Deltron

SINGLE PHASE
STATIC TRANSFER SWITCH

32-63-120A

2 Poles

USER MANUAL

CONTENTS

INTRODUCTION

STS automatic static transfer switch (STS), is a device that enables automatic or manual transfer between two AC power supply sources, ensuring a transfer time of less than ¼ of a cycle.

The use of STS 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.

The 1Phase-STS series is available in 32-63-120 Ampere models;
The range is available in 2Poles (including Neutral switching), in standard or hot-swappable formats.
The STS provides a guaranteed means of switching between two alternative and independent power sources thus ensuring a continued supply of power to any critical load.

The switching can either be AUTOMATIC should the incoming supply fall outside the predefined window of operation (user-defined), or MANUAL should an operator want to force switching between the two input supply sources from the mimic display panel or via a remote connection.

ATTENTION

This manual contains instructions for the installation, start up and use of the product.
Read the manual carefully before installing the product.
The manual contains important information with regards to use of the device; therefore it must be read carefully and should be consulted before activating the STS.
All the installation and maintenance operations inside the device must be conducted exclusively by trained personnel.
Do not insert any objects in the ventilation slots or in any other openings.
To reduce the risk of electric shock, install the device in sites with controlled ambient temperature and relative humidity, free of open flames and corrosive substances.
The device has two power input lines. Even if only one of the sources is active, the voltage level inside the system is dangerous.

When the device is in manual BY-PASS status, the voltage level inside the system is dangerous.

SAFETY REGULATIONS

Always ensure that the ground connection is the first connection to be made during the installation of the system.

THE STS MUST NOT BE OPERATED WITHOUT A GROUND CONNECTION.

The STS must only be operated with all cabinet covers closed and fastened.

INSTALLATION ENVIRONMENT

Follow these recommendations when choosing the installation environment:
- avoid dusty areas
- relative humidity at 20°C must not be greater than 90° non-condensing
- avoid placing the device in a position exposed to direct sunlight or hot air
- verify that the ambient temperature, with the STS in operation, is less than:

operating temperature: 0 ÷ +40°C
maximum temperature for 8 hours/day: + 40°C
average temperature over 24 hours: + 35°

In order to maintain the temperature of the operating environment as specified above, it may be necessary to install a means of removing the heat dissipated by the STS.

STORAGE

If the STS is not to be installed immediately, it must be stored in its original packing and be shielded from humidity and bad weather. The storage room must have the following characteristics:

Temperature: -10° ÷ +50°C
Relative humidity 90% max

PRELIMINARY OPERATIONS

PACKING CASE CHECK

When the STS is delivered confirm that the packing case has not been damaged during transportation.
Be careful when removing the packing case to avoid scratching the STS cabinet.
The device must be handled carefully: any knocks or falls may damage it.

CONTENTS CHECK

The following item must be included inside the packing case.

- **Operating Manual**
- **Test report**

POSITIONING

The air used to cool the STS is drawn in through the grills located on the front side of the rack mounted STS cabinet. The cooling air leaves the STS cabinet through the grills located on the rear side.
When mounting the STS in an 19'' enclosure of suitable depth, keep in mind that:

- there should be enough ventilation provided for the 19'' enclosure to keep the air temperature in the specified limits for proper cooling of the STS unit.
- input/output power cables are to be connected to the clip-on terminals on the rear panel of the 1Phase STS cabinet.

PRELIMINARY INFORMATION

Some basic specifications about single phase rack type STSs are given in the following table;

MODEL*	**STS*2032***	**STS*2063***	**STS*2120***
Nominal current	32 A	63 A	120 A
Operating temperature	0 – 40° C		
Max. installation height	1000m at nominal current rating		
Dimensions (mm)	2U (19''rack),depth=545mm (hot-swappable=590mm)		3U (19''rack), depth=605mm (hot-swappable=645mm)
Weight(approx.kg)2pole	12	13	20
Protection level	IP20		
Power cables connection	Clip-on terminals (on the rear panel)		
Communication	RS232 standard – STS NET TCP/IP option		
Swift transfer	Available - Standard		
LCD panel and mimic	Available - Standard		
Backfeed protection	Optional		
Software management	Available - Standard		
Dry contact outputs	Available - Standard		
EPO input	Available – Standard (NC)		
Safety Standard	EN 62310-1		
EMC compatibility standard	EN 62310-2		

Table no. 1

NOTE: Every model STS mentioned in Table1 is available with two alternatives:

1- ***STANDARD 19'' RACK :*** **Fixed mounting with built-in Maintenance Bypass Switch.**
2- ***HOT-SWAPPABLE 19'' RACK:*** **It can be removed for maintenance without disturbing the load and denoted as *STSxxxxHSW.***

BLOCK DIAGRAM OF THE STS:

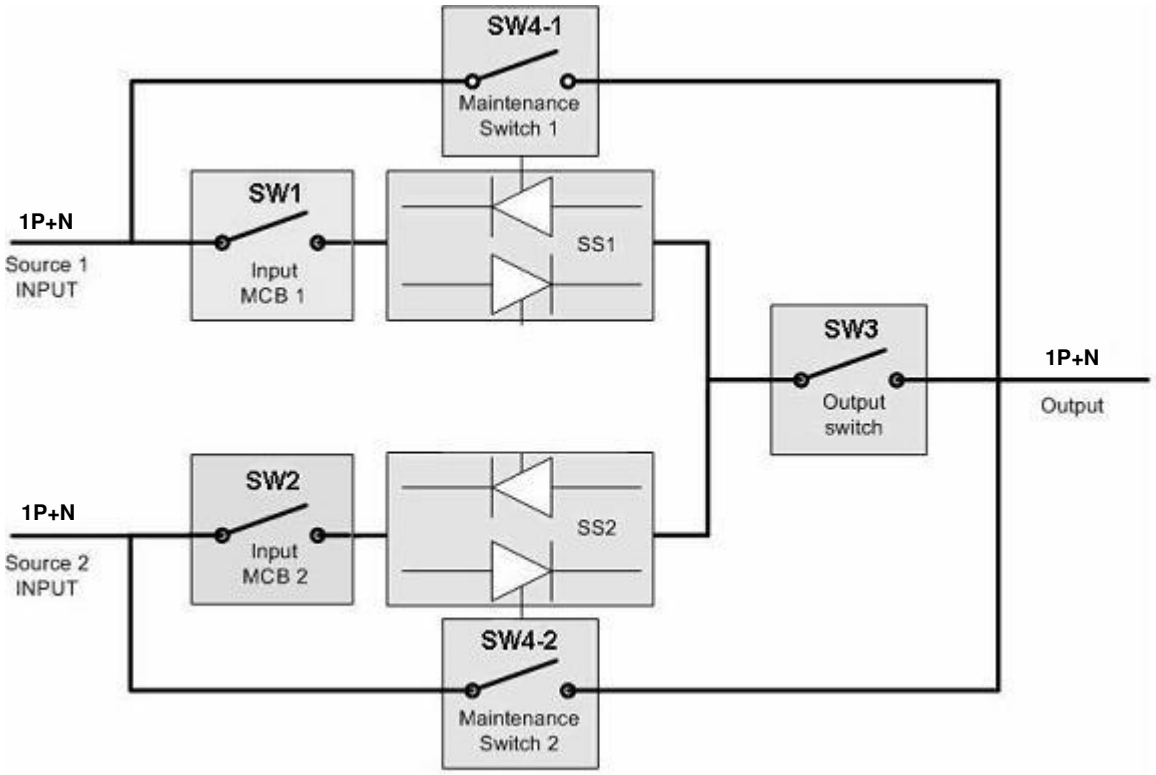


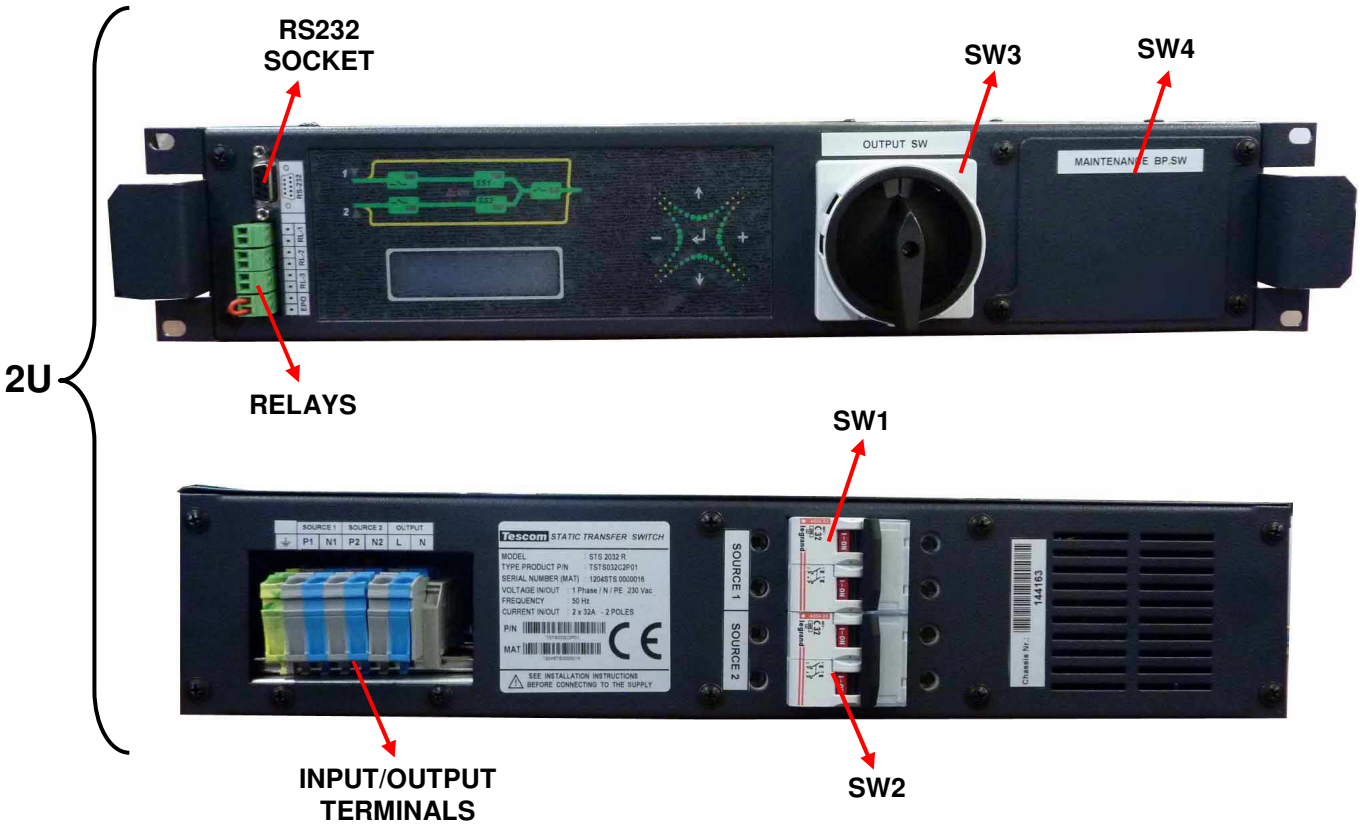
Figure no.1

SW1	Source1 input circuit breaker (MCB)	This switch is a thermally and magnetic protected type and switches off Source 1 input
SW2	Source2 input circuit breaker (MCB)	This switch is a thermally and magnetic protected type and switches off Source 2 input
SW3	Output switch **(Not available in hot-swappable units)**	This switch isolates the output from the STS.
SW4	Mechanical bypass switch	During maintenance this switch connects Source 1 or 2 input directly to the STS output
SS1	Static transfer SCR circuit to Source1	This static switch is controlled by microcontroller.
SS2	Static transfer SCR circuit to Source2	This static switch is controlled by microcontroller.

Table no: 2

The two input lines are provided with two magneto-thermal switches, shown as SW1 and SW2 in the block diagram, which are used for the full isolation of STS power.The size of these switches depends on the size of the STS.

FRONT AND REAR VIEWS OF THE SINGLE PHASE RACK TYPE STS:



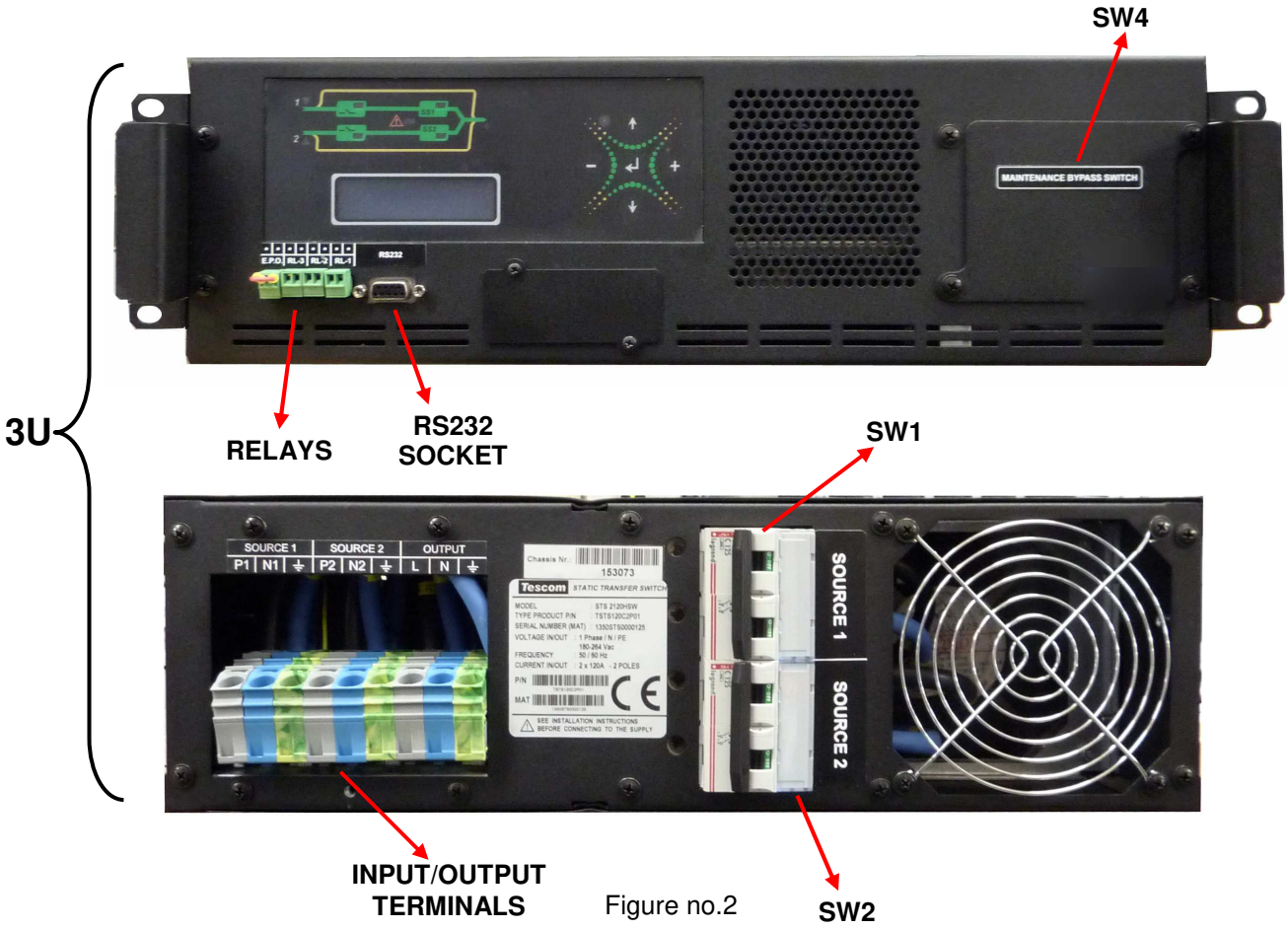


Figure no.2

MANUAL BYPASS (MAINTENANCE BYPASS SWITCH):

The Static Switch may be manually bypassed using the Maintenance Bypass Switch (SW4) so as to allow the voltage from one source to power the output load directly.

The bypass is performed by means of SW4 which is a changeover switch having three positions (1-0-2). This allows the power section of the STS to be bypassed without turning off the current to the load and is required to work on the electronic components of the unit without the risk of dangerous voltages. Before switching to the bypass using SW4, the source to be bypassed has to be selected by means of front panel buttons using Command Menu.

ELECTRICAL CONNECTION PROCEDURE

POWER SOURCE CONNECTIONS:

The input and output connections of the single phase STS are shown below:

Figure no: 3

1. After installing and fixing the rack type STS unit into a 19'' enclosure of suitable depth, before making any connections, verify that:
   a) All the STS switches are open (SW1, SW2, SW3 and SW4 are at ''0'' position)
   b) No power applied to the source cables before completing all connections to the STS unit.

2. The first connection must be the ground cable connection to the GROUND terminal at the rear side of the STS unit.

CAUTION! THE STS MUST NEVER BE OPERATED WITHOUT A GROUND CONNECTION.

SOURCE 1 INPUT CONNECTION

3. Connect the phase cable of Source1 input to the terminal identified as P1. The neutral cable must be connected to terminal N1.

SOURCE 2 INPUT CONNECTION

4. Connect the phase cable of Source2 input to the terminal identified as P2. The neutral cable must be connected to terminal N2.

OUTPUT CONNECTION

5. Connect the output phase cable to the terminal identified as L. The output neutral cable must be connected to terminal N.

CABLE CROSS SECTIONS:

The cross section of the various STS input and output cables are specified in the table below. These are the recommended cable sizes by the manufacturer.

	Nominal cable section (mm^2)						**Max Connecting Capacity (mm^2)**		
	SOURCE 1 / 2			OUTPUT			SOURCE 1 / 2 - OUTPUT		
Size	PE	L	N	PE	L	N	PE	L	N
32	6	6	6	6	6	6	10	10	10
63	6	10	10	6	10	10	10	16	16
120	25	25	25	25	25	25	25	25	25

Table no: 3

INITIAL SWITCH-ON PROCEDURE

- Verify that all switches are in OFF position
  SW1 – MCB input 1 in the OFF position
  SW2 – MCB input 2 in the OFF position
  SW3 – Output SW in the OFF position (if exists)
  SW4 – Maintenance by-pass switch in the central position (0) with the safety cover closed.

1. Turn on the supply to input 1 and confirm that the voltage is correct at terminal connections
2. Turn on the supply to input 2 and confirm that the voltage is correct at terminal connections
3. Confirm that the maintenance bypass switch (SW4) is in the 0 position (central position)
4. Turn on the input MCBs (1 position) SW1 and SW2. The STS control circuits will be energized and the STS will start operation.
5. Select your "PREFERRED" source. (Default factory setting is Source 1). You can change your selection using the OPTIONS MENU.
6. Check via the mimic diagram located on the control panel, that the static switch of the preferred source is turned on (either SS1 or SS2).
7. Switch on the output switch SW3 (if exists), to apply power to the load connected to the output of the STS.
   ATTENTION: In hot-swappable units, the power is directly connected to the output terminals after step ''6''.
8. Confirm that there are no alarms on the LCD panel.
9. The Static Transfer Switch is now operating normally.

OPERATIONAL TESTING:

When the STS is operating normally, it is possible to simulate supply outages by using the STS input switches, or by using the switches located upstream from the STS.

During this process confirm that the load switches from one source to the other smoothly and that no power interruption to the connected load occurs.

MANUAL BY-PASS PROCEDURE FOR MAINTENANCE

When the STS is operating normally it is possible to execute a manual by-pass for maintenance without creating any interruption to the load. In order to do this follow the steps mentioned below;

1. Select the input source which is going to supply the load during maintenance, and use the manual XFER facility ın **COMMAND MENU** to select this source (either Source1 or Source2) **S1< 000 XFER >S2**

2. Confirm on the mimic diagram that the load has been switched to the source selected manually (On the second line of LCD either ***A12 MAN.XFER S1*** or ***A13 MAN.XFER S2*** messages)

3. Open its protecting cover and switch the Maintenance Bypass Switch (SW4) to the selected source for maintenance. Confirm that the maintenance bypass message is displayed on the LCD panel (***A14 MAN BP TO S1*** or ***A15 MAN BP TO S2***).

4. Switch off the output switch SW3 (if exists). This switch disconnects the static transfer switches SS1 and SS2 from the STS output, the load will continue to be supplied via the maintenance bypass line

5. Switch off the input switches SW1 and SW2.

6. Following these operations the power section of the STS will be isolated from any hazardous voltages, and therefore will be ready for maintenance.

NOTES:

1- FOR STANDARD UNITS

The input terminals of SW1, SW2 and the input/output terminals of SW3,SW4 will remain live and therefore must be considered hazardous!

2- FOR HOT SWAPPABLE (HSW) UNITS

After turning on the Maintenance Bypass Switch (MBP SW), and after turning-off SW1 and SW2, the part of the STS cabinet containing the electronic controls can be completely removed for service purposes if necessary. The input MCBs (SW1 and SW2) and MBP SW remains on the fixed portion of the rack-mount cabinet.The output load is not disturbed during these operations (See the following figures).

HOT- SWAPPABLE RACKS:

-2U-

Figure: Normal operation case

Figure: Removal of the electronics

-3U-

Figure: Normal operation case

Figure: Removal of the electronics

PROCEDURE FOR RETURN TO NORMAL OPERATION FROM MAINT. BY-PASS

It is possible to return to normal operation, from the maintenance by-pass mode, without causing any interruption to the load. In order to do this follow the steps illustrated below.

NOTE: If the STS is HOT-SWAPPABLE, and the removable part has already been disconnected, please re-insert the removable part into its place and proceed as follows:

1- Switch on input switches SW1 and SW2
2- Confirm that the maintenance bypass switch SW4 is in the previously selected maintenance source position, and ensure that the corresponding static switch (either SS1 or SS2) is turned on.
3- Switch on the output switch SW3 (if exists)
4- Switch the maintenance bypass switch SW4 to “0”, and close its protecting cover again”
5- Wait until the load is transferred to the preferred source (***ON PREFERRED***).
6- **Confirm that there are no alarms on the** LCD display, if no alarms are present then the unit is in normal operation mode.

SHUTDOWN PROCEDURE

1- Switch off all of the loads which are connected to STS output
2- Switch off the output switch SW3 (if exists)
3- Switch off the input switches SW1 and SW2
4- Confirm that the Maintenance Bypass Switch SW4 is in the “0” position
5- The STS has now been completely isolated from all power sources and is therefore shut down

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 ore more critical electrical loads from a 1-phase power supply source (source 1) to a second 1-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 (user-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 approx. ***2msec*** following the line fault. With two *asynchronous* lines, the transfer can take place in various ways which can be set by the user. These are described in the following pages..

The acceptable phase angle difference between the two lines for synchronous transfers can be selected by the user (the predefined value is ***20°,*** equivalent to 1,11msec. for 50hz).

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.

In 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.

AUTOMATIC TRANSFER MODE

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

When the two sources are ***in synchronisation*** if the source powering the load goes out of tolerance (with respect to voltage or frequency), the STS automatically transfers the load onto the alternative power source in less than ***5msec***, the transfer is always effected using the method " **0-curr** " (zero current mode).

If the two sources are ***not in synchronisation***, the transfer may take place in one of three different ways which can be configured by the user via the **OPTIONS MENU:**

1. **NSYNC.TR:0-curr. (zero current mode):** the transfer takes place when the output current goes to zero (method used for synchronised switching) with a maximum transfer time of approx. 10msec.
2. **NSYNC.TR:DELAY (delay time mode):** the transfer takes place after a delay that can be configured by the user, (default value is 24 msec) during this period the load is not powered
3. **NSYNC.TR:DISABLE (disable mode):** the transfer is inhibited for asynchronous sources

MANUAL TRANSFER MODE

A manual transfer may be performed from the mimic display panel.

Manual transfer can be performed using two different methods which can be selected by the user via the **options menu:**

1. **MAN.XFER:0-curr. (zero current mode):** the transfer takes place when the output current goes to zero
2. **MAN.XFER:SWIFT (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 each 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 entered again.

RETRANSFER MODES

SYNCHRONISED RE-TRANSFER:

If the user selects one of the two sources as the preferred source, the selected source is shown by the corresponding LED (L1 or L2 on the mimic display panel). The preferred source powers the load continuously provided it remains within the tolerance range.

A failure in the preferred source causes the load to be transferred onto the alternative power source.

The re-transfer takes place in "**0-curr** "(zero current mode), this is when the load current goes to zero.

UNSYNCHRONISED RE-TRANSFER:

If the two sources are not synchronised, the user can configure the method used for the re-transfer onto the preferred source. This can be selected via the **OPTIONS MENU:**

1. **RET.MOD:0-curr. (zero current mode):** re-transfer takes place in any case when the load current goes to zero
2. **RET.MOD:WAIT SYNC (wait synchron mode):** the STS waits until the two sources are in sync before effecting the re-transfer. The two sources have to remain in sync for 30 msec. at least
3. **RET.MOD:DELAY (delay time mode):** the re-transfer takes place after a delay that can be set by the user (default value is 24 msec.) during this period the load is not powered
4. **RET.MOD:SWIFT (Swift mode):** the STS retransfers the load to the preferred source when the current of the two sources goes to zero at the same time (synchronized sources). If this does not occur, the load is not re-transferred.

The number of times the load is switched between the two sources can be limited by inhibiting the re-transfer onto the preferred source. The re-transfer option can be enabled or disabled from the menu **OPTIONS MENU** / **R-XFER**: (ON or OFF).

When the values of the preferred source return to normal condition, the load is automatically re-transferred onto the preferred source after a delay (re-transfer delay time default value 5 sec.) from 3 to 127 sec. which can be configured by the user from the **OPTIONS MENU**. (**D.R-XFER** parameter).

DISPLAY AND MIMIC PANEL

The front panel of the STS has a control panel with a 2x16 alphanumeric character LCD display, a mimic panel with LEDs to show the status of the Static Switch and a keyboard to control the various menus and submenus.

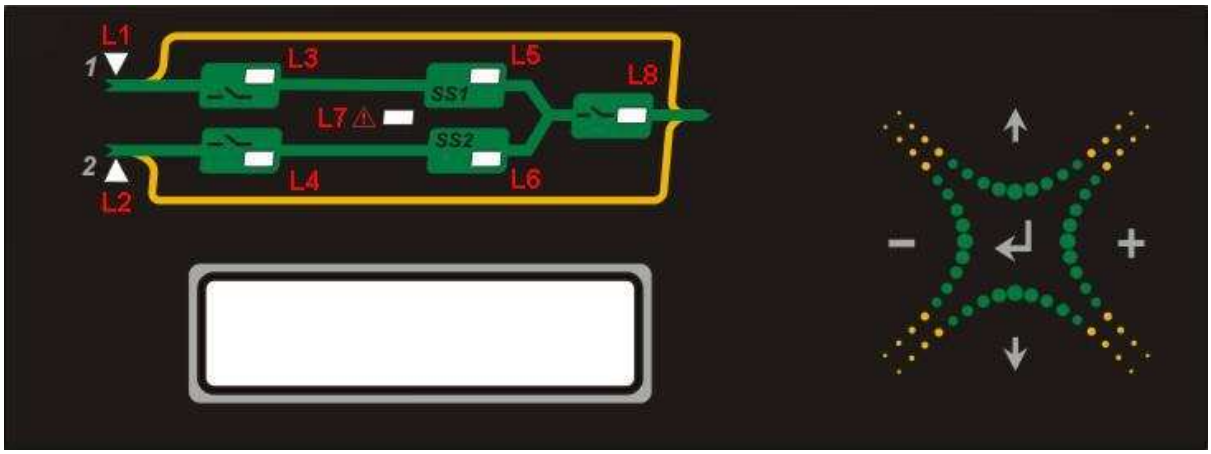


Figure no. 4

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
L8	Output monitoring lamp (Green LED) **(Not available in hot-swappable units)**	On : output switch on
		Off : output switch off
		Flashing : output voltage inhibited
L7	Alarm monitoring lamp (Red LED)	Flashing : an alarm has occurred
		Off : there is no alarm on the STS

Table no: 3

If one or more alarms are activated, LED L7 lights up and an acoustic alarm sounds, whilst the display shows the details regarding the fault that has been detected.

KEYBOARD

ENTER : key used to confirm a selection or enter the submenus

UP : key used to scroll up the menus

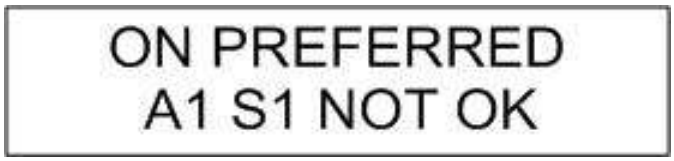
DOWN : key used to scroll down the menus

RIGHT : Increases the currently monitored data **(+)**

LEFT : Decreases the currently monitored data **(-)**

MENU FUNCTIONS

The display has two lines; the first line shows the status of the STS and the parameters measured and it is also possible to scroll through the MAIN MENU, whilst the second line of the display shows the alarm messages.



1st line = STATUS MESSAGES

2nd line = ALARM MESSAGES

The MAIN MENUs are listed below:

- **MEASURES MENU**
- **COMMAND MENU**
- **ALARM MENU**
- **OPTIONS MENU**
- **TIME MENU**
- **INFORMATION MENU**
- **ADJUST MENU**
- **SERVICE PASSWORD**
- **USER PASSWORD**

The UP and DOWN keys can be used to scroll through the main menu functions in the sequence shown above.

The ENTER key is used to enter the selected MAIN MENU. Again, the UP and Down keys are used to select the required SUBMENU in the selected MAIN MENU.

STATUS MESSAGES:

This group of messages provides the user with general information on the status of the device. The following messages may be displayed:

• ***ON PREFERRED*****:** this message indicates that the source selected as preferred is switched onto the STS output (the load is being supplied by the preferred source)

• ***ON ALTERNATIVE*****:** this message indicates that the non preferred (alternative) source is switched onto the STS output.Possible causes of this message include: preferred source outside the limits and therefore not suitable, or a manual transfer has been carried out onto the alternative power source

• ***MANUAL XFER*****:** this message indicates that the load has been manually switched

• ***MANUAL BP S1*****:** this message indicates that the load is connected directly to source 1 via the bypass switch

• ***MANUAL BP S2*****:** this message indicates that the load is connected directly to source 2 via the bypass switch

• ***OUTPUT INHIBIT*****:** this message indicates that no output is present on the STS output.Possible causes of this message include: both input sources source 1 and source 2 are outside the specified limits, or transfer with asynchronous mains is disabled

• ***EMERGENCY STOP*****:** this message indicates that the EPO (Emergency Power Off) command has been given and the STS output has been switched off. To reset the STS, both input switches SW1 and SW2 have to be opened and then closed

• ***OVERLOAD INHIBIT*****:** this message indicates that an extended overload has occurred on output and activated the overload protection, therefore the STS output is currently off until the alarm is reset.

► MEASURES MENU

This menu is used to monitor all of the STS parameters and measurements.

The STS can provide the following data:

• **S1.: 230 V** - Input source S1 voltage

• **S2.: 230 V** - Input source S2 voltage

• **LD%: 045** % - Percentage of the load on the output

• **OPI: 032 A** - Value of the STS output current

• **TEMP..: 030 C°** - STS heatsink temperature

• **S1-FREQ: 50.0 Hz** - Frequency of source S1

• **S2-FREQ: 50.1 Hz** - Frequency of source S2

• **SYNC.ANG: 001 Deg** - Phase difference between the two input sources; this value is expressed in angular degrees

• **PS 1=..OK 2=..OK** - Monitor for redundant power supply voltages inside the STS.

If the value is **OK**, the power supplies are working correctly.

If the value is **N.OK**, the alarm "**SUPPLY 1 or 2 FAIL**" occurs and it is necessary to replace the faulty power supply.

► *COMMAND MENU*

The following commands are available in this menu:

• **S1< 045 XFER >S2**

(Note:''045 indicates the phase difference between the sources in angular degrees)

This command can be used for manual switching from one source to the other and vice versa

LEFT BUTTON	Manual transfer to source 1
ENTER BUTTON	Automatic transfer (STS decides and tries to stay on preferred source)
RIGHT BUTTON	Manual transfer to source 1

Table no: 4

• **ENT: XFER TEST :**

This command is used to perform a transfer test.

Press the ENTER key to switch the load from the preferred source to the alternative power source. The STS remains on the alternative power source for a pre-set time (re-transfer delay) set via the ADJUST MENU, and then the load is switched back onto the preferred source again.

• **ENT: RESET**

If for any reason the STS output has been inhibited, the STS can be reset by pressing the ENTER key. This function resets all the alarms.

• **ENT: SOUND ON/OFF :**

This command is used to enable / disable the acoustic alarm (buzzer).

• **RELAY TEST:**

This submenu is used to test the 3 output interface relays.The number of relays to be tested can be changed by pressing the LEFT or RIGHT keys. The table below shows the function according to each number set.

RELAY TEST : 000	Relay test disabled; relays will function normally
RELAY TEST : 001	Relay 1 is activated
RELAY TEST : 002	Relay 2 is activated
RELAY TEST : 003	Relay 3 is activated

Table no: 5

• **ENT: LED TEST**

Press the ENTER key to test that all the mimic panel LEDs are working properly.All the LEDs should remain on for 5 seconds and then return to normal operation (L1 and L2 are turned on and off alternatively during this time)

• **ENT: LOGOUT**

Press the ENTER key to start the LOG-OUT procedure, which cancels all access connections (LOG-IN). Each access password is active for 3 minutes after which the LOG-OUT procedure is automatically started.

► *ALARM MENU*

The STS is provided with a real time clock which records all events and alarms according to date of occurrence. All the events and alarms can be seen in the order in which they occurred.

• **000>260112 10:30:**

This shows that the last alarm recorded was on 26/01/2012 at 10.30 and the event number is 000. The second line of the display shows the alarms recorded on that date.

Press the LEFT or RIGHT keys to scroll through the events from 000 up to 127; event 000 is the last event that occurred whilst event 127 is the first, and therefore the oldest.

The following table shows all the alarm messages that are used by the STS and these messages will be recorded in the event log.

ALARM MESSAGES *(these messages are displayed on the second line of the LCD)*	
A1 S1 NOT OK	If input source 1 is out of tolerance this alarm occurs
A2 S2 NOT OK	If input source 2 is out of tolerance this alarm occurs
A3 SYNC NOT OK	Shows that 2 input sources are not synchronised
A4 OVERLOAD	Output current of the STS is too high
A5 NSYNC INHIBIT	Non synchronous transfer is disabled by the user, and during non sync status transfer process started ,currently output shutdowns
A6 XFER INHIBIT	During transfer the STS can not find a good source and the output shutdowns
A7	Not used
A8	Not used
A9 SUPPLY 1 FAIL	Redundant power supply 1 is bad
A10 SUPPLY 2 FAIL	Redundant power supply 2 is bad
A11 OVERTEMP	SCR heat sink temperature is higher than 75°C
A12 MAN.XFER S1	Load is transferred to Source 1 by the user manually
A13 MAN.XFER S2	Load is transferred to Source 2 by the user manually
A14 MAN BP TO S1	Load is directly transferred to Source 1 by maintenance bypass
A15 MAN BP TO S2	Load is directly transferred to Source 2 by maintenance bypass
A16 OUT SW OFF	The output switch of the STS is off
A17 IN SW1 OFF	The Source 1 input switch is off (optional)
A18 IN SW2 OFF	The Source 2 input switch is off (optional)
A19 S1 BLACKOUT	On Source1, input black-out sensed
A20 S2 BLACKOUT	On Source2, input-black out sensed
A21 S1 FREQ FAIL	Source 1 input frequency out of tolerance

A22 S2 FREQ FAIL	Source 2 input frequency out of tolerance
A27 SHORT CIRCUIT	Short circuit on the output of the STS
A28 MIS-FUNCTION	Faulty usage of manual transfer switch
A29 B.FEEDTRIP1	Backfeed protection activated for source 1 (optional)
A30 B.FEEDTRIP2	Backfeed protection activated for source 2 (optional)
SERVICE LOGIN !	Service personal is logged on from panel or RS232 for adjustment
EMERGENCY STOP	External emergency stop signal is detected and the output shutdown
ON SOURCE 1	Load is on source 1
ON SOURCE 2	Load is on source 2
STS RESET	STS is started (power on)
EMPTY LOG	The current log record is empty
OUT SHUTDOWN	Output of the STS is shutdown currently
USER LOGIN !	User is logged on from panel or RS232 for adjustment

Table no: 6

• **ENT: CLEAR LOG**

If the ENTER key is pressed with this message, all the events recorded in the memory will be deleted.

• **S1 CODE: 000** : This message shows the alarm codes specific to Source 1.

• **S2 CODE: 000** : This message shows the alarm codes specific to Source 2.

► *OPTIONS MENU*

This menu contains operating modes and user-configurable parameters. A **USER PASSWORD** is required to enter the **OPTIONS MENU**, so as to protect these parameters. The default value of **USER PSW** is **0000.**

OPTION MENU - DEFAULT PARAMETERS:

PARAMETERS	AVAILABLE CONFIGURATIONS	DEFAULT
PREFERRED	Source 1 or Source 2	***Source 1***
R-XFER	ON / OFF	***ON***
D.R-XFER	003 ÷ 127 sec.	***003sec.***
OVLOAD	enable / disable	***enable***
AL HOLD	002 ÷ 064 sec.	***002 sec.***
NSYNC. TR	0-Curr., Delay, Disable	***0-Curr.***
OVL. RESET	AUTO – MANUAL	***AUTO***
INH. RESET	AUTO – MANUAL	***MANUAL***
REMOTE	ON / OFF	***ON***
RET. MOD	0-curr., WAIT SYN, DELAY, SWIFT	***SWIFT***
SCR ALARM	ON / OFF	***ON***
MAN. XFER	0-curr, SWIFT	***SWIFT***
LANGUAGE	ENGLISH /ITALIAN	***ENGLISH***
XFER ACTION	SHUT / STAY	***STAY***
USER PSW		***0000***

Table no: 7

The following parameters are configurable.

• **PREFERED:** ***Source1*** *or* ***Source 2***

The + or – keys are used to select one of the two input sources as the preferred source.

• **R-XFER.:** (***ON*** or ***OFF****)*

The + or – keys are used to decide whether to enable or disable the re-transfer.

After switching has occurred for any reason, the user can decide whether to re-transfer the load back onto the preferred source or to remain in that situation until the alternative power source returns within the accepted range.

If re-transfer is enabled, this takes place after a delay set by the user (REX-DELAY from 003 to 127 sec).

• **D.R-XFER :*003-127 sec*** (how long the STS stays on the alternative source)

This submenu can be used to set the time of the delay before re-transferring from the alternative mains supply to the one selected as the preferred source. The + or – keys can be used to increase or decrease the interval of time before a re-transfer. The interval of time can be set from 003 to 127 seconds.

• **OVLOAD:** (***enable*** or ***disable***)

The user can select the kind of behaviour to be followed by the STS in an overload condition.

enable: in this configuration the electronic overload control is enabled.

disable: in this configuration the electronic overload control is disabled, thus the STS continues to power the load with any current value.

• **AL HOLD:** ***002-064sec***

The + or – keys can be used to increase or decrease the duration of an alarm from a minimum of 2 sec to a maximum of 64 sec. (default value 2 sec.)

• **NSYNC.TR:** ***(0-Curr, Delay, Disable***)

The user can select the kind of behaviour to be followed by the STS in the event of a transfer with the two input sources out of sync.

If the two sources are *not synchronised,* the transfer can take place in three different user configurable ways:

- *0 Curr*. (transfer with zero current): the transfer takes place when the output current goes to zero (method used for synchronised switching).

- *Delay* (transfer with delay time): the transfer can only take place after a safety delay time that can be set by the user, during this period the load is not powered.The time delay can be set via the ADJUST MENU described below (from 20 to 255 msec) default value 24msec.

- *Disable* (transfer disabled): the transfer is not performed for non-synchronised sources.

If the preferred source goes out of the accepted limits while the two sources are not synchronised, the STS will not perform the transfer and the load will be lost.

• **OVL.RESET:** (***AUTO*** or ***MANUAL***)

***AUTO*:** the overload alarm is automatically reset and at the end of the “alarm hold time” the STS goes back to powering the load.

***MANUAL*:** the STS no longer powers the load until the overload alarm is manually reset via command ENTR-INHIBIT RST from the COMMANDS MENU.

• **INH.RESET:** (***AUTO*** or ***MANUAL***)

After an alarm causing the SCRs to open and the subsequent loss of power to the load, the user can decide to automatically or manually reset the alarm.

***AUTO*:** the alarm is automatically reset and at the end of the “alarm hold time” the STS goes back to powering the load.

***MANUAL*:** It is manually reset via command ENTR-INHIBIT RST from the COMMANDS MENU.

• **REMOTE:** (***ON*** or ***OFF****)*

This function is used to enable / disable the remote control of the STS via the serial port.

• **RET.MODE:** (***0-curr., WAIT SYN, DELAY, SWIFT***)

The user can select the kind of behaviour to be followed by the STS for the re-transfer onto the preferred source with the two sources out of sync.

If the two sources are *not synchronised,* the transfer can take place in four different user configurable ways:

- *0-curr.* (re-transfer with zero current): the re-transfer takes place in any case when the load current goes to zero.

- *WAIT SYN* (wait for synchronisation): the STS waits until the two sources are in sync before effecting the re-transfer, using zero current mode. If the sources never synchronise, the STS remains on the alternative power source.

- *DELAY* (re-transfer delay time): the re-transfer can only take place after a delay that can be set by the user; during this period the load is not powered. The delay time can be set via the ADJUST MENU described below (from 20 to 255 msec).

- *SWIFT* (Swift re-transfer mode): the STS re-transfers the load onto the preferred source when the two sources are in sync; if this does not occur, the load is not re-transferred.

• **SCR ALARM:** (***ON*** or ***OFF****)*

This option enables or disables the control of thyristor status.

• **MAN.XFER:** (***0-curr., SWIFT***)

This function can be used to determine the behaviour to be followed by the STS for the manual transfer from one source to the other. The following options can be selected:

- *0-curr.* (manual transfer with zero current): manual transfer takes place in any case when the load current goes to zero.

- *SWIFT* (swift manual transfer mode): the STS transfers the load onto the preferred source when the two sources are in sync; if this does not occur, the load is not transferred.

• **LANGUAGE : *ENGLISH* / *ITALIAN***

Determines LCD panel language. Default language is English

• **XFER ACTION:** (***SHUT*** *or* ***STAY***)

This function determines the behaviour to be followed by the STS when the single good source available exceeds the tolerance range excepted by the STS. The following options can be selected:

- *SHUT*: STS inhibits the power supply to the load thus avoiding supplying a voltage that is not suitable for the load and thus cause damage to it.

- *STAY*: with this setting the output voltage is not interrupted, but the source remains supplied to the load even if out of tolerance.

► TIME MENU

This menu can be used to set the date and time of the STS real time clock.

• **TIME: 10:30** Current time on the RTC

• **DATE: 26-01-2012** Current date on the RTC

• **SET HOURS: 10** Press the LEFT or RIGHT key to change the hour

• **SET MINS: 30** Press the LEFT or RIGHT key to change the minutes

• **SET DAY: 26** Press the LEFT or RIGHT key to change the day

• **SET MONTH: 01** Press the LEFT or RIGHT key to change the month

• **SET YEAR: 2012** Press the LEFT or RIGHT key to change the year

• **ENT: UPDATE** Press the ENTER key to update date and time

• **ENT: EXIT** Press the ENTER key to exit the TIME MENU

► *INFORMATION MENU*

This menu contains information on the status and the transmission of STS data.

• **RS232 Receive: OK** receive via RS232 is active

• **RS232 Receive: ---** receive via RS232 is not active

This message indicates that the STS is connected to a PC via serial communication.

This may help the user with regards to any losses of communication.

• **VERSION:** ***STA12-25***

This message indicates the Version of the control software.

► *ADJUST MENU*

A **SERVICE PASSWORD** is required for access to the **ADJUST MENU** in order to protect certain setting parameters.

► *USER PASSWORD*

FACTORY SETTING : 0000

The user password is a 4 digit numerical code.The options menu function requires the user password

Once this menu is entered the **USR.PSW: 0000** message is shown, one of characters will be flashing, this character can be changed by pressing the up and down buttons accordingly.

The left and right buttons change the cursor position.

Once the correct user password has been written, press the **ENTER** button. If the password is correct, the USER LOGIN message will be shown on the second line of the LCD.The user password can be changed by the user during login status.

COMMUNICATIONS INTERFACES AND REMOTE MANAGEMENT

The following communications and interface facilities are available for the single phase STS.

- Serial communication via RS232
- Dry relay contacts for the most important events (programmable)

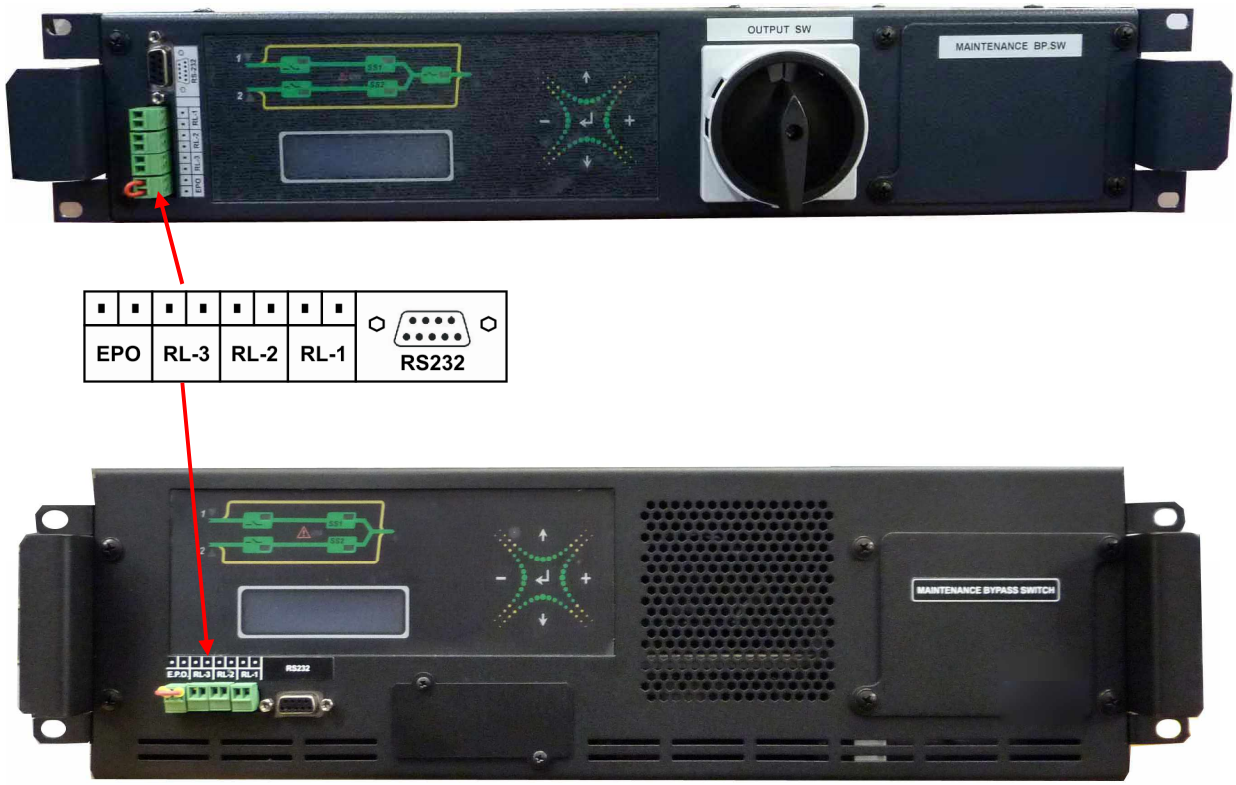


Figure no: 5

DRY CONTACTS:

A communication card with dry contact relays is available to provide the user with information. There exist three relays with normally open (NO) dry contacts .

RELAYS	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)

Table no: 8

RELAYS FUNCTION TABLE:

The RL1, RL2, RL3 alarm relays are programmable in ADJUST MENU; one of the alarms shown in the following table can be assigned to each relay.

COMMON ALARM	
A1	S1 NOT OK
A2	S2 NOT OK
A3	SYNC NOT OK
A4	OVERLOAD
A5	NSYNC INHIBIT
A6	XFER INHIBIT
A7	Not used
A8	Not used
A9	SUPPLY1 FAIL
A10	SUPPLY2 FAIL
A11	OVERTEMP.
A12	MAN.XFER.S1
A13	MAN XFER.S2
A16	OUT SW OFF
A17	IN.SW.1 OFF
A18	IN.SW.2 OFF
A19	S1 BLACKOUT
A20	S1 BLACKOUT
A21	S1 FREQ FAIL
A22	S2 FREQ FAIL
A23	S1 BAL FAIL (INVALID)
A24	S2 BAL FAIL (INVALID)
A25	ROTATE PH S1 (INVALID)
A26	ROTATE PH S2 (INVALID)
A29	BFS1 TRIPS2 (optional)
A30	BFS2 TRIPS1 (optional)
ON PREFERRED	

Table no: 9

EMERGENCY POWER OFF:

The EPO (Emergency Power Off) contact should normally be closed. If the user intervenes by opening this contact, the STS will perform the shut down procedure and switch off the output.

The STS remains in stand-by status until the EPO contact is restored; the alarm has to be reset by opening and then closing the two input switches SW1 and SW2.

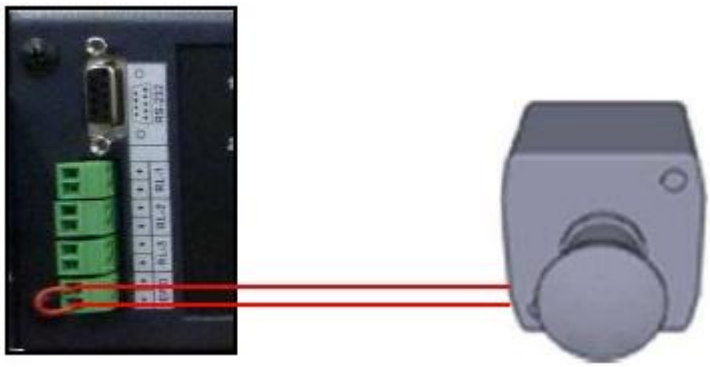


Figure no: 6

COMMUNICATIONS INTERFACE:

Different kinds of communications interfaces are available:
- Serial Communication via RS232
- RS232 Duplexer ML100 (optional)
- STS NET TCP/IP Eternet Card (optional)

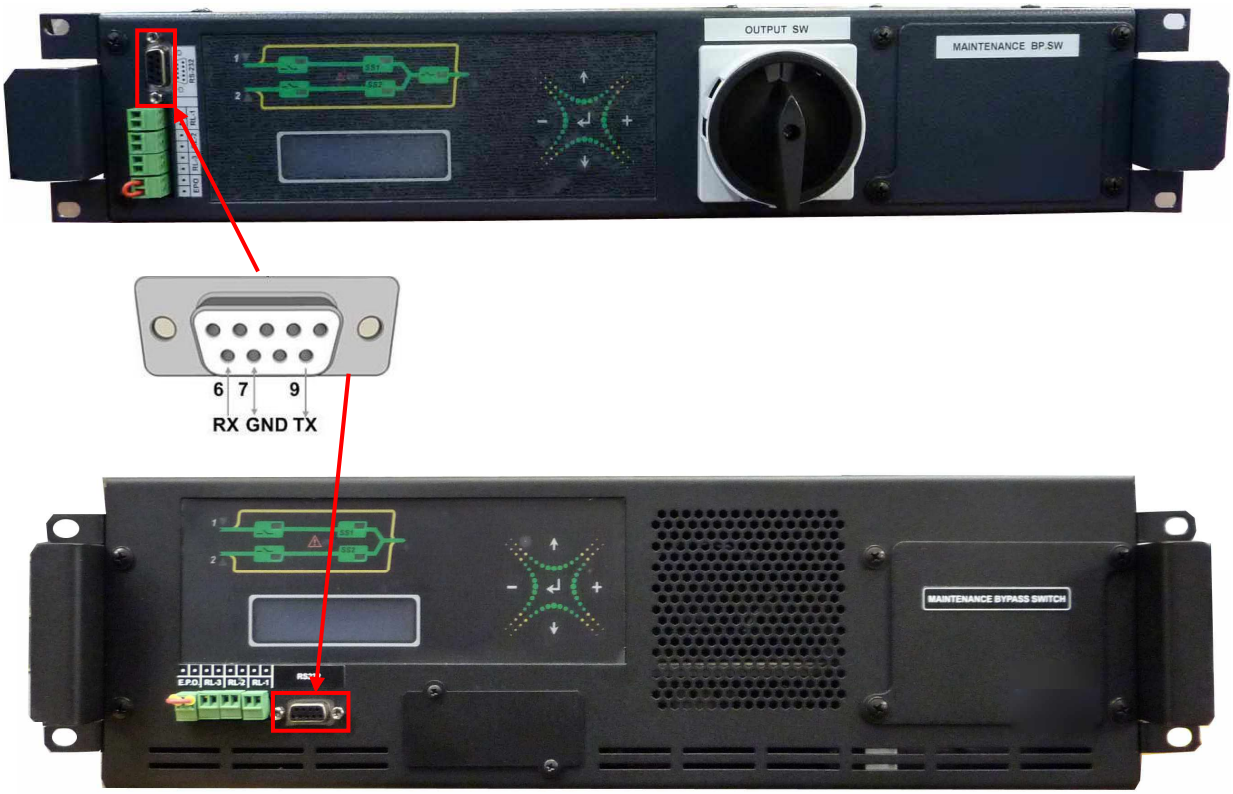
For communications over greater distances RS485 is also available

RS232 HARDWARE	
BAUD RATE	2400 baud
STOP BIT	1
DATABITS	8 BIT
PARITY	None

Table no: 10

To connect the STS with a PC via RS232 it is necessary to use the cable provided with the STS.It is also essential to have the STS MANAGER software (given with the STS unit in a CD ROM) installed on the PC.

RS232 CONNECTION TO PC



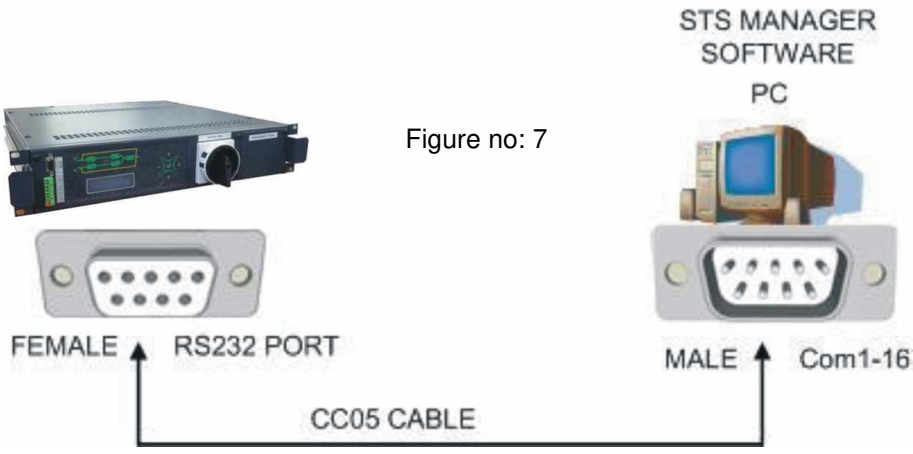


Figure no: 7

The serial port of the STS interacts with the PC so that the PC can transmit all commands to the STS.To prevent unauthorised access to the STS two levels of security measures are available:

1) The user can enable or disable the RS232 serial port from the OPTIONS MENU. If the remote control is disabled (OFF), the STS will ignore commands sent through the serial port.

2) A password is required to connect the PC to the STS (USER LOGIN). If the password sent to the STS is correct, LOGIN status will last for a period of 2 minutes. During this interval the RS232 serial port will be active and it will be possible to send control commands from the PC to the STS. At the end of the two minutes' period, the serial port will be disabled and it will therefore be necessary to LOGIN again.

Default user login is: 0000

EXTERNAL RS232 DUPLEXER (OPTIONAL):

If two independent RS232 serial ports are required an external duplex adaptor may be inserted, on request, to allow a double serial connection as shown in the figure below.
RS232 Connection 1 and connection 2 both require a CC05 cable to communicate with the remote terminal.

Figure no: 8

TECHNICAL CHARACTERISTICS:

MODEL	**STS*2032***	**STS*X063***	**STS*X120***
Nominal current	32 A	63 A	120 A
MECHANICAL DATA			
Dimensions (mm)	2U (19''rack),depth=545mm (hot-swappable=590mm)		3U (19''rack), depth=605mm (hot-swappable=645mm)
Weight(approx.kg)2pole	12	13	20
Protection level	IP20		
Power cables connection	Clip-on terminals (on the rear panel)		

ELECTRICAL DATA	
Nominal input voltage (S1-S2)	220-230-240 Vac
Input voltage range	180÷264 Vac (Ph-N)
Nominal input frequency	50 or 60Hz
Input frequency range (operation range adjustable)	46-54 Hz for 50Hz 56-64 Hz for 60Hz
Transfer type	"Break Before Make" (no sources overlapping)
Transfer methods available	Automatic-Manual-Remote
Transfer control	•Synchronised •Non-synchronised with adjustable delay •Non-synchronised with "zero current mode"
Synchronised automatic transfer	Zero current mode
Non-synchronised automatic transfer	•Enable with Delay (adjustable delay 20÷255 msec.) •Enable with "Zero current mode" •Disable
Retransfer methods	•Zero current mode •Delay (adjustable delay 20÷255 msec.) •Wait synchro •Swift
Transfer time due to source failure	≤ 4 msec (S1-S2 synchronised) ≤ 10msec (S1-S2 non-synchronised)
Transfer time due to manual command	≤ 2msec.
Retransfer to preferred source	•Enable with delay (adjustable delay 3÷127 sec.) •Disable
Maximum allowable phase angle error between S1-S2 phases	Adjustable 0-255° (default=20°)
Admissible Overload (Overload Control ENABLED)	• 0-100% Continuous •101-150% 1 minute •151-200% 10 seconds • >200% 250 msec
Transfer Inhibit	if load > 200% of the nominal
Breaking current cap. SW1,SW2	10kA
Output Current Crest Factor	3
LCD panel and mimic	Available - Standard
LCD display languages available	English/Italian
Communication	RS232 standard – STS NET TCP/IP option
Backfeed protection	Optional
Software management	Available - Standard
Dry contact outputs	Available - Standard
EPO input	Available – Standard (NC)

ENVIRONMENTAL DATA	
Storage temperature	- 10° up to +50 °C
Operating temperature	0 – 40° C
Max.humidity during operation	90% (non condensing)
System ventilation	Forced (redundant fans)
Ventilation air flow	From front to rear
Max. installation height	1000m at nominal current rating
Noise level	≤ 52dbA
Safety Standard	EN 62310-1
EMC compatibility standard	EN 62310-2

Table no: 11

VENTILATION:

Adequate ventilation is required to ensure operation of the components at optimum temperature.The ventilation system of the unit has been designed for continuous operation at an ambient temperature of 40°C and with a 90% rate of humidity even in the event of an overload.

The SCR heatsink has a temperature sensor for warning the user if the temperature exceeds **75°C** and tripping at **90°C** forcing the logic to switch off the STS after 15 seconds in order to protect the thyristors. When this alarms occurs the display will show A11 (OVERTEMP).

COMPLIANCE AND APPROVAL:

1- Reference Standards and Requirements:

This product shall be classified for use with information technology equipment, and shall be 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
- EN 62310-3 Static Transfer System (STS): Method of specifying the performance and test requirements

2- General and Safety requirements

The STS assembled in its frame shall be examined for its compliance with the safety requirements laid down in the standard. The unit must satisfy the requirements laid down in the following standard: EN 62310-1

According with that standard the electric strength test is carry out apply 2000Vac / 2700Vdc.

3- Electromagnetic Compatibility (EMC)

The unit must satisfy 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)

NOTES: