

Technical Specifications

# Master Switch STS

32/63/120 A TWO-POLE SINGLE PHASE





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## 1. SCOPE

This specification covers all aspects of the **MASTER SWITCH** automatic static transfer switch (STS), this device enables automatic or manual transfer between two AC power supply sources, ensuring a transfer time of less than a ¼ of one cycle.

The use of **MASTER SWITCH** static transfer switches within an electrical distribution system provides a means of secure protection against any potential disruption of the power supply, due to interruptions of the supply source or failure of the distribution lines caused by environmental phenomena or human error.

For further information with regards to other power related products visit: [www.riello-ups.com](http://www.riello-ups.com).

## 2. DESCRIPTION OF THE SYSTEM

**MASTER SWITCH** enables the transfer without interruption, via automatic or a manual command of one or more critical load from one single-phase power source to a second single-phase power source and vice versa.

The system constantly monitors the two power supply sources; and each time the supply source that is powering the load exceeds the predefined limits (user-defined), the load is automatically transferred onto the alternative power source. The STS continuously monitors the status of the power supply sources but does not interact in any way with them to modify their fundamental parameters.

Main Characteristics:

- LEDs and Display indication panel
- Mechanical Manual Bypass for maintenance
- HOT SWAP function (all models)
- Settable parameters by software and by user panel
- Communication ports: RS232 (RPS Protocol)
- Expansion slot (RPS protocol) alternative to RS232
- Isolate dry contacts
- EPO

## 3. APPLICABLE STANDARDS

The Company's quality system is certified ISO 9001/2000 (Certificate No. CERT-04674-99-AQ-VEN-SINCERT) and covers all procedures, operating methods, and controls from design through to production and sales. This certification represents a guarantee for each customer that covers:

- use of quality materials
- rigorous accuracy during production and testing
- continuous customer support

In addition to company certification, this product also complies with the following provisions that relate to UPS devices:

**European Directives:**

### **LVD directive 2014/35/EU**

The LVD covers all health and safety risks of electrical equipment operating with a voltage between 50 and 1000 V for alternating current and between 75 and 1500 V for direct current.

### **EMC directive 2014/30/EU**

The EMC Directive **limits electromagnetic emissions from equipment**; The Directive **also governs the immunity of such equipment to interferences**.

This product is manufactured according to the latest revisions of the following standards and specifications.

- **EN 62310-1** Static Transfer System (STS): General and Safety requirements
- **EN 62310-2** Static Transfer System (STS): Electromagnetic Compatibility (EMC) requirements.  
According with that standard the electric strength test is carry out apply 2000Vac / 2700Vdc.
- **EN 62310-3** Static Transfer System (STS): Method of specifying the performance and test requirements

The unit satisfies the requirements laid down in the following standard: **EN 62310-2**

**EMC CERTIFICATIONS:**

EMI	Conducted Emission	EN 62310-2 Category C3 (according to CISPR22)
	Radiated Emission	EN 62310-2 Category C3 (according to CISPR22)
	ESD (Electro Statically Discharge)	EN 62310-2 (according to EN61000-4-2)
EMS	R/F (Radiated Fields)	EN 62310-2 (according to EN61000-4-3)
	EFT (Fast Transient - burst)	EN 62310-2 (according to EN61000-4-4)
	SURGE	EN 62310-2 (according to EN61000-4-5)
	HARMONIC	EN 62310-2 Category C3 (according to EN61000-3-2)

#### 4. APPLICATIONS

The STS or **MASTER SWITCH** is configured for two independent power supply sources, these being: the PREFERRED SOURCE (PS) and the ALTERNATIVE SOURCE (AS).

During normal operating conditions the MASTER SWITCH powers the load by means of the PS and guarantees continuous power supply by means of the microprocessor that controls the static switch.

- In the event of a disruption or irregularities occurring on the PS the load is transferred to the AS and therefore once the PS returns to normal the load is automatically switched back to the PS (a configurable function)
- In the case of a short circuit in the output, the MASTER SWITCH will block transfer to the other source, thus eliminating the risk of spreading the short circuit and its negative effects to other applications or supplies

INSTALLATION TYPE	OPERATION DESCRIPTION
	<p>MASTER SWITCH in</p> <p><b>REDUNDANT</b> Mode</p> <p>The reliable secondary source [AS] will power the load only and exclusively when the primary source (PS) fails, so as to guarantee maximum redundancy and quality of the power supply to the loads.</p>
	<p>MASTER SWITCH in</p> <p><b>CROSS FEEDING</b> Mode</p> <p>The two sources power a number of critical loads using the MASTER SWITCHES configured in such a way as to make one of the two power sources the priority source (PS). In cases of power faults or failure on one of the two sources, the other one will be able to supply power to all the loads connected to the system.</p>
	<p>MASTER SWITCH in</p> <p><b>BACK UP</b> Mode</p> <p>MASTER SWITCH powers a number of loads using the priority source (PS). The secondary source (AS) is formed by independent and separate sources which can supply standby power should the priority source (PS) fail suddenly</p>

## 5. DESCRIPTION OF STS COMPONENTS

### 5.1 Sources

Both sources are continuously monitored for:

- Voltage
- Frequency
- Sync between the two sources (not controlled by the STS)

The user can define which of the two incoming supply sources is to be the preferred source (PS) or the alternative source (AS).

### 5.2 Control and diagnosis

MASTER SWITCH operations are completely controlled by the microprocessor logic, thus guaranteeing safety and speed in switching operations. The LEDs and the display panel rapidly provide intuitive information with regards to the status of the system, alarms, history events logging and all measured values during operation.

### 5.3 Static switch

- Each source is connected to the output line by means of its static switch assembly which must be sized for the rated value specified on the STS label and is equipped with an internal thermal sensor, which will alert the user by means of a dedicated alarm on the display panel should it exceed the established limit
- STS is also provided with a manual bypass for maintenance switch in order to completely isolate the system for maintenance or electronic subassembly replacement (**Hot Swap** function)
- Both sources are protected by an MCB switch which is intended to intervene and to protect its associated static switch according with overload protection control
  - 1) in the event of sudden overloads due to short circuits (magnetic function)
  - 2) in the event of extended overloads (thermal function)
- In the event that the static switch interrupts the supply of power due to a failure of the component itself (open SCR) or the driver circuit, the control logic will automatically transfer the load to the other available source and block the return to the original source, whilst at the same time generate a ("XFER INHIBIT") alarm on the display panel
- **MASTER SWITCH** include standard built-in **back-feed protection**. This control makes it possible to detect simultaneous circulation of power on both sources following malfunctioning of the static switch in the stand by one (the one that is not supplying the critical load). In the event of back-feed of energy to one of the two input sources, the load is transferred to that source. At the same time, the control logic activates the protection inhibiting any transfer to the source that is not supplying the load anymore generating an alarm (A29/A30) on the display
- The back-feed protection device is compliant with standard **IEC 62310**.

### 5.4 Output stage

The system is equipped with rapid and precise control of the output voltage/current in order to:

- Monitor the output voltage continuously and control the transfer to the other source should the voltage exceed the predefined limits
- Identify an output short circuit and block the transfer of the load to the alternative source. Any protective devices located downstream of the STS must be configured to isolate the short circuit. Sizing/co-ordination of such devices must be accurately calculated with respect to the type of equipment and the selection criteria.

### 5.5 Internal power supply devices

The power supply for the internal circuits has been designed using a redundant architecture so that even in the event of a failure of one of the power supplies, power will continue to be provided to the internal circuits without interruption and therefore with not disruptions for the STS operations.

## 5.6 Switches and protection

### 2-POLE

MODEL	SW1/SW2	MB-1/MB-2
MMS 32	MCB 032A -2p C curve	32A -2p
MMS 63	MCB 063A -2p C curve	63A -2p
MMS 120	MCB 120A -2p C curve	126A -2p

## 6. OPERATING MODES

### 6.1 Description of general functions

The static transfer system (STS) is used to continuously power critical loads from 2 separate sources of alternating current (source 1 and source 2), thus guaranteeing a redundant power supply without having to shut down the critical load connected to output. The static transfer switch (STS) is a device that enables the transfer of one or more critical electrical loads from a single phase power supply source (source 1) to a second single phase power supply source (source 2) and vice versa. The transfer takes place without any interruption of power to the load and may be automatic or manually controlled (via a user command).

The system constantly monitors the 2 power supply sources; each time the line powering the load goes out of the correct tolerance range (service-definable), the load is automatically transferred onto the alternative (secondary) power source. One of the two input sources may be set as the preferred, or priority source. This is the source to which the STS will transfer the load each time the parameters of this source fall within a window of acceptable values.

If the preferred source that is powering the load is considered to be out of this range, the STS transfers the load onto the alternative power source. If the preferred source subsequently returns to the accepted tolerance range, the STS then transfers the load back onto the preferred source.

In order to keep transfers between the two sources as a minimum, the re-transfer onto the preferred source when it returns within the accepted tolerance range can be inhibited, with the load being powered from the alternative power source for as long as this source is considered to be good.

The STS allows switching between two independent AC sources, in both synchronous and asynchronous source conditions. When the two lines are synchronous, the load is transferred from one source to the other within 4 msec following the line fault. With two asynchronous lines, the transfer can take place in various ways which can be set by the user.

The acceptable phase angle difference between the two lines for synchronous transfers can be selected by the authorized personnel (the predefined value is 20°, equivalent to 1.11 msec. for 50 Hz).

For the whole family of Static Switches, transfer of the load from one source to the other uses BREAK-BEFORE-MAKE mode, which ensures that the two sources are never parallel-connected.

These STS are 2-poles models. The neutral conductor is also switched between the neutrals of two sources.

The load can be transferred from one power supply source to the other manually by the user with the appropriate command given via the mimic panel.

The use of STSs in an energy distribution system thus provides secure protection against potential interference in the source powering the load or even any power failures that may occur along the line.

To provide maximum reliability all models are equipped with a mechanical manual bypass switch for maintenance purpose. Additionally **hot swap** function is included on all models (32, 63,120 Amp version) so that following a manual bypass operation the electronic part can be easily and quickly replaced granting business continuity anyway.

### 6.2 Automatic Transfer Mode

#### Synchronous sources

The STS constantly monitors the voltage and frequency of both input supply sources.

If the supply source powering the load exceeds the predefined voltage or frequency tolerances, the STS automatically transfers the load onto the alternative power source within an interval of approx. 4 msec.; the transfer is always carried using the method " **0-curr** " (**zero current mode**).



## Asynchronous Sources

In this case transfer can be executed in one of three user-defined modes:

- a) **NSYNC.TR:0-curr (zero current mode):** the transfer is executed at the instant when output current is at zero. This guarantees that there is no overlapping of power between the two sources and the maximum duration of the transfer is approx. 10 msec.
- b) **NSYNC.TR:DELAY (delay time mode):** the transfer takes place after a delay that can be configured by the, authorized personnel (default value is 24 msec) during this period the load is not powered
- c) **NSYNC.TR:DISABLE (disable mode):** the transfer is inhibit for asynchronous supply sources

### 6.3 Manual Transfer Mode

Manual transfer can be initiated from the LCD display/control panel.

The user can select between two modes of manual transfer:

- 1) **transfer with zero current (zero current mode):** this transfer is executed when the output current phase is at zero; the transfer interval is approx. 2 msec.
- 2) **swift transfer (Swift transfer mode):** on activation of a manual transfer, the STS monitors the two sources for 30 seconds. If within this period the two sources are in phase with one other, the STS transfers the load in sync using the **zero-current** method. If during this period the two sources are never in sync, no switching takes place and the command has to be given again and will again be active for a further interval of 30 seconds.

### 6.4 Re-transfer Mode

Re-transfer mode refers to the switching of the power supply back to the preferred source (PS) following a temporary transfer of the load to the alternative source (AS).

The re-transfer mode can be enabled, or disabled, (R-XFER ON/OFF) by the user and can also be delayed, with respect to the time when the PS returns within the predefined voltage and frequency window limits, by 3 to 127 seconds. (“**D.R-EFER**”)

## Synchronous sources

If the user identifies one of the two sources as PS, the LED that corresponds to the selected source lights (L1 or L2 on the mimic panel). The selected preferred source will power the load continuously, provided it remains within the predefined tolerance limits.

A failure or disruption of the PS will trigger transfer of the load to the AS. If Re-transfer is enabled, when the parameters of the preferred source return to normal, the load will automatically be transferred back to the preferred source after the configured delay. (“**D.R-EFER**”)

Re-transfer will be executed in **zero current** mode, that is when the load phase is at zero, and in any case with an interval of less than one quarter of a cycle (typically 4 msec).

## Asynchronous Sources

If the two sources are *asynchronous*, the user can define the mode of Re-transfer back to the preferred source:

- 1) **RET.MOD: 0-curr (zero current mode):** re-transfer is performed only when the phase of the load current is at zero
- 2) **RET.MOD: WAIT SYNC (wait synchron mode):** the STS will wait until the two sources are in sync (for 30 seconds continuously at least) and then execute the re-transfer. It is possible that the two sources are never in sync, effectively excluding any re-transfer
- 3) **RET.MOD: DELAY (delay time mode):** the re-transfer takes place after a delay that can be set by the authorized personnel (default value is 24 msec.) during this period the load is not powered
- 4) **RET.MOD: SWIFT (swift mode):** the STS will transfer the load back automatically to the preferred source at the instant when the two sources are in sync within an interval of 30 seconds. If this does not occur, the load is not transferred back to the PS.

## 6.5 Operating modes and ambient conditions

**MASTER SWITCH** has been designed to guarantee uninterrupted power supply even in the presence of critical ambient conditions such as:

### 6.5.1 Overload:

**MASTER SWITCH** can operate with an overload of up to 100% of the rated value; for greater loads the overload control can be enabled or disabled:

- *Enabled:*

Overload capacity	Alarm display type	Action
101-150%	Overload	STS will block the output after 60 seconds
151-200%	Overload	STS will block the output after 10 seconds
>200%	Short circuit	STS will block the output after 250 milliseconds

- *Disabled:*

An “overload inhibit” message will appear on the display. The internal logic will not activate the STS command to block the output; therefore all protection is entrusted to the MCCB switch at the input of each supply source to the STS or to the electrical system protection downstream from the static switch.

### 6.5.2 Overheating:

**MASTER SWITCH** can function without interruption in conditions of ambient temperature of up to 40°C; Internal ventilation provides adequate heat dissipation.

If the ambient temperature exceeds 40°C, or the ventilation of the STS is interrupted, when critical parts reach 75°C the **MASTER SWITCH** will trigger internal protection and alert the user (“Overtemp” alarm); the STS is equipped with an internal second level protection which will interrupt the supply to the load as soon as the environment conditions become critical for the correct/safe operation of the STS.

### 6.5.3 Short circuit in output:

The presence of a short circuit in the STS output will alter the voltage waveform of the power source. Despite this **MASTER SWITCH**, detecting immediately short circuit in the STS output, inhibits the transferring of the load to the secondary source. This prevents transferring the short circuit and its negative effects to the other source that could normally be supplying other applications. Thus the STS will continue to power the short circuit until one of the following conditions occurs:

- 1) The upstream source has the capacity to clear the fault
- 2) The MCB protection on board the STS is triggered
- 3) The downstream protection is triggered
- 4) The STS control detect short circuit turning off Thyristors (within 10 ms)

The installer must co-ordinate the distribution downstream of the STS correctly, that is in accordance with selective criteria, in order to facilitate co-ordinated operation of the protective devices. In this way, a short circuit in the STS output will systematically trigger any downstream protection and not the upstream, avoiding to disrupt the power supply to the other applications connected to the same power supply.

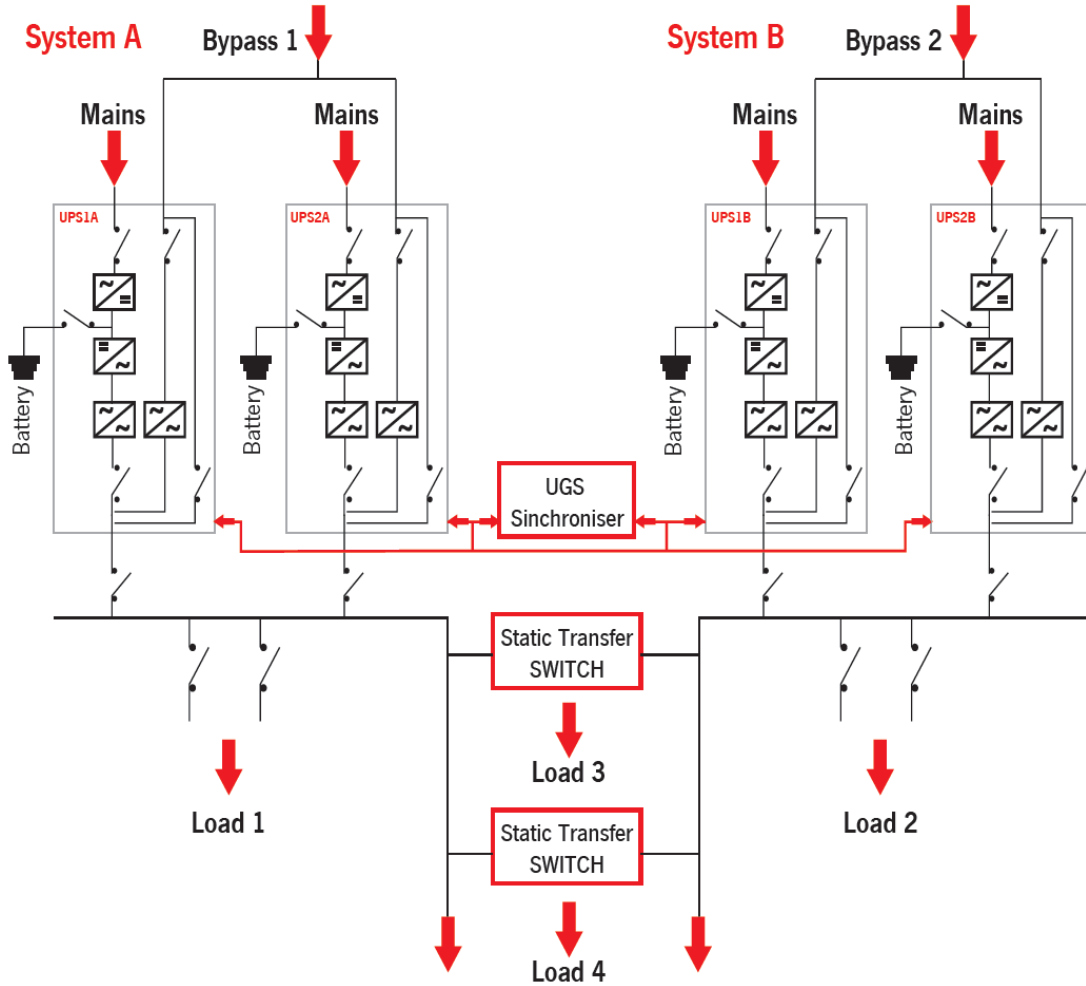
### 6.5.4 Synchronism of the sources:

**The two sources that power MASTER SWITCH** are completely independent of each other and the STS does not take any action that would modify their characteristics (voltage, frequency or synchronisation).

Whenever the parameters of the two sources do not permit synchronised switching between them **MASTER SWITCH** will adopt one of the various modes described before.

Whenever the incoming supply sources are derived from two UPS systems (either single or parallel installation), the UPS systems will guarantee synchronisation between the two sources. If the user wishes to exclude asynchronous switching of any kind between the supply sources, they must use UPS that guarantee synchronised outputs.

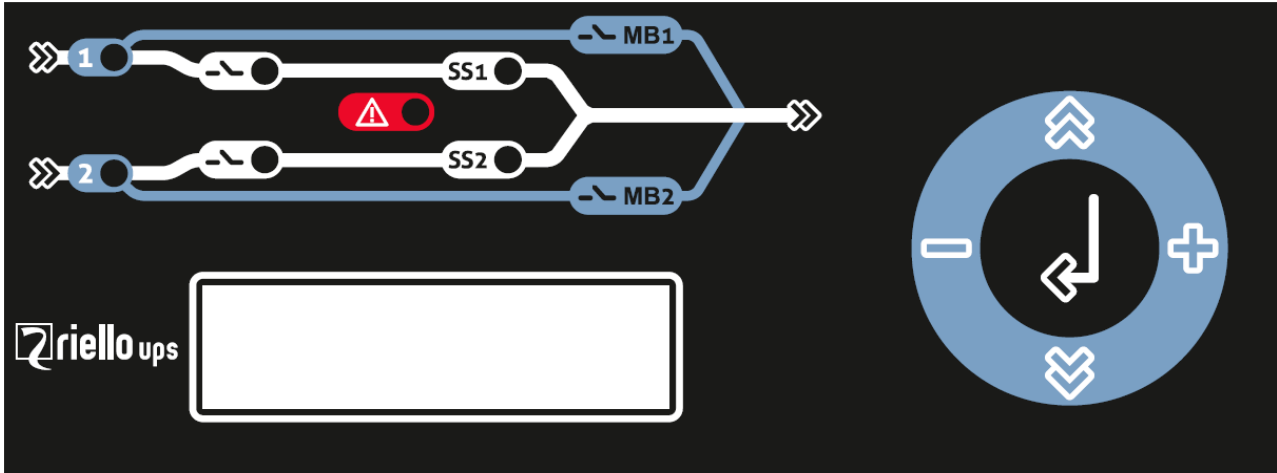
Appropriately configured Riello UPS units can be used to guarantee the synchronisation between their outputs and other UPS units (even those of other manufacturers) or other independent power supply sources (generators or other independent networks), thanks to the **UGS** (Unit Group Synchroniser) function integrated within the UPS (according with model type). Thanks to this provision, in the event of a failure of the bypass supply will synchronise the UPS output with another external and independent power source.



## 7. CONTROL PANEL






### 7.1 LED panel and keys

The control panel is composed of an LCD display of 16x2 characters, 8 LED indicators and 5 input keys.



L1	Source1 preferred lamp	(Yellow LED)	On : source 1 is the preferred source Off : source 1 is the alternate source
L2	Source2 preferred lamp	(Yellow LED)	On : source 2 is the preferred source Off : source 2 is the alternate source
L3	Source1 input monitor lamp	(Green LED)	On : source 1 input is OK Off : source 1 input failed
L4	Source2 input monitor lamp	(Green LED)	On : source 2 input is OK Off : source 2 input failed
L5	Source1 static switch on lamp	(Green LED)	On : SS1 SCRs turned on Off : SS1 SCRs turned off
L6	Source2 static switch on lamp	(Green LED)	On : SS2 SCRs turned on Off : SS2 SCRs turned off
L7	Alarm monitoring lamp	(Red LED)	Flashing : an alarm has occurred Off : there is no alarm on the STS

#### KEYBOARD:

-  ENTER : key used to confirm a selection or enter the submenus
-  ARROW UP : key used to scroll up the menus
-  ARROW DOWN : key used to scroll down the menus
-  PLUS : Increases the currently monitored data
-  MINUS : Decreases the currently monitored data

## 7.2 LCD Display

The messages on the backlit LCD display (2 lines of 16 characters) are available in Italian and English.

The graphical display, in conjunction with the LED flow diagram provides a close-up, uninterrupted and real-time view of STS status. Directly from the control panel the user can switch over S1/S2, view the electrical parameters of both the input and output supplies and can also be used to configure the STS. The 10 main menus are as described below.

### 1- STATUS MENU:

Area of the display where the information regarding the general status of the STS is provided:

- Preferred source powering the load
- Alternative source powering the load
- Manual switching has been carried out
- Load powered by the S1 source via the by-pass switch
- Load powered by the S2 source via the by-pass switch
- No output from the STS
- Emergency Power OFF command has been activated
- Output supply is inhibited due to extended overload

### 2- INDICATORS MENU:

Main area of the display used to present the UPS operational values (updated in real time):

- S1/S2 input voltage and frequency (single phase)
- S1/S2 input phase shift (value in degrees)
- Output current (absolute and percentage values for the single phase)
- STS internal heat sink temperature
- STS Internal power supply status

### 3- COMMANDS MENU:

This menu, together with the 5 command keys, makes it possible to enable switching between the S1/S2 sources, and also to access auxiliary functions:

- Manual switching between the S1/S2 sources
- Enable (disable) the alarm buzzer
- Test the 3 volt-free alarm contacts
- Test the LEDs of the mimic panel
- Reset the power supply inhibit to the load ("Inhibit reset")

### 4- ALARMS MENU:

Displays the logged events (in chronological order) caused by ambient conditions outside the tolerance limits (voltage, high temperature, overloads, etc.) or internal failures.

The event log will save the last 127 events, each of which is a snapshot (date/time) of the alarms.

The event log can be viewed on the graphic display by means of the arrow keys.

It is also possible to download the event log in word format by means of the "STS Manager" software provided to service personnel.

### 5- OPTIONS MENU:

This menu makes it possible to personalise the STS functions in accordance with the customer's requirements, the type and critical importance of supported applications and also ambient conditions.

A User Password that the customer can modify through the specific menu ensures protection of the system.

MASTER SWITCH is delivered with a default User Password, this being "0000".

The configuration and personalisation options are listed below.

Personalised configuration of the STS:

PARAMETERS	ACRONYM	CONFIGURATIONS	DEFAULT PARAMETERS
Preferred source selection	PREFERRED	S1 / S2	S1
Re-transfer enable	R-XFER	ON / OFF	ON
Re-transfer delay	D.R-XFER	From 03 to 127 seconds	03 sec
Overload control	OVLOAD	Enable Disable	Enable
Display alarm hold time	AL HOLD	From 02 to 64 seconds	02 sec
Asynchronous transfer mode	NSYNC. TR	Disable Zero current Zero Current + delay	Zero current
Overload Reset	OVL. RESET	Auto Manual	Auto
Output inhibit reset	INH. RESET	Auto Manual	Manual
Remote access	REMOTE	ON / OFF	ON
Re-transfer mode	RET. MOD (Non synchro)	Zero current Delay Wait synchron Swift	Swift
SCR not conducting	SCR ALARM	Enable Disable	ON
Manual mode transfer	MAN.XFER	Zero current Swift	Swift
Transfer mode with both sources out of limits	XFER ACTION	Shut( Output switch OFF) Stay (Keep load on PS)	Stay
Display languages	LANGUAGE	English Italian	English

#### 6- TIME/DATE MENU:

This menu, together with the 5 command keys, can be used to set the date and time used by the event log.

#### 7- INFO MENU:

This menu provides information with regards to the status of the RS232 serial communications with the outside and the control software version.

#### 8- ADJUST MENU:

This menu, together with the 5 command keys, makes it possible to vary the configuration and define certain parameters for alarm thresholds and calibration of measurement values.

A Service Password protects this area. Only specialised technicians who have been authorised to do so can access the menu and change the password.

#### 9- SERVICE PASSWORD:

This menu provides access to ADJUST menus, and makes it possible to modify the access passwords.

#### 10- USER PASSWORD:

This menu provides access to the OPTIONS menu, and makes it possible to modify the access password. The default password is: "0000".

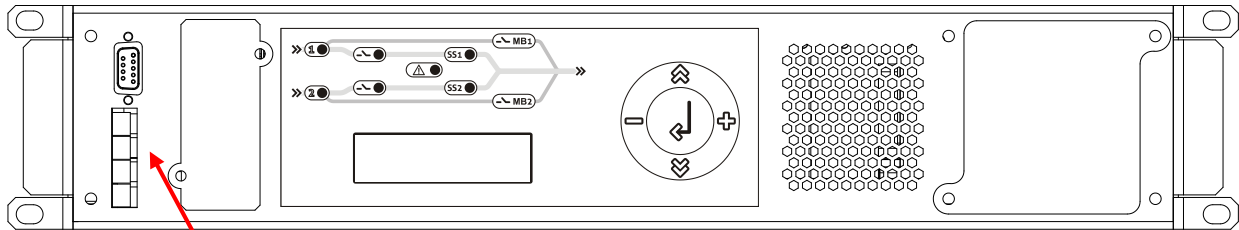
**PS: For a detailed list of configurations and available parameters see the MASTER SWITCH operating manual.**

## 8. COMMUNICATIONS

**MASTER SWITCH** is equipped with three levels of communication; these are positioned on the front of the system for remote control of the STS.

### 8.1 Voltage-free contacts:

STS is equipped with three voltage-free relay outputs (all of them programmable), normally open (NO). The relay contacts are connected via a screw-type terminal connector where the connection wires can be terminated. User can draw 1 Ampere maximum from dry contact @ 24VDC (or 48VAC) maximum voltage.

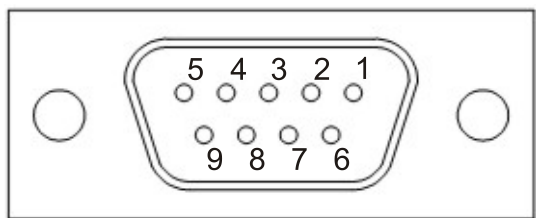


RELAY	FUNCTION
Relay 1	Programmable (ADJUST MENU:default set-up A1: S1 NOT OK)
Relay 2	Programmable (ADJUST MENU:default set-up A2: S2 NOT OK)
Relay 3	Programmable (ADJUST MENU:default set-up COMMON ALARM)
INPUT CONTACT	
Emergency Power OFF	If the user presses the external emergency stop switch for more than 2 seconds the STS shutdowns the output (NC contact)

### 8.2 232 Serial communications port:

The connection with the RS232 serial interface is made via a DB-9 connector on the front panel. To connect the STS with a PC using the RS232 it is necessary to use the 1,5-metres pin-to-pin cable provided with the STS.

**RS232 CONNECTOR**



PIN #	NAME	TYPE	SIGNAL
1			
2	TX	OUT	Serial line TX
3	RX	IN	Serial line RX
4			
5	GND	POWER	
6			
7			
8			
9			

## 9. OPTIONS

### 9.1 Communication Slot

The STS is equipped with an expansion slot for accessory communication boards, enabling the equipment to communicate using the main communication standards. Some examples:

- Serial duplicator
- Ethernet agent with TCP/IP, HTTP and SNMP protocol
- JBUS / MODBUS protocol converter

### 9.2 Remote Monitoring

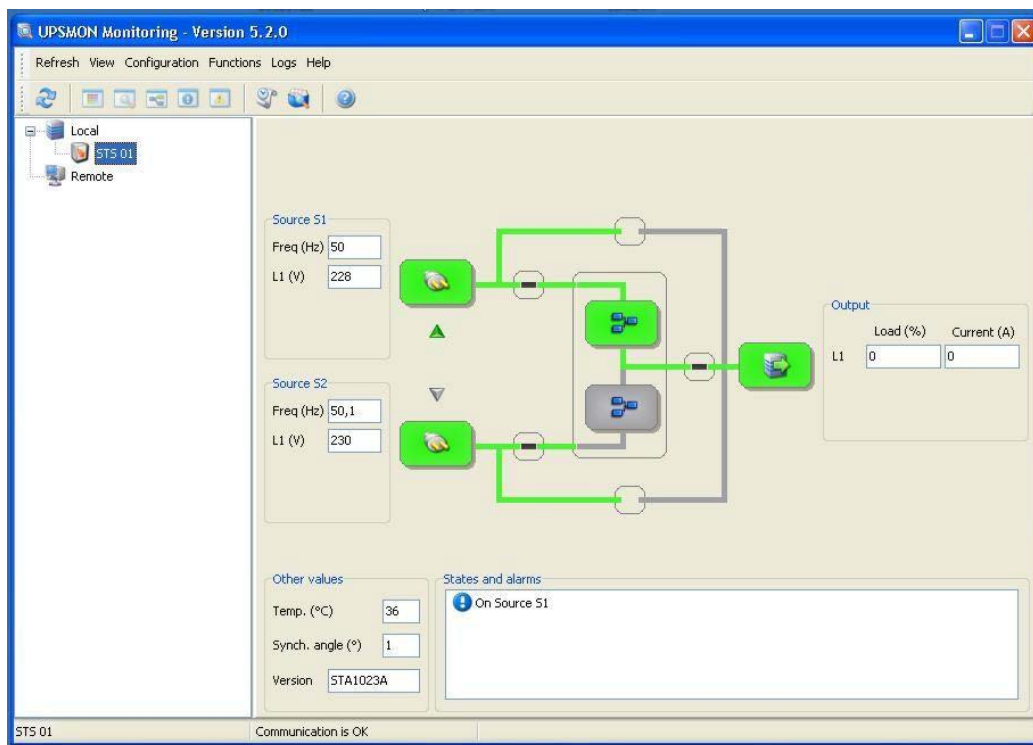
#### 1- "POWERSHIELD<sup>3</sup>":

Both "NETMAN 102" and RS232 ports allow the interfacing with the proprietary remote monitoring software, "POWERSHIELD<sup>3</sup>" supplied together with the STS on a CD ROM.

"POWERSHIELD<sup>3</sup>" makes it possible to view, from a remote location, the status of the STS by means of a graphical representation of the status of the various switches and of the power supply to the applications through S1 and S2. The same screen graphics include the voltage/frequency readings of the two sources, their phase shift, output current, load percentage and internal temperature of the static switch.

This tool also makes it possible to display and save the specific file with the events log.

For further information see the **MASTER SWITCH** operating manual.



#### 2- "SERVICE TOOLS":

The RS232 standard serial port makes it possible for specialised technical service staff, if authorised, to connect up locally via PC to activate the STS control and monitoring module program. This tool also makes it possible:

- To conduct the same configuration activities by means of the **configuration menus** (ADJUST MENU and OPTIONS MENU)
- To send the commands to transfer the load from one source to another, to silence the alarm buzzer and to interrupt the power supply.



## 10. TECHNICAL DATA SHEET 32-120 A

Item	STS Range (current per phase) [A]		
	MMS 32	MMS 63	MMS 120
Dimensions [mm]			
• Width	19"		
• Depth	590		
• Height	2U		
Net Weight [Kg] (Gross Weight) [Kg]	12 (14)	13 (15)	20 (24)
Cables Inlet	Clip-on terminals (L + N + PE)		
Colour	RAL 9005 (black)		
Mechanical Arrangement	19" rack type		
IP Protection Level	IP20		

Electrical specification	STS Range (current per phase) [A]		
	MMS 32	MMS 63	MMS 120
Input voltage range (S1/S2) (Ph-N)	180-264 (Vac)		
Maximum input voltage distortion	15%		
Nominal frequency	50 or 60 Hz (Setting)		
Input frequency tolerance (operation range)	46-64 Hz (upper and lower limits adjustable)		
Input switched phases	Ph+N (two pole)		
Distribution network compatibility	IT, TT, TNS		
Transfer type	"Break Before Make" (NO sources overlapping)		
Transfer methods available	Automatic / Manual / Remote		
Transfer control	Synchronised / No-synchronised with adjustable delay / No-synchronised with "Zero current mode"		
Synchronised automatic transfer	Zero current mode		
Non-Synchronised automatic transfer	Enable with Delay (adjustable delay 20-255msec.) / Enable with "Zero current mode" / Disable		
Re-transfer methods	Zero current mode / Delay (adjustable delay 20÷255 msec.) / Wait synchro / Swift		

Item	STS Range (current per phase) [A]		
	MMS 32	MMS 63	MMS 120
Transfer time due to source failure	Less than 4 msec (S1/S2 synchronised) 10 msec depending on the delay setting (S1/S2 non-synchronised)		
Transfer time due to manual command	≤ 2 msec.		
Retransfer to Priority Source (PS)	Enable with Delay (adjustable delay 3-127 sec.) / Disable		
Maximum phase angle error S1/S2	20° (Adjustable 0-255°)		
Admissible Overload	<ul style="list-style-type: none"> <li>• 0-100% Continuous</li> <li>• 101-150% 1 minute</li> <li>• 151-200 10 seconds</li> <li>• &gt;200% 250 msec</li> </ul>		
Overload control	<i>If Enable:</i> after the timing (above indicated) STS switches OFF <i>If Disable:</i> SW1/SW2 (inside STS) trip according with current value		
Transfer inhibit short circuit detection	Load > 200% within 10 msec		
Overload (% In) If Overload Control DISABLED (MCB curve @ 30°C)	<ul style="list-style-type: none"> <li>• % 60 minutes</li> <li>• % 10 minutes</li> <li>• % 1 minute</li> <li>• % 100 ms</li> <li>• % 10 ms</li> </ul>		
Breaking current SW1/SW2 (inside STS) [KA]	10 kA		
Neutral overlapping time during transfer	10 msec. max		
Output Current Crest Factor (peak/RMS)	3.0		
Thyristor $\hat{i}^2t$ (Tj 125°C) [A <sup>2</sup> S]	5000	8500	127000
Thyristor maximum current in short circuit for 20 ms (Tj 125°C) [A]	600	700	2500
Re-transfer methods	Zero current mode / Delay (adjustable delay 20÷255 msec.) / Wait synchro / Swift		
Safety Standard	EN 62310-1		
EMC compatibility standard	EN 62310-2		
LCD display Languages available	Italian/English		

Item	STS Range (current per phase) [A]		
	MMS 32	MMS 63	MMS 120
Efficiency (%)			
• Full load	98,0	98,6	98,7
• 50% load	96,8	98,5	98,5
• 10% load	93,7	96,0	96,7
Self consumption (no load) [W]	<50	<65	<100
Noise level @ 1 meter from front (from no load to full load) –[dBA]	<45		<52
Storage temperature	- 10° up to +50 °C		
Working temperature	0 ± 40 °C		
System ventilation	Forced (redundant fans)		
Ventilation air flow	From front to rear		
Max. relative humidity during operation	90% (non condensing)		
Max. installation altitude	1000 m at nominal power (- 1% power for every 100m above 1000m) Max 4000m		
Power dissipated at nominal resistive load *	0,20 kW 175 kcal/h 695 B.T.U./h	0,30 kW 260 kcal/h 1040 B.T.U./h	0,50 kW 440 kcal/h 1750 B.T.U./h
Fan capacity in installation room for dissipating heat **	120 mc/h	180 mc/h	300 mc/h
Max current leaked to earth ***	≤ 100 mA		

\* 3.97 B.T.U. = 1 kcal

\*\* To calculate air capacity the following formula can be used:

$$Q [\text{mc/h}] = 3,1 \times P_{\text{diss}} [\text{Kcal}] / (t_a - t_e) [^{\circ}\text{C}]$$

$P_{\text{diss}}$  is the power dissipated by the STS (expressed in Kcal) within the installation environment.

$t_a$ = room temperature,  $t_e$ = external temperature. 10% must be added to the derived figure to take into account system losses. In the above table an example is shown of capacity with  $(t_a - t_e)=5^{\circ}\text{C}$  and a resistive nominal load (pf=0.9).

PS: This formula can be applicable if  $t_a > t_e$ ; otherwise, the installation will require air conditioning.

\*\*\* The leakage current of the load must be added to that of the STS on the ground protection conductor.



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