

# **SCL/SCM Series**

## **Installation and Operation Manual**



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## INSTALLATION

Ensure proper handling and avoid excessive mechanical stress. Do not bend any components and do not change any insulation distances during transport, handling, installation or maintenance.

Do not touch any electronic components or contacts. This drive contains electrostatically sensitive components, which can easily be damaged by inappropriate handling. Static control precautions must be adhered to during installation, testing, servicing and repairing of this drive and associated options. Component damage may result if proper procedures are not followed.

This drive has been tested by Underwriters Laboratory (UL) and is an approved component in compliance with UL508C Safety Standard.

 <p><b>Warnings!</b></p>	<ul style="list-style-type: none"><li>• Suitable for use on a circuit as described in Section 7.0 of this manual.</li><li>• Use minimum 75°C copper wire only.</li><li>• Shall be installed in a Pollution Degree 2 macro-environment.</li></ul>
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## 2 SCL/SCM DIMENSIONS

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### 3 SCL/SCM MODEL DESIGNATION CODE

The SCL/SCM model number gives a full description of the basic drive unit.

**EXAMPLE:** SL210S = SCL Series, 208/240 Vac, 1 HPT

MODEL SCL

INPUT

OUTPUT

HEAT

## 6 INSTALLATION



### NOTE

SCL/SCM Series drives are intended for inclusion within other equipment, by professional electrical installers according to EN 61000-3-2. They are **not** intended for stand-alone operation.



## 7 INPUT AC POWER REQUIREMENTS

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## 7.2 Input Fusing Requirements

A circuit breaker or a disconnect switch with fuses must be provided in accordance with the National Electric Code (NEC) and all local codes. Refer to the following tables for proper ratings:

INPUT FUSE & CIRCUIT BREAKER RATINGS (for installation to UL and EN 60204-1)							
120 Vac 1 phase		208/240 Vac 1 phase		208/240 Vac 3 phase		400/480 Vac 3 phase	
SM004S	10 A	S_204S	10 A				
SM005S	15 A	S_205S	10 A	SM205	10 A	SM405	10 A
		S_208S	10 A				
SM010S	25 A	S_210S	15 A	SM210	10 A	SM410	10 A
SM015S	35 A	S_215S	20 A	SM215	12 / 10 A	SM415	10 A
		S_220S	25 / 20 A	SM220	15 / 12 A	SM420	10 A
		S_230S	30 / 25 A	SM230	20 / 15 A	SM430	10 A
				SM250	30 / 25 A	SM450	15 / 12 A
				SM275	45 / 40 A	SM475	20 / 20 A
				SM2100	50 / 50 A	SM4100	30 / 25 A
				SM2150	80 / 75 A	SM4150	40 / 35 A



### NOTE

- Applicable national and local electrical codes take precedence over recommendations in these tables.
- Use UL Class CC fast-acting, current limiting type fuses. Select fuses with low I<sup>2</sup>T values, rated at 200,000 AIC. Recommended fuses are Bussman KTK-R, JJN, and JJS. Similar fuses with equivalent ratings by other manufacturers may also be used. Refer to the FEF0020-BDCqu









## 9 SCL/SCM POWER WIRING DIAGRAM



## 10 CONTROL WIRING

### 10.1 Control Wiring vs. Power Wiring

External control wiring **MUST** be run in a separate conduit away from all other input and output power wiring. If control wiring is not kept separate from power wiring, electrical noise may be generated on the control wiring that will cause erratic drive behavior. Use twisted wires or shielded cable grounded at the drive chassis **ONLY**. Recommended control wire is Belden 8760 (2-wire), 8770 (3-wire), or equivalent.



#### NOTE

Control terminals provide basic isolation (insulation per EN 61800-5-1). Protection against contact can only be assured by additional measures e.g. supplemental insulation.

Strip off 0.20 to 0.25 inches (5 to 6 mm) of insulation for control wiring, and torque the control terminals to 2 lb-in (0.2 Nm). Be careful not to overtorque the control terminals, as this will cause damage to the terminal strip. This is not covered under warranty and can only be repaired by replacing the control board.

### 10.2 TB-2: Circuit Common

The TB-2 terminal is used as circuit common for the analog speed reference inputs. If necessary TB-2 may be connected to chassis ground.

### 10.3 Surge Suppression on Relays

Current and voltage surges and spikes in the coils of contactors, relays, solenoids, etc, near or connected to the drive, can cause erratic drive operation. Therefore, a snubber circuit should be used on coils associated with the drive. For AC coils, snubbers should consist of a resistor and a capacitor in series across the coil. For DC coils, a free-wheeling or flyback diode should be placed across the coil. Snubbers are typically available from the manufacturer of the



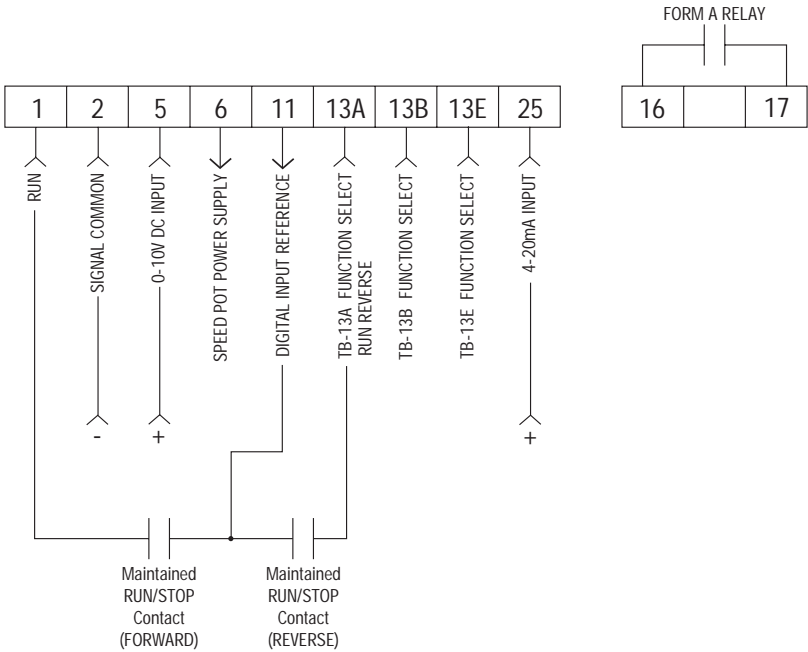


## 11 SCL/SCM CONTROL WIRING DIAGRAMS

### 11.1 SCL/SCM Terminal Strip

Shown below is the control terminal strip, along with a brief description of the function of each terminal. The following wiring diagram examples provide a detailed description of the terminal strip.

## 11.2 Two-Wire Start/Stop Control



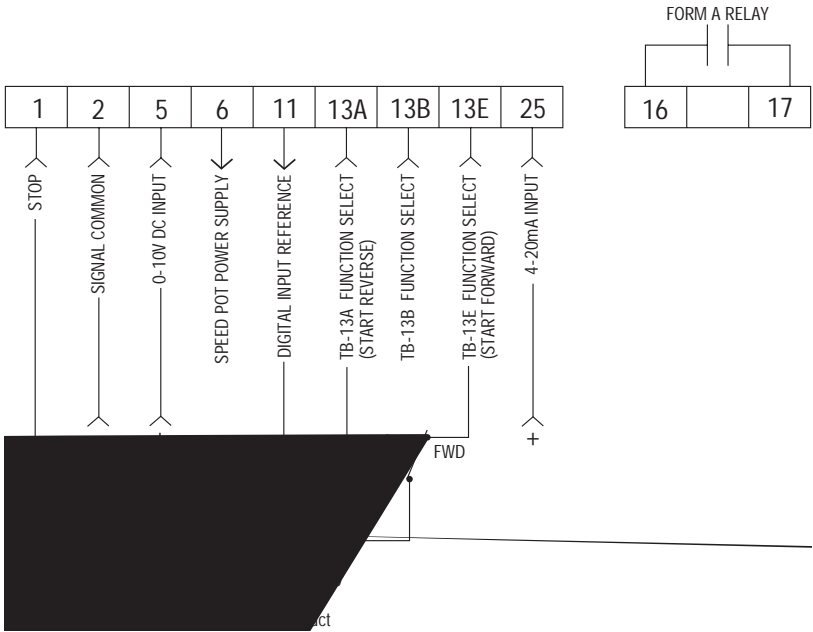
2-Wire Start/Stop Control



### NOTE

- Close TB-1 to TB-11 to RUN, and open to STOP. TB-1 functions as a RUN input for two-wire start/stop circuits, and a STOP input for three-wire start/stop circuits. Refer to Section 11.3
- If reverse direction is required, set ROTATION (Parameter 17) to

### 11.3 Three-Wire Start/Stop Control



3-Wire Start/Stop Control



**NOTE**

- Program TB-13E (Parameter 12) for START FORWARD (06).
- If reverse direction is required, set ROTATION (Parameter 17) to FORWARD AND REVERSE (02), and program TB-13A (Parameter 10) for START REVERSE (07).
- Momentarily close TB-13E to TB-11 to START in the forward direction, or close TB-13A to TB-11 to START in the reverse direction. Momentarily open TB-1 to TB-11 to STOP the drive.
- For 0-10 VDC or 4-20 mA speed control, set STANDARD SPEED SOURCE (Parameter 05) to 0-10 VDC (03) or 4-20 mA (04).







3. Use the **g** button to increase the





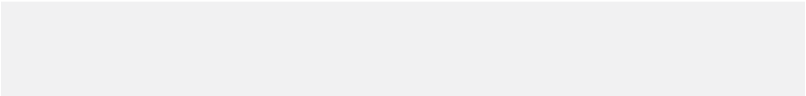




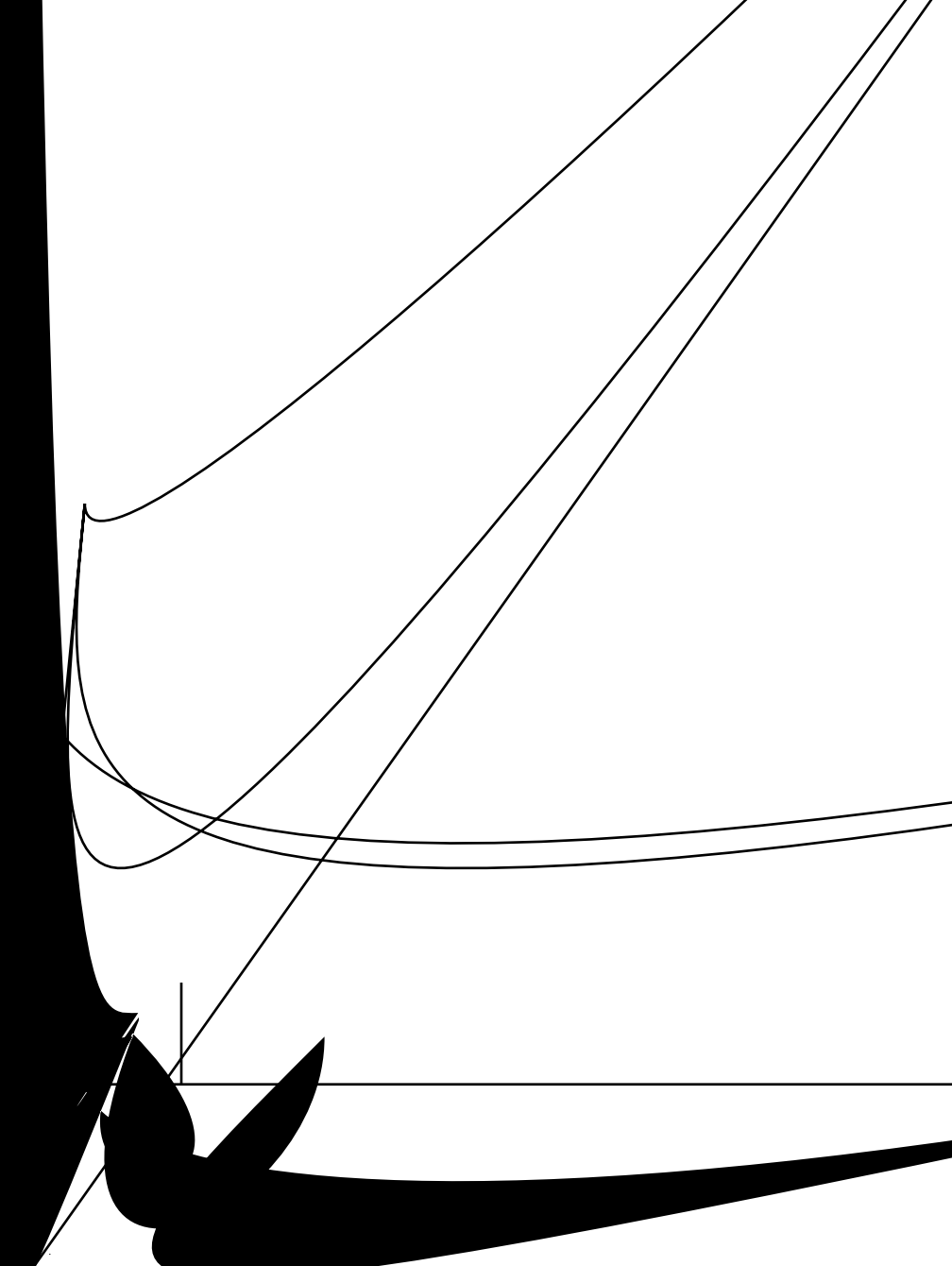
## 14 PARAMETER MENU

NO.	PARAMETER NAME	RANGE OF ADJUSTMENT	FACTORY DEFAULT
01	LINE VOLTAGE	HIGH (01), LOW (02)	HIGH (01)
02	CARRIER FREQUENCY	4kHz (01), 6 kHz (02), 8 kHz (03), 10 kHz (04)	6 kHz (02)
03	START METHOD	NORMAL (01), START ON POWER UP (02), START WITH DC BRAKE (03), AUTO RESTART WITH DC BRAKE (04), FLYING RESTART 1 (05), FLYING RESTART 2 (06), FLYING RESTART 3 (07)	NORMAL (01)
04	STOP METHOD	COAST (01), COAST WITH DC BRAKE (02), RAMP (03), RAMP WITH DC BRAKE (04)	COAST (01)
05	STANDARD SPEED SOURCE	KEYPAD (01), PRESET #1 (02), 0-10 VDC (03), 4-20 mA (04)	KEYPAD (01)
06	RELAY OUTPUT	NONE (01), RUN (02), FAULT (03), INVERSE FAULT (04), FAULT LOCKOUT (05), AT SET SPEED (06), ABOVE PRESET #3 (07), CURRENT LIMIT (08), AUTO SPEED (09), REVERSE (10)	NONE (01)
10	TB-13A FUNCTION SELECT	NONE (01), 0-10 VDC (02), 4-20 mA (03), PRESET SPEED #1 (04), START FORWARD (05), RUN REVERSE (06), START REVERSE (07), EXTERNAL FAULT (08), INVERSE EXT FAULT (09), AUXILIARY STOP (10), ACCEL/DECEL #2 (11)	NONE (01)
11	TB-13B FUNCTION SELECT	NONE (01), 0-10 VDC (02), 4-20 mA (03), PRESET SPEED #2 (04), DECREASE FREQ (05), START FORWARD (06), JOG FORWARD (07), JOG REVERSE (08), EXTERNAL FAULT (09), INVERSE EXT FAULT (10), AUX. STOP (11), ACCEL/DECEL #2 (12), REMOTE KEYPAD (13)	NONE (01)







03 START WITH DC BRAKE:

- 04 RAMP WITH DC BRAKE: When a stop command is given, the drive will decelerate the motor down to 0.2 Hz (at the rate set by Parameter 20 - DECELERATION TIME) and then activate DC braking according to the settings of Parameters 21 - DC BRAKE

## **P10 TB-13A FUNCTION SELECT**

P10 selects the function of terminal TB-13A. Closing TB-13A to TB-11 (or opening in the case of settings 08 and 10) activates the selected function. The following functions can be selected:

- 01 NONE: Disables the TB-13A function.
- 02 0-10 VDC: Selects a 0-10 VDC signal (at TB-5) as the AUTO speed reference input.
- 03 4-20 mA: Selects a 4-20 mA signal (at TB-25) as the AUTO speed reference input.
- 04 PRESET SPEED #1: Selects PRESET SPEED #1 as the speed reference. The drive will operate at the frequency programmed into Parameter 31.
- 05 START FORWARD: Sets up the drive for a 3-wire start/stop circuit. Momentarily close TB-13A to TB-11 to start the drive, and momentarily open TB-1 to TB-11 to stop.
- 06 RUN REVERSE: Close TB-13A to TB-11 to run in the reverse direction, and open to stop. Close TB-1 to TB-11 to run in the forward direction and open to stop.
- 07 START REVERSE: Momentarily close TB-13A to TB-11 to start the drive in the reverse direction, and momentarily open TB-1 to TB-11 to stop. Parameter 17 - ROTATION must be set to FORWARD AND REVERSE (02), and TB-13E must be used for START FORWARD.
- 08 EXTERNAL FAULT: Sets TB-13A as a normally closed external fault input. Open TB-13A to TB-11 to trip the drive.
- 09 INVERSE EXTERNAL FAULT: Sets TB-13A as a normally open external fault input. Close TB-13A to TB-11 to trip the drive.
- 10 AUXILIARY STOP: When TB-13A is opened with respect to TB-11, the drive will decelerate to a STOP (even if STOP METHOD is set to COAST) at the rate set into ACCEL/DECCEL #2 (Parameter 42).
- 11 ACCEL/DECCEL #2: Selects the acceleration and deceleration time programmed into ACCEL/DECCEL #2 (Parameter 42).

## **P11 TB-13B FUNCTION SELECT**

P11 selects the function of terminal TB-13B. Closing TB-13B to TB-11 (or opening in the case of settings 09 and 11) activates the selected function. The following functions can be selected:

- 01 NONE: Disables the TB-13B function.
- 02 0-10 VDC: Selects a 0-10 VDC signal (at TB-5) as the AUTO speed reference input.
- 03 4-20 mA: Selects a 4-20 mA signal (at TB-25) as the AUTO speed reference input.
- 04 PRESET SPEED #2: Selects PRESET SPEED #2 as the speed reference. The drive will operate at the frequency programmed into Parameter 32.



The following input functions can be selected for P12:

- 01 NONE: Disables the TB-13E function.
- 02 0-10 VDC: Selects a 0-10 VDC signal (at TB-5) as the AUTO speed reference input.
- 03 4-20 mA: Selects a 4-20 mA signal (at TB-25) as the AUTO speed reference input.
- 04 PRESET SPEED #3: Selects PRESET SPEED #3 as the speed reference. The drive will operate at the frequency programmed into Parameter 33.
- 05 INCREASE FREQ: Closing TB-13E to TB-11 will increase the speed setpoint until the contact is opened. INCREASE FREQ will only work when the drive is running. TB-13B must be programmed for DECREASE FREQ.
- 06 START FORWARD: Sets up the drive for a 3-wire start/stop circuit. MomentarilyC 0.549 015d(

06 Text<FB

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**NOTE**

- If the displayed value will exceed 999, the value is shown in two parts. For example, if the displayed value is 1800, the display will indicate this by toggling between "1-" and "800".
- If SPEED SCALING is set such that the maximum displayable value (6553.6) is exceeded, the display will flash "9999" to indicate that the value is out of range. For example, if SPEED SCALING is set to 6000, the drive will display 6000 when it is running at 60 Hz. If the speed is increased past 65.5 Hz (at 65.5 Hz, the scaled value would be 6550), the display will flash "9999" because a scaled value above 6553.6 cannot be displayed.

**P42 ACCEL / DECEL #2**

Parameter P42 sets the second acceleration and deceleration rate of the drive, which can be activated using terminals TB-13A, 13B, or 13E (Parameter 10, 11, or 12).

**P44 PASSWORD**

P44 allows the PASSWORD to be changed to any number between 000 and 999. Setting PASSWORD to 000 disables the password function. The factory default password is 225.

**P45 SPEED AT MIN SIGNAL**

P45 sets the speed at which the drive will run when it receives the minimum speed reference signal (0 VDC or 4 mA). This is used in conjunction with SPEED AT MAX SIGNAL (Parameter 46) to define the speed range of the drive when following an analog speed reference signal.

**P46 SPEED AT MAX SIGNAL**

P46 sets the speed at which the drive will run when it receives the maximum speed reference signal (10 VDC or 20 mA). This is used in conjunction with SPEED AT MIN SIGNAL (Parameter 45) to define the speed range of the drive when following an analog speed reference signal.

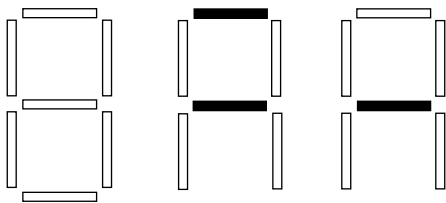
**NOTE**

If SPEED AT MIN SIGNAL

**P48      PROGRAM SELECTION**







## 16 TROUBLESHOOTING

To aid in troubleshooting, Parameters 50 through 60 can be accessed without entering the PASSWORD. Simply press the **Mode** button t7C 0.206 0 it d[(P) 2c) 2010a) 20m) 2z2a7 2849lv52(r)2





Refer to the following table for the possible speed reference source displays:


SPEED SOURCE DISPLAYS	
DISPLAY	DESCRIPTION
CP	CONTROL PAD: Speed is set using the <b>g</b> and <b>h</b> buttons on the front of the drive.
EI	EXTERNAL CURRENT: Speed is controlled by a 4-20 mA signal wired to TB-25 and TB-2
EU	EXTERNAL VOLTAGE: Speed is controlled by a 0-10 VDC signal wired to TB-5 and TB-2.
JG	JOG: The drive is in Jog mode, and the speed is set by Preset Speed #2 (Parameter 32).
OP	MOP (Motor Operated Pot): Contacts wired to TB-13B and TB-13E are used to increase and decrease the drive speed.
Pr1 - Pr7	PRESET SPEEDS #1-7: Speed is set by the indicated Preset Speed (Parameters 31-37).



#### NOTE

The speed source displays will flash when the speed reference source is changed while the drive is running to indicate that the new speed reference source is active

### 17.3 Status and Warning Messages

STATUS AND WARNING MESSAGES	
DISPLAY	DESCRIPTION
br	DC BRAKING: The DC braking circuit is activated.
cE	"cE" will be displayed if an EPM with a different parameter version is installed and then an attempt is made to change parameter settings without performing the TRANSLATE function. Refer to PROGRAM SELECTION (Parameter 48).
CL	CURRENT LIMIT: The output current has exceeded the CURRENT LIMIT setting (Parameter 25) and the drive is reducing the output frequency to reduce the output current. If the drive remains in CURRENT LIMIT for too long, it can trip into a CURRENT OVERLOAD fault (PF).
Er	ERROR: Invalid data has been entered or an invalid command was attempted.
GE	"GE" will be displayed if an attempt is made to change the OEM default settings when the drive is operating in the OEM mode (refer to Parameter 48).
GF	If "GF" is displayed when a RESET OEM is attempted, it indicates that the OEM defaults in the EPM are corrupted. If "GF" is displayed upon power-up, it indicates that the OEM defaults and the user settings in the EPM are corrupted. Refer to Section 13.2.
LC	FAULT LOCKOUT: The drive has failed three restart attempts and now requires a manual reset.
SE	SERIAL: The optional remote keypad is active as the user interface instead of the buttons on front of the drive. Refer to Parameter 14 (CONTROL).
SP	START PENDING: "SP" blinks during the interval between restart attempts.
	DECEL OVERRIDE (both upper decimal points blinking): The drive has stopped decelerating to avoid tripping into an HF fault due to regenerative energy from the motor.

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