



STC3000 SERIES

3 - PHASE THYRISTOR STACKS FOR PHASE ANGLE OR SOFT START BURST FIRE CONTROL OF COMPLEX HEATING LOADS



- ✓ **Communicating**
- ✓ **Flexible**
- ✓ **Capable**

Features

- **Comprehensive systems capability (Analogue and Digital I/O, Communications)**
- **Communications (Modbus RTU, *DeviceNet*, Profibus DP)**
- **Simple menu driven configurability (Line voltage, feedback mode, etc)**
- **Comprehensive limit setpoints (current, voltage, V x I)**
- **True RMS measurement of voltages and currents**
- **Current ratings from 80A to 800A standard**
- **Conservatively rated at 50°C (45°C 800A unit) ambient temperature**
- **Simple installation - compact design**

GENERAL DESCRIPTION

This is a modern range of thyristor stacks, specifically designed for control of AC heating loads in medium and high current applications for furnaces, ovens, dryers etc. These stacks are particularly useful where current limit is required (eg loads with low cold resistance), or for use with generator sets, or when feeding the primary of transformers. They are fitted with 2 analogue inputs and one analogue output, 6 isolated digital inputs, and 2 isolated digital outputs, 1 relay alarm output, and Modbus® RTU compatible communications as standard, providing a comprehensive systems capability. DeviceNet or Profibus DP communications are available as an option.



Adjust the operating parameters of the stack to match your requirements using a short configuration menu

Store local setpoints (such as current or power limit)

Setpoints (including the control setpoint) may also be sent to the stack using digital communications, reducing cabling and simplifying maintenance



Monitor the stack operating status either on the display or using communications. (The illustration shows line 1 present, that the stack is phase locked, that the heatsink temperature is OK and the firing mode is phase angle).



Monitor the values of line and load voltages, currents, etc using true RMS measurements.

ORDERING INFORMATION

The stacks may be ordered using the order code shown below, or by description:-

Type	Current Rating	Voltage Rating	Driver Supply Voltage AC 50/60 Hz	Hardware Configuration Code	DeviceNet or Profibus comms if required
STC 3000					

80A, 125A, 160A, 200A, 250A, 315A, 400A, 600A, 800A

250V, 480V, 660V

115V, 230V

Standard, 6-wire open delta, 6 wire open delta/star

DeviceNet, Profibus (Modbus is standard)

The configuration code defines the hardware set up of the stack which we will deliver. Other details of the configuration may be set up by the user using a simple menu on the LCD display. (We will be happy to set these up before despatch if required).

The standard configuration is for 3-wire star or delta loads (Including 3-wire transformer loads), and 4-wire star connected loads.

The 6-wire open delta connection is for use with the stack wired in the delta loop, thus reducing the required current rating of the stack. It may be used with resistive loads or 3 single phase transformers which feed independent loads. It is not for use with delta / star connected transformer coupled loads, which require the 6-wire open delta / star configuration. This mode of operation requires an additional card to be fitted in the stack. Note that a special transformer is also required for this mode of operation, which should not be attempted with standard transformers.

If DeviceNet or Profibus communications are required this must be specified when the stack is ordered, as the control card build is different, different software is installed, and an extra interface card is fitted.

OVERVIEW OF FACILITIES

LOAD CONFIGURATION

3 - wire star or delta, 4 - wire star, 6 - wire open delta.

FIRING MODES

The stacks operate in either phase angle mode, or soft start burst fire mode. Provision is made to switch between operating modes using a digital input. Current limit may be applied in either mode; in burst fire mode the stack will phase back if current limiting action is required. In burst fire mode the cycle time and the soft start / finish time may be independently set.

FEEDBACK MODES

In phase angle mode the stack may either be operated open loop, or closed loop with V , I , V^2 , I^2 , $V_{rms} \times I_{rms}$, or I^2 / V^2 transfer feedback. The I^2 / V^2 transfer is useful with loads which have a low cold resistance. The control signal initially controls the current fed to the load, until the voltage feedback signal becomes greater than the current feedback signal, when control is switched to voltage. Current limit action may also be applied.

In burst fire mode the stack operates open loop, with or without line voltage feedforward compensation, as selected.

CONTROL AND LIMIT SETPOINTS

Control and limit setpoints may be provided as analogue inputs, settings on the LCD display, or via the communications link. There are two analogue inputs, so one may be assigned to control and one to a limit setpoint.

Setpoints available are; control, current limit, voltage limit, power limit. All can be operational together.

Provision is made for limit setpoints to be activated / de-activated by means of digital inputs.

DIGITAL INPUTS

Six opto-isolated digital inputs are provided. These may be used as either sink or source in association with 24V DC plc / logic systems, or, using the energising supply provided, with volt free contacts (Contact closure activates).

They are assigned to; phase angle / burst fire select; 3 off limit enable; control setpoint local (keypad) / remote; stack enable.

DIGITAL OUTPUTS

Two opto-isolated digital outputs are provided, which may be used as either sink or source in conjunction with 24V DC plc or relay logic.

They indicate (1), that a limit setpoint is controlling the load, and (2), that the stack is enabled.

In addition a relay output is available (volt free contacts), contacts rated up to 250V AC, which operates in an alarm condition.

ANALOGUE OUTPUT

One analogue output is provided, which may be used as a retransmission signal of either; Load Voltage, Load current (average of 3 currents), or Load Power.

The stacks are all fitted with semiconductor fuses.

They have an uncluttered internal layout. Line connections are to the top and load connections to the bottom, protected by clear pre-cut polycarbonate covers (see front picture)

Control wiring is to the bottom of the control card mounted on the door.

COMPLIANCE WITH STANDARDS

Electrical

The stacks are designed to meet the requirements of international standards and are CE marked in compliance with the European Low Voltage Directive.

The following standards have been applied in whole or in part in the design of these units: EN 60947-1, EN61010-1, EN50178

Electromagnetic Compatibility

The control circuits of the unit meet or exceed the requirements of EN 61000-6-2 and EN 50 081 part 2 (immunity and emissions for industrial environment). Systems compliance with EN 50 081 is not possible in phase angle mode, without the use of external filters to reduce conducted emissions..



SPECIFICATIONS

PHYSICAL

Stack Rating	Approximate dimensions	Approximate Weight
80A, 125A, 200A	390mm H x 256mm W x 280mm D	13KG
315A, 400A,	500mm H x 389mm W x 305mm D	27KG
600A, 800A	500mm H x 389mm W x 305mm D	34KG

Environmental

Ambient Operating Temperature	0-50°C (0-45°C - 800A unit)
Storage Temperature	-25 to +70°C
Relative Humidity	0-95% non condensing
Pollution (IEC 664)	Degree 2 (Only non conductive pollution is allowed. Temporary condensation may occur, but not normally while equipment is operating).
Elevation	Derate current rating 1% per 100 metres above 200 metres

ELECTRICAL

Rated Supply Voltage (Load)	250V, 440V, 480V, 660V* +10%, -25%
Rated Current	As ordered. Rated current is specified at 45 / 50°C ambient temperature
Supply Frequency	50Hz or 60Hz +/-8%
Rated Impulse Withstand Voltage (IEC 664)	4KV
Auxiliary Supply for control electronics	115 or 230V +10% -15%, 50/60 Hz. 80A unit 40VA; 125, 200A units and fans 90VA; 315, 400A, 600A units 115VA; 800A unit 190VA.

CONTROL SIGNAL INPUTS AND OUTPUTS

Analogue input control signals	0-5V, 1-5V, 0-20mA, 4-20mA, 0-10V, 2-10V (mA signals use 250Ω burden resistor)
Analogue output signal	0-5V, 0-10V, link selectable.
Digital Inputs	Optoisolated from main control board, isolation voltage 1,500V RMS, but not from each other. Logic high level 5V to 30V. Logic low level <1V. Contact closure input, using on-board isolated supply.
Digital Outputs	Optocoupled transistor outputs, sink or source, rated 24V DC, 50mA.
Alarm Relay Output	Volt free contacts, rated 250V AC, 30V DC, 2A

LED INDICATORS AND DISPLAY

A green LED indicates that the stack is enabled. A red LED indicates an alarm condition. A 2 line x 16 character LCD display and 4 buttons are used for configuration and calibration, and in use are used for entry of setpoints, and reading of line and load voltages, load currents and power.

COMMUNICATIONS

Standard stacks are provided with a galvanically isolated comms port which can be link configured as either RS422 (separate tx and rx twisted pairs) or RS485 (single twisted pair). Baud Rates available are 4,800; 9,600; 19,200; Parity odd; even or none. The protocol emulated is a subset of Modbus[®] RTU. Optionally this port may be replaced by an additional card providing either DeviceNet or Profibus DP connectivity. The communications facility enables most parameters (eg setpoints, voltages, currents, digital I/O) to be read, and setpoints to be written. Analogue parameters are stored as 16bit binary values, representing the parameter in engineering units, multiplied by 10 (eg a current of 96.5A would be stored as 965 converted to 16bit binary)

Notes

The 80A unit is convection cooled. All other units are force cooled. An auxiliary power supply of either 115 or 230V +10%, -15%, 50/60 Hz. is required on all units to power the control electronics, and fans where applicable.

All units are fitted with snubber capacitors and MOV transient over voltage protection.

* 660V units. Note that impulse withstand voltage is restricted to 4kV. Consult us.

Please contact us for further information or a full manual. Alternatively visit our Web site

Caledon Controls Ltd

Unit 2 Block 4 Castlehill Industrial Estate, Carlisle, Lanarkshire, Scotland. ML8 5UF

Telephone +44 (0)1555 773355 Fax +44 (0)1555 772212

Email info@caledoncontrols.co.uk

Website www.caledoncontrols.co.uk