GE Consumer & Industrial
Digital Energy™

INSTALLATION and OPERATING MANUAL

Digital Energy™ STS-400-25/40/63/100-3/4

Static Transfer Switch
400V-25/40/63/100A-3/4-pole

CE

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INSTALLATION AND OPERATING MANUAL
Digital Energy STS-400-25/40/60/100 Static Transfer Switch
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400V-25/40/63/100A-3/4-pole

Preface

We thank you for selecting a **General Electric Digital Energy™ STS Series Static Transfer Switch** and recommend that you read these instructions carefully before installation and start-up of the device.

The instructions in this manual are for:
the 3-phase 3-pole models STS-400-25-3, STS-400-40-3, STS-400-63-3 and STS-400-100-3;
the 3-phase 4-pole models STS-400-25-4, STS-400-40-4 and STS-400-63-4.

Please keep this manual in a safe place for future reference and carefully read the important safety instructions in chapter 1 before installation of this device.

CONTENTS

1 - Important Safety Instructions

1.1 Save these instructions

This manual contains important instructions that should be followed during erection, installation, use and maintenance of the Static Transfer Switch. Before attempting to erect, install and use of the device, carefully read this manual. Keep this manual next to the device for future references

Full understanding of and compliance with the safety instructions and warnings contained in this manual are

THE ONLY CONDITION

to avoid any dangerous situation during erection, installation, operation and maintenance work, and to preserve the maximum reliability of the system.

In the event of equipment failures or special problems it is not permitted to take unauthorised remedial action. In such cases the responsible GE technical service department must be contacted and the required information obtained.

GE refuses any responsibility in case of non-observance, unauthorized alterations or improper use of the delivered device.

While every care has been taken to ensure the completeness and accuracy of this manual, GE accepts no responsibility or liability for any loss or damage resulting from the use of the information contained in this document

This document shall not be copied nor reproduced without the permission of GE.

Due to technical improvements, some of the information contained in this manual may be changed without notice

1.2 Safety warnings and symbols

Safety warnings

The text of this manual contains warnings to avoid risk to persons and to avoid damages to the UPS system and the supplied critical loads. Do not proceed beyond these warnings if you do not fully understand and/or are not able to meet the mentioned conditions.
The non-observance of the warnings reminding hazardous situations could result in human injury and equipment damage. Please pay attention to the meaning of the following warnings and symbols.

	**WARNING !** Refers to procedures or operations which, when not correctly performed, could cause personal injury or serious damage to the system

	**NOTE** Warns the user about important operations or procedures described in this manual

Safety Symbols

	**CAUTION** The product may be in danger: when procedures or operations are not correctly performed, damage to the product may be the result.

	**DANGER OF PARTS ELECTRICALLY LIVE** Related to all situations with potentially hazardous voltage

1.3 General

DANGER!

RISK OF ELECTRIC SHOCK.

When the STS operates, some of its parts are necessarily under a hazardous voltage.

Do not remove the cover; there are no user serviceable parts inside.

There may be danger, loss of life or personal injury if warnings are not strictly observed.

CAUTION

There may be damage to the equipment if procedures and practices are not strictly observed and followed.

NOTE

Do not attempt to service the STS unless you have had proper training. Refer all maintenance and servicing to properly qualified, skilled and competent service personnel.

Properly qualified, skilled and competent service personnel are persons who:

- Are familiar with the erection, installation and operation of the equipment and the system that is being installed.
- Are capable of performing switching operations according to safety technology standards and entitled and authorized to switch the equipment on and off and to isolate from the voltage.
- Are instructed according to the standards of safety technology in the care and use of safety equipment.
- Are trained to immediate rescue measures (first aid).
- Have completed instructions with appropriate confirmation of GE.

1.4 Intended use

- A Static Transfer Switch (STS) is designed to transfer power supply between independent AC power sources, thus protecting the connected load from power supply interruptions. It protects automatic systems for power industry, power supply systems for petrochemical industry, computer and telecommunication centers, automatic and security systems of 'intelligent' buildings as well as other equipment that is highly sensitive for power supply interruptions.

- The STS is intended to be operated by technically qualified personnel.
  Technically qualified personnel are persons who (because of their training, experience, and position as well as their knowledge of appropriate standards, regulations, health and safety requirements and working conditions) are authorised to be responsible for the safety of the equipment, at all times whilst carrying out their normal duties and are therefore aware of, and can report, possible hazards (observe IEC 364, DIN VDE 0105 and national wiring regulations and accident prevention rules).

- The technical data as well as information concerning connecting requirements can be found on the rating label and in this document and shall be strictly observed.

1.5 Transport, storage, unpacking

- The STS should be transported in a container truck with shock protection against moves during transport. The STS should be belted to the wall of the container.
- Any special treatment during storage of the STS is not needed.
- Move the STS in its original package to the final destination room.
- Check for sufficient floor and elevator loading capacity.
- Immediately after unpacking carefully check the integrity of the equipment. In case you note recognizable damage, do not connect any voltage to the STS, do not put the STS into operation, but contact the nearest Service Centre.

1.6 Installation

The following instructions are provided for the personal safety of operators and also for the protection of the described product and connected equipment.

- Observe the prescribed accident prevention and safety rules for the specific application.
- When installing the STS strictly observe all information on technical data and operating conditions. Comply with all warnings, and strictly follow the procedures and practices as described in this manual.
- This STS is intended to be used in a controlled indoor environment and free of conductive contaminants and protected against animal intrusion.
- Check for sufficient floor loading capacity.
- Avoid placing the unit in direct sunlight or near heat sources.
- It is important that the unit has adequate ventilation. Maintain air movement around and through the unit. Do not block the air vents.
- The unit must be placed in a sufficiently ventilated area; the ambient temperature should not exceed 40°C (104°F).
- Do not install the STS in an excessively humid environment or near water, relative humidity should not exceed 90% at 20°C (68°F).
- Avoid spilling liquids or dropping any foreign object into the STS.
- Emergency stop devices must be provided for all applications. An emergency stop must inhibit any further uncontrolled operation.
- The electric connections must be covered.
- Earth connection must be checked for safe function after assembly.
- Countermeasures should be taken to avoid accidental turning on of previously switched off systems through either a control vault or a third party (e.g. key switches).
- Do not touch electronic components. They may be electrostatic sensitive and are for that reason easily damaged due to improper handling.
- To avoid potential health risks, electrical components should not be mechanically damaged or destroyed.
- Isolate from mains and battery before installation or dismantling work, as well as for fuse changes or post installation modifications.

1.7 Electrical connection

- All electrical connections are to be realized by properly qualified, skilled and competent service personnel only.
- When working on live STS, be sure to comply with the applicable national accident prevention rules.
- Before putting into operation make sure that the rated voltage for the unit corresponds to the local supply voltage.

1.8 Operation

- These instructions cover normal operation in the automatic as well as in manual modes. Special operating conditions, such as short circuit tests, input supplies, etc., are not covered in this document. These operating modes require comprehensive knowledge of the overall system and should be carried out by properly qualified, skilled and competent service personnel only. Refer to section 1.3 for further details.
- Operators shall make sure that the system is ready for operation and that all cabinet doors are properly closed before switching it on.
- Warning signs are placed on all cabinet doors to warn of excessive voltage (over 50 V) in the control cabinets, but also of voltages in the power section and enormous short circuit currents. These signs supply a warning not to open the doors during operation.

	**DANGER ! High Voltage!** Only qualified personnel may carry out work or manipulation of the device.

- Operators are prohibited from performing any work inside the control cabinets.
- Service and maintenance will not be covered in this document.

1.9 Fire regulations

	**WARNING** Should a fire break out inside the system, a fire extinguisher with CO2 or halogen must be used. Do not inhale vapors.

1.10 Standards applied and conformity

European Standards	
Standard	**Description**
EN 60950	Safety of information technology equipment, including electrical business equipment
EN 50178 (project)	Equipment of Power Plants with electronic resources
IEC 600076	Power transformers
IEC 60146-1-2	General requirements and line commutated converters
IEC 60529	Degrees of protection provided by enclosures (IP codes)
IEC 60617	Graphical symbols and diagrams
EN 50082-2	EMC Requirements
DIN 41773 Part 1	Static power converters, semiconductor rectifiers equipment with IU characteristics for charging of Lead Acid batteries - guideline

CE

The standards mentioned above fulfil the requirements for CE marking.

The product mentioned in this manual conforms to the relevant requirements to the appropriate EU Directive, i.e. that this product meets all relevant EU Directives and that it can be sold inside the European Union without national commercial hindrances.

Relevant EU Directives for GE are called EMC- and Low Voltage Directives:

- EU Directive on Electromagnetic Compatibility 89/336/EU, in version 92/31/EU, 93/68/EU
- EU Directive on Electrical Equipment designed for use within certain Voltage Limits (Low Voltage Directive) 73/23/EU, in version 93/68/EU

The directives themselves define only on a modest scale what's to do and refer to the harmonised Standards. One of the EU harmonised product standards is applicable for rectifier systems. According to this standard GE fulfils the basic requirements.

2 - Introduction

2.1 Warranty

GE Digital Energy, operating through its authorized agents, warrants that the standard products will be free of defects in materials and workmanship for a period of 24 months after the date of invoice, or such other period as may be specified.

	**NOTE** This warranty does not cover failures of the product which result from incorrect installation, misuse, alterations by persons other than authorized agents, or abnormal operating conditions

2.2 Description

Static Transfer Switches type STS-400-XX-3/4 (four 3-pole models STS-400-25/40/63/100-3 and three 4-pole models STS-400-25/40/63-4) are designed for switching between two alternative electrical power sources without interruption of the power supplied to the load. The neutral wires in the 3-pole STS type are connected together, whereas the neutral wires in the 4-pole type are being switched the same way as the phase wires. The static transfer switch (STS) is connected to two sources of electrical power with terminals called X01 PRIMARY SOURCE and X02 SECONDARY SOURCE. The rated voltage of both sources is 400V AC phase-to-phase and the frequency is 50Hz. Depending on the current settings and the state of the system, one of the two sources (either the PRIMARY SOURCE or the SECONDARY SOURCE) is “connected” to the output terminal called X03 STS OUTPUT. Possible methods for transferring the load from one source to other are explained in chapter 4.

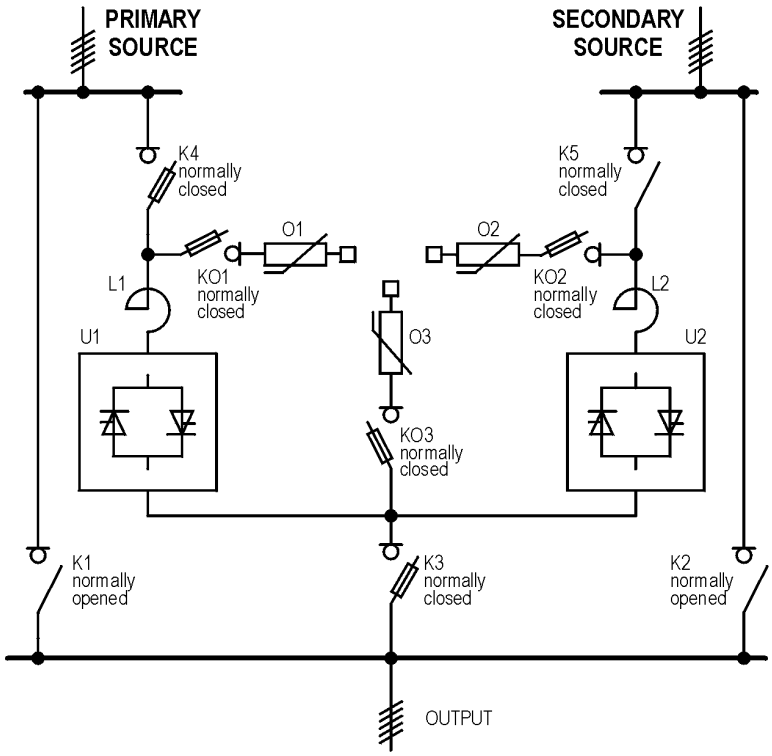


Figure 1. Electrical diagram of Static Transfer Switch (STS) with manual bypasses

Each single line on the diagram represents three wires inside the 3-pole STS and four wires inside the 4-pole STS.
PRIMARY SOURCE, SECONDARY SOURCE and STS OUTPUT connections consist of five wires each including Protective Earth (PE).

Five switches (figure 3) are set from the front panel without need for taking out the panel. These switches are equipped with a mechanical interlock that prevents against short circuit between both supplying sources. Each of them may be set manually into one of two positions: either “ON” or “OFF”. The device operates in STS mode if the switches are set as in table 1.

Table 1

K1 STS PRIMARY BYPASS	OFF
K2 STS SECONDARY BYPASS	OFF
K3 STS OUTPUT	ON
K4 STS PRIMARY SOURCE	ON
K5 STS SECONDARY SOURCE	ON

In normal mode of operation, the process of transferring the supply from one input to the other one is performed automatically. The start up procedure is described in chapter 3, operation is explained in chapter 4.
The device is equipped with a mechanical interlock plate that prevents against unintentional short circuit during manipulation with high current switches. The interlock plate is being moved aside during manipulation and may be set in three positions: SECONDARY BYPASS, NORMAL MODE and PRIMARY BYPASS. The interlock plate is equipped with a knurled nut that is screwed after a change of plate position. In that way the interlock plate positions are locked with the knurled nut to prevent unintentional move of the plate.

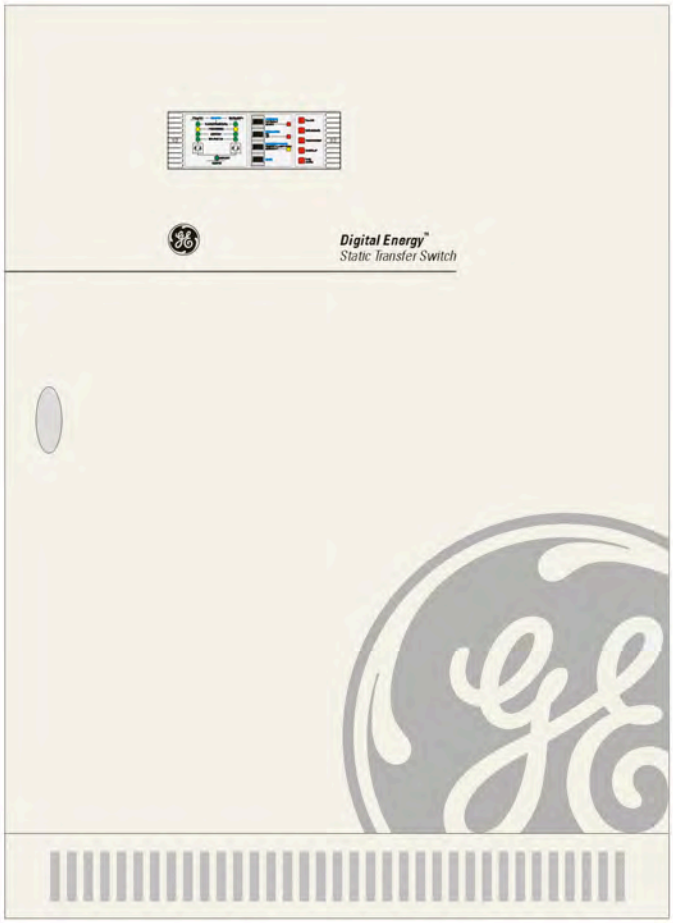


Figure 2. STS front

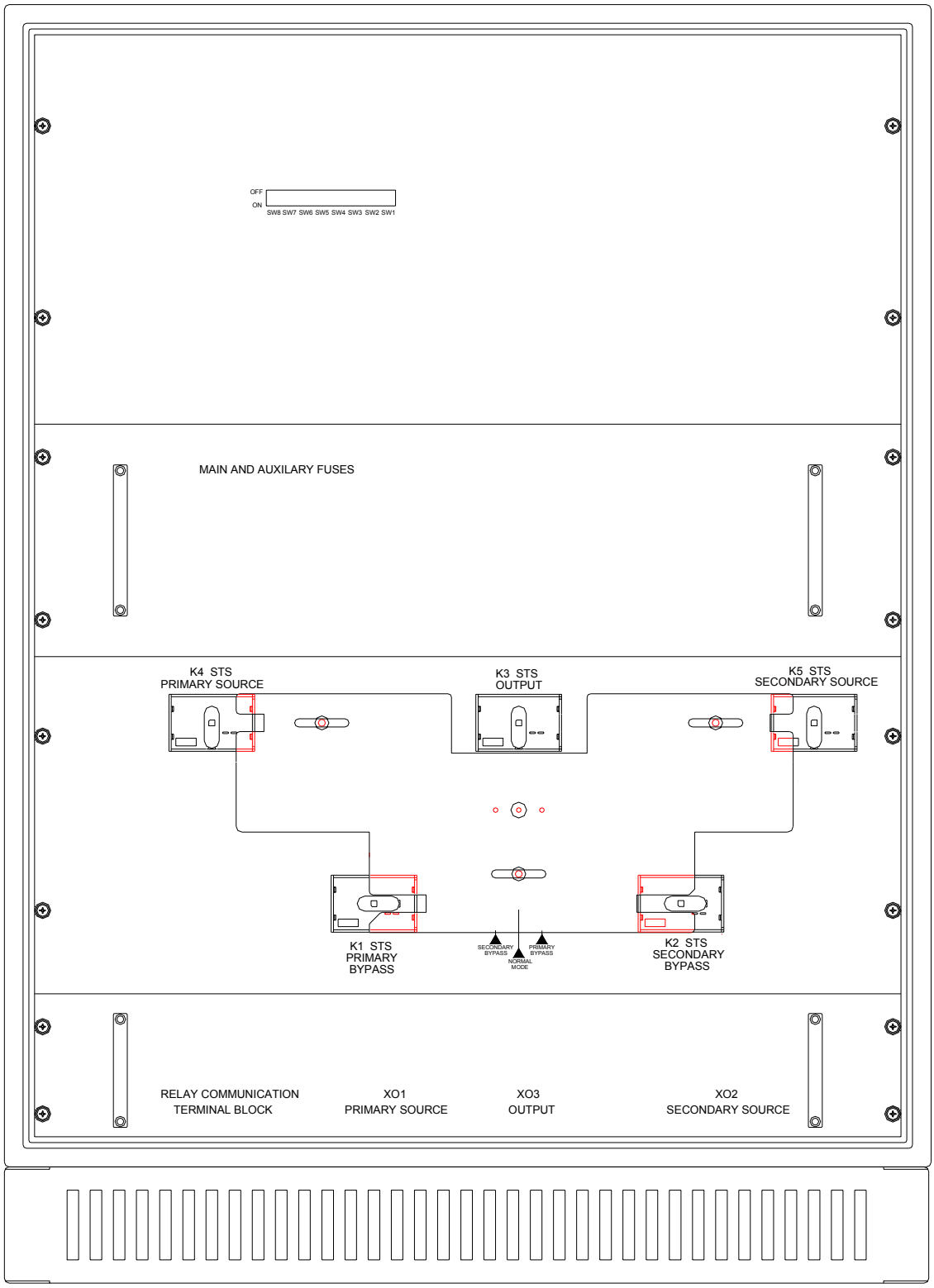


Figure 3. STS with opened door

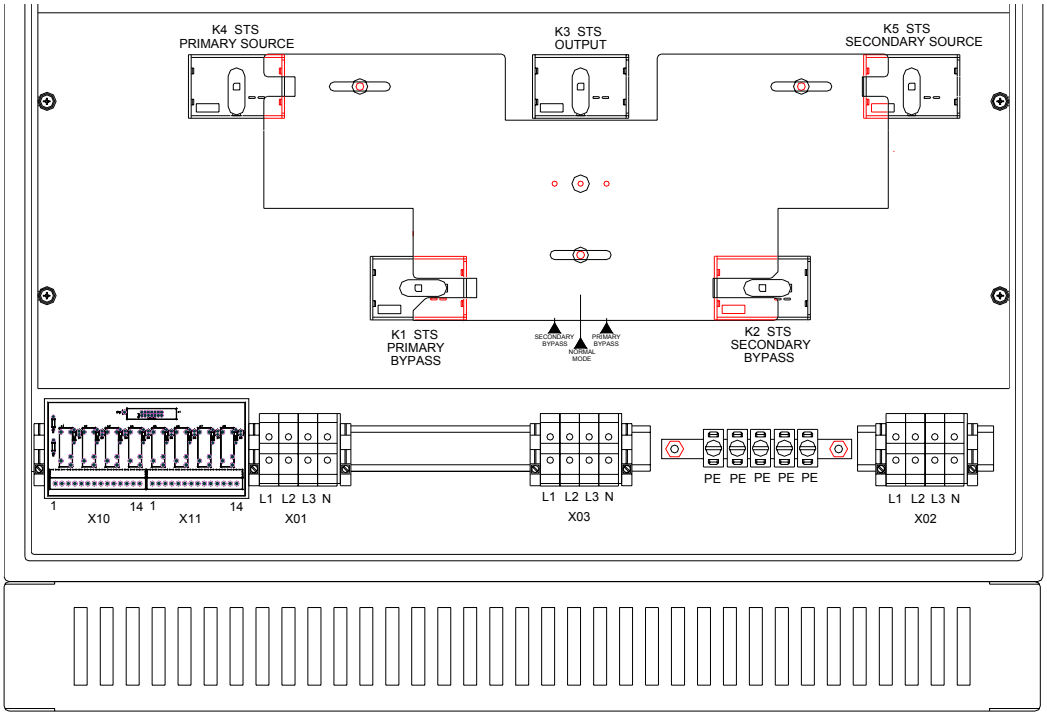


Figure 4.a. High current terminals location for all types excluding STS-400-100-3 (cover removed)

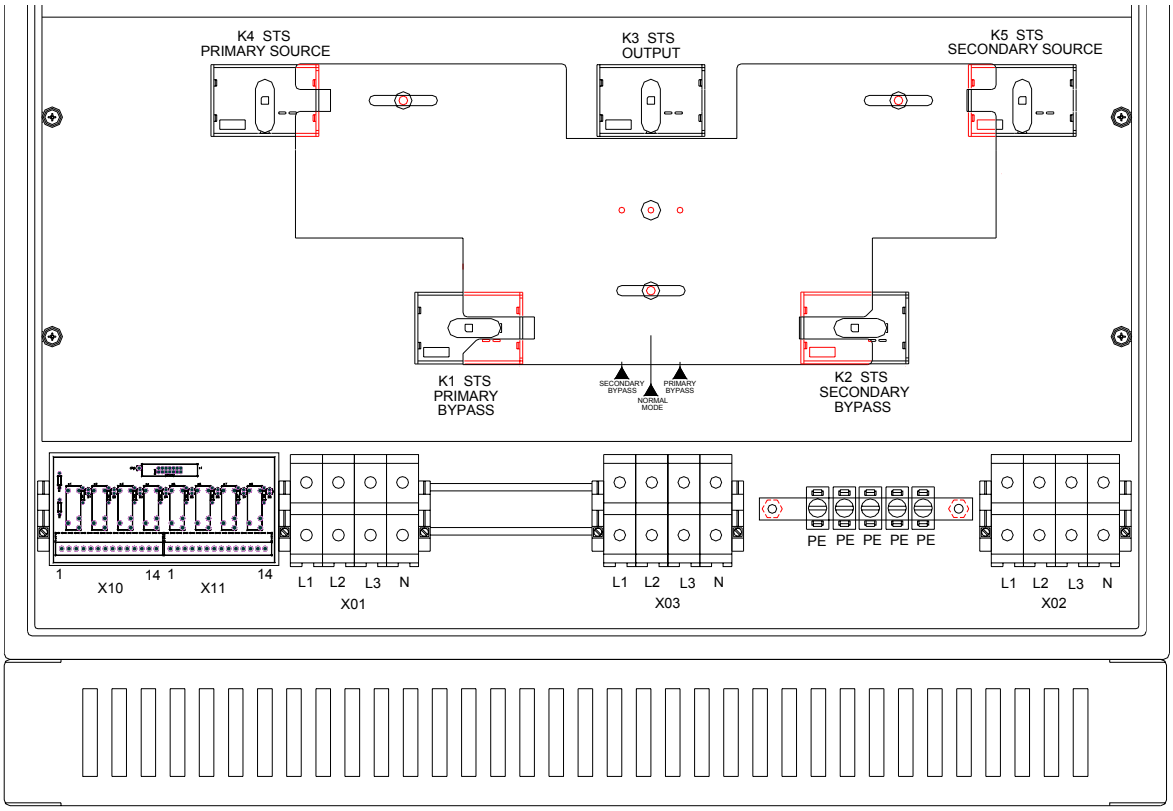


Figure 4 b. High current terminals location for STS-400-100-3 (cover removed)

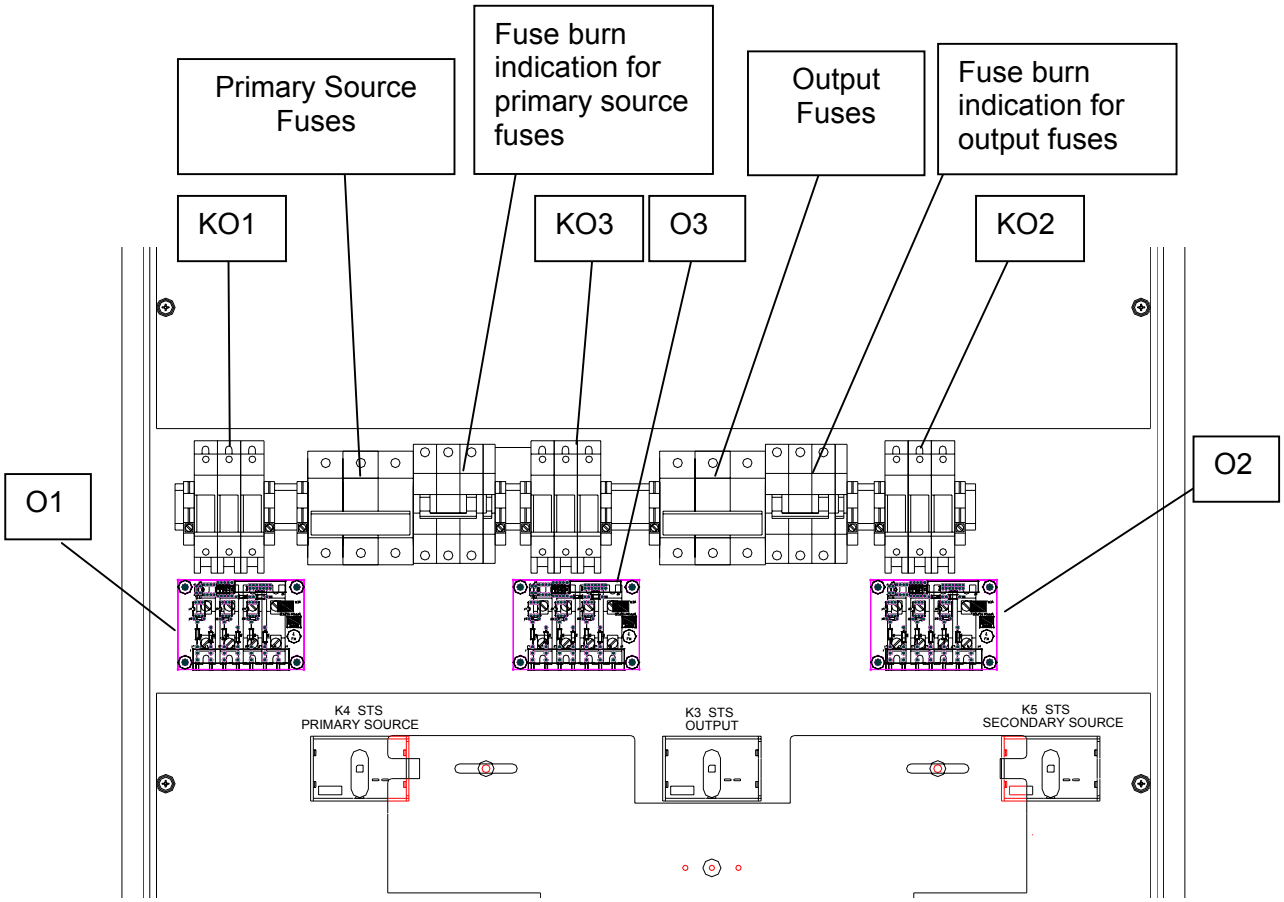


Figure 5 a. Fuses and TVSS location (without STS-400-100-3)

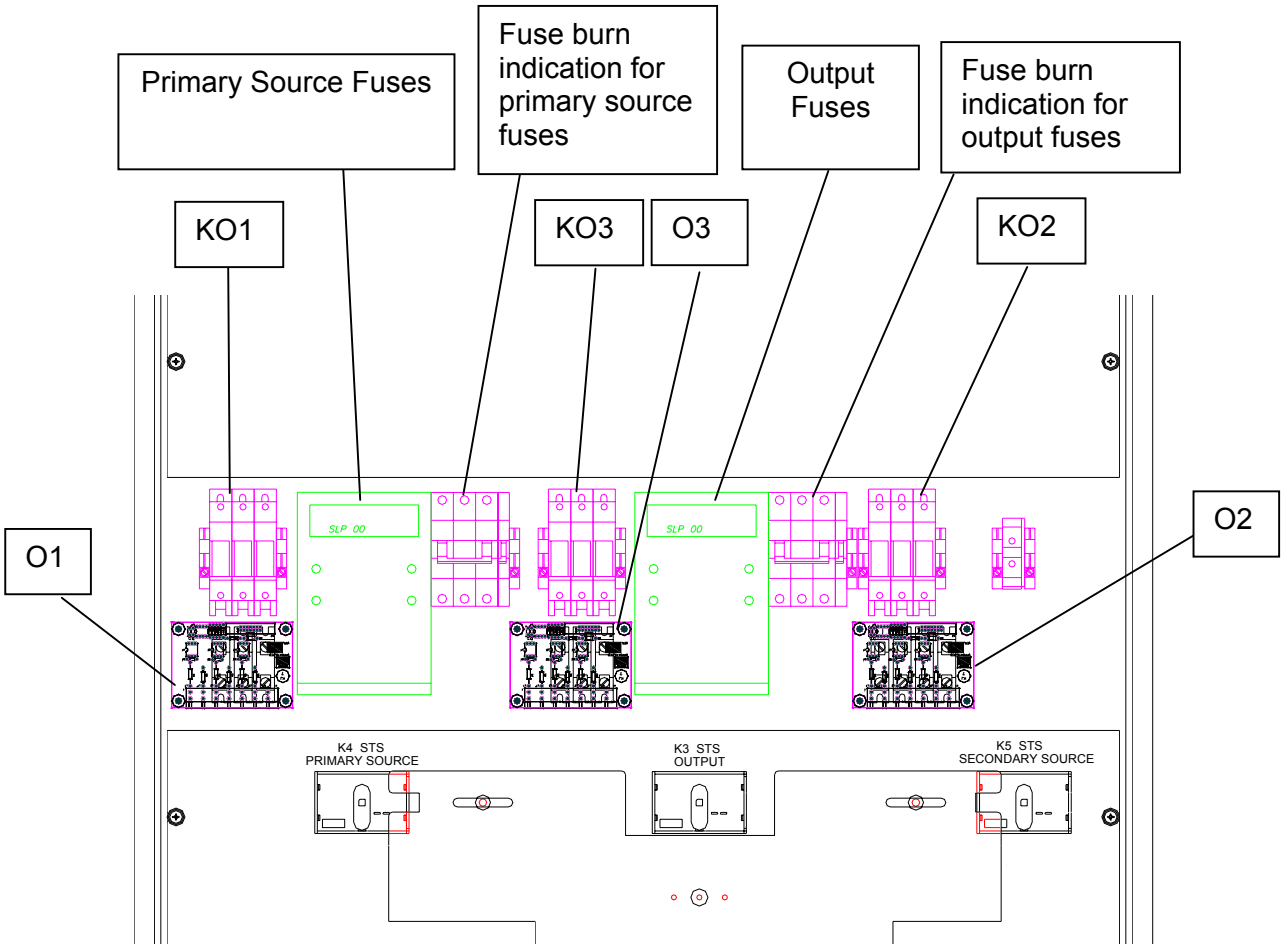


Figure 5b. Fuses and TVSS location for STS-400-100-3

2.3 Application

The STS-400-XX is designed to operate with two electrically separated electrical power sources connected to terminals X01 PRIMARY SOURCE and X02 SECONDARY SOURCE. The sources are connected to the STS with a five-wire cable each (three wires for the phases, one for neutral and one for PE). Electrical parameters of the input sources (PRIMARY SOURCE and SECONDARY SOURCE) and output external circuit (STS OUTPUT) should meet the specifications for the STS. Three cables coming into the STS, two from the sources and one from the load, create three outgoing lines on the diagram showed in figure 1. Lines going from the sources are called input lines and consequently the line going to the load is called output line. Input line voltage and output line current values should not exceed acceptable ranges.

2.4 Fuses and TVSS circuits

Fuses and TVSS units (TVSS – Transient Voltage Surge Suppressor) are placed behind the plate with MAIN AND AUXILARY FUSES label (figure 4). Exchange of fuses and TVSS units is possible after removing that plate (figure 6).
Fuses are placed in the primary input line and in the output line (figure 1). Each fuse is equipped with a signalling circuit which indicates a burnt fuse. The signalling circuit is based on an auxiliary overcurrent circuit breaker which is connected in parallel to the main fuse. When the main fuse is burnt the auxiliary circuit breaker is energized too. In this way the state of the auxiliary circuit breaker indicates which fuse was burnt. In case of exchanging the burnt fuse, the auxiliary circuit breaker should be set into position “on”.
Each line (two input lines and output line) is protected by TVSS units against voltage transients. In case of short circuit inside the TVSS unit caused by a voltage transient, each TVSS is equipped with an overcurrent circuit breaker that cuts off the circuit with a burnt TVSS. TVSS burning is indicated by a LED diode placed on the control panel (figure 7). In case of a TVSS alarm, each TVSS unit should be checked. Each burnt TVSS unit should be replaced as well as its fuse.

3 - Installation

3.1 Transport

The STS should be transported in a container truck with shock protection against moves during transport. The STS should be belted to the wall of the container. Because of limitation of height for air transport up to 1.6 meter, the STS is placed horizontally on a palette.

Move the STS in its original package to the final destination room using a pallet truck or forklift.

	**CAUTION** During transport, pay attention to:	

For storage and transport the cabinet of the Static Transfer Switch (STS) is covered with cardboard sheet belted with steel wrapping bands to europalettes or other suitable for forklift transport.

The package box supplies the following information:

- Name or logo of manufacturer
- Quality control sign
- Warnings according to PN-67/O-79252 Standard

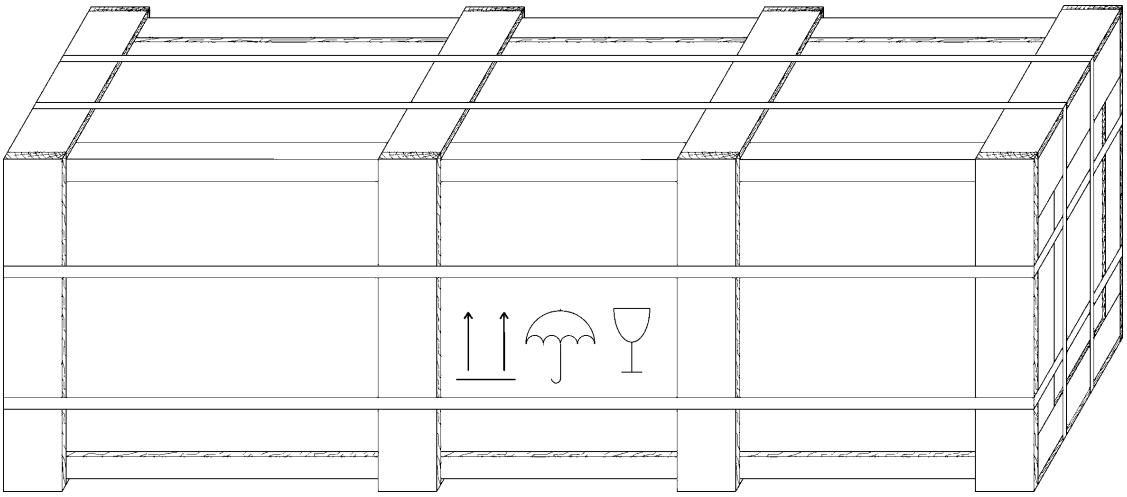


Figure 6. View of crate package

In case of installing a STS on upper levels, four lifting eyes are available on top of the cabinet allowing transport with a crane or others.

The STS should be stored in closed rooms free of chemically aggressive vapours, temperature 0°C to +40°C (32°F to 104°F) and humidity lower than 90% at 20°C (68°F).

3.2 Unpacking

1. Cut the wrapping bands, and remove the shipping box.
2. Immediately after unpacking carefully check the integrity of the equipment. In case you note recognizable damage,
   - notify the carrier and place of purchase
   - contact the nearest Service Center.

WARNING! In case of recognizable damage:

DO NOT connect any voltage to the unit
DO NOT put the unit into operation

3. Turn the unit into vertical position and place it on a frame. Screw the pedestal of the STS to the frame.
4. Recycle the packing material in compliance with all applicable regulations.

3.3 Location

- This STS is intended to be used in a controlled indoor environment and free of conductive contaminants and protected against animal intrusion.
- Check for sufficient floor loading capacity.
- Avoid placing the unit in direct sunlight or near heat sources.
- It is important that the unit has adequate ventilation. Maintain air movement around and through the unit. Do not block the air vents.
- The unit must be placed in a sufficiently ventilated area; the ambient temperature should not exceed 40°C (104°F).
- Do not install the STS in an excessively humid environment or near water, relative humidity should not exceed 90% at 20°C (68°F).
- Avoid spilling liquids or dropping any foreign object into the STS.

3.4 Installation

NOTE

The STS may only be installed by properly qualified, skilled and competent service personnel.
Refer to section 1.3 for further details.

CAUTION

Make sure that condensation does not occur as a result of a relatively low temperature of the unit. Especially if transport took place at sub-zero temperatures, allow the unit to warm up before installation and starting up.

External cable connections are being made during the installation procedure.

- When installing the STS strictly observe all information on technical data and operating conditions. Comply with all warnings, and strictly follow the procedures and practices as described in this manual.
- Do not touch electronic components. They may be electrostatic sensitive and are for that reason easily damaged due to improper handling.
- To avoid potential health risks, electrical components should not be mechanically damaged or destroyed.

NOTE

Before making any connection and switching on the STS, check the following conditions.

- Make sure that the rated voltage and frequency for the unit corresponds with the local supply voltage and frequency.

NOTE

Rated voltage of both sources is **400V AC phase to phase** and the frequency is **50Hz**.

- Make sure that the total power requirement of the equipment connected to the STS does not exceed the rated output power of the STS.

CAUTION

Wrong connection of the external sources to the STS may cause a fault inside the STS and unpredicted operation of external devices connected to the STS.

3.5 Connection

1. Switch off the supply in both supplying lines outside the STS. Switches for both sources may be placed in some distance to the STS depending on the topology of the rest of the power system.
2. Check the absence of the voltage in the two input lines with a proper voltmeter.
3. Open the door of the STS.
4. Set the switches into positions as in table 2.
5. Unscrew 4 screws (figure 3) from the lowest panel and take the panel out.
6. Firmly connect five wires coming from the first supplying device (PRIMARY SOURCE) into the X01 PRIMARY SOURCE terminal (figure 4).
7. Firmly connect five wires coming from the second supplying device (SECONDARY SOURCE) into the X02 SECONDARY SOURCE terminal (figure 4).
8. Firmly connect the five wires going to the load (STS OUTPUT) into the X03 STS OUTPUT terminal (figure 4).
9. Check the connection of three external lines. Especially the output line going to the load should be connected to the right terminal in the STS.
10. Check if L1, L2 and L3 of each source are connected to right terminal.
11. Put the front panel of the lower board back in place and fasten it with screws.
12. Switch on the supply for the two input sources. The STS is ready to start up.

Table 2

K1 STS PRIMARY BYPASS	OFF
K2 STS SECONDARY BYPASS	OFF
K3 STS OUTPUT	OFF
K4 STS PRIMARY SOURCE	OFF
K5 STS SECONDARY SOURCE	OFF

3.6 Starting up

Make sure that all necessary connections described in chapter 3.5 have been made.

Make sure that the internal switches are in the positions as described in table 2, and that the bypass interlock plate is in position “NORMAL MODE”.

Start up procedure for connecting the PRIMARY SOURCE to the STS OUTPUT should proceed as follows:

1. Choose the primary source as preferred with the button “PREFERRED SOURCE” on the control panel (button is released if primary source is preferred).
2. Choose manual operation mode with the button “OPERATION” (button is released if manual mode is on). Remote control is blocked when manual mode is on.
3. Set switch K4 STS PRIMARY SOURCE into “ON” position.
4. Check if the LEDs on the control panel indicate that the primary source is preferred, healthy, and on.
5. Set switch K5 STS SECONDARY SOURCE into “ON” position.
6. Check if the LEDs on the control panel indicate the secondary source as healthy and proper synchronization of both sources.
7. Set switch K3 STS OUTPUT into “ON” position.
8. Choose automatic operation mode with the button “OPERATION” on the control panel. In case of automatic operation the button is pressed.
9. Close the door of the STS.

After the start up procedure the states of the switches should be as in table 3.

Table 3

K1 STS PRIMARY BYPASS	OFF
K2 STS SECONDARY BYPASS	OFF
K3 STS OUTPUT	ON
K4 STS PRIMARY SOURCE	ON
K5 STS SECONDARY SOURCE	ON

4 - Operation

The STS operates in one of the following three modes:

Preferred source mode – the selected preferred source supplies the load.
The load is transferred to the other source if the voltage of the preferred source is outside acceptable range.

Automatic retransferring mode – After a transfer triggered by disturbances in the preferred source, the load is transferred again to the preferred source with a minimum delay of 6 seconds if the preferred source is healthy again.

Manual mode – connections are set manually (not automatically).

4.1 Operation mode settings

Three buttons on the control panel determine the current operation mode: OPERATION, RETRANSFER and PREFERRED SOURCE.

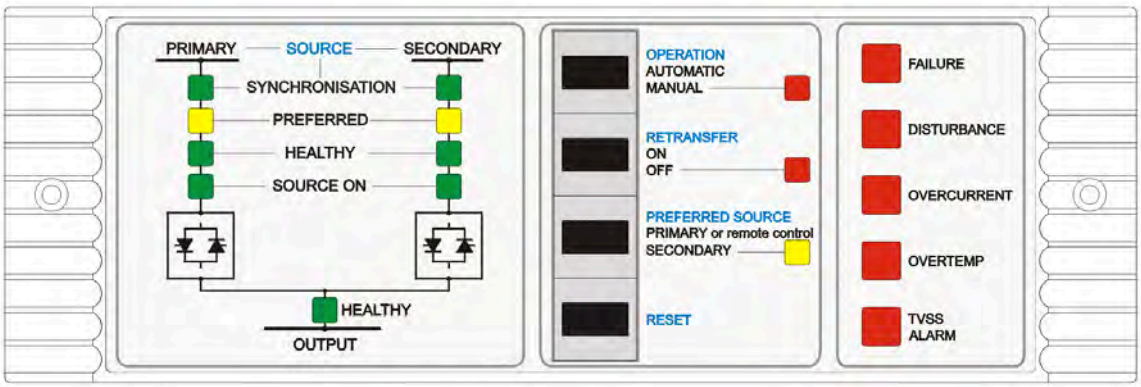


Figure 7. Control panel

4.1.1 Preferred source selection

Button designation	Position	Operation
PREFERRED SOURCE	PRIMARY – button is released	PRIMARY SOURCE or REMOTE CONTROL selected. ***NOTE**
	SECONDARY – button is pushed	SECONDARY SOURCE selected. SECONDARY BUTTON LED is on.

***NOTE**

If remote control signal is connected, its selection is valid. Preferred source may be selected by remote signal when switch PREFERRED SOURCE is set into "PRIMARY" position. If MANUAL mode is on, remote control is not active.

4.1.2 Automatic retransferring

Button designation	Position	Operation
RETRANSFER	ON – button is pushed	Retransfer operates
	OFF – button is released	Retransfer does not operate. RETRANSFER OFF LED is on.

4.1.3 Manual operation

Button designation	Position designation	Operation
OPERATION	MANUAL – button is released	Manual operation is active. OPERATION MANUAL is on. MANUAL LED is on. ***NOTE**
	AUTOMATIC – button is pushed	Automatic operation is active

***NOTE**

Remote control is blocked when manual mode is on. If MANUAL mode of operation is selected, the active source may be changed even if the second one is not operational.

4.1.4 Reset button

The reset button allows states of the alarms and LEDs which are memorized to be reset to default states.

4.2 Manual bypass operation

4.2.1 Bypassing load to primary source

	**NOTE** In case of STS failure, switch to bypass of active source

Initial states of the switches are described in table 3 (figure 8). The Interlock Plate is set in “NORMAL MODE” position. Bypassing the load to the primary source is achieved by the following steps:

1. Set button “PREFERRED SOURCE” into “PRIMARY” position (button is released if primary source is preferred)
2. Check if LEDs on the control panel indicate that the primary source is preferred, healthy and currently supplying the load.
3. Open the door of the STS.
4. Unscrew the knurled nut that locks the Interlock Plate.
5. Set switch K5 STS SECONDARY SOURCE into “OFF” position.
6. Move the Bypass Interlock Plate into PRIMARY BYPASS position.
7. Set switch K1 STS PRIMARY BYPASS into “ON” position.
8. Set switch K3 STS OUTPUT into “OFF” position.
9. Set switch K4 STS PRIMARY SOURCE into “OFF” position.
10. Screw the knurled nut that locks the Interlock Plate.

After described above procedure, the states of the switches should be as in table 4 (figure 9).

Table 4

K1 STS PRIMARY BYPASS	ON
K2 STS SECONDARY BYPASS	OFF
K3 STS OUTPUT	OFF
K4 STS PRIMARY SOURCE	OFF
K5 STS SECONDARY SOURCE	OFF

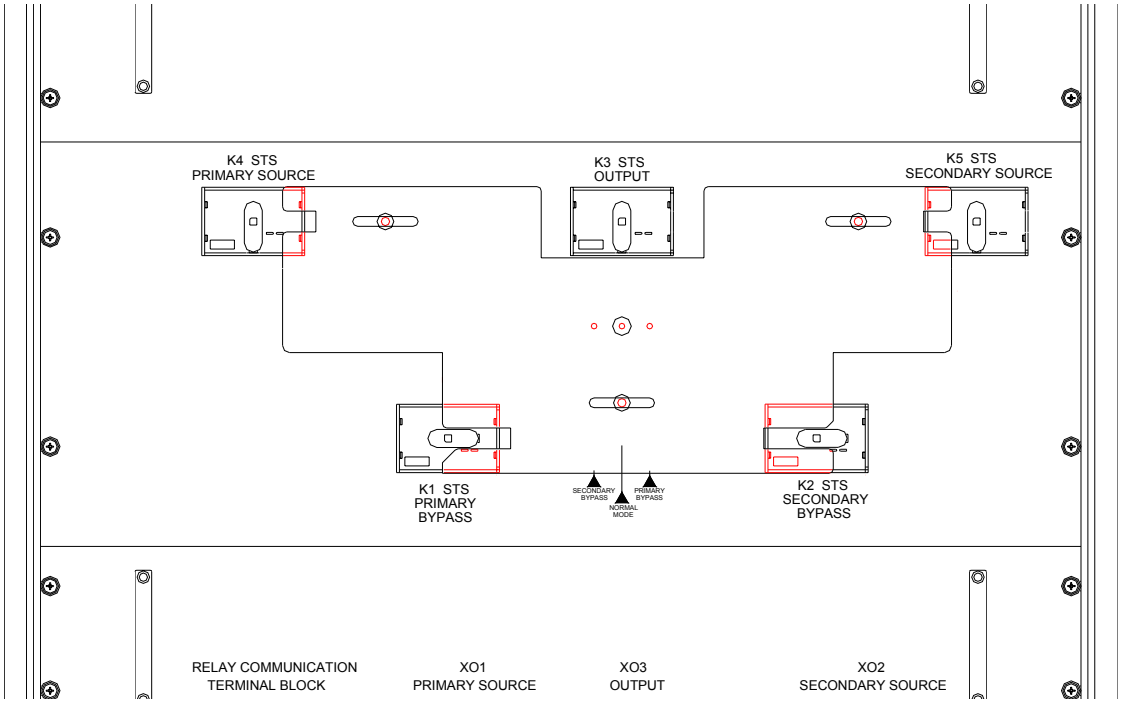


Figure 8. Switches set for normal STS mode of operation

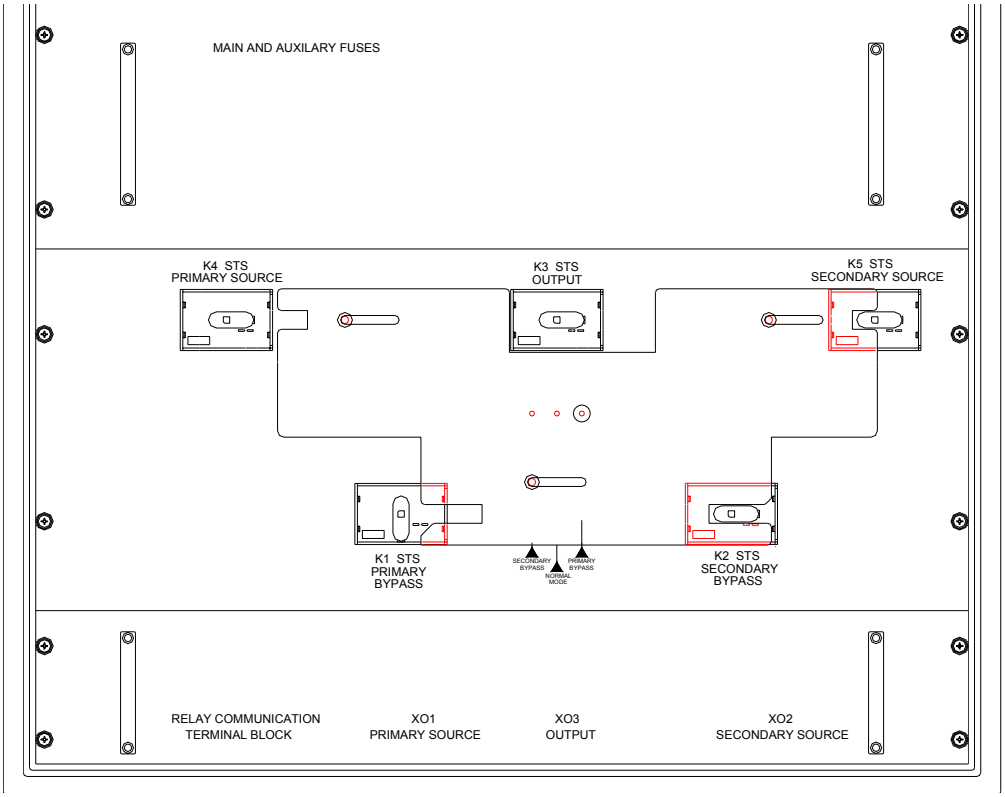


Figure 9. Switches set for primary bypass mode of operation

4.2.2 Return from primary bypass mode to STS operation

Initial states of the switches are described in table 4 (figure 9). The Interlock Plate is set in PRIMARY BYPASS position. Return from bypassing to STS primary source operation is achieved by the following steps:

1. Set button “PREFERRED SOURCE” into “PRIMARY” position (button is released if primary source is preferred).
2. Set button “OPERATION” into “AUTOMATIC” position (button is pushed in case of automatic operation).
3. Open the door of the STS.
4. Unscrew the knurled nut that locks the Interlock Plate.
5. Set switch K4 STS PRIMARY SOURCE into “ON” position.
6. Check if LEDs on the control panel indicate that the primary source is preferred, healthy and currently supplying the load.
7. Set switch K3 STS OUTPUT into “ON” position.
8. Set switch K1 STS PRIMARY BYPASS into “OFF” position.
9. Move the Bypass Interlock Plate into “NORMAL MODE” position.
10. Set switch K5 STS SECONDARY SOURCE into “ON” position.
11. Screw the knurled nut that locks the Interlock Plate.

After the procedure described above, the states of the switches should be as in table 5 (figure 8).

Table 5

K1 STS PRIMARY BYPASS	OFF
K2 STS SECONDARY BYPASS	OFF
K3 STS OUTPUT	ON
K4 STS PRIMARY SOURCE	ON
K5 STS SECONDARY SOURCE	ON

4.2.3 Bypassing load to secondary source

NOTE

In case of STS failure, switch to bypass of active source

Initial states of the switches are described in table 5 (figure 8). The Interlock Plate is set in NORMAL MODE position. Bypassing the load to the secondary source is achieved by the following steps:

1. Set button “PREFERRED SOURCE” into “SECONDARY” position (button is pushed if secondary source is preferred).
2. Check if LEDs on the control panel indicate that the secondary source is preferred, healthy and currently supplying the load.
3. Open the door of the STS.
4. Unscrew the knurled nut that locks the Interlock Plate.
5. Set switch K4 STS PRIMARY SOURCE into “OFF” position.
6. Move the Bypass Interlock Plate into “SECONDARY BYPASS” position.
7. Set switch K2 STS SECONDARY BYPASS into “ON” position.
8. Set switch K3 STS OUTPUT into “OFF” position.
9. Set switch K5 STS SECONDARY SOURCE into “OFF” position.
10. Screw the knurled nut that locks the Interlock Plate.

After the procedure described above, the states of the switches should be as in table 6 (figure 10).

Table 6

K1 STS PRIMARY BYPASS	OFF
K2 STS SECONDARY BYPASS	ON
K3 STS OUTPUT	OFF
K4 STS PRIMARY SOURCE	OFF
K5 STS SECONDARY SOURCE	OFF

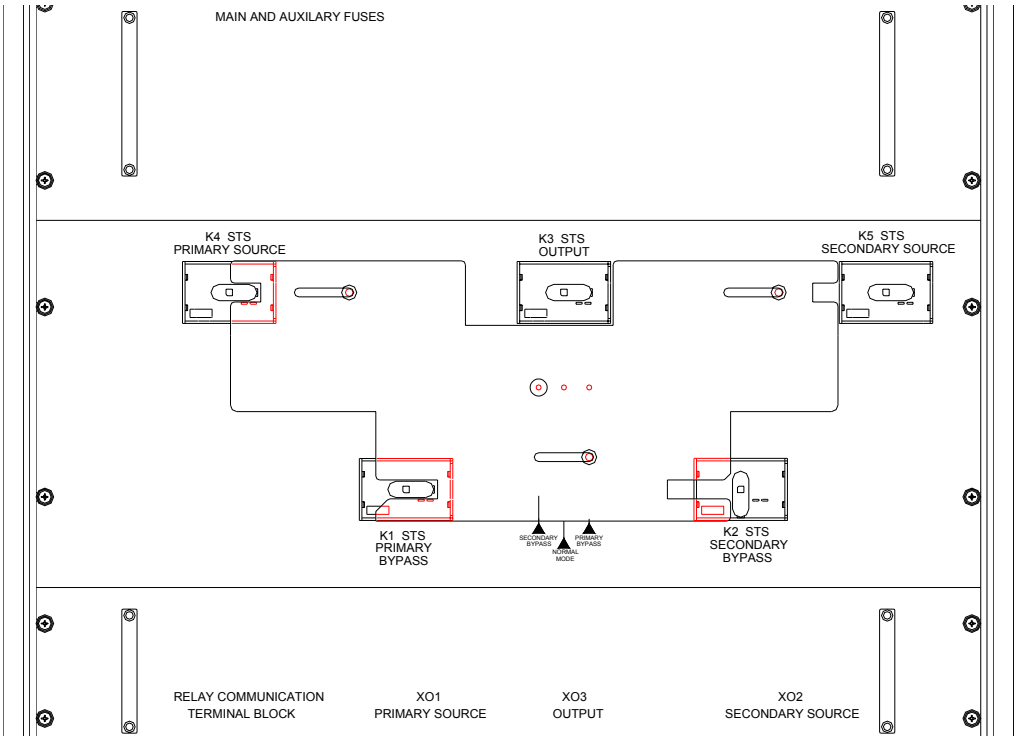


Figure 10. Switches set for secondary bypass mode of operation

4.2.4 Return from secondary bypass mode to STS operation

Initial states of the switches are described in table 6 (figure 10). The Interlock Plate is set in SECONDARY BYPASS position. Return from bypassing load to secondary source to STS operation is achieved by the following steps:

1. Set button “PREFERRED SOURCE” into “SECONDARY” position (button is pushed if secondary source is preferred).
2. Set button “OPERATION” into “AUTOMATIC” position (button is pushed in case of automatic operation).
3. Open the door of the STS.
4. Unscrew the knurled nut that locks the Interlock Plate.
5. Set switch K5 STS SECONDARY SOURCE into “ON” position
6. Check if LEDs on the control panel indicate that the secondary source is preferred, healthy and currently supplying the load.
7. Set switch K3 STS OUTPUT into “ON” position.
8. Set switch K2 STS SECONDARY BYPASS into “OFF” position.
9. Move the Bypass Interlock Plate into “NORMAL MODE” position.
10. Set switch K4 STS PRIMARY SOURCE into “ON” position.
11. Screw the knurled nut that locks the Interlock Plate.

After the procedure described above, the states of the switches should be as in table 7 (figure 8).

Table 7

K1 STS PRIMARY BYPASS	OFF
K2 STS SECONDARY BYPASS	OFF
K3 STS OUTPUT	ON
K4 STS PRIMARY SOURCE	ON
K5 STS SECONDARY SOURCE	ON

4.3 Service

4.3.1 STS operation test

1. Check if both sources are healthy (their LEDs are on) and if both sources are synchronized.
2. Set secondary source as preferred, using the PREFERRED button.
3. The STS transfers the load to the secondary source within 30 seconds; the transfer time depends on the dipswitch settings.
4. Set primary source as preferred using the PREFERRED button.
5. The STS transfers the load to primary source within 30 seconds; the transfer time depends on the dipswitch settings.

NOTE

The next step can cause loss of output voltage if the SECONDARY SOURCE or the STS is out of order.

6. Switch off K4 PRIMARY SOURCE.
7. STS immediately transfers the load to the secondary source. You can check the output transfer time locking output voltage waveform during transfer by oscilloscope.
8. Switch on K4 PRIMARY SOURCE.
9. STS transfers the load to the preferred primary source within 30 seconds; the transfer time depends on the dipswitch settings.
10. Set the secondary source as preferred one using PREFERRED button.

NOTE

The next step can cause loss of output voltage if the PRIMARY SOURCE or the STS is out of order.

11. Switch off K5 SECONDARY SOURCE.
12. The STS immediately transfers the load to the primary source. You can check the output transfer time locking output voltage waveform during transfer by oscilloscope.
13. Switch on K5 SECONDARY SOURCE.
14. The STS transfers load to the preferred secondary source within 30 seconds. The transfer time depends on the dipswitch settings.

4.3.2 Main fuse exchange procedure

1. Open the door of the STS.
2. Bypass the load to either the primary or secondary source according to one of the two procedures described in chapters 4.2.1 and 4.2.3. After that procedure switches K3 STS OUTPUT, K4 STS PRIMARY SOURCE and K5 STS SECONDARY SOURCE should be in “OFF” position.
3. Remove the panel marked with label “MAIN AND AUXILARY FUSES”.
4. Check the state of the circuit breakers used for fuse burn indication. If neither is switched off, probably there is no need to exchange fuses at all. If any fuse should be exchanged, its circuit breaker should be in off position.
5. Remove burnt fuses and close the cover properly.
6. Switch on the circuit breaker(s) used for fuse burn indication.
7. Reinstall the panel marked with label “MAIN AND AUXILARY FUSES”.
8. Return from bypass to STS operation according to one of two procedures described in chapters 4.2.2 and 4.2.4. After that procedure switches K3 STS OUTPUT, K4 STS PRIMARY SOURCE and K5 STS SECONDARY SOURCE should be in “ON” position. Switches K1 STS PRIMARY BYPASS and K2 STS SECONDARY BYPASS should be in “OFF” position.
9. Close the door of the STS.

4.3.3 TVSS fuse exchange procedure

1. Open the door of the STS.
2. Bypass the load to either the primary or secondary source according to one of the two procedures described in chapters 4.2.1 and 4.2.3. After that procedure switches K3 STS OUTPUT, K4 STS PRIMARY SOURCE and K5 STS SECONDARY SOURCE should be in “OFF” position.
3. Remove the panel marked with label “MAIN AND AUXILARY FUSES”.
4. Check fuses KO1, KO2 and KO3 (9 fuses in three fuse holders) and the TVSS units with an ohmmeter. Burnt TVSS may be located with an ohmmeter or just by visual inspection, without any tools.
5. Exchange the damaged TVSS units as well as their fuses.
6. Reinstall the panel marked with label “MAIN AND AUXILARY FUSES”.
7. Return from bypass to STS operation according to one of two procedures described in chapters 4.2.2 and 4.2.4. After that procedure switches K3 STS OUTPUT, K4 STS PRIMARY SOURCE and K5 STS SECONDARY SOURCE should be in “ON” position. Switches K1 STS PRIMARY BYPASS and K2 STS SECONDARY BYPASS should be in “OFF” position.
8. Close the door of the STS.

4.3.4 Trouble shooting

FAILURE LED is ON	**A.** Check if OVERCURRENT LED is off **B.** Check if OVERTEMP LED is off **C.** Press RESET button to remove memorized alarm **D.** Check PRIMARY FUSES and their indication switches **E.** Check STS OUTPUT FUSES and their indication switches
DISTURBANCE LED is ON	**A.** Check if PRIMARY SOURCE HEALTHY LED is ON **B.** Check if SECONDARY SOURCE HEALTHY LED is ON **C.** Check if SYNCHRONIZATION LEDs are ON **D.** Check if TVSS ALARM LED is OFF **E.** Check if RETRANSFER OFF LED is OFF **F.** Check if MANUAL LED is OFF
OVERCURRENT LED is ON	**A**. Check with clamp meter if the output current of STS in all phases is correct (notice crest factor of output current) **B.** Switch off some load
OVERTEMP LED is ON	**A.** Check if air ventilation in the cabinet is sufficient **B**. Check if each fan in STS is working **C.** Check with clamp meter if the output current of STS in all phases is correct (notice crest factor of output current). After restoring right condition (nominal load), heatsink temperature drops down below sensor deactivation level (hysteresis). It takes about 1 hour time. During that time OVERTEMP LED is on.
TVSS ALARM LED is ON	Check if any of transient voltage surge suppressors fuses are burnt and replace them with new ones
RETRANSFER OFF LED is ON	Check position of RETRANSFER button – turn it into ON position (button is pushed)
MANUAL LED is ON	Check position of OPERATION button – turn it into AUTOMATIC position (button is pushed)
SYNCHRONIZATION LEDs are OFF	**A.** Check phase order in both inputs X01 and X02 **B.** Check phase delay in right phases between voltages in both supplying sources

4.4 Parameters settings (dipswitches)

	**WARNING !** DIP switch manipulation is allowed with STS set in manual bypass mode of operation and with switches K3, K4 and K5 in OFF position.

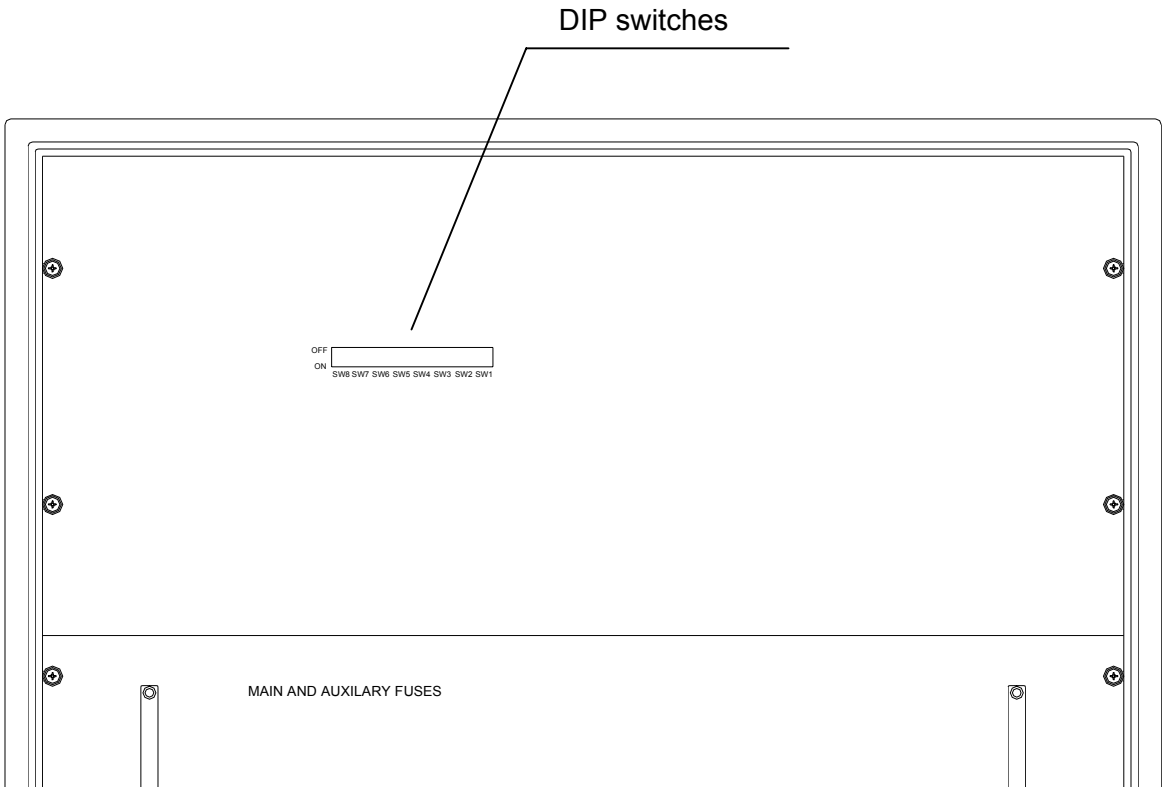


Figure 11. Access to DIP switches

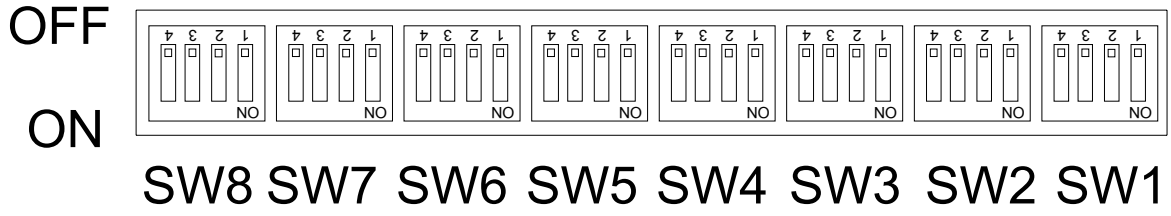
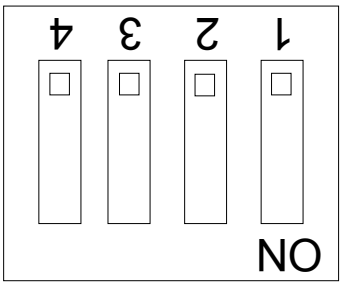


Figure 12. DIP switches (zoom)

	**NOTE** DIP switches numbering order is from left to right side ! Each single DIP switch is in upside down position.

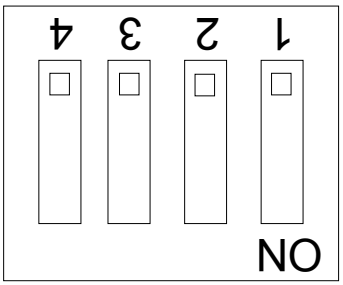
	NOTE DIP switches numbering order is from left to right side as in figure 11 !



Designation on the enclosure	Function	Designation				Value	
		1	2	3	4		
SW1	Undervoltage level for PRIMARY SOURCE	OFF	OFF	OFF	X	forbidden	
		ON	OFF	OFF	X	-8%	
		ON	ON	OFF	X	-12%	
		OFF	ON	OFF	X	-16%	
		OFF	ON	ON	X	-20%	
		OFF	OFF	ON	X	-24%	
SW2	Overvoltage level for PRIMARY SOURCE	OFF	OFF	OFF	X	forbidden	
		ON	OFF	OFF	X	+6%	
		ON	ON	OFF	X	+9%	
		OFF	ON	OFF	X	+13%	
		OFF	ON	ON	X	+16%	
		OFF	OFF	ON	X	+20%	
SW3	Undervoltage level for SECONDARY SOURCE	OFF	OFF	OFF	X	forbidden	
		ON	OFF	OFF	X	-8%	
		ON	ON	OFF	X	-12%	
		OFF	ON	OFF	X	-16%	
		OFF	ON	ON	X	-20%	
		OFF	OFF	ON	X	-24%	
SW4	Overvoltage level for SECONDARY SOURCE	OFF	OFF	OFF	X	forbidden	
		ON	OFF	OFF	X	+6%	
		ON	ON	OFF	X	+9%	
		OFF	ON	OFF	X	+13%	
		OFF	ON	ON	X	+16%	
		OFF	OFF	ON	X	+20%	
SW5	Level of delay angle between two synchronized input line voltages	OFF	OFF	OFF	X	forbidden	If delay angle is larger than set level, transfer is performed with additional delay.
		ON	OFF	OFF	X	8°	
		ON	ON	OFF	X	12°	
		OFF	ON	OFF	X	16°	
		OFF	ON	ON	X	20°	
		OFF	OFF	ON	X	24°	

X – either OFF or ON freely (it is not important for this function)

	NOTE DIP switches numbering order is from left to right side as in figure 11 !

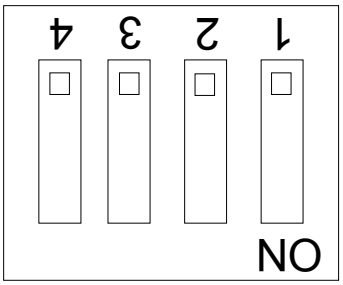


Designation on the enclosure	Function	Designation				Value	
		1	2	3	4		
SW6	Overcurrent level	OFF	OFF	OFF	X	-	Transfer without overcurrent control
		ON	OFF	OFF	X	$3I_n$	If instantaneous current is larger than set level, transfer is not performed.
		ON	ON	OFF	X	$4.5I_n$	
		OFF	ON	OFF	X	$6I_n$	
		OFF	ON	ON	X	$7.5I_n$	
		OFF	OFF	ON	X	$9I_n$	
SW7	Retransferring delay	OFF	OFF	X	X	25 s	
		OFF	ON	X	X	1 s	
		ON	OFF	X	X	8 s	
		ON	ON	X	X	0.8 s	
	Switching delay with unsynchronized sources	X	X	OFF	OFF	50 ms	Delay between switching off and switching on
		X	X	OFF	ON	17 ms	
		X	X	ON	OFF	25 ms	
		X	X	ON	ON	13 ms	
SW8	Sequence of the thyristors firing	OFF	X	X	X	Only possible setting for STS-400-XX-4. Other setting may cause wrong operation of the device.	
		ON	X	X	X	Only possible setting for STS-400-XX-3. Other setting may cause wrong operation of the device.	

X – either OFF or ON freely (it is not important for this function)

4.5 Default DIP switch settings

	NOTE DIP switches numbering order is from left to right side as in figure 11 !



Designation	Function	Default value				Meaning
		1	2	3	4	
SW1	Undervoltage level for PRIMARY SOURCE	ON	OFF	OFF	OFF	-8%
SW2	Overvoltage level for PRIMARY SOURCE	ON	OFF	OFF	OFF	+6%
SW3	Undervoltage level for SECONDARY SOURCE	ON	OFF	OFF	OFF	-8%
SW4	Overvoltage level for SECONDARY SOURCE	ON	OFF	OFF	OFF	+6%
SW5	Level of delay angle between two synchronized input line voltages	ON	OFF	OFF	OFF	8°
SW6	Overcurrent level	ON	OFF	OFF	OFF	$3I_n$
SW7	Retransferring delay	ON	ON	ON	ON	0.8s
	Switching delay with unsynchronized sources					13ms
SW8	Sequence of the thyristors firing	OFF	OFF	OFF	OFF	for STS-400-XX-4
		ON	ON	ON	ON	for STS-400-XX-3

4.6 Terminals

4.6.1 Relay communication terminal block

Inputs to and outputs from device for controlling or monitoring functions are accessed through the RELAY COMMUNICATION TERMINAL BLOCK.

Terminal designation					Meaning
1	X10	1	NC	Output	SECONDARY SOURCE OK. Secondary source operates if there is electrical connection between “common” and “NC” terminal.
2		2	NO		
3		3	COMM		
4		4	NC	Output	PRIMARY SOURCE OK. Primary source operates if there is electrical connection between “common” and “NC” terminal.
5		5	NO		
6		6	COMM		
7		7	NC	Output	DISTURBANCE ALARM *1) Alarm is set if there is electrical connection between “common” and “NO” terminal.
8		8	NO		
9		9	COMM		
10		10	NC	Output	FAILURE ALARM *2) Alarm is set if there is electrical connection between “common” and “NO” terminal.
11		11	NO		
12		12	COMM		
13		13	NC	Output	SECONDARY SOURCE ON Secondary source was selected if there is electrical connection between “common” and “NC” terminal.
14		14	NO		
15	X11	1	COMM		
16		2	NC	Output	PRIMARY SOURCE ON Primary source was selected if there is electrical connection between “common” and “NC” terminal.
17		3	NO		
18		4	COMM		
19		5	NC	Output	RETRANSFER OFF Retransfer function was blocked if there is electrical connection between “common” and “NO” terminal.
20		6	NO		
21		7	COMM		
22		8	NC	Output	MANUAL ON *3) Manual mode of operation was chosen if there is electrical connection between “common” and “NO” terminal.
23		9	NO		
24		10	COMM		
25	X11	11	Not used		
26		12	Not used		
27		13		Input	REMOTE CONTROL If closed secondary source is selected. Otherwise primary source is selected. This selection is valid if PREFERRED SOURCE switch is set in “PRIMARY or remote control” position.
28		14			

*1) DISTURBANCE ALARM appears if at least one of the following events takes place:
- Overvoltage in at least one of input sources
- Undervoltage in at least one of input sources
- Input sources not synchronized
- Transient voltage surge protection device was burnt
- Retransfer was blocked
- Internal supply failure
- Manual mode of operation was chosen

*2) FAILURE ALARM appears if at least one of the following events takes place:
- Fuse was burnt
- Overcurrent
- Overtemperature
- Internal STS failure

*3) If MANUAL mode of operation is selected, active source may be changed even if second one is not operational.

4.6.2 Communication Interface Module CI-M1

The Communication Interface Module CI-M1 is delivered as an option and it is used to communicate between devices and an external overall system with MODBUS communication protocol. This module allows the device to be monitored by user control systems.

Data transmission is performed through a serial port that works in RS485 standard. The serial communication channel is optically isolated from the other part of the module and in consequence it is isolated from the connected device. The task of the Communication Interface Module CI-M1 is to pass information about states of signalizing contactors to the overall system.

Transmission parameter:
- asynchronous serial transmission
- preset transmission speed
- 1 stop bit
- 8 data bits
- without parity bit

The transmission speed is selected by setting a switch on the PCB (printed board). The switch is marked as **PR TRANS** and it has 16 positions. Table 8 below shows the settings and corresponding transmission speed.

Table 8

PR TRANS setting	Transmission speed in bauds
0	600
1	1200
2	2400
3	4800
4	9600
5	19200
6	38400
7	57600
8	115200

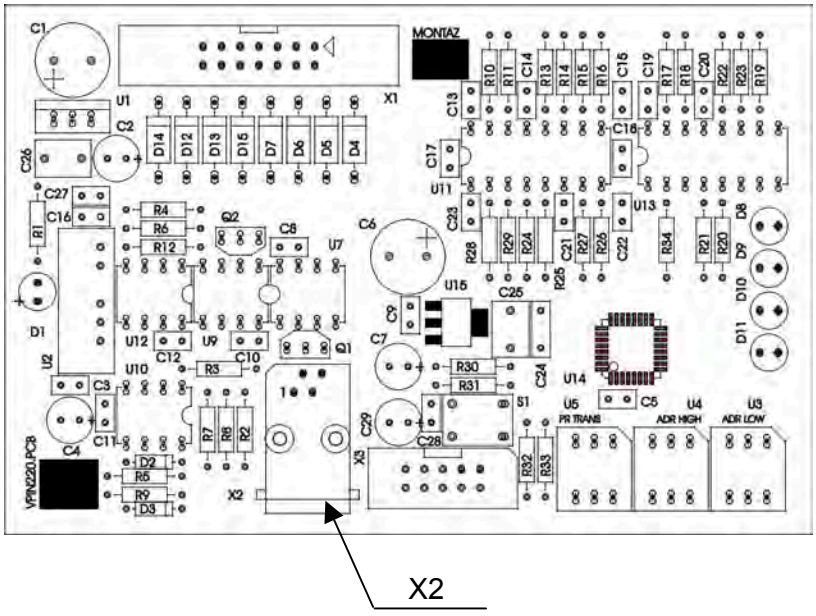


Figure 13. PCB of Communication Interface Module CI-M1

The X2 user connector is a socket type RJ10 with outlets as in figure 14.

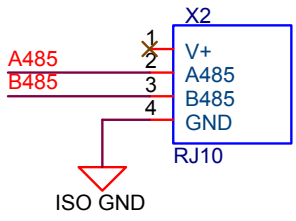


Figure 14. RS485 connector

Logical address setting

The switches **ADR HIGH** and **ADR LOW** are used to give each device its own unique -within the system- device number (logical address). The device number may be set within the range from 0 to 255. The number is set in hexadecimal code. **ADR HIGH** setting refers to higher number tetrad and **ADR LOW** to lower number tetrad.

Table 10 presents the logical address numbers based on **ADR HIGH** (ADRH) and **ADR LOW** (ADRL) switch settings.

Transmitted data description

Data transmission from the device to the overall system is performed in accordance with the MODBUS RTU protocol, where the transmission module is in Slave mode of operation. Register value and its meaning is presented in table 9 below.

Table 9. Objects map for MODBUS protocol

Word	Byte	Bit	Parameter	Format
0	0	0	MANUAL_ON	Logic 1=active
		1	RETRANSFER_OFF	Logic 1=active
		2	PRIMARY_SOURCE_ON	Logic 0=active
		3	SECONDARY_SOURCE_ON	Logic 0=active
		4	FAILURE_ALARM	Logic 1=active
		5	DISTURBANCE_ALARM	Logic 1=active
		6	PRIMARY_SOURCE_OK	Logic 0=active
		7	SECONDARY_SOURCE_OK	Logic 0=active
	1	8..15	Reserved	

Device compatibility with MODBUS standard

The device transmits and receives frames in binary variety of MODBUS standard. Frames are protected by double byte control sum CRC (first the lower byte is transmitted, then the higher one)
The Module executes the following commands of the protocol:

03 - reading of word block,
01 - reading of bit sequence

Table 10. Switches settings: ADR HIGH (higher tetrad) and ADR LOW (lower tetrad).

No	ADR HIGH	ADR LOW	No	ADR HIGH	ADR LOW	No	ADR HIGH	ADR LOW	No	ADR HIGH	ADR LOW	No	ADR HIGH	ADR LOW
0	0	0	53	3	5	106	6	A	159	9	F	212	D	4
1	0	1	54	3	6	107	6	B	160	A	0	213	D	5
2	0	2	55	3	7	108	6	C	161	A	1	214	D	6
3	0	3	56	3	8	109	6	D	162	A	2	215	D	7
4	0	4	57	3	9	110	6	E	163	A	3	216	D	8
5	0	5	58	3	A	111	6	F	164	A	4	217	D	9
6	0	6	59	3	B	112	7	0	165	A	5	218	D	A
7	0	7	60	3	C	113	7	1	166	A	6	219	D	B
8	0	8	61	3	D	114	7	2	167	A	7	220	D	C
9	0	9	62	3	E	115	7	3	168	A	8	221	D	D
10	0	A	63	3	F	116	7	4	169	A	9	222	D	E
11	0	B	64	4	0	117	7	5	170	A	A	223	D	F
12	0	C	65	4	1	118	7	6	171	A	B	224	E	0
13	0	D	66	4	2	119	7	7	172	A	C	225	E	1
14	0	E	67	4	3	120	7	8	173	A	D	226	E	2
15	0	F	68	4	4	121	7	9	174	A	E	227	E	3
16	1	0	69	4	5	122	7	A	175	A	F	228	E	4
17	1	1	70	4	6	123	7	B	176	B	0	229	E	5
18	1	2	71	4	7	124	7	C	177	B	1	230	E	6
18	1	3	72	4	8	125	7	D	178	B	2	231	E	7
20	1	4	73	4	9	126	7	E	179	B	3	232	E	8
21	1	5	74	4	A	127	7	F	180	B	4	233	E	9
22	1	6	75	4	B	128	8	0	181	B	5	234	E	A
23	1	7	76	4	C	129	8	1	182	B	6	235	E	B
24	1	8	77	4	D	130	8	2	183	B	7	236	E	C
25	1	9	78	4	E	131	8	3	184	B	8	237	E	D
26	1	A	79	4	F	132	8	4	185	B	9	238	E	E
27	1	B	80	5	0	133	8	5	186	B	A	239	E	F
28	1	C	81	5	1	134	8	6	187	B	B	240	F	0
29	1	D	82	5	2	135	8	7	188	B	C	241	F	1
30	1	E	83	5	3	136	8	8	189	B	D	242	F	2
31	1	F	84	5	4	137	8	9	190	B	E	243	F	3
32	2	0	85	5	5	138	8	A	191	B	F	244	F	4
33	2	1	86	5	6	139	8	B	192	C	0	245	F	5
34	2	2	87	5	7	140	8	C	193	C	1	246	F	6
35	2	3	88	5	8	141	8	D	194	C	2	247	F	7
36	2	4	89	5	9	142	8	E	195	C	3	248	F	8
37	2	5	90	5	A	143	8	F	196	C	4	249	F	9
38	2	6	91	5	B	144	9	0	197	C	5	250	F	A
39	2	7	92	5	C	145	9	1	198	C	6	251	F	B
40	2	8	93	5	D	146	9	2	199	C	7	252	F	C
41	2	9	94	5	E	147	9	3	200	C	8	253	F	D
42	2	A	95	5	F	148	9	4	201	C	9	254	F	E
43	2	B	96	6	0	149	9	5	202	C	A	255	F	F
44	2	C	97	6	1	150	9	6	203	C	B			
45	2	D	98	6	2	151	9	7	204	C	C			
46	2	E	99	6	3	152	9	8	205	C	D			
47	2	F	100	6	4	153	9	9	206	C	E			
48	3	0	101	6	5	154	9	A	207	C	F			
49	3	1	102	6	6	155	9	B	208	D	0			
50	3	2	103	6	7	156	9	C	209	D	1			
51	3	3	104	6	8	157	9	D	210	D	2			
52	3	4	105	6	9	158	9	E	211	D	3			

4.6.3 High current terminal

Terminal designation	Designation	Cross section for the wire (maximum)	
		STS-400-100-3	Others
X01, X02, X03	PE	70 mm^2	35 mm^2
	L1	70 mm^2	35 mm^2
	L2	70 mm^2	35 mm^2
	L3	70 mm^2	35 mm^2
	N	70 mm^2	35 mm^2

4.7 Fuse selection

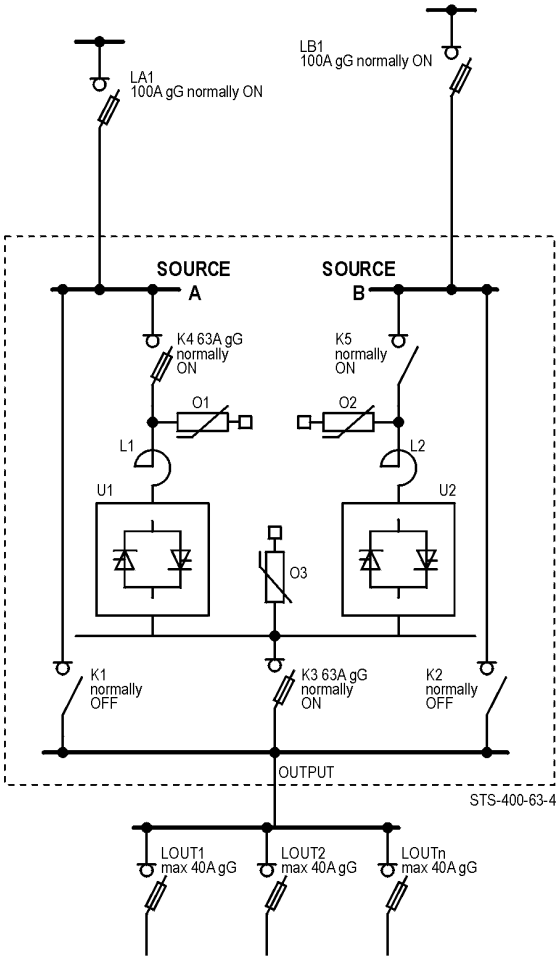


Figure 15. Overcurrent protection for supply and load lines of the STS (Figure shows values for the STS-400-63-4)

For selective fuse operation, fuse sizes should be selected as in the tables below

STS-400-100-3		
Fuses of line A and B (minimum value)	**STS fuses**	**Fuses of load lines (maximum value)**
160A gG	100A gG	63A gG
125A gG	80A gG	50A gG
100A gG	63A gG	40A gG

STS-400-63-3/4		
Fuses of line A and B (minimum value)	**STS fuses**	**Fuses of load lines (maximum value)**
100A gG	63A gG	40A gG
80A gG	50A gG	32A gG
63A gG	40A gG	25A gG

STS-400-40-3/4		
Fuses of line A and B (minimum value)	**STS fuses**	**Fuses of load lines (maximum value)**
63A gG	40A gG	25A gG
50A gG	32A gG	20A gG
40A gG	25A gG	16A gG

STS-400-25-3/4		
Fuses of line A and B (minimum value)	**STS fuses**	**Fuses of load lines (maximum value)**
40A gG	25A gG	16A gG
32A gG	20A gG	10A gG

5 - Specifications

5.1 Technical data

Input line parameters (supply)			
Rated input voltage	3 x 400 V RMS phase to phase		TN-C, TN-S
Acceptable changes of input voltages	-25% ÷ +20%		
Frequency	50 Hz		
Acceptable changes of frequency	-9% ÷ +6%		
Voltage surge withstand	<1,5kV		limp 15kA 8/20us
	<1,0kV		limp 5kA 8/20us
Voltage insulation	AC 2kV 60s		
Efficiency	>99%		cos(ϕ) > 0,8
Output line parameters			
Rated output current	STS-400-63-4		3 x 63 A RMS + 125 A RMS (neutral)
	STS-400-40-4		3 x 40 A RMS + 80 A RMS (neutral)
	STS-400-25-4		3 x 25 A RMS + 50 A RMS (neutral)
	STS-400-100-3		3 x 100 A RMS + 200 A RMS (neutral)
	STS-400-63-3		3 x 63 A RMS + 125 A RMS (neutral)
	STS-400-40-3		3 x 40 A RMS + 80 A RMS (neutral)
	STS-400-25-3		3 x 25 A RMS + 50 A RMS (neutral)
Maximum crest factor	3,5		
Power factor cos(ϕ)	0,5-1		lag, lead
Voltage surge withstand	<1,5kV		limp 15kA 8/20us
	<1,0kV		limp 5kA 8/20us
Acceptable overload	125% 400% 800% 1000% 1500%		t=1h t=5s t=0,4s t=0,2s t=20ms
Short circuit withstand for thyristors (130°C)	3200 A/20ms 8000 A/20ms for STS-400-100-3		
I^2t value for thyristors (130°C)	51200A^2s 320000 A^2s for STS-400-100-3		
Breaking ability for fuses	50kA		

Operational parameter		
Preferred source selection	PRIMARY SOURCE or SECONDARY SOURCE	With retransfer or without retransfer after disturbance disappearing
Remote preferred source selection	PRIMARY SOURCE or SECONDARY SOURCE	Remote relay selection for preferred source
Overvoltage level setting	+6% +9% +13% +16% +20%	Transfer is performed when voltage value crosses the level. Programmed by DIP switch selection
Undervoltage level setting	-8% -12% -16% -16% -24%	Transfer is performed when voltage value crosses the level. Programmed by DIP switch selection
Phase delay limit for synchronized sources	±8° ±12° ±16° ±20° ±24°	Programmed by DIP switch selection
Transfer blocked after output current limit exceeding	3 In 4.5 In 6 In 7.5 In 9 In	Programmed by DIP switch selection
Transfer without overcurrent blockade		
Transfer delay after manual triggering with both sources synchronized	<0,1ms	
Transfer delay in automatic mode with both sources synchronized	<6ms	
Transfer delay in manual or automatic mode without synchronization	13ms 17ms 25ms 50ms	Programmed by DIP switch selection
Retransfer to preferred source delay with both sources operational	0.8 s 1s 8s 25s	Programmed by DIP switch selection

Alarm signals		
Failure alarm	relay	FAILURE ALARM appears if at least one of the following events takes place: • Fuse was burnt • Overcurrent • Overtemperature • Internal STS failure
Disturbance alarm	relay	DISTURBANCE ALARM appears if at least one of the following events takes place: • Overvoltage in at least one of input sources • Undervoltage in at least one of input sources • Input sources not synchronized • Voltage surge protection device was burnt • Retransfer was blocked • Internal supply failure • Manual mode of operation was chosen
MANUAL ON	relay	If MANUAL mode of operation is selected, active source may be changed even if second one is not healthy
RETRANSFER OFF	relay	Retransfer to preferred source is not performed
PRIMARY SOURCE OK.	relay	Indicating if primary source is healthy
SECONDARY SOURCE OK.	relay	Indicating if secondary source is healthy
PRIMARY SOURCE ON	relay	Indicating if primary source is active
SECONDARY SOURCE ON	relay	Indicating if secondary source is active
Alarm connectors parameters		
Maximum operational voltage	300V= or 250V~	
Maximum current	4A for 220V~	
	0,3A for 220V=	
Operation conditions		
Ambient temperature	0÷40°C	
Storage temperature	0÷40°C	
Humidity	max 95%	Without condensation
Maximum altitude.	1000m	
Cooling	Forced with redundancy	Forced cooling is applied only to increase MTBF factor
Acoustic noise level	Below 55dBA	
Interference's level	Level B	EN55022, EN60555-2,-3
Enclosure		
Protection	IP20	

5.2 Dimensions

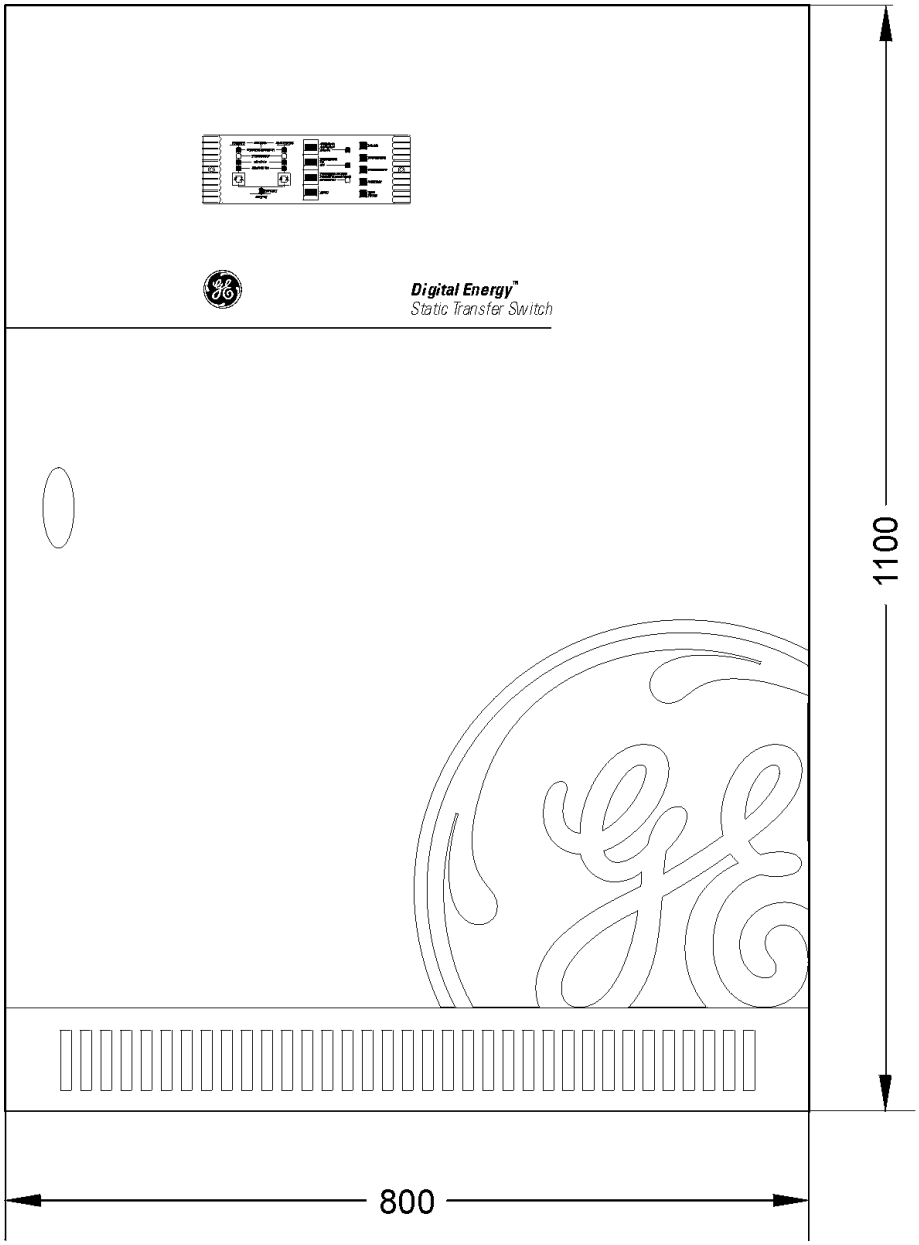


Figure 16. Front view

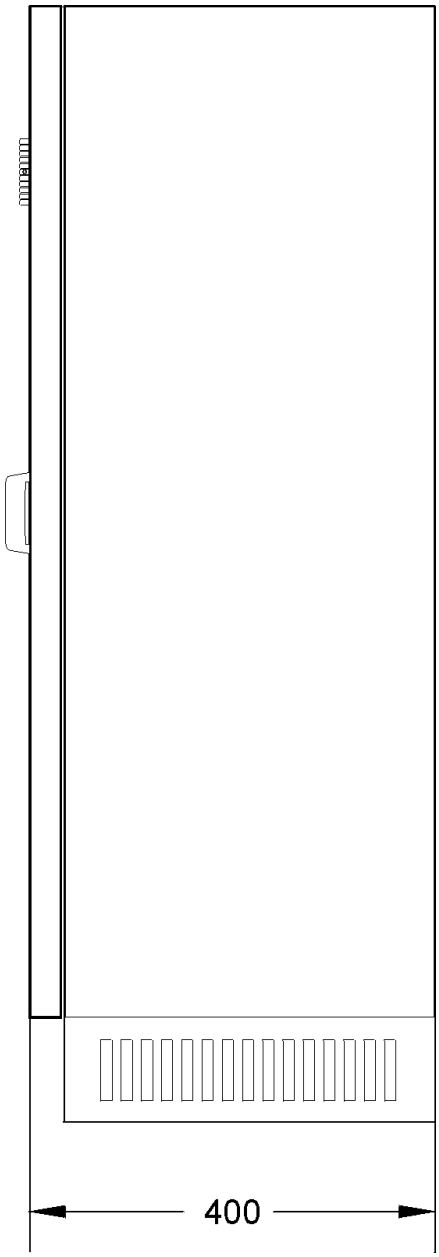


Figure 17. Side view of STS

Assembly holes:

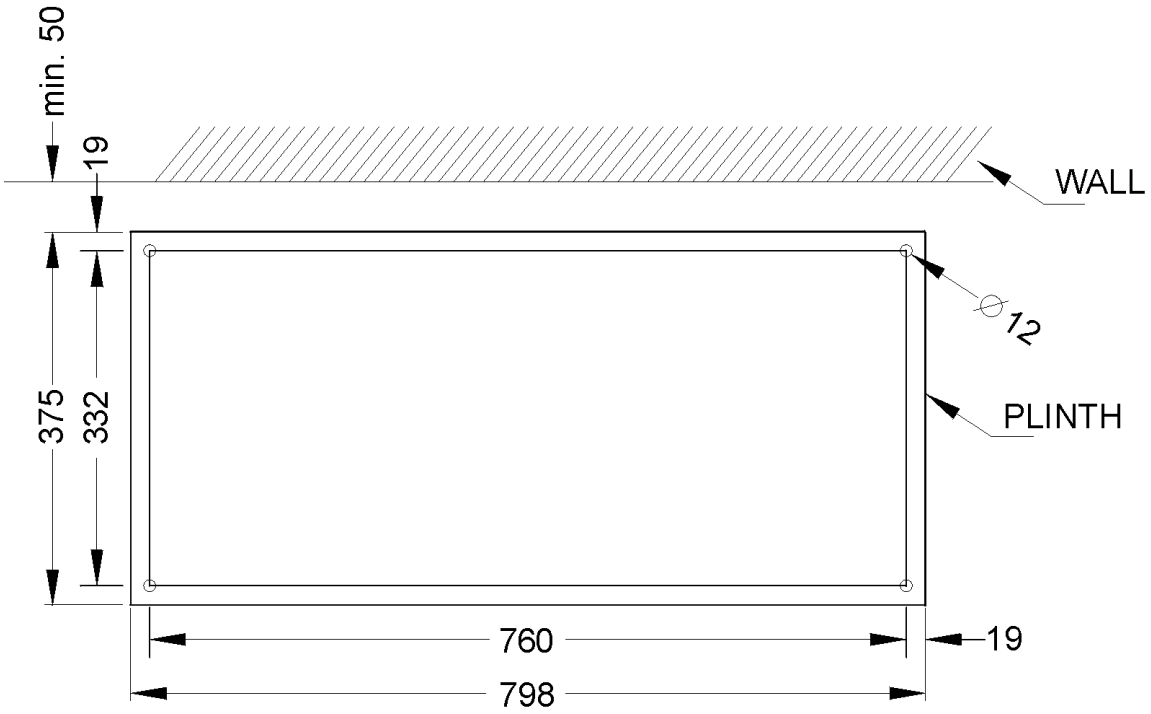


Figure 18. Top view of STS