32W	Two Fans - (16W x 2) 32W

Refer to the complete manual for the optional versions of the fans (115 Vac / 24Vdc)

2.5 Environmental installation conditions

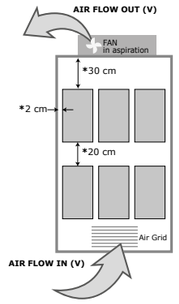
Ambient temperature	0-40°C (32-104°F) at nominal current. Over 40°C use the derating curve.
Storage temperature	-25°C to 70°C, -13°F to 158°F
Installation place	Don't install at direct sun light, where there are conductive dust, corrosive gas, vibration or water and also in salty environmental.
Altitude	Up to 1000 meter over sea level. For higher altitude reduce the nominal current of 2% for each 100m over 1000m
Humidity	From 5 to 95% without condense and ice
Pollution Level	Up to 2nd Level ref. IEC 60947-1 6.1.3.2

2.6 Derating Curve

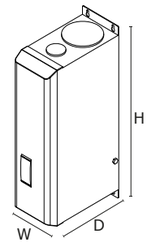


3. Installation

Before to install, make sure that the Thyristor unit have not damages.
If the product has a fault, please contact the dealer from which you purchased the product. Verify that the product is the same thing as ordered.
The Thyristor unit must be always mounted in vertical position to improve air cooling on heat-sink.
Maintain the minimum distances in vertical and in horizontal as represented.
When more unit has mounted inside the cabinet maintain the air circulation like represented in figure.
Sometimes is necessary installing a fan to have better air circulation.

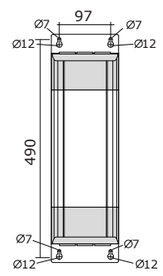


3.1 Dimensions and Fixing holes

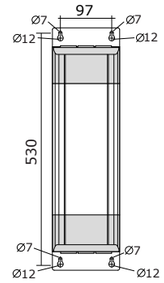


Size:	S12 (300-700A)	Size:	S15 (800A)
W (mm):	137	W (mm):	137
D (mm):	270	D (mm):	270
H (mm):	520	H (mm):	560
Weight (kg):	15	Weight (kg):	15

S12



S15



4. Wiring instructions

The Thyristor unit could be susceptible to interferences lost by near equipments or by the power supply, for this reason in accord to the fundamental practices rules is opportune take some precautions:

- The coil contactor, the relays and other inductive loads must be equipped with opportune RC filter.
- Use shielded bipolar cables for all the input and output signals.
- The signal cables must not be near and parallel to the power cables.
- Local regulations regarding electrical installation should be rigidly observed.

Use copper cables and wires rated for use at 75°C only.

4.1 Removing the cover

Instructions for open the thyristor unit

4.2 Line power and Load cable/bar dimensions and torque (suggested)

Current	Connector Type	Torque		Cable			Cable Terminal	Bar
		Lb-in	Nm	AWG	mm²	kcmil		
300A (S12)	Power field wiring Bus Bar with M10 screw	265	30.0	2 x 1/0	2 x 70	350	UL Listed (ZMVV) Copper Tube Crimp. Lug	Bus bar 30x5mm
400A (S12)	Power field wiring Bus Bar with M10 screw	265	30.0	2 x 3/0	2 x 95	600	UL Listed (ZMVV) Copper Tube Crimp. Lug	Bus bar 66x4mm
500A (S12)	Power field wiring Bus Bar with M10 screw	265	30.0	-	2 x 150	2x250 900	UL Listed (ZMVV) Copper Tube Crimp. Lug	Bus bar 66x6mm
600A (S12)	Power field wiring Bus Bar with M10 screw	265	30.0	-	2 x 185	2x350 1500	UL Listed (ZMVV) Copper Tube Crimp. Lug	Bus bar 66x6mm
700A (S12)	Power field wiring Bus Bar with M10 screw	265	30.0	-	2 x 300	2x500	UL Listed (ZMVV) Copper Tube Crimp. Lug	Bus bar 66x6mm
800A (S15)	Power field wiring Bus Bar with M10 screw	265	30.0	-	2 x 300	2x500	UL Listed (ZMVV) Copper Tube Crimp. Lug	Bus bar 66x6mm

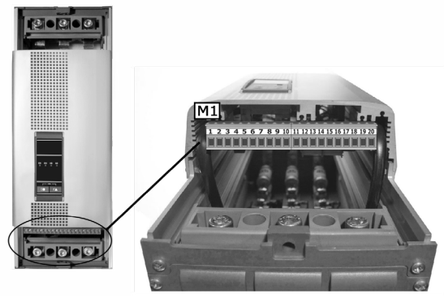
4.3 Cable dimensions (suggested) of Earth and of the Command Terminals

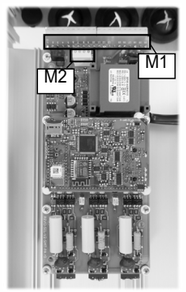
Current	Earth			Command Terminals	
	Cable		Screw	Cable	
	mm²	AWG	M	mm²	AWG
300A (S12)	50	1	M8	0,50	18
400A (S12)	50	1	M8	0,50	18
500A (S12)	70	1/0	M8	0,50	18
600A (S12)	70	1/0	M8	0,50	18
700A (S12)	70	1/0	M8	0,50	18
800A (S15)	70	1/0	M8	0,50	18

4.4 Terminals Positions

Open and flip the cover

⚠ Warning: Before connecting or disconnecting the unit check that power and control cables are isolated from voltage sources.





4.5 Power Terminals

Terminal	Description
L1	Line Input Phase 1
T1	Load Output Phase 1

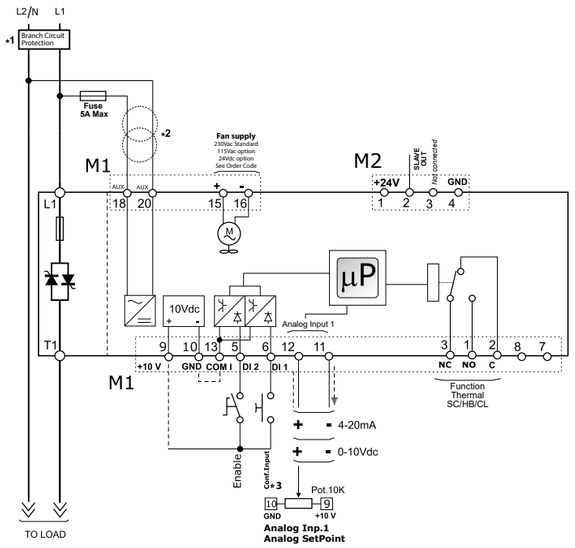
4.6 Control Terminals

Terminal M1	Description
1	NO - Normally Open contact alarm relay output (Thermal or SC/HB/CL)
2	C - Common contact alarm relay output
3	NC - Normally Close contact alarm relay output (Thermal or SC/HB/CL)
4	Not Connected
5	DI 2 – Enable Digital Input
6	DI 1 - Configurable Input
7	Not Connected
8	Not Connected
9	Output +10Vdc stabilized 1 mA MAX
10	0V GND
11	- Analog Input 1 (0-10Vdc/4-20mA Analog Setpoint)
12	+ Analog Input 1 (0-10Vdc/4-20mA Analog Setpoint)
13	COM I - Common Digital Input
14	Not Connected
15	Fan supply (230V Standard – 115 Option - for DC Fan Option +24Vdc)
16	Fan supply (230V Standard – 115 Option - for DC Fan Option -24Vdc)
17	Not Connected
18	Aux – Voltage Supply for electronic boards and synchronization (See order code for Value)
19	Not Connected
20	Aux – Voltage Supply for electronic boards and synchronization (See order code for Value)

Terminal M2	Description
1	24V Out Max 5mA
2	Slave Output
3	Not Connected
4	0V GND

4.7 Schematic

⚠ Caution: this procedure must be performed only by qualified persons.



NOTE:

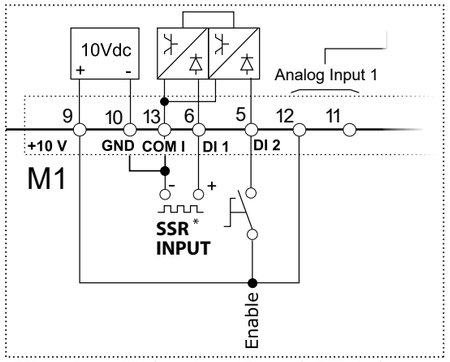
*1 The user installation must be protecting by electromagnetic circuit breaker or by fuse isolator.
The Fuse must be branch circuit protection. For UL any listed UL branch circuit fuse would be acceptable as an external fuse, following national electric code guide for resistive heating of 125% load current rating to protect external wires.

*2 The auxiliary voltage supply of the Revo S unit must be synchronized with load voltage power supply. If the Auxiliary Voltage (written on the identification label) is different from Supply Voltage (to the load), use an external transformer as designated.

*3 For SSR input connection follow next schematic.

4.7.1 SSR Control Input schematic

For SSR input use follow the schematic below and configure Digital Input 1 as Fast Enable.

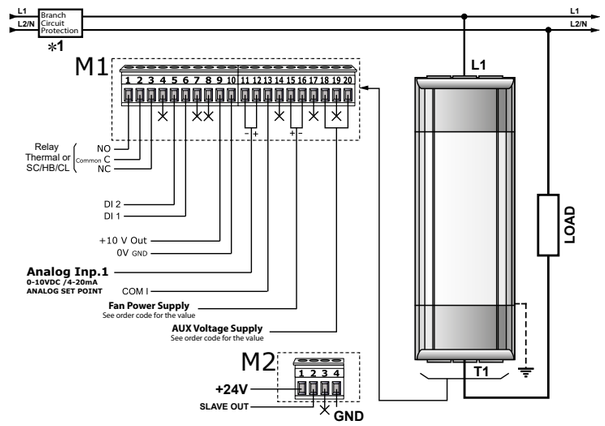


* SSR Input: 4 ÷ 30Vdc 5mA Max (ON >4Vdc OFF <1Vdc)
3HZ Max on time min. 100 ms

* SSR Input:
4 ÷ 30Vdc 5mA Max (ON >4Vdc OFF <1Vdc)
3HZ Max on time min. 100 ms

4.8 Connection Diagram for Single-phase

⚠ Caution: this procedure must be performed only by qualified persons.



Note: Aux Voltage and Load Voltage must be synchronized

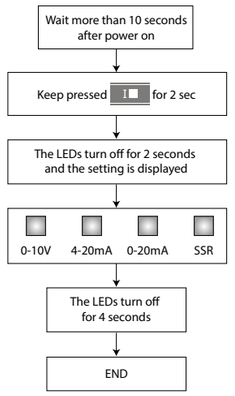
X = not connected

*1 The user installation must be protecting by electromagnetic circuit breaker or by fuse isolator. The Fuse must be branch circuit protection. For UL any listed UL branch circuit fuse would be accettable as an external fuse, following national electric code guide for resistive heating of 125% load current rating to protect external wires.

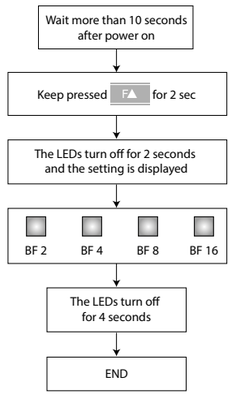
5. Led status and alarm

LED	STATUS	DESCRIPTION
EN	LED flashing	Waiting for Enable Signal
	LED ON	Enable Signal to terminal
ON	LED OFF	Load is NOT powered
	LED ON	Load is powered
SC	LED OFF	Load OK
	LED ON	SCR short circuit (only with HB option)
	LED Flashing	Enable contact open or Over temperature on heat sink
HB	LED OFF	Load OK
	LED ON	Load Fault (only with HB option)

Input type informations



Burst Firing informations

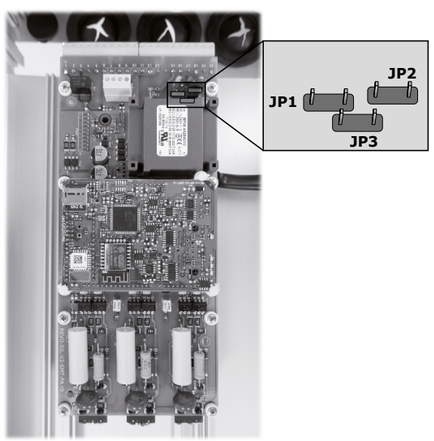


6. Supply the electronic board

The REVO S thyristor unit, to work, requires a voltage supply for the electronic boards. The Max consumption is 8VA. The voltage supply for the electronic boards is configured in line with customer requirements that are defined in the Order Code. The Order Code is written on the identification label.

⚠ Warning: Before connecting or disconnecting the unit check that power and control cables are isolated from voltage sources.

Terminal M1	Description
18	Voltage Supply for Electronic Boards (Auxiliary Voltage)
19	Not Used
20	Voltage Supply for Electronic Boards (Auxiliary Voltage)



To change auxiliary supply voltage sold the correct link-jumper on REVO S board, the type of mounted transformer depends of the chosen Voltage in the order code.

Order Code	As ordered		Change to	
	Jumper JP1 + JP2 are linked		Link only Jumper JP3	
	Transformer range	Line voltage	Transformer range	Line voltage
RS1_ _ _-_1	90:135V	100/120V	180:265V	200/208/220/ 230/240V
RS1_ _ _-_2	180:265V	200/208/220/ 230/240V	342:528V	380/400/415/ 440/480V
RS1_ _ _-_3	238:330V	277V	540:759V	600/690V
	Only Jumper 3 is linked		Link Jumper JP1 + JP2	
RS1_ _ _-_5	342:528V	380/400/415/ 440/480V	180:265V	200/208/220/ 230/240V
RS1_ _ _-_6	540:759V	600V	238:330V	277V
RS1_ _ _-_7	540:759V	690V	238:330V	277V

If the Auxiliary Voltage (written on the identification label) is different from Supply Voltage (to the load), use an external transformer with primary equal to load voltage and secondary equal to the Auxiliary Voltage.

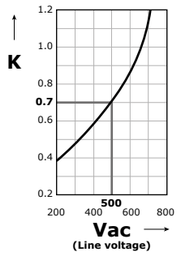
Attention! never link all the jumpers JP1+JP2+JP3 at the same time or JP3 + any other jumper, JP3 must be always alone, follow only the configuration shown.

7. Internal Fuse

The thyristor unit have internal fuse extrarapid at low I²t for the thyristor protection of against the short-circuits.
The Fuses must have I²t 20% less than thyristor's I²t. The warranty of thyristor is null if no proper fuses are used.

Size	200 kARMS Symmetrical A.I.C.					Qty
	Fuse CODE	Current (A RMS)	FUSE I²T value Suggested A2s (at500V)*	FUSE I²T value Suggested A2s (at660V)	Vac	
300A (S12)	FM350	350	73500	105000	660	1
400A (S12)	FMM550	550	150500	215000	660	1
500A (S12)	FMM700	700	294000	420000	660	1
600A (S12)	4x 20 559 20.250	4 x 250	246400	352000	660	1
700A (S12)	4x 20 559 20.250	4 x 250	246400	352000	660	1
800A (S15)	4x 20 559 20.250	4 x 250	246400	352000	660	1

*I2T are multiplied for K value in function of Vac at 500V K is equal to 0,7 (ex:105000 X 0,7 = 73500).
At 660Vac K is equal to 1.



Fuses replacement

Open the cover and remove the screws, then replace it with the correct fuse, use the screws with a proper suggested torque indicated below.

Type	Screw	Torque Lb-in (N-m)
300-800A	M8	133.7 (15.0)

⚠ Caution: High speed fuses are used only for the thyristor protection and can not be used to protect the installation.

⚠ Caution: The warranty of thyristor is null if no proper fuses are used. See tab.

⚠ Warning: When it is supply, the Thyristor unit is subject to dangerous voltage, don't open the Fuse-holder module and don't touch the electric equipments.

DOWNLOAD THE FULL MANUAL FROM: www.west-cs.co.uk

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