sprecher+schuh

INDUSTRIAL MOTOR CONTROL + PROTECTION

User Manual

Series CET7, CEUT7

Electronic Motor Starters

Important User Information

Because of the variety of uses for the products described in this publication, those responsible for the application and use of this control equipment must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes and standards.

The illustrations, charts, sample programs and layout examples shown in this guide are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Sprecher+Schuh does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

Rockwell Automation publication SGI-1.1, Safety Guidelines for the Application, Installation and Maintenance of Solid-State Control (available from your local Sprecher+Schuh office), describes some important differences between solid-state equipment and electromechanical devices that should be taken into consideration when applying products such as those described in this publication.

Throughout this manual we use notes to make you aware of safety considerations:

ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss.

Attention statements help you to:

- identify a hazard
- avoid a hazard
- recognize the consequences

IMPORTANT Identifies information that is critical for successful application and understanding of the product.

Table of Contents

Chapter 5

Protection Functions

Chapter 6

Troubleshooting

About This Publication

This publication provides information on how to install, program, and use the CET7/CEUT7 electronic motor starters.

The user manual assumes that the installer is a qualified person with previous experience and has a basic understanding of electrical terminology, configuration procedures, required equipment, and safety precautions.

For safety of maintenance personnel and others who might be exposed to electrical hazards associated with maintenance activities, follow all local safety-related work practices (such as NFPA 70E, Part II in the United States).

Maintenance personnel must be trained in the safety practices, procedures, and requirements that pertain to their respective job assignments.

Terminology

Throughout this publication, we refer to the CE*T7 electronic starter as the CET7/CEUT7 starter. These terms are interchangeable. Where applicable, we refer to the CEUT7 (reversing) and CET7 (non-reversing) starters, specifically.

Table 1 lists some of the main terms that are used throughout this document.

Table 1 - List of Common Abbreviations

Term	Definition
DOL	Direct-on-line
FLA	Full load amperage (full-load current)
HFT	Hardware fault tolerance
N.C.	Normally closed
N.O.	Normally open
OSSD	Output signal switching device
POST	Power-on self-test
PTI	Proof test interval
SCPD	Short-circuit protection device
TCU	Thermal capacity utilization

WARNING: Only personnel familiar with the controller and associated machinery should plan or implement the installation, startup, and subsequent maintenance of the system. Failure to do so can result in personal injury and/or equipment damage.
WARNING: To avoid shock hazard, disconnect the main power before working on the controller, motor, and control devices such as Start-Stop push buttons. Procedures that require parts of the equipment to be energized during troubleshooting, testing, and so on, must be performed by properly qualified personnel, using appropriate local safety work practices and precautionary measures.
WARNING: The device can restart automatically after a trip. Take precautions to avoid injury.

AVERTISSEMENT: Seul le personnel familiarisé avec le démarreur et les mécanismes associés doit planifier ou réaliser l'installation, la mise en route et la maintenance consécutive du système. Le non-respect de ces recommandations peut entraîner des blessures ou des dommages matériels.
AVERTISSEMENT: Pour éviter les chocs électriques, coupez l'alimentation principale avant d'intervenir sur le démarreur, sur le moteur et sur les équipements de commande tels que les boutons-poussoirs Marche/Arrêt. Les procédures qui nécessitent une alimentation partielle de l'équipement pendant le dépannage, les tests, etc., doivent être effectuées par du personnel dûment qualifié, en appliquant les pratiques de sécurité au travail et les mesures de précaution locales.
AVERTISSEMENT: Le dispositif peut redémarrer automatiquement après un déclenchement. Veuillez prendre des précautions pour prévenir les risques.

ATTENTION: The controller must be correctly applied and installed. If applied or installed incorrectly, damage to the components or the reduction in product life may occur.
ATTENTION: The system may malfunction if the following wiring or application errors occur: undersizing the motor, using an improperly sized controller, using an incorrect or inadequate AC supply, excessive ambient temperatures, or power quality.
ATTENTION: The controller may be damaged if single-phase wiring errors occur. See Single-phase Wiring Diagram on page 20.
ATTENTION: You must set the Motor Current adjustment dial to provide proper protection.
ATTENTION: Overload configuration must be properly coordinated with the motor.
ATTENTION: This product has been designed and tested as Class A equipment for electromagnetic compatibility (EMC). Use of this product in domestic environments may cause radio interference, in which case, the installer may need to employ additional mitigation methods.
ATTENTION: Static control precautions are required when you install, test, service, or repair the assembly. The controller contains electrostatic discharge (ESD) sensitive parts and assemblies. Component damage may result if ESD control procedures are not followed. If you are not familiar with static control procedures, See applicable ESD protection handbooks.
ATTENTION: After a short circuit occurs, you must verify device functionality.

Additional Resources

These documents contain additional information concerning related products from Sprecher+Schuh. You can view or download publications at https://www.sprecherschuh.com/library/literature.html.

Resource	Description
Installation Instruction for Motor Starters, publication CET7-IN001	This publication provides information on how to install the CET7/CEUT7 electronic starter.
Electronic Motor Starters Technical Data, https://www.sprecherschuh.com/ecatalog.html	Provides product selection and specification information for the CET7/CEUT7 line of starters.
Motor Protection Circuit Breaker and Motor Circuit Protector Specifications, publication KT9-IN008E-MUP	Provides product selection and specification information for the KTA5 and KT_9 series of motor protection devices.
Short-circuit Current Ratings and Your Industrial Control Panel, publication SCCR-AT002	Provides examples for short-circuit current ratings of panels that are based on the methods that are stated in UL 508A Supplement B.
American Standards, Configurations, and Ratings: Introduction to Motor Circuit Design, publication IC-AT001	Provides an overview of American motor circuit design based on methods that are outlined in the NEC.
Industrial Components Preventive Maintenance, Enclosures, and Contact Ratings Specifications, publication IC-TD002	Provides a quick reference tool for Rockwell Automation industrial automation controls and assemblies.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Selection and Configuration tools, https://www.sprecherschuh.com/ecatalog.html	Provides product selection and specification information for the KTA5 and KT_9 series of motor protection devices.
Rockwell Automation Global SCCR tool, rok.auto/sccr	Provides coordinated high-fault branch circuit solutions for motor starters, soft starters, and component drives.
Product Certifications website, https://www.sprecherschuh.com/library/approvals/ul-csa-coc.html	Provides declarations of conformity, certificates, and other certification details.
System Security Design Guidelines Reference Manual, publication SECURE-RM001.	Provides guidelines for how to use Rockwell Automation products to improve the security of industrial automation systems.

Notes:

Overview

Product Description

The CET7/CEUT7 starter is an advanced motor starter that combines the functionality of a contactor and an overload relay into a smaller footprint. This direct-on-line (DOL) starter series offers forward-only and reversing configurations.

These three-pole starters can control both single- and three-phase motors up to 480V AC and are available with maximum current ratings of 9 A and 23 A. The CET7/CEUT7 starter has integrated electronic overload protection, which eliminates the need for a separate overload relay.

The CET7/CEUT7 series of starters includes non-reversing and reversing with standard options, which have the same slim form factor. All CET7/CEUT7 starter options can be installed side-by-side without derating. This configuration is referred to as 'zero stacked.' Zero-stacking significantly reduces required panel space.

For a list of compatible short circuit protection devices (SCPDs), see the CET7/CEUT7 Starter Specifications Technical Data publication at https://www.sprecherschuh.com/ecatalog.html

I/O

The CET7/CEUT7 starter requires a 24V DC control power source for control power and uses 24V DC control signals. The CET7/CEUT7 starter control inputs are Type 1 according to EN 60947-1. For control inputs, the CET7/CEUT7 starter is equipped with start, stop, remote reset, and reversing (when applicable).

Interface

The CET7/CEUT7 starter features a user interface on the front of the unit for configuration and diagnostics. Status indicators identify module, motor, and reversing status when applicable. With the CET7/CEUT7 starter DIP switches, you can switch between single- and three-phase control and select auto or manual overload reset. A full load ampere (FLA) selector dial is also installed on the front of the unit, which can be used to configure the CET7/CEUT7 starter protection features.

Starter Features

Figure 1 - CET7/CEUT7 Starter Features

For CET7/CEUT7 starter terminal block information, see Figure 5 on page 16.

Protection Features

The CET7/CEUT7 starter offers multiple protection functions:

- Thermal overload protection with Class 10 overload trip
- Auto and manual overload reset
- Phase loss protection
- Phase imbalance protection
- Contact weld protection
- Single-phase mis-wiring protection
- Remote reset control input

Security Considerations

To help maintain a secure system, follow these guidelines:

- Limit physical access to authorized personnel only
- Implement physical barriers, such as locked cabinets
- Only purchase products from official suppliers

Catalog Number Explanation

The examples that are provided in this section are not intended to be used for product selection. Not all combinations produce a valid catalog number.

CET7	-	9	-	S
a		b		c

a	
Bulletin Number	
Code	Description
CET7	Reversing starter
CEUT7	Non-reversing starter

b	
Current Range	
Code	Description
9	0.75...9 A
23	4.6...23 A

c	
Terminals	
Code	Description
S	Screw terminals

For a list of available accessories, see the CET7/CEUT7 Starter Specifications Technical Data publication https://www.sprecherschuh.com/ecatalog.html.

Specifications

Table 2 - General Ratings

Attribute			Value
Standards compliance			• UL 60947-4-1 • CSA C22.2, No. 60947-4-1 • EN 60947-4-1 • NM EN 60947-4-1
Certifications			• cULus, CE, UKCA, Morocco, RCM For additional product certifications currently available from Sprecher+Schuh, see https://www.sprecherschuh.com/library/approvals/ul-csa-coc.html
Rated operating current		9 A configuration	0.75...9 A
		23 A configuration	4.6...23 A
Rated operating voltage U_e			480V AC
Maximum operating voltage			480V AC
Rated insulation voltage U_i			500V
Rated impulse withstand voltage U_{imp}			6 kV
Rated frequency			50/60 Hz
Trip class			10
Utilization category			AC-3, AC-3e
Number of operations			1,000,000 (AC-3, AC-3e)
Temperature	Storage temperature range		-40...+85 °C (-40...+185 °F)
	Ambient temperature range		-20...+55 °C (-4...+131 °F)
	Surrounding air temperature range		-20...+65 °C (-4...+149 °F)
Humidity	Operating		5...95% noncondensing 92% relative humidity
	Damp Heat - Steady State Per IEC 60068-2-78		93% relative humidity 40 °C (104 °F) 56 days
	Damp Heat - Cyclic Per IEC 60068-2-30		93% relative humidity 25 °C/40 °C (77 °F/104 °F) 21 Cycles
Cooling method			Natural convection
Resistance to vibration Per IEC 60068-2-6		9 A configuration	Operating 3 G
		23 A configuration	
Resistance to shock Per IEC 60068-2-27		9 A configuration	15 G Operating 30 G Nonoperating
		23 A configuration	15 G Operating 25 G Nonoperating
Maximum altitude			2000 m (6561 ft)
Pollution environment			Pollution Degree 3
Mounting			Vertical Mounting Recommended See Mount the Starter on page 13
Minimum distance to other units, same type			Zero-stack capability
Degree of protection			IP20 with terminal blocks installed
Minimum senclosure size		9 A configuration	406 x 305 x 203 mm (16 x 12 x 8 in.)
		23 A configuration	

Table 3 - Fault Ratings

Rating	Protection Type	Attribute	9 A Starters	23 A Starters
UL Standard Fault	Fuse or circuit breaker	Max Fuse [A]	35 (Class RK5)	90 (Class J)
		Max Circuit Breaker [A]	30 (series KTU9)	
		Standard Fault Current [kA]	1	3
UL High Fault	Fuse	Max Class J Fuse [A]	35	60
		Max Class CC Fuse [A]	30	–
		High Fault Current [kA]	100	
	Circuit breaker	Max Circuit Breaker [A]	30	
		High Fault Current [kA]	65	
		Recommended Circuit Breaker (480Y/277V)	Cat. No. KTU9-40H-3D-30	

Devices rated for 9 A (CET7-9-S, CEUT7-9-S) are suitable for motor group applications when used on the load side of a cat. no. KTA9-40H-C20 with an SCCR rating of 65 kA @ 480Y/277V.

These ratings represent the maximum allowable ratings needed to achieve the listed SCCR. When using a smaller circuit breaker or fuse, confirm that the short circuit rating of the circuit breaker or fuse is the same or higher than the short circuit rating in Table 3.

Power-up Tests

The CET7/CEUT7 starter performs a power-on self-test (POST) at system startup. If the POST detects any hardware faults that are related to critical and noncritical errors, it reports the faults at system startup. The module status indicator identifies any critical error hardware faults discovered during the POST.

A critical error is defined as an issue that could result in indeterminate device operation — for example, non-volatile memory or RAM corruption.

IMPORTANT	If the system detects any critical errors during the POST, essential functions performed by the CET7/CEUT7 starter must be stopped until the errors are resolved.

Installation

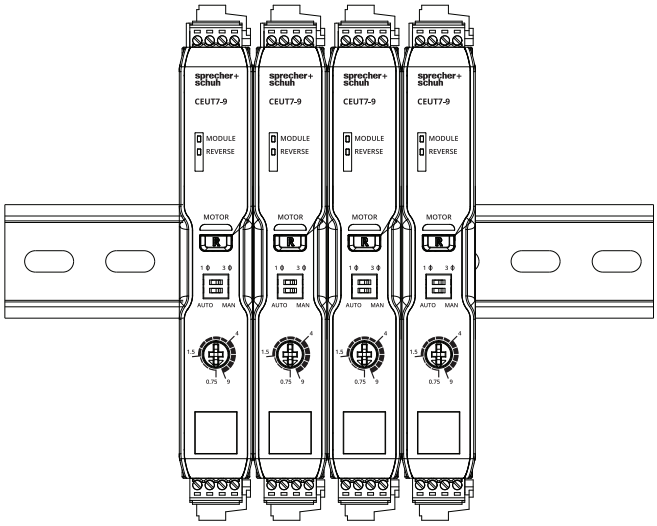
To install the CET7/CEUT7 starter, complete these tasks as directed in this chapter.

- Mount the starter
- Connect the power, control, and I/O wires

Mount the Starter

The CET7/CEUT7 starter can be mounted vertically in a zero-stacked configuration at maximum current without derating.

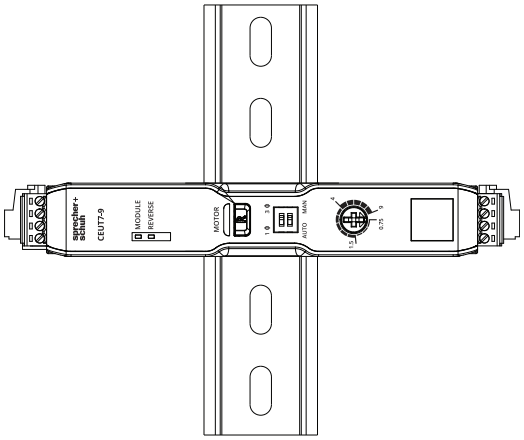
Figure 2 - Vertical Mounting



The CET7/CEUT7 starter is designed to be mounted in a vertical orientation. However, it operates correctly when mounted horizontally.

IMPORTANT	There must be a minimum of 10 cm (4 in.) of clearance above and below the CET7/CEUT7 starter.

Figure 3 - Horizontal Mounting



IMPORTANT	If the CET7/CEUT7 starter is mounted horizontally, do not mount additional starter units above or below the unit.

Approximate Dimensions

Dimensions are in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.

Figure 4 - Approximate Dimensions

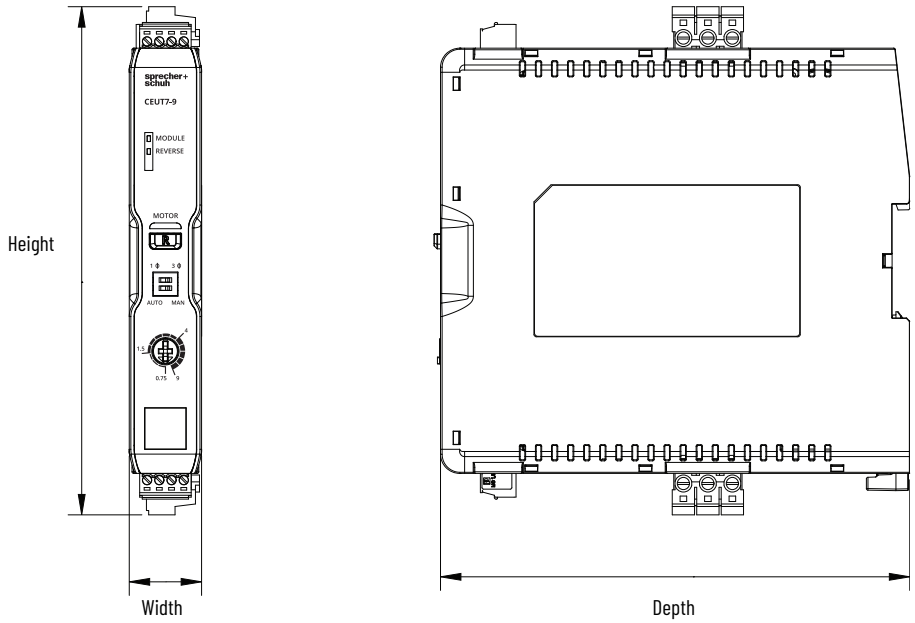


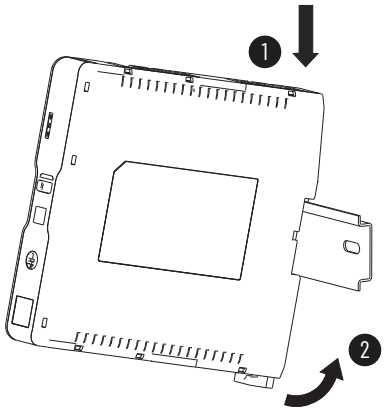
Table 4 - Approximate Dimensions

Starter Size	Height [mm (in.)]	Width [mm (in.)]	Depth [mm (in.)]
9 A	158.10 (6.22)	22.50 (0.89)	148.00 (5.83)
23 A	180.60 (7.11)	45.00 (1.77)	168.70 (6.64)

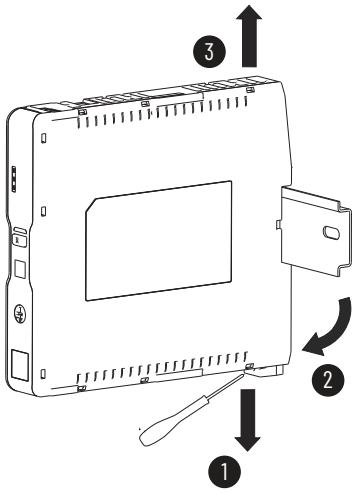
DIN Rail Installation

Install the CET7/CEUT7 starter on a standard EN/IEC 60715 35.00 x 7.50 mm (1.38 x 0.30 in.) DIN rail.

To install the CET7/CEUT7 starter on a DIN rail, perform these steps.



To remove the CET7/CEUT7 starter from a DIN rail, perform these steps.



When mounted on a DIN rail in a vertical orientation, the starter provides top-feed power line and bottom-feed motor load terminations.

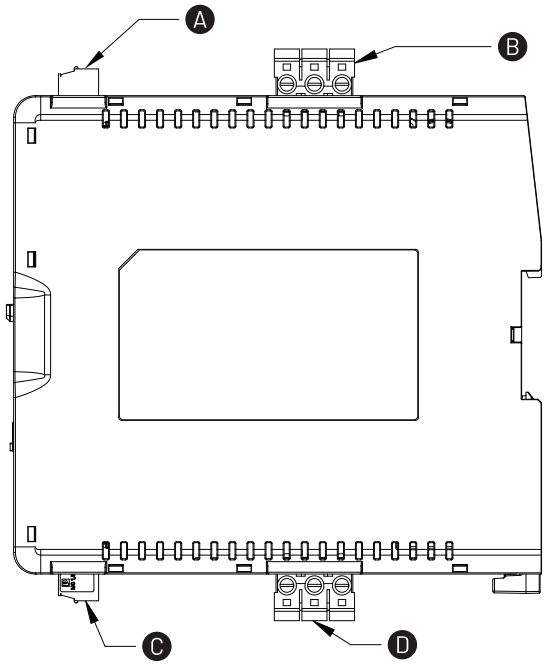
For additional CET7/CEUT7 starter installation on a DIN rail, see the CET7/CEUT7 Motor Starters Installation Instructions, publication CET7-IN001.

Connect Power, Control and I/O Wires

Connector Locations

The CET7/CEUT7 starter has the following connectors for power, control and I/O connections. See Wire Terminals on page 18 for connector terminal identification.

Figure 5 - Connectors

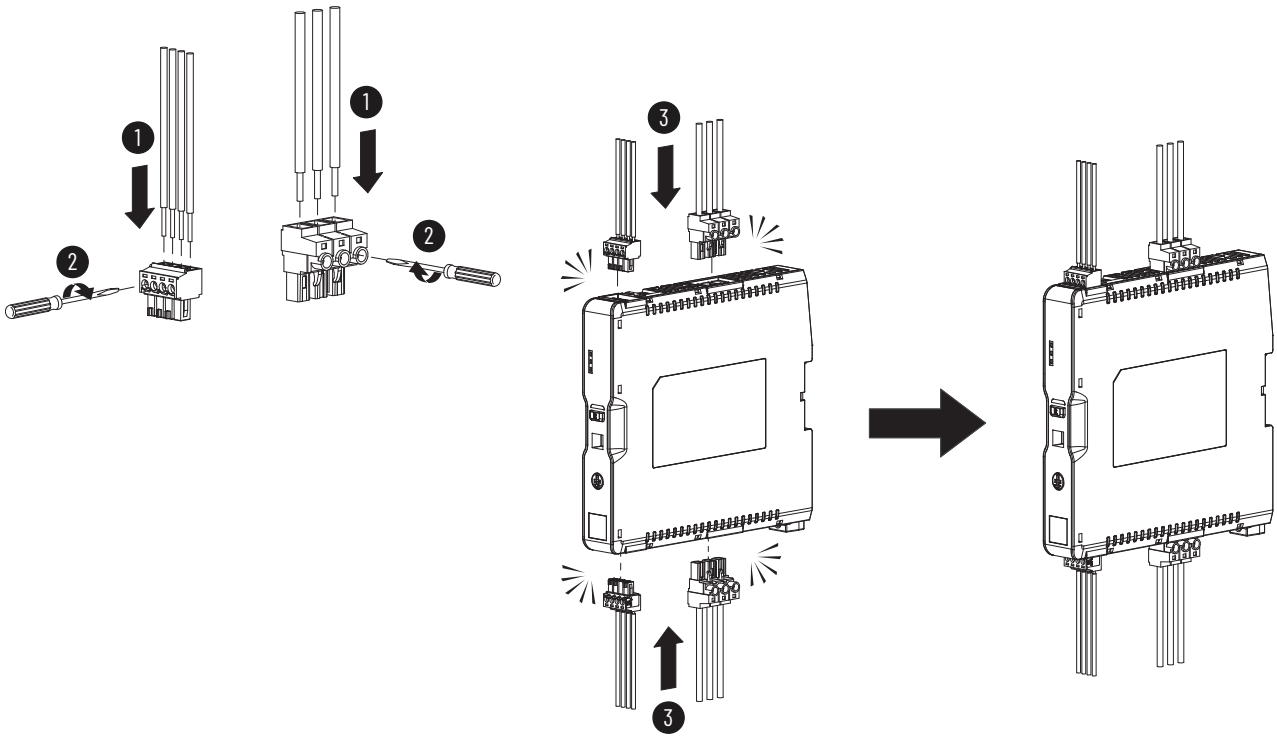


ID	Description
A	Control terminal block
B	Power line terminal block

ID	Description
C	I/O terminal block
D	Power load terminal block

To connect power to the CET7/CEUT7 starter, complete these steps.

Figure 6 - Power Connector Installation



Line and Load Connections

Connect line and load wiring to the device in a three-phase configuration.

To maintain short-circuit performance while using the device in a three-phase configuration, secure the cables as shown in Figure 7.

The CET7/CEUT7 starter terminal main line and load connections support the following:

- Flexible stranded wire
- Flexible stranded wire with ferrule
- Coarse-stranded wire
- Solid wire

Only one single conductor can be used on the power terminals. The control/aux terminal can use two conductors per terminal.

Wiring

Use the information in Figure 7 and Table 5 on page 18 to install and secure the CET7/CEUT7 starter wiring properly. Attach a cable tie securely every 5 cm (2 in.) along the length of the power cables, starting at the power plug and ending at the wireway.

ATTENTION: For UL certification, the wire ties are required to achieve the maximum short circuit rating.

Figure 7 - Secure the Power Cables

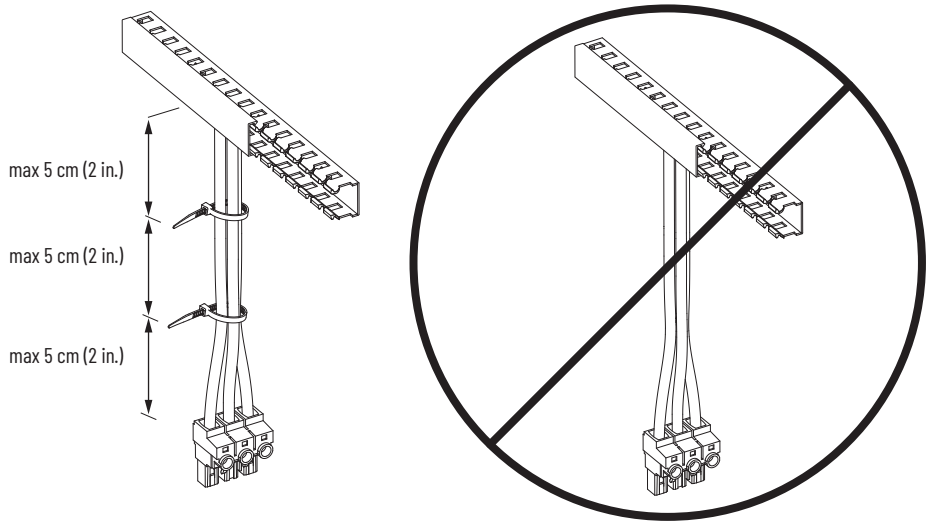
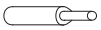


Table 5 - Wiring and Torque Specifications

Connection					Screw Terminals			
					Power Terminals(1)		Control/Auxiliary Terminals	
					9 A	23 A	9 A	23 A
Wiring	Solid		1 conductor	mm^2	2.5…4	2.5…6	1…2.5	
				AWG	14…12	14…10	18…14	
			2 conductors	mm^2	–	–	1…1.5	
				AWG	–	–	18…16	
	Stranded(2)		1 conductor	mm^2	2.5…4	2.5…6	1…2.5	
				AWG	14…12	14…10	18…14	
			2 conductors	mm^2	–	–	1…1.5	
				AWG	–	–	18…16	
Strip length					9 mm (0.35 in.)		9 mm (0.35 in.)	
Recommended screwdriver					3.5 mm (9/64 in.)		2.5 mm (3/32 in.)	
Tightening torque				N•m	0.5	0.6	0.25	
				lb•in	4.4	5.3	2.21	

(1) Power terminals allow only one conductor per terminal (line and load sides).
(2) Main line and load connections support flexible stranded wire, flexible stranded wire with ferrule, or coarse-stranded wire.

For more information on wiring terminal installation and specifications, see the Installation Instruction for Motor Starters, publication CET7-IN001.

Wire Terminals

The CET7/CEUT7 starter series terminals use standard nomenclature for terminal designations, as follows.

Table 6 - Terminal Designations

Terminal	CET7 Standard Nonreversing	CEUT7 Standard Reversing
1/L1	Line phase 1	
3/L2	Line phase 2	
5/L3	Line phase 3	
2/T1	Load phase 1	
4/T2	Load phase 2	
6/T3	Load phase 3	
A1+	24V DC control power source positive	
A2-	24V DC control power source common	
IN1	24V DC control input (start)	
IN2	24V DC control input (stop)	
REV	–	24V DC control input – positive (reverse)
O-1	Auxiliary output contactor status – 24V DC, 100 mA maximum	
O-2	Auxiliary output fault status – 24V DC, 100 mA maximum	
RES	24V DC input – remote reset	

Wiring Diagrams

Three-phase Wiring Diagrams

The CET7/CEUT7 starter has the following three-phase configuration.

Figure 8 - Three-phase Wiring

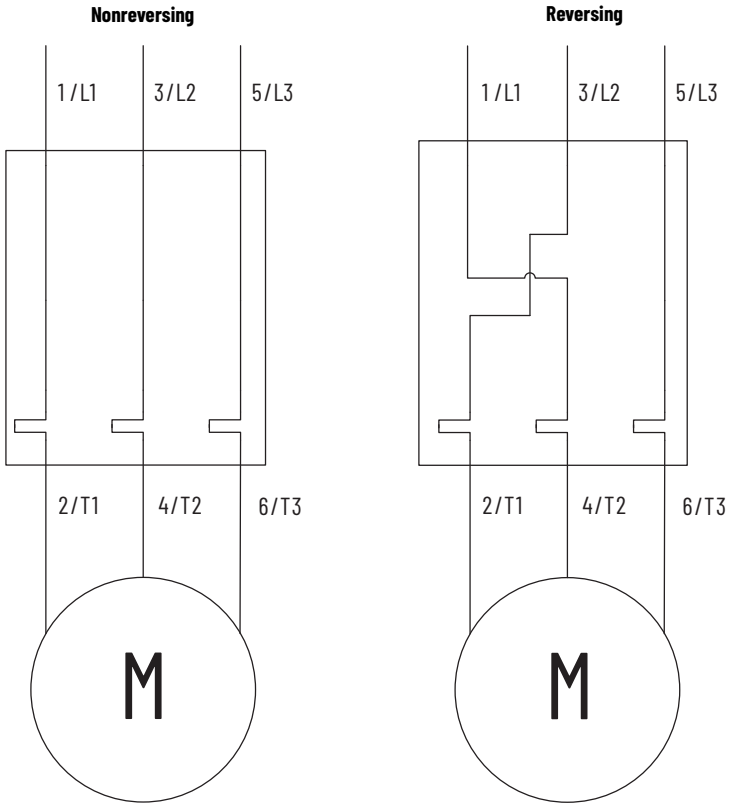


Table 7 - Line and Load Connections

Starter Type	Motor Direction	Description	Connections
Nonreversing[1]	Forward	When a valid start command is sent to the system, all nonreversing configurations of the CET7/CEUT7 starter connect.	• L1 to T1 • L2 to T2 • L3 to T3
Reversing	Forward[1]	When a valid start forward direction command is sent to the system, all reversing configurations of the CET7/CEUT7 starter connect.	
Reversing	Reverse[1]	When a valid start reverse direction command is sent to the system, all reversing configurations of the CET7/CEUT7 starter connect.	• L1 to T2 • L2 to T1 • L3 to T3

(1) This requirement applies to three-phase configurations.

Single-phase Wiring Diagram

ATTENTION: The motor starter can be damaged if single-phase wiring errors occur.

The CET7/CEUT7 starter has the following single-phase configuration.

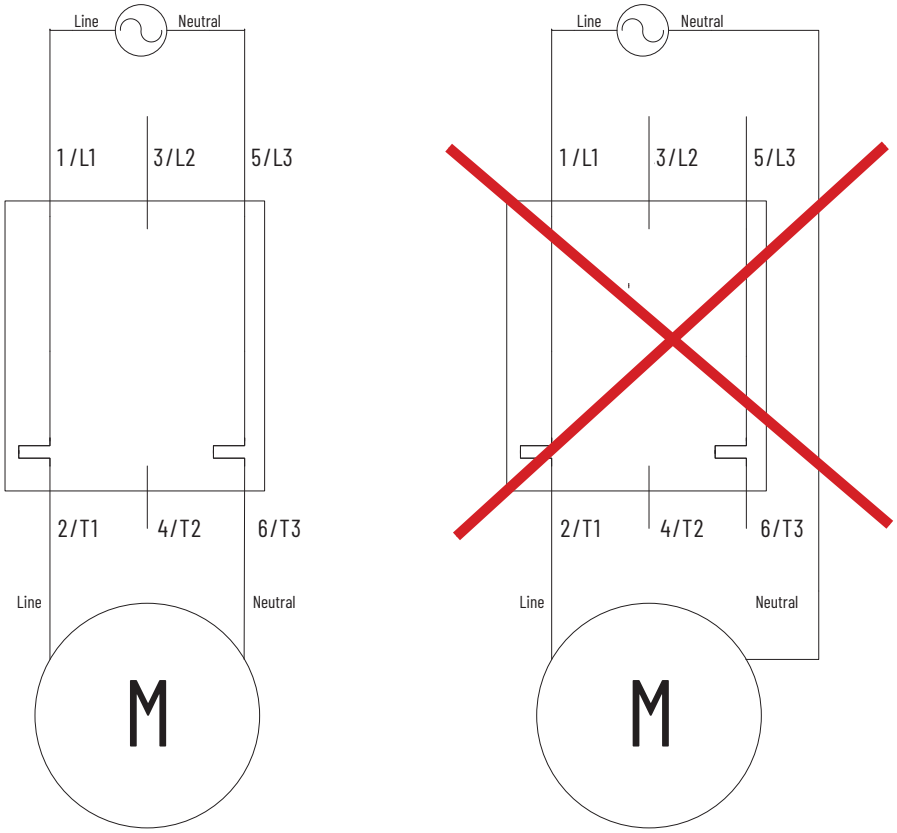
When configured in single-phase mode, the device must only be wired to the line and load as follows:

- Line — wiring on terminals L1 and L3 only
- Load — wiring on terminals T1 and T3 only

ATTENTION: The line and neutral wires must both be wired to the CET7/CEUT7. See Figure 9.

Any other connection that is installed can cause the CET7/CEUT7 starter to be damaged or generate a single-phase miswire fault.

Figure 9 - Single-phase Wiring



ATTENTION: The controller can be damaged if single-phase wiring errors occur.

Control Wiring Diagram

Figure 10 shows the correct wiring to configure the CET7/CEUT7 starter for three-wire control.

Figure 10 - Three-wire Control — Remote Reset, Reversing, Auxiliary Outputs

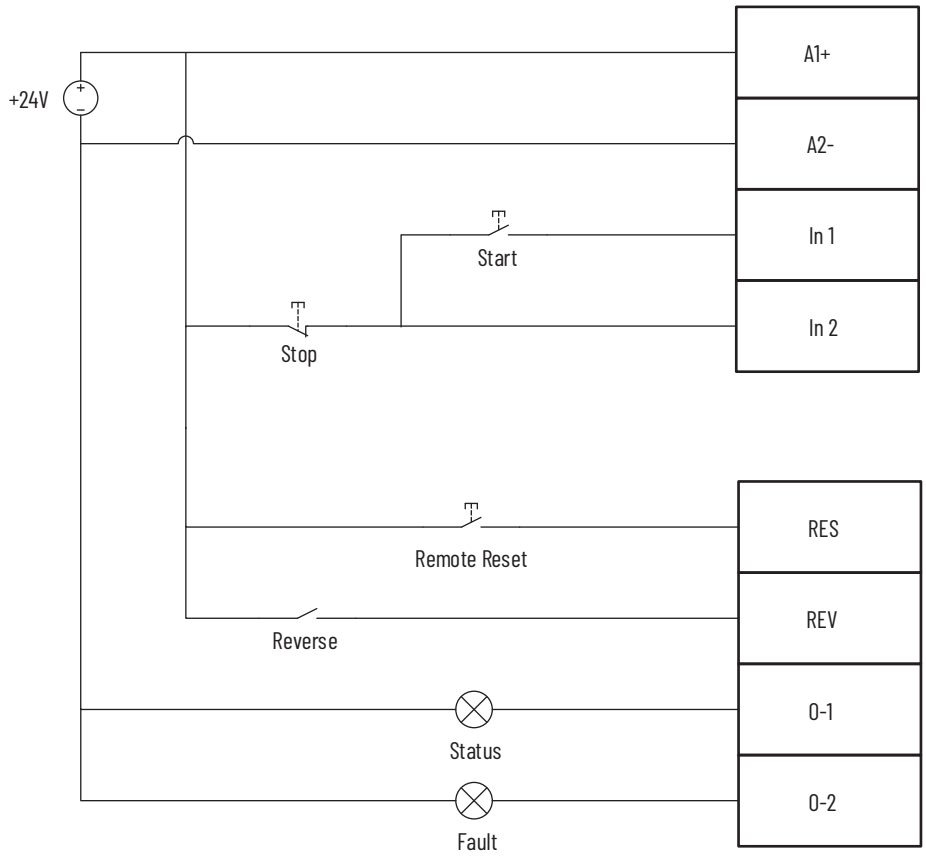


Figure 11 shows the correct wiring to configure the CET7/CEUT7 starter for two-wire control.

Figure 11 - Two-wire Control — Remote Reset, Reversing, Auxiliary Outputs

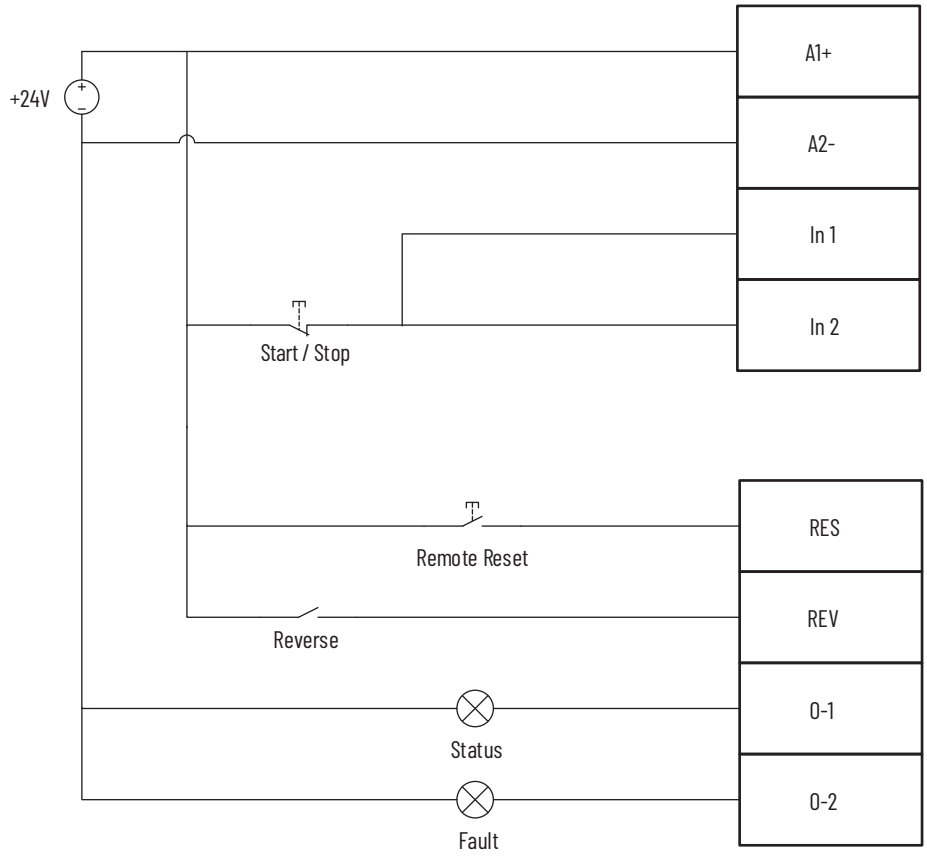


Table 8 - Control Wiring Diagram Details

Item	Description
24V DC positive	Apply to A1+
24V DC negative	Apply to A2-
All inputs	24V DC Use the same signal that is tied to A1+
Return for inputs	Internally connected to A2-
Start/Stop	Appropriate switch configurations to In1 and In2 See Figure 10 on page 21 and Figure 11
Reverse	Reverses motor direction **Note**: Stop the motor before you change direction(1).
Remote Reset	Use to reset motor trips

(1) If motor and load are not stopped before changing motor direction, the motor can encounter high inrush currents that could result in nuisance overload or circuit protection trips.

Control Power Voltage Source

All CET7/CEUT7 starters must use a 24V DC (-15% / +10%) control power source on the A1+/A2-terminals.

The CET7/CEUT7 starter is designed with internal overcurrent protection to limit the maximum energy into the control circuit.

Configuration and Operation

Choose Full Load Ampere Setting

The CET7/CEUT7 starter is designed with a rotary switch that can be used to adjust the current range for the protection features.

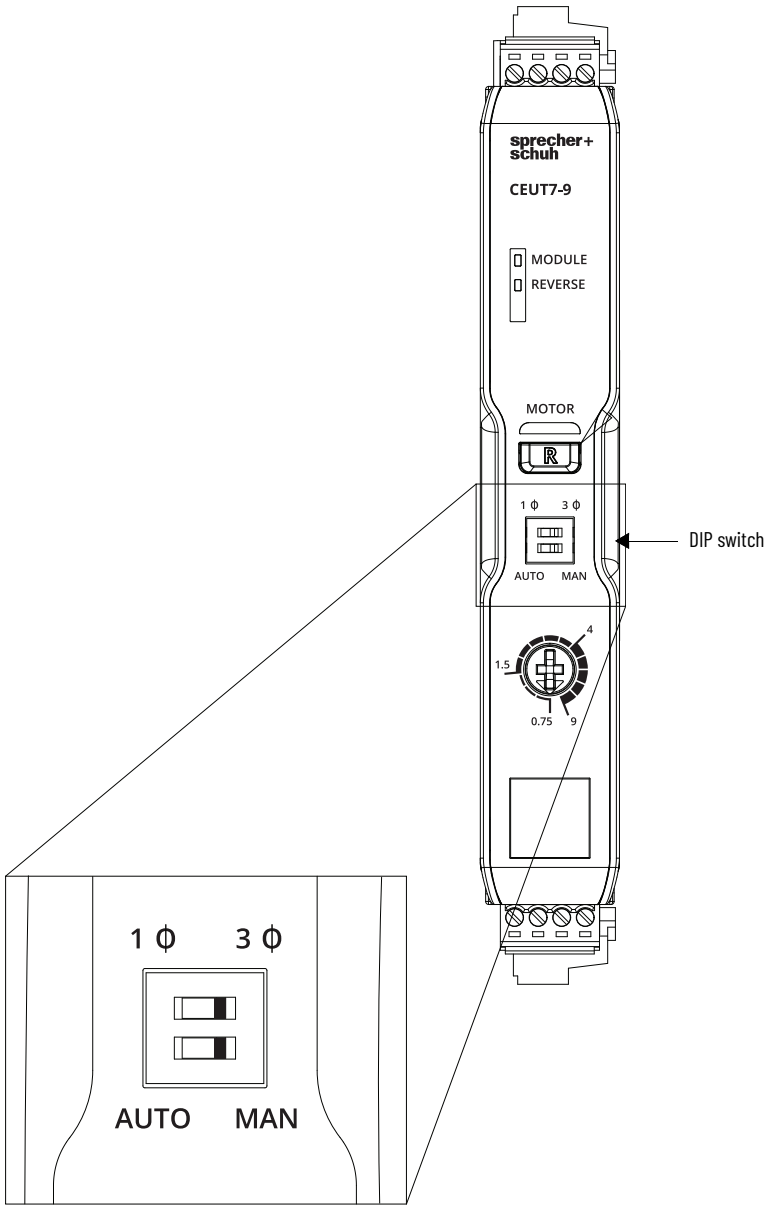
Set the CET7/CEUT7 starter FLA rotary dial to match the motor nameplate FLA.

See Specifications on page 11 for more information.

Choose Single- or Three-phase Power

To configure the CET7/CEUT7 starter for single- or three-phase operation, select the appropriate DIP switch setting, which is on the front of the unit. See Figure 12 for more information.

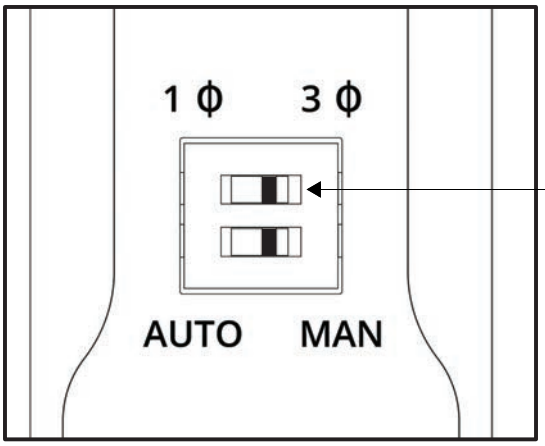
Figure 12 - Power Phase DIP Switch Location



The CET7/CEUT7 starter is configured to use three-phase power by default.

To change the system to single-phase, move the top DIP switch to the left position.

Figure 13 - Power Phase DIP Switch Selection



Phase Selection (Top DIP Switch)
Right Position: Three-phase (Default)
Left Position: Single-phase

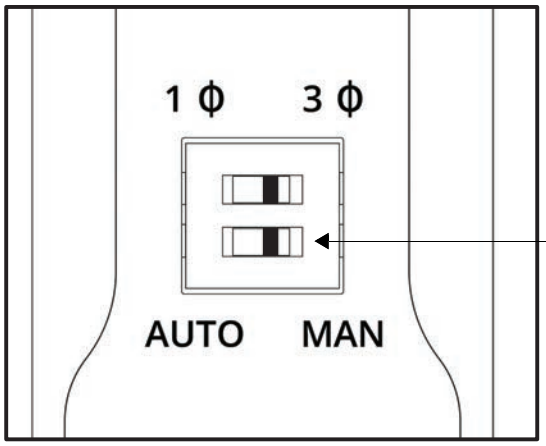
Automatic Reset

The CET7/CEUT7 starter is configured to reset the overload trips manually by default. To change the system to reset the overload trips automatically, move the bottom DIP switch to the left "AUTO" setting.

WARNING: If the device is set to Automatic Reset, it restarts automatically. Take precautions to help prevent hazards.

AVERTISSEMENT: Si le dispositif est réglé en mode de réinitialisation automatique, il redémarrera automatiquement. Veuillez prendre des précautions pour prévenir les risques.

Figure 14 - Reset DIP Switch Selection



Reset Selection (Bottom DIP Switch)
Right Position: Manual Reset (Default)
Left Position: Automatic Reset

Auxiliary Output Contactor Status

Table 9 provides the CET7/CEUT7 starter auxiliary output contactor status functionality.

Table 9 - Contactor Status Output

Contactor State	Output State
Open	0V(1)
Closed	+24V DC(2)

(1) In this state, the output measures 0V (± 10 mV), with a 240 Ω load to common.
(2) In this state, the output measures the control voltage at A1+ (+0V / -1V), with a 240 Ω load to common.

Auxiliary Output Fault Status

Table 10 provides the CET7/CEUT7 starter auxiliary output fault status functionality.

Table 10 - Fault Status Output

Fault State	Output State
Not faulted	0V(1)
Faulted	+24V DC(2)

(1) In this state, the output measures 0V (± 10 mV), with a 240 Ω load to common.
(2) In this state, the output measures the control voltage at A1+ (+0V / -1V), with a 240 Ω load to common.

Control Inputs Operation

The CET7/CEUT7 starter IN1, IN2, reverse, and reset control inputs are 24V DC (U_e), Type 1 rated inputs, as defined in EN 60947-1.

Table 11 provides the CET7/CEUT7 starter control inputs functionality.

0 refers to state 0 (0V DC) and 1 refers to state 1 (24V DC), as defined in EN60947-1.

Table 11 - Controls Input

In1	In2	Action
0	0	Stop Command
1	0	Stop Command
0	1	Maintains current state (stopped or running)
1	1	Start Command

Table 12 provides the CET7/CEUT7 starter reverse input functionality.

Table 12 - Reverse Input

Input	Input Setting	Action
Reverse(1)	0	Motor runs in the forward direction
	1	Motor runs in the reverse direction

(1) The motor direction change does not occur until the next motor start command is initiated. The CET7/CEUT7 does not prevent flying start commands. To help prevent nuisance tripping, stop the motor load before you issue a start command.

Table 13 provides the CET7/CEUT7 starter remote reset input functionality.

Table 13 - Remote Reset Input

Input	Input Setting	Action
Remote Reset (requires N.O. push button)	0	No action
	1	Trip reset

Notes:

Status Indicators

Motor Status Indicator

The CET7/CEUT7 starter motor status indicator provides the functionality identified in Table 14.

Table 14 - Motor Status Indicator

Indicator Status	Activity	Device State
Off	–	The power contacts are open
Green	Steady on	• The power contacts are closed • The motor is running and no warnings or trips are present
Yellow	Steady on	• The power contacts are closed • The motor is not running
Red	Flashing trip ID details: The number of flashes followed by a pause identifies the specific trip code as shown in Table 19 on page 36.	Tripped
Yellow		Warning

Module Status Indicator

The CET7/CEUT7 starter module status indicator provides the functionality identified in Table 15.

Table 15 - Module Status Indicator

Indicator Status	Activity	Device State
Off	–	The device is powered off
Green	Steady on	• The module is powered on • No internal faults are present
Red	Steady on	The module has an unrecoverable fault
Red	Flashing	• The module has an internal hardware fault • A power cycle is required

Trip and Warning IDs

See Table 19 on page 36 and Table 20 on page 36.

Reversing Status Indicator

The CET7/CEUT7 starter reversing status indicator provides the functionality identified in Table 16.

Table 16 - Reversing Status Indicator

Indicator Status	Activity	Device State
Off	–	• The motor is stopped or • The motor is running in the forward direction
Green	Steady on	The motor is running in the reverse direction

Notes:

Protection Functions

Reset a Trip

After the trip condition is removed, the CET7/CEUT7 starter can be reset from the tripped state by using one of these methods:

- Reset button
- Remote reset control input
- Automatic reset (motor overload only)
- Cycling 24V DC control power

Reset Button

- To reset a trip, press the reset button.
- To generate a test trip, press and hold the reset button for at least 3 seconds.
- When a test trip is generated, the Motor status indicator flashes the trip code. For more information, see Table 14 on page 27 and Table 19 on page 36.

For more information see Auxiliary Output Contactor Status on page 24.

Remote Reset Control Input

When 24V DC is applied to the reset (RES) input, a trip reset signal is sent. If the trip condition is no longer present, the fault is reset.

Trip Reset

The CET7/CEUT7 starter provides trip reset functionality for three-wire and two-wire configurations as shown in Figure 15 and Figure 16.

IMPORTANT After you reset a trip, cycle the stop input signal before you start the motor.

Figure 15 - Trip Reset for Three-wire Configurations

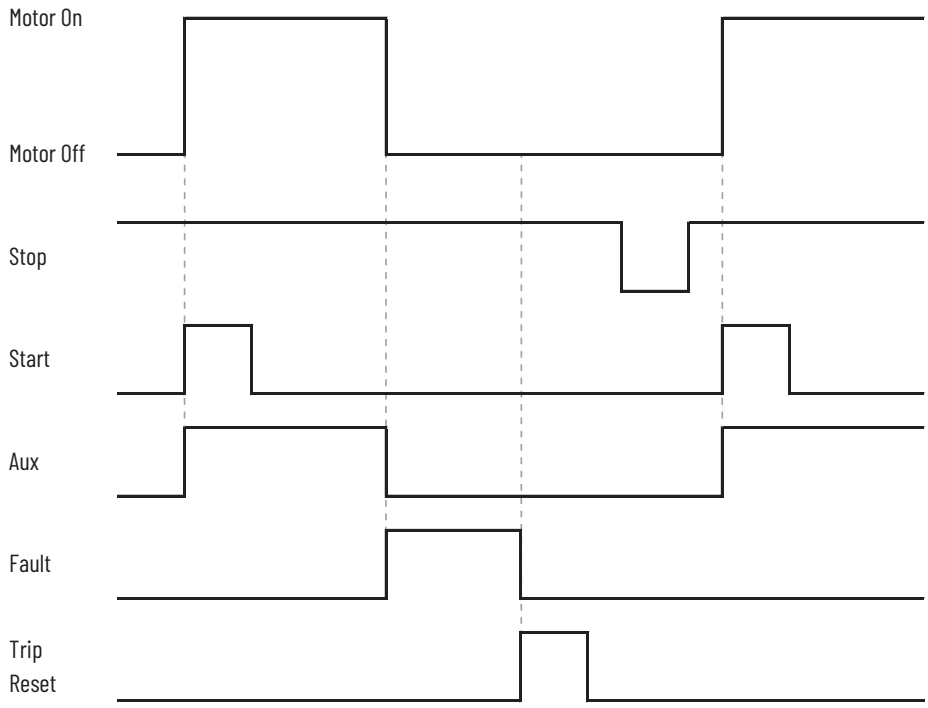
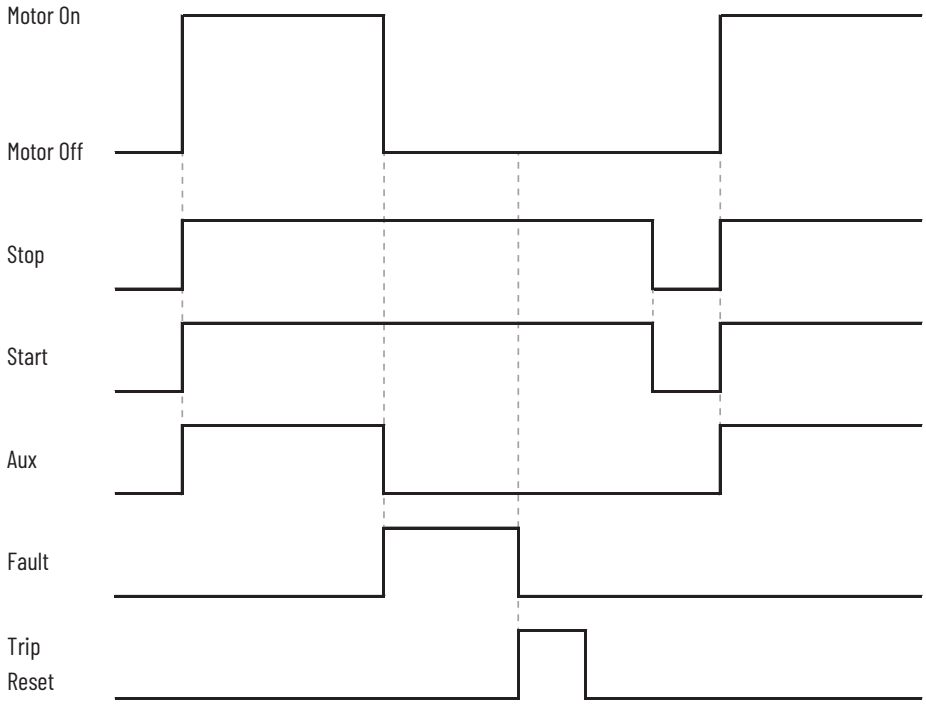


Figure 16 - Trip Reset for Two-wire Configurations



Thermal Overload Protection

The CET7/CEUT7 starter provides Class 10 thermal overload protection, which is always enabled.

When the motor Thermal Capacity Utilization (TCU), is equal to or greater than 100%, an overload trip signal is generated and the Motor status indicator flashes the trip code. For more information, see Table 14 on page 27 and Table 19 on page 36.

When a trip reset is issued and the TCU is less than 70%, a thermal overload trip can be reset. When automatic reset is enabled, and the TCU is less than 70%, a thermal overload trip is automatically cleared.

A thermal overload warning occurs when the TCU value is greater than or equal to 90%.

The thermal overload warning is cleared when the TCU value drops below the thermal overload warning level.

Trip Curves

Figure 17 - Trip Curves— 9 A

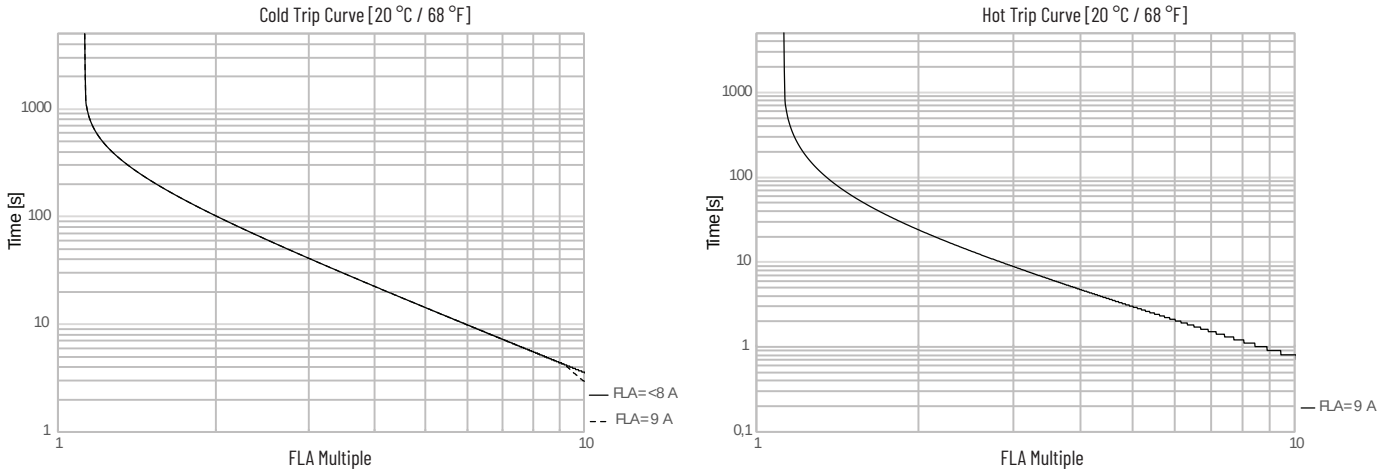


Figure 18 - Trip Curves — 23 A

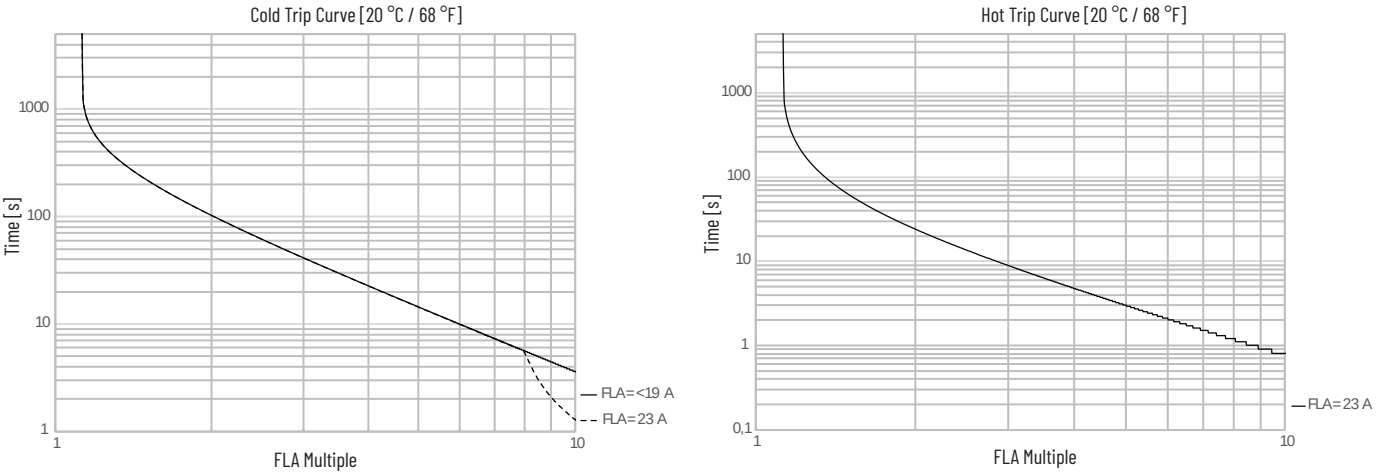


Figure 19 - Maximum Starts per Minute @ 20 °C (68 °F) – 9 A and 23 A Devices, 80% FLA

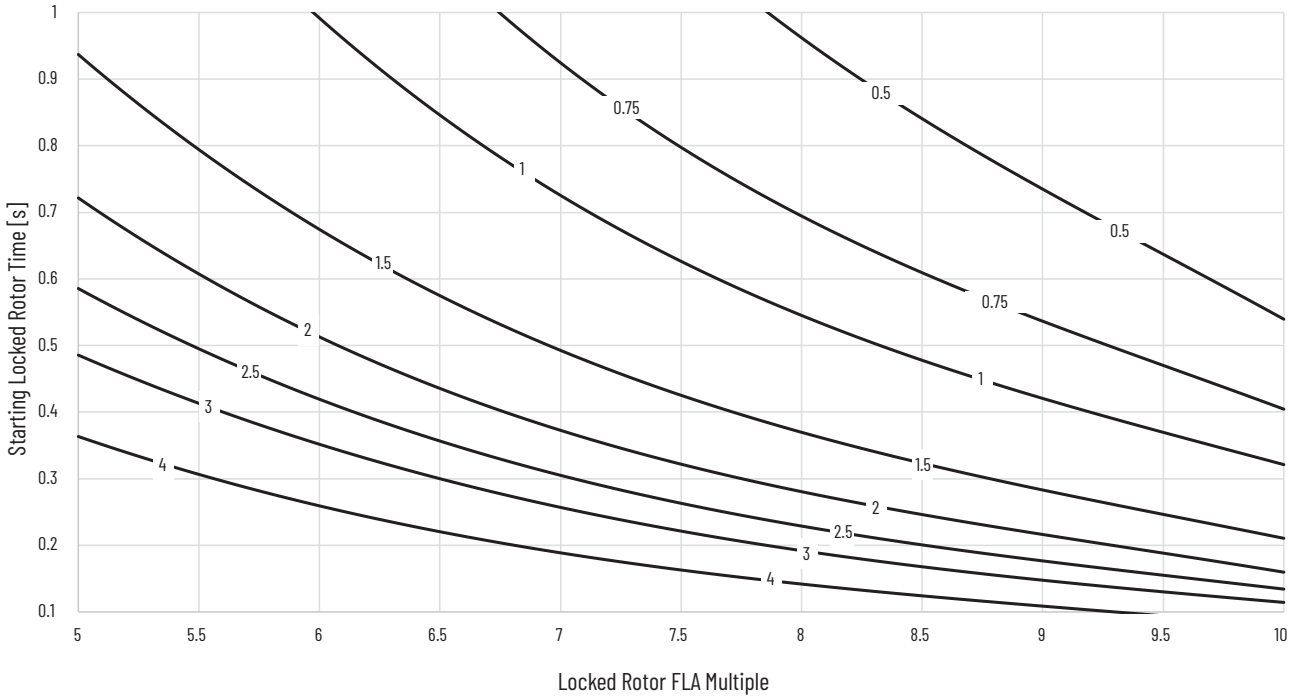


Figure 20 - Maximum Starts per Minute @ 20 °C (68 °F) – 9 A and 23 A Devices, 100% FLA

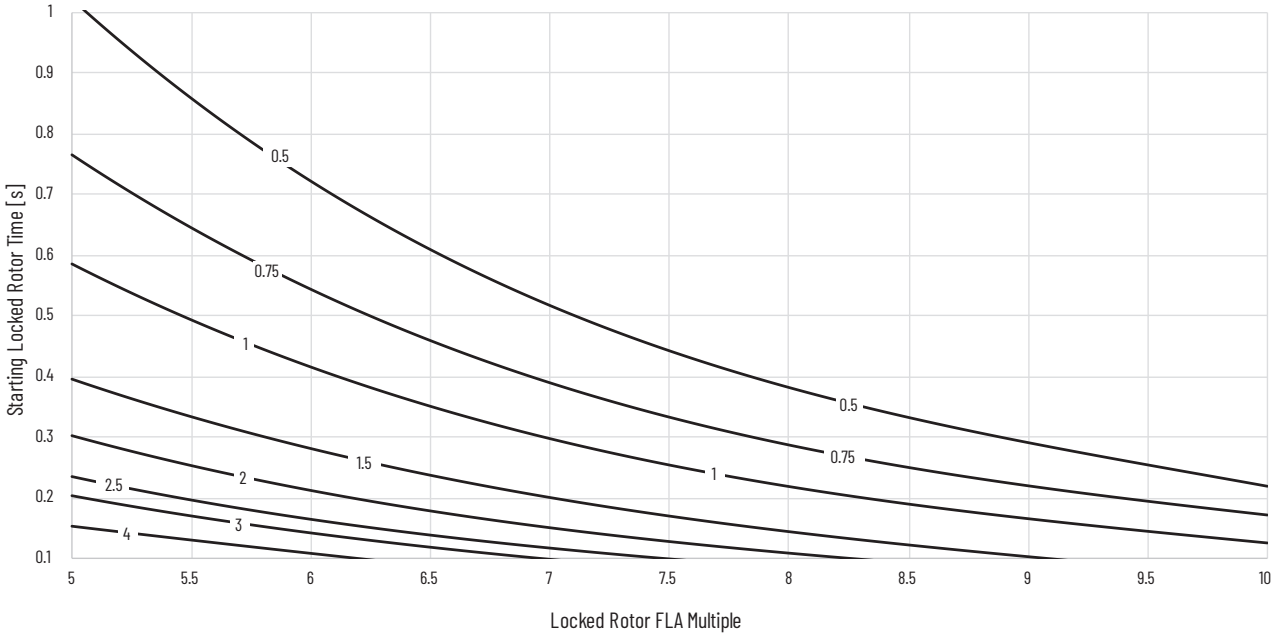
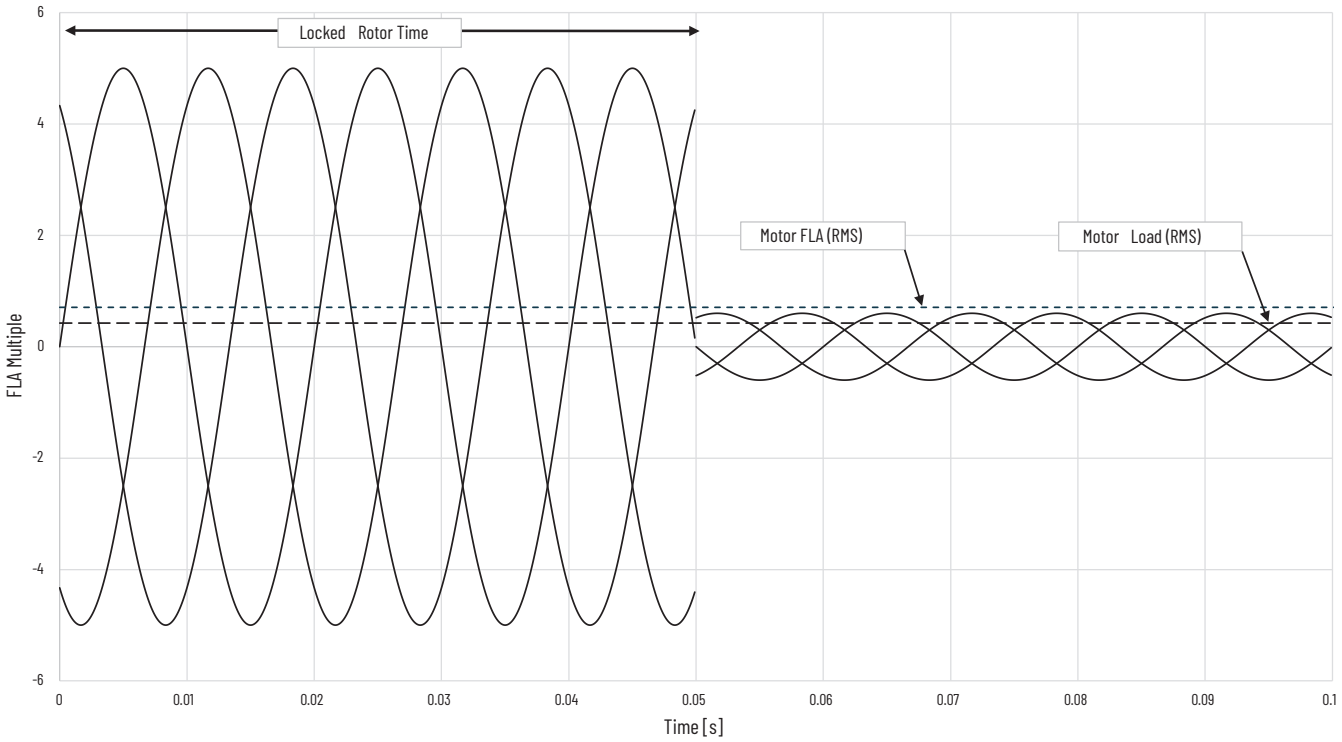


Figure 21 - Simplified Motor Start



Phase Loss Protection

The CET7/CEUT7 starter provides phase loss protection when controlling three-phase motors. Phase loss protections are disabled when controlling single-phase motors.

When a phase loss condition exists for 3 seconds, the device generates a phase loss fault. In this case, the Motor status indicator flashes the trip code. For more information, see Table 14 on page 27 and Table 19 on page 36. Phase loss trips are cleared when a trip reset occurs.

A phase loss warning signal is sent when a phase loss condition exists for at least 0.1 seconds. The Motor status indicator flashes the trip code. For more information, see Table 14 on page 27 and Table 19 on page 36.

Contact Weld Protection

When a motor start command is issued, the CET7/CEUT7 starter performs a diagnostic test. If the starter detects a welded power contact in any phase, it generates a hardware fault.

Single-phase Miswiring Protection

The CET7/CEUT7 starter has the following single-phase miswiring access operation, trip levels, and reset options.

Table 17 - Single-phase Miswiring Protection

Attribute	Value
Single-phase miswiring trip	• Sent when a single-phase miswiring condition exists for 1 s • The Motor status indicator flashes the trip code See Table 14 on page 27 and Table 19 on page 36
Single-phase miswiring trip reset	Cleared when the trip is reset

Phase Imbalance Protection

The CET7/CEUT7 starter has the following phase imbalance protection operation, trip levels, and reset options.

Table 18 - Phase Imbalance Protection

Attribute	Value
Phase imbalance access	• Enabled when operating three-phase mode • Cannot be disabled when operating three-phase mode • Disabled when operating in single-phase mode
Phase imbalance function	• Enabled (motor running) when the calculated current imbalance is: – greater than 50% and – the average current is greater than 30% min FLA
Current imbalance calculation	The maximum difference between each phase current and the average phase current, divided by the average current
Phase imbalance trip	• Enabled when a phase imbalance condition exists for ≥ 10 s • The Motor status indicator flashes the trip code See Table 14 on page 27 and Table 19 on page 36 • Cleared when the trip is reset
Phase imbalance warning signal	• Signal sent when a phase imbalance condition exists for at least 0.1 s • The Motor status indicator flashes the trip code See Table 14 on page 27 and Table 19 on page 36 • Cleared when the phase imbalance condition ends

Troubleshooting

Introduction

If the CET7/CEUT7 starter encounters any errors, refer to the fault and warning code information that is contained in this section.

For safety of maintenance personnel and others who might be exposed to electrical hazards associated with maintenance activities, follow the local safety-related work practices (for example, NFPA 70E, Part II in the United States). Maintenance personnel must be trained in the safety practices, procedures, and requirements that pertain to their respective job assignments.

WARNING: Servicing energized industrial control equipment can be hazardous. Electrical shock, burns, or unintentional actuation of controlled industrial equipment may cause death or serious injury. For safety of maintenance personnel and others who may be exposed to electrical hazards associated with the maintenance activities, follow the local safety-related work practices (for example, the NFPA 70E, Part II, Electrical Safety for Employee Workplaces, in the United States) when working on or near energized equipment.
WARNING: Maintenance personnel must be trained in the safety practices, procedures, and requirements that pertain to their respective job assignments.
WARNING: Do not work alone on energized equipment.

AVERTISSEMENT: Intervenir sur un équipement de commande industriel sous tension peut être dangereux. Les risques d'électrocution, de brûlure ou l'activation involontaire d'équipements industriels commandés risque de provoquer des blessures graves, voire mortelles. Pour la sécurité du personnel de maintenance et des autres personnes pouvant être exposées aux risques d'électrocution liés aux activités de maintenance, observez les directives de sécurité locales (par' exemple, la directive NFPA 70E, Part II, Electrical Safety for Employee Workplaces, aux États-Unis) lors d'intervention sur des équipements sous tension ou à proximité de ceux-ci.
AVERTISSEMENT: Le personnel de maintenance doit être formé aux pratiques, procédures et exigences de sécurité associées à ses missions respectives.
AVERTISSEMENT: Ne travaillez pas seul sur un équipement sous tension.

Fault and Warning Codes

Table 19 - Motor Fault and Warning Codes

Fault/ Warning Code	Condition	Possible Causes	Possible Solutions
1	Overload	Motor overloaded	Check motor overload condition
		Overload dial setting is not matched to the motor	Check FLA dial setting and motor FLA rating
			Verify current draw of the motor
2	Phase Loss	High impedance line connection	Check for open line- and load-side connections Check for loose line- and load-side connections
		Missing supply phase	Check for open line (for example, a blown fuse)
		Motor not connected properly	Check for open motor lead(s)
		Incoming three-phase voltage instability	Verify power quality
		Loss of load side power wiring	Check all load-side power connections
			Check motor windings (insulation resistance tester)
3...6 9, 10	Reserved	–	–
7	Phase Imbalance	Power line unbalance is greater than preprogrammed values See Table 18 on page 34	Check the power system and correct if necessary
8	Single-phase Miswire (Trip only)	Single-phase motor or power is not wired correctly	Check single-phase power and motor wiring See Figure 9 on page 20
		DIP switch setting incorrect	Check DIP switch setting See Figure 13 on page 24
11	Test Fault	The CET7/CEUT7 starter controller reset button was pressed for more than 3 seconds	To reset the Test fault, press the reset button for less than 2 seconds
		The CET7/CEUT7 starter controller reset button is stuck or damaged	Attempt to dislodge the reset button Replace the device if necessary

Table 20 - Module Fault Codes

Fault Code	Condition	Possible Causes	Possible Solutions
1	Device Overtemperature	Controller ventilation blocked	Check for proper controller ventilation
		Controller duty cycle exceeded	Check application-appropriate duty cycle
		Ambient temperature limit exceeded	Wait for controller to cool
			If ambient temperature is high, provide external cooling
2	NVS Error	Controller Memory Corrupted	Cycle control power
			Replace device
3	Device Reset	Device Reset	Verify that 24V DC control power is within specification See Control Power Voltage Source on page 22
			Cycle control power
			Replace device
4	User Interface Error	User interface control not recognized	Check all control wiring
			Confirm that control voltage is within specification See Control Power Voltage Source on page 22
			Cycle control power
			Replace device
5	Control Power out of Range	Control power source out of range	Verify that 24V DC control power is within specification See Control Power Voltage Source on page 22
			Cycle control power
			Replace device
6...10	Power Supply out of Range	Internal power supply out of range	Cycle control power
			Contact Sprecher+Schuh for Support
			Replace device

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User Manual:

Series CET7, CEUT7 Electronic Motor Starters

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Today, Sprecher + Schuh offers a wide range of low-voltage industrial control products, including contactors, a variety of relays, starters, push buttons, switches, terminals and controllers, to name a few. All of our products are crafted with precision and tested rigorously for performance — far exceeding industry standards. Moving forward, we continue along the path of constantly seeking innovative ways to provide solutions for our customers. It is by this philosophy that Sprecher + Schuh has come to be the industrial control manufacturer of choice for many customers around the globe seeking quality, reliability, and a name they can trust.