

THYCON

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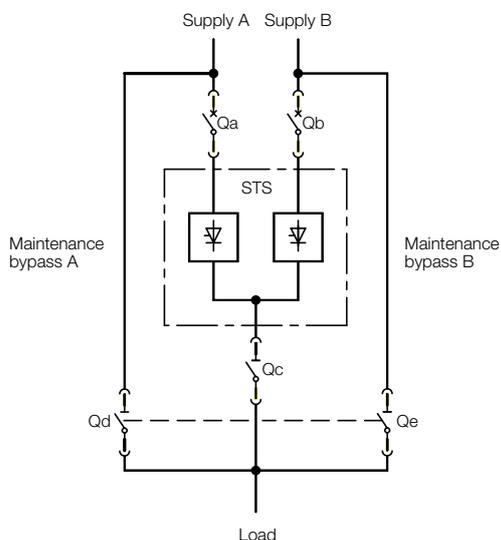
Static Transfer Switches

STSt 100 – 3000A

STSi 100 – 3000A

THYCON





Concept

Static Transfer Switches (STS) are essential for achieving highly reliable and redundant supply to critical systems.

The STS provides power to items requiring a single AC supply by selecting from one of many input AC supplies. If one supply becomes unavailable the STS automatically transfers the critical load to an alternative AC supply source. Manual selection of supply is also possible.

Applications

STSs are suitable for back up power supply protection where multiple independent supplies are available on stand-by and ready for use when required.

Typical STS applications include:

- data centres to eliminate single points of (power supply) failure
- active maintenance bypass for UPS
- fault isolation

STS features and benefits

- Thycon’s Point of Wave Transfer Technology
- microprocessor-based diagnostics and controls
- high fault clearing capability
- high overload capacity
- soft-start control
- fibre optic firing control
- robust technology
- no moving parts
- fuseless design
- high efficiency
- high reliability
- long life
- cost effective
- low maintenance cost
- compact, modular construction
- indoor or outdoor enclosures
- Australian made

Principle of operation

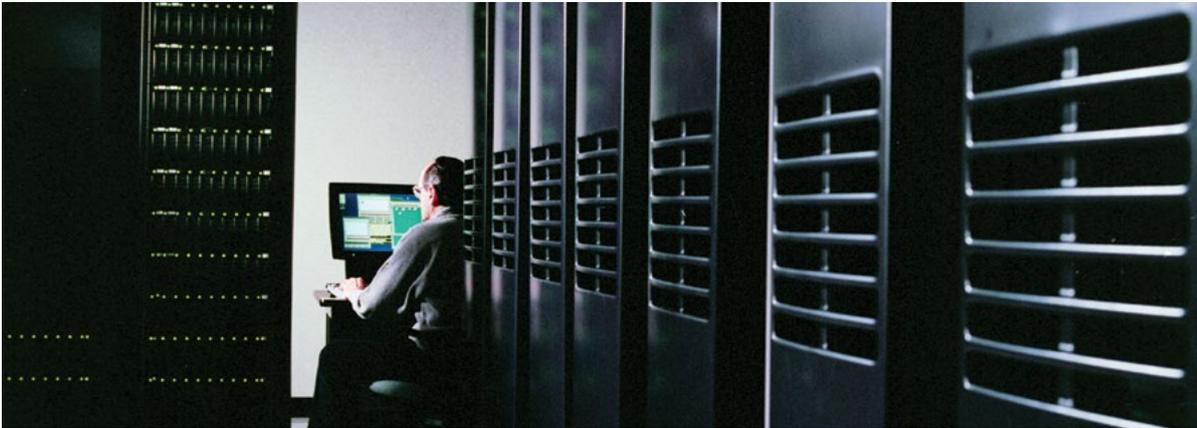
Thycon provides two classes of static transfer switch for the various requirements of critical systems:

Thycon’s Point of Wave Transfer Technology ensures the STS transfers to the same point of the alternative supply’s waveform therefore minimising inrush to supply sensitive loads such as transformers, drives and motors.

- Thycon STSt
- Thycon STSi

Both classes statically interrupt the supply to the load the instant a failure of the incoming AC source is detected. The load is isolated and then immediately re-connected to the alternative source.

Both the STSt and STSi implementation use break-before-make transfer characteristics to ensure that two supply sources can be truly independent and that the failure of one has no impact on the other.



Computer server room

The Thycon STSt and STSi inhibit transfer and raise an alarm condition in the system monitor under the following fault conditions:

- open circuit switching device within the STS
- short circuit switching device within the STS
- supply phase synchronism out of tolerance
- output phase voltage imbalance
- control fault
- load fault
- device over-temperature
- ambient over-temperature

Thycon STSt

The Thycon STSt uses thyristor switch technology that can:

- switch supplies in typical conditions in less than 5ms (1/4 power cycle)
- switch supplies to the same point of the alternative supply's waveform
- switch with up to ± 15 degrees phase shift between supplies (user defined)

This proven, robust technology uses large safety factors, achieves high reliability and longevity and is very economical. Today, single thyristors can switch in excess of 5000A and 10,000V.

Thycon STSi

The Thycon STSi uses IGCT (Integrated Gate Commutated Thyristor) switch technology which can:

- switch supplies in less than 0.5ms under any fault condition
- switch with up to ± 180 degrees phase shift in supplies without feeding or damaging the overtaking supply or load

Today, a single IGCT can switch in excess of 4000A and 6000V.

Like the Thycon STSt this technology also uses large safety factors, is proven to achieve high reliability and longevity but is higher in cost.

STSt can have break times of 5 milliseconds under fault conditions as thyristors naturally turn off at zero current crossovers or by

external commutation. In certain fault conditions, these break times can take in excess of 10 milliseconds. An IGCT however, will guarantee turn-off within microseconds and ensure a break time of approximately 500 microseconds.

Installation and testing

To ensure high reliability, independent sources with high MTBF and low MTTR must be connected to the STS.

It is essential that the STS load transfer time is suitable for the system load requirements and that the faulty supply cannot feed or damage the overtaking supply or load.



Data centre

The STS offers modular design for quick and easy site installation. All that is required is the installation of power cables and control/monitoring cabling. The STS is tested comprehensively prior to delivery and needs minimal site commissioning.

An STS can also be provided as a complete containerised assembly that can be placed in the harshest Australian conditions and easily relocated to other sites.

Reliability and maintenance requirements

Thycon has been supplying static switches for 40 years and has demonstrated their high reliability and low maintenance demands in critical applications in defence, telecommunications, computer centres and manufacturing.

Power electronic converters can be forced or naturally cooled, which contributes to high reliability and low ongoing maintenance. The power components

(switchgear and instrument transformers) are all standard commercial products of proven reliability and life expectancy.

Thycon STS maintenance requirements are dependent on environmental and application conditions. We accommodate customer requirements from basic to full warranty maintenance. Each maintenance plan ensures the equipment operates in top condition with maximum availability of engineers and parts at minimum cost to the customer. Qualified engineers perform the maintenance with the full back up and resources of Thycon.

Training and support

Training and support can be provided to on-site personnel to ensure that they are fully versed in the operation, maintenance and fault rectification of the Thycon STS.

Control and monitoring

Smart digital signal processing provides fast and accurate control of the STS. Point of Wave Transfer Technology ensures minimal transfer inrush to transformer loads and out of synch transfer during fault conditions.

An optional soft-start mechanism at turn-on can provide low inrush current to transformer loads during automatic or manual transfers.

STSs can be controlled and monitored from the unit itself and remotely via serial, TCP/IP or SCADA.



Static interrupter

Control and status

The STS provides a simple mimic and control interface.

The STS system monitor mimic diagram enables the operator to see the path of power flow at a glance. Push buttons are used to transfer the STS from supply A to supply B. LEDs indicate the status of the STS including A and B supply selection, A and B out-of-synch alarm and general alarm.

Monitoring

The STS system monitor is a smart LCD panel featuring a simple and effective user interface that incorporates advanced diagnostic facilities enabling immediate access to:

- power monitoring – voltage / current / kW / kVA / power factor / harmonic distortion
- operating status and alarms
- event history
- password protected user defined settings
- service control and test options

The system monitor stores the last 200 system events in a non-volatile information buffer for fast, efficient fault diagnosis and status indication even after a re-start or a complete power outage.

Low-level interface

In the form of 8 standard voltage-free contacts, operating status of the equipment to a remote monitoring system can be performed.

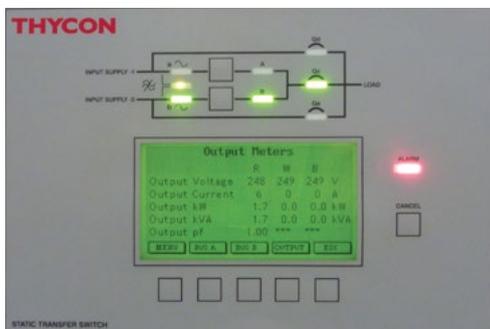
High-level interface

Real-time performance monitoring of the STS is performed via serial or TCP/IP connection. A basic hardcopy of operating events and data can be obtained by connecting a printer. An optional high-level interface via Modbus, SNMP or web html can be provided for immediate performance monitoring and analysis. Additional features

... stores the last 200 system events in a non-volatile information ... even after a re-start or a complete power outage.

enable you to notify your network server of alarm conditions, perform automatic low battery autonomy shutdowns of the critical load and send emails to designated recipients.

STS data such as real-time waveforms, alarms and system events can be stored in solid state, non-volatile memory holding up to 500 MBs of information. Connecting the STS to a PC using any of the available ports allows you to maintain a full history of the equipment over its lifetime.



STS monitor

Options

Soft-start facility

A soft-start mechanism at turn-on provides low inrush current to transformer loads.

Thycon's Point of Wave Transfer Technology can be used to provide superior transfer characteristics when the alternate supply is out of synch during a fault-initiated transfer. This world-leading technology ensures the STS transfers to the same point of the alternative supply's waveform therefore minimising inrush to supply sensitive loads such as transformers, drives and motors.

Remote monitoring

Modem connection enables the STS to dial and notify Thycon or a remote user automatically whenever an alarm condition

arises. Thycon's Service Centre automatically logs data, performs analysis and diagnostics and then alerts our 24-hour staff if further intervention is required. All STS utilisation and incidents found or reported are logged and a full report is provided for each occurrence. The report highlights remedial actions, cautions and follow up recommendations. Alternatively, the remote user can interrogate the STS at will.

Thycon power system monitor

The STS monitor offers the user a web-based interactive diagnostic tool and database management system for continuous real-time monitoring of STS system utilisations, alarms, events and variables. The database management logs data to your PC's hard disk for future analysis and display.

Container modules

The STS can be provided as a complete containerised assembly that can be placed in the harshest Australian conditions and easily relocated to other sites. Each module is self-contained enabling use in applications varying from city building rooftops to coastal oil rigs to outback mining stations.

Thycon STS advantages

Design advantages

Simple, reliable design	Uncomplicated design facilitates high strength, durability and reliability. The power circuit uses simple, robust switches to enable fast and efficient transfer.
Robust technology	Robust construction achieves reliable performance and long equipment life, as proven by 40 years of Thycon installations.
Component rating	Commercially available standard mains frequency thyristors are used as single devices up to 2.4kA. No series or parallel matching of components is required to achieve high-power applications.
Thyristor technology	Use of thyristors (SCRs) eliminates the need for special high-speed semiconductor fuses resulting in a simpler design with increased reliability. Thyristors have the highest power and fault tolerance of all semiconductor devices and can withstand faults of up to 10 times the current for 1000 times the period of IGBT and transistor switching technologies.
Fuseless design	Operates without power fuses. Power components are liberally over-rated so that simple and reliable methods of circuit breaker protection can be used. This greatly reduces downtime and eliminates the need for stock control of spare fuses.
Surge protection	Built-in surge protection increases the attenuation of over-voltages caused by distribution faults and lightning.
Compatibility	The control panel provides the operator with an efficient, user-friendly interface.
Modular construction	Construction from standardised components and modules ensures high mean time between failures (MTBF) and low mean time to repair (MTTR).
Environment	The equipment can be used in computer rooms or in harsher environments without de-rating. Thycon equipment can be containerised to provide a complete solution for extreme environments. In many cases there is no need for special air conditioning, reducing operating and capital costs.

Performance advantages

Point of Wave Transfer Technology	Thycon's world-leading Point of Wave Transfer Technology enables fast, dynamic transfers without the fear of "out of synch" consequences during supply fault conditions. This technology allows transfer to the same point of the alternate supply to ensure the load can never see an out of synch transfer and prevents inrush current effects of loads during automatic transfers.
Fault current capability	Supplies 10-20 times the rated current under load fault short circuit conditions.
Efficiency	System operates up to 99% efficiency resulting in low running costs and heat dissipation.

Technology comparison

Parameter	Bi-directional Thyristor Static Transfer Switch - STSt	Integrated Gate Commutated Thyristor Static Transfer Switch - STSi
Rating range	200 - 2800 amps	300 - 2000 amps
Efficiency	99%	98.6%
Fault capacity	up to 100kA	up to 30kA
Over load capability at 150%	120s	120s
Over load capability at 1000%	1000ms	500ms
Allowable crest factor	> 5	> 5
Device safety margin (typ)	1000%	500%
Manual transfer time (asynchronous)	0 - 1s	0 - 1s
Fault transfer time	< 5ms	< 1ms
Fault detection time	0.5ms	0.5ms
Operation during load fault	Remains online until protection activates OR disconnects output to protect weak source. (< 5ms)	Remains online until protection activates OR disconnects output to protect weak source. (< 1ms)
Failure mode	Short circuit	Short circuit
Operational reliability factor	0.999	0.995
MTBF	250,000 hrs	200,000 hrs
MTTR	1 hr	1 hr
Transfer mode	Break before make	Break before make
Make/break	< 0.1ms	< 0.01ms
Remote transfer capability	Yes	Yes
Voltage protection	Yes	Yes
Protection method	Thermal/magnetic circuit breaker	Thermal/magnetic circuit breaker

Specifications are subject to change without notice



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