

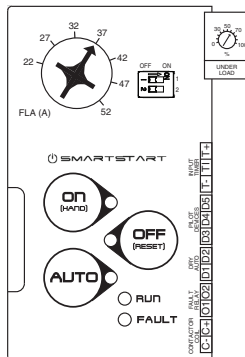
## Operation

- Intended for use with 3-Phase, 50/60Hz
- Accepts 208-600VAC  $\pm 10\%$
- **Short Circuit** (RMS, Symmetrical)  
Stand-Alone Overload Unit - 200 KAIC, 600V Max.  
Standard Starter - See UL label on panel  
Combination Starter - See UL label on panel
- Ambient Operating Temperature = -20°C to 60°C
- Ambient Storage Temperature = -40°C to 85°C



- Ensure that all connections are properly torqued and enclosure is closed prior to applying power to the device.
- Ensure all mechanical equipment operated by the starter is clear for safe operation in case of starter activation.
- When in AUTO mode, starter may be activated remotely by the control system

Keypad Interface



### Operation Modes

#### ON (HAND)

Press the ON mode button to manually engage motor.

#### OFF (RESET)

Press the OFF mode button to manually disengage the motor. Additionally, the OFF button serves as a manual Reset. Press and hold OFF for 5 seconds to Reset the starter after a fault trip.

#### AUTO

When utilizing AUTO mode, the starter is controlled by a remote Start/Stop command.

### LED Status Indicators

#### MODE LEDs

Illuminates with corresponding mode selection (HAND/OFF/AUTO). Flashing mode LED signals a fault trip during the last operating mode.

#### RUN LED

Illuminates when starter is given a Run signal and 20% of the overload current setting is detected. LED will flash when Run signal is present without proof of flow to the motor.

#### FAULT LED

Blinks when current reaches 115% of the overload setting or greater and illuminates upon a fault condition or overload trip. Starter must be returned to the OFF mode in order to Reset.

## Setting Adjustments

### Overload

Set the overload dial to the SFA amperage value listed on the motor nameplate. If no amperage value for SFA is provided, set the overload dial to the FLA listed on the motor nameplate.

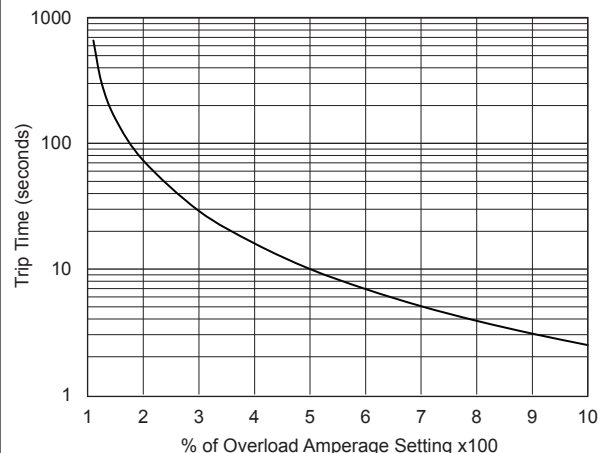
### Underload

For submersible motor applications, it is suggested that the dial be set to 70% to protect against dry-run condition.

## I/O Descriptions

Use 14-26AWG wire for I/O Terminals, Torque to 3.5 lb-in	
TERMINAL	DESCRIPTION
T- / TI / T+	<b>Run-Timer Input</b> - Connections for optional 1/2-12hr run timer. (Not applicable for S1P and S2, NEMA 1 TSSs. NEMA 3R versions may be used in NEMA 1 applications)
D3 / D4 / D5	<b>Pilot Device Input</b> - Connections for a 3-position (HOA) switch for motor control. (Wired from manufacturer on N3R enclosed units)
D1 / D2	<b>Dry Auto Input</b> - When closed, the starter will run when in Auto Mode. (N.O. dry contact or transistorized input)
O1 / O2	<b>Fault Relay Output</b> - Normally open relay contacts that closes in the event of a fault condition. 120VAC, 0.6A
C- / C+	<b>Contactor Output</b> - Provides a 24V output to close the contactor when the motor starter is commanded in either HAND or AUTO mode. Once the contactor is closed, the output drops to 2-4V to maintain contactor closure while optimizing efficiency. Only for use with FCS contactor with 24VAC coil (24V, 0.875A Max).

TSS I2t Trip Curve



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## Installation & Operation Guide

This manual is available for download at  
www.taco-hvac.com



## Precautions

To prevent injury and property damage, follow these instructions. Failure to adhere to installation/operation procedures and all applicable codes may result in hazards as indicated by warning codes outlined below:



indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.



indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.



This is the safety alert symbol. Read and follow instructions carefully to avoid a dangerous situation.



This symbol alerts the user to the presence of "dangerous voltage" inside the product that might cause harm or electrical shock.

## Safety Instructions



Equipment can start automatically. Lockout/tagout before servicing.



As with all electrical products, read manual thoroughly. Only qualified, expert personnel should perform maintenance and installation. Contact the nearest authorized service facility for examination, repair, or adjustment. Do not disassemble or repair unit unless described in this manual; death or injury to electrical shock or fire hazard may result. Specifications and manual data subject to change. Consult factory for additional information.

Installation



HAZARDOUS VOLTAGE

- Disconnect and lock out all power before installing or servicing equipment.
- This equipment may require locking out multiple power sources prior to service
- Install and wire in accordance with all applicable local & national electrical and construction codes

FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN DEATH OR SERIOUS INJURY

Mounting

Mount the starter on a vertical surface, with the line terminals facing up.

CE compliant Installations

To conform to the EMC directive a ferrite core is required on the input of the starter module. Consult the factory for the recommended part number.  
For a CE compliant installation, all electrical connections must be made by a qualified electrical technician.



- To maintain overcurrent and short-circuit protection, the manufacturer's instructions for selecting current elements and setting the instantaneous-trip circuit breaker must be followed.
- Tripping of the instantaneous-trip circuit breaker is an indication that a fault current has been interrupted. Current-carrying components of the magnetic motor controller should be examined and replaced if damaged to reduce the risk of fire or electric shock.
- Do not locate starter in an environment subject to flammable gases, dusts or materials. Contact arcing can induce explosion or fire.
- Locate starter in a location appropriate to enclosure ratings and operational ratings.  
(e.g. NEMA 1 should only be located in a dry, protected environment).
- Do not allow any metal shavings or debris from installation to enter enclosure.

Wiring

Wire main power input and motor leads to the appropriate terminals tightened to specified torques indicated in the Torque Table below. Use only copper conductors rated at least 60°C for applications less than 100A and at least 75°C ≥ 100A. Maintain proper clearances and verify that no possibility of an electrical short exists between the power conductors or enclosure. Ensure that wires are not under stress and all insulation is intact.

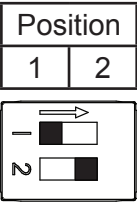
Low Voltage Wiring

Automation system control wiring should be run in a separate conduit. The control terminals accept 26~14AWG wire torqued to 3.5 lb-in.

Torque Table

Starter	Input (lb-in)	Output (lb-in)
	Terminal Blocks	Motor Leads
TSS1-9	10.6	20
TSS1-18	10.6	35

Program Switches



<b>SWITCH 1</b> Default = Position 1	<b>Smartstart Disable</b> - The following protective functions will be disabled when in the on position.  Locked Rotor Max Start Time Out of Calibration Phase Unbalance* *Changes threshold setting. See Protective Features below.
<b>SWITCH 2</b> Default = Position 2	<b>Power Fail Modes</b>  (Position 1) - In the event of a power failure, the starter will return to OFF mode. (Position 2) - In the event of a power failure, the starter will return the last mode it was in (Hand, Off, or Auto) within 10 seconds.

Protective Features

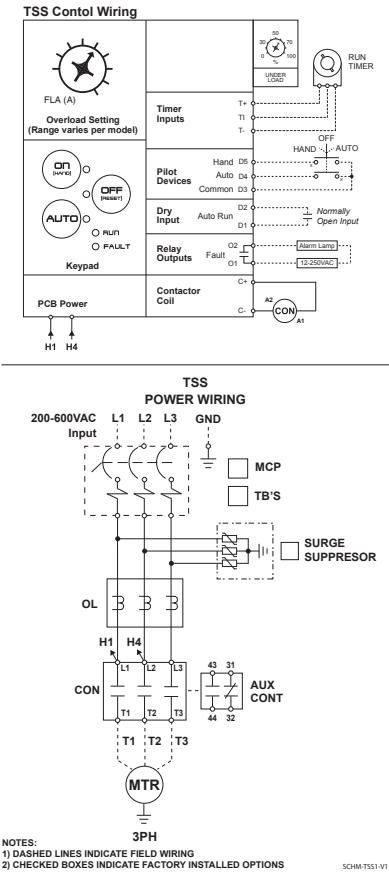
Cycle Fault	Trips when the starter is activated at a rate exceeding 20 starts per minute.
Hardware Fault	Trips if the starter's current drawn from the 24V contactor terminals exceeds the rating of the contactor. Also trips if the wrong size contactor is installed, or in the event of a circuit board failure. <b>Note: Contactor terminals C+ &amp; C- are for use with a Franklin Control Systems contactor only. Do not connect to any other devices.</b>
Locked Rotor	Trips when a locked rotor condition is detected for 0.5 seconds. (Smartstart mode only)
Max Start Time	Trips if the motor takes more than 10 seconds to start. (Smartstart mode only)
Out of Calibration	Trips if the overload setting is determined to be incorrect based on the motor inrush current. (500-1400% of FLA current) (Smartstart mode only)
Stall	Trips if a STALL condition is detected. (0.5 sec @ 300% overload setting and current slope not decreasing) Disabled during startup.
Overload	Trip current = 115% of dial setting. Trips when the load is greater than the trip current. (I²t trip curve)
Underload	Trips if the current falls below the user selected % threshold of the overload dial setting for 0.5 seconds and if the current is not increasing. (0-100% of overload setting)
Current Phase Unbalance	Trips the in the event of a phase failure or if any phase deviates by more than 25% from the average when Smartstart is enabled. If Smartstart is disabled, the starter will trip if any phase deviates more than 80% of the average.

Electronic Overload Operation

When a fault trip occurs, the fault LED will illuminate. The type of fault will be indicated by flashing a combination of the HAND/OFF/AUTO/RUN/FAULT LEDs as indicated in the table below.

FAULT	FLASHING LED
Cycle Fault	NONE
Hardware Fault	RUN & FAULT LEDs
Locked Rotor	OFF LED
Max Start Time	OFF & AUTO LEDs
Out of Calibration	HAND LED
Stall	HAND & AUTO LEDs
Overload	HAND & OFF LEDs
Underload	AUTO LED
Phase Unbalance	HAND, OFF, & AUTO LEDs

Wiring Schematic\*



\*Standard product wiring diagram shown. As-built product wiring may vary. Product wiring diagram located on starter enclosure.