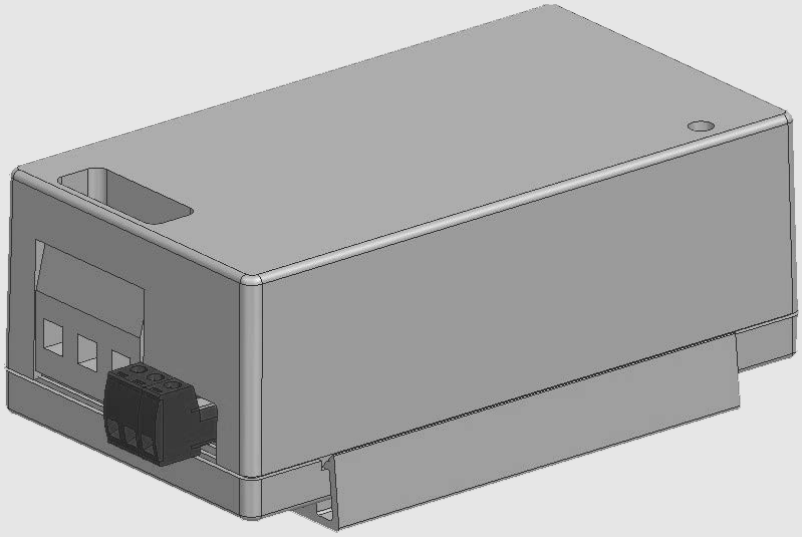

Smart Start Assist—Field Install Kit

For SM/LM Single-Phase Units

BOSCH

Installation Manual

8733831984 (2022/04)

CONTENTS

DOCUMENT CONVENTIONS

Key to Symbols

Warnings

Warnings in this document are identified by a warning triangle printed against a gray background. Keywords at the start of the warning indicate the type and seriousness of the ensuing risk if measures to prevent the risk are not taken.

The following keywords are defined and can be used in this document:

- **DANGER** indicates a situation that, if not avoided, will result in death or serious injury.
- **WARNING** indicates a situation that, if not avoided, could result in death or serious injury.
- **CAUTION** indicates a situation that, if not avoided, could result in minor to moderate injury.
- **NOTICE** is used to address practices not related to personal injury.

Important Information

This symbol indicates important information where there is no risk to property or people.

SAFETY WARNINGS

IMPORTANT: Read the entire instruction manual before starting installation or service.

DANGER: PERSONAL INJURY HAZARD
Installation and servicing of this equipment can be hazardous due to system pressure and electrical components. Only trained and qualified personnel should install, repair, or service the equipment.

DANGER: ELECTRIC SHOCK
Before performing service or maintenance operations on the system, turn off electrical power to unit and observe the proper process of locking-out power at the main/ disconnect box. Electrical shock could cause personal injury or death

WARNING: PERSONAL INJURY
When working on equipment, always observe precautions described in the unit's IOM, tags, and labels attached to the unit. Follow all safety codes.

CAUTION: PERSONAL INJURY HAZARD
Sheet metal parts may have sharp edges or burrs. Use care and wear appropriate protective clothing and gloves when handling parts.

SMART START FIELD INSTALL KIT

Kit Contents

Quantity	Description
1	Smart Start Assist
1	Smart Start Assist Metal Cover
3	Screw #8 x 0.375
1	Smart Start Wiring Kit (included in the smart start packaging)
1	Insulated Snap Bushing 1-1/16”
1	Mounting Base

General Description

The BOSCH Smart Start Assist Kit is designed for SM and LM single phase units. The kit contains two main parts; both are installed on top of the unit’s electrical box (e-box).

The Smart Start Assist attaches to the e-box top via a mounting plate, that, itself attaches to the Smart Start Assist as shown in Figure #1.

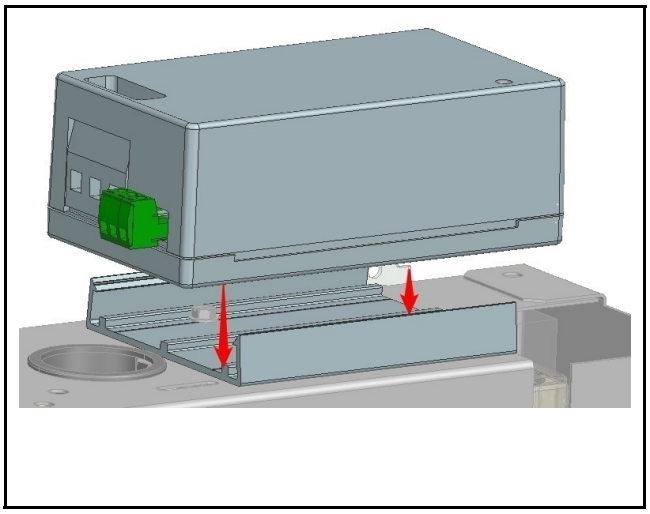

Fig. 1 Smart Start Assist–ISO View

Physical Characteristics

Characteristics	Single Phase	
	Model #SS1B08-16	Model #SS1B16-32
STORAGE TEMPERATURE, °F [°C]	-40° [-40°] to 185° [85°]	-40° [-40°] to 185° [85°]
CASE MATERIAL	ABS Flameproof UL-94 V0	ABS Flameproof UL-94 V0
IP RATING	IP20	IP20
LINE CONDUCTORS/AWG	14–6	14–6
LINE CONDUCTOR STRIP LENGTH, IN. [MM]	0.47 [12]	0.47 [12]
MINIMUM LINE CONDUCTOR LENGTH, IN. (MM)	15.7 [400]	15.7 [400]
LINE TERMINAL TIGHTENING TORQUE, IN-LBS (N-M)	11.5 [1.3]	11.5 [1.3]
START WINDING & COMPRESSOR COMMON, AWG	16–12	16–12

Operating Characteristics

Characteristics	Single Phase	
	Model #SS1B08-16	Model #SS1B16-32
RATED VOLTAGE, VAC	208–230	208–230
RATED PHASES	1	1
RATED FREQUENCY, HZ	50/60	50/60
MAXIMUM LOAD CURRENT, AMPS	16	32
MAXIMUM STARTING CURRENT, AMPS	35	65
CONTROL INPUT, VAC	Auto-Start at Power Up	Auto-Start at Power Up
NUMBER OF STARTS/HOUR (EVENLY DISTRIBUTED)	15	15
SHORT-CIRCUIT CURRENT RATING (SCCR), KA	5	5
SHUTDOWN ON LOW VOLTAGE, VAC	175	175
MINIMUM STARTUP VOLTAGE, VAC	180	180
MAXIMUM HIGH VOLTAGE, VAC	253	253
OPERATING AMBIENT, °F [°C]	-4° [-20°] to 140° [60°]	-4° [-20°] to 140° [60°]
LIFE EXPECTANCY (AT MAXIMUM-RATED LOAD)	Min. 100,000 Operations	Min. 100,000 Operations

INSTALLATION OF SMART START ASSIST

The Smart Start Assist Kit includes all components required for installation. The Smart Start Assist (SSA) module attaches to the unit by clipping onto its plastic holder (base).

The Smart Start Assist module can be mounted with its terminal block facing left or right, depending on the unit configurations (left or right discharge air).

Required Tools

- Small Flat Head Screwdriver
- Phillips Screwdriver
- Torque Screwdriver
- Drill with 1/8” Bit

DANGER: ELECTRIC SHOCK
Before performing service or maintenance operations on the system, turn off electrical power to unit and observe the proper process of locking-out power at the main/ disconnect box. Electrical shock could cause personal injury or death

Disconnecting Power and Removing Panels

1. Remove power to the unit. Be sure to follow all applicable state and federal laws and regulations concerning lock out and tag out for the power source. Use a multi-meter to verify there is no power at the unit.

Unit may contain two (2) power sources. Ensure both are de-energized and locked out/tagged out.

2. Unscrew the visible screws on the main unit access panels and remove the panels in order to access main unit electrical control box.

Hardware Installation

Follow the steps below to mount the Smart Start Assist (SSA) module to the top of the electrical control box.

Both Horizontal (HZ) and Vertical (VT) configurations use the same mounting procedure.

1. Remove the mounting base from the Smart Start Assist module. To do this, use a small flat screwdriver and press outwards on the clip-on tabs, located on either side of the module. Refer to Fig. 2.

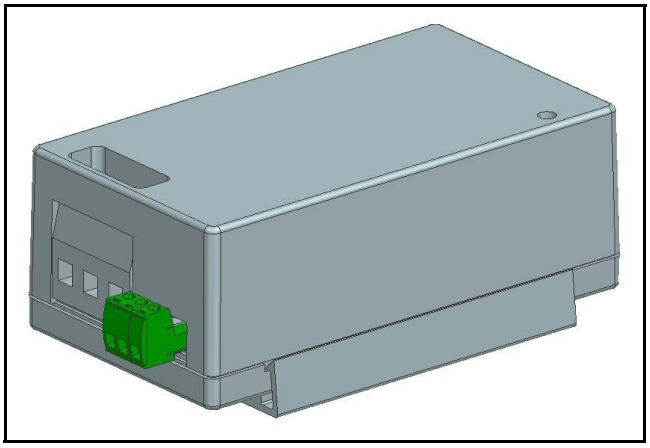

Fig. 2 Smart Start Assist with Base

2. Attach the mounting base to the main unit electrical box as follows.

For SM model:

a. Align the bracket to the edge of the electrical box.
b. Center the base across top of the electrical box.
c. Mark hole pattern on mounting base to be drilled. Refer to Fig. 3.
d. Drill 1/8” holes in the mounting base. Refer to Fig. 4.
e. Mount the base using the provided screws (two (2) #8 screws). Refer to Fig. 5.

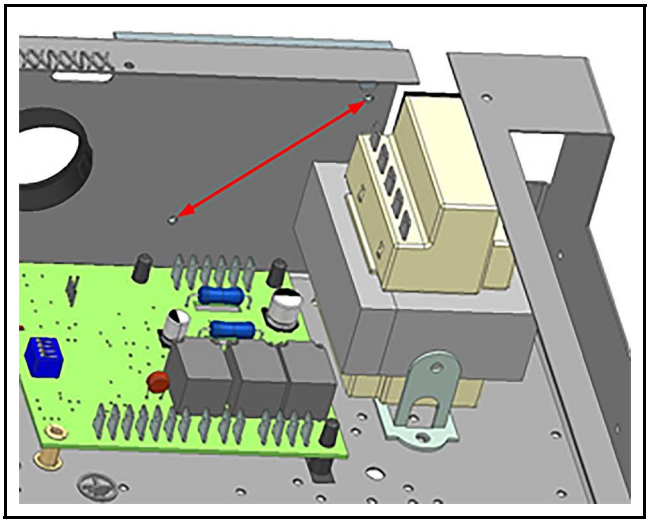

Fig. 3 Holes Locations to be Marked (SM Control Box Bottom View)

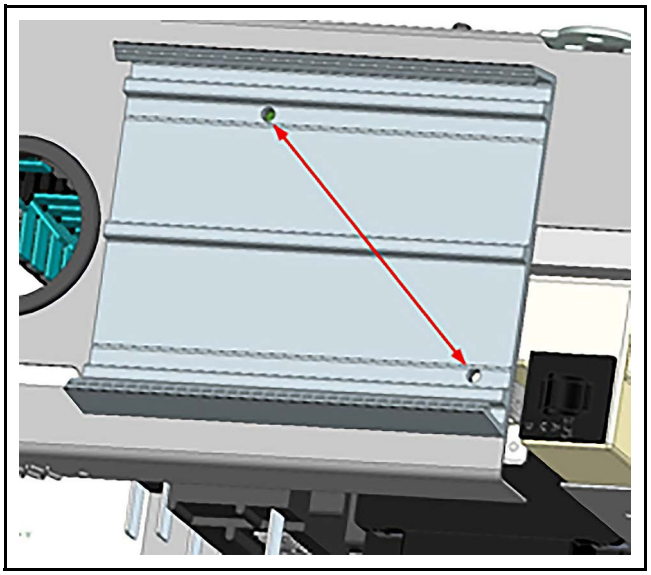

Fig. 4 Location of Drilled Holes on the Mounting Base (SM Control Box Top View)

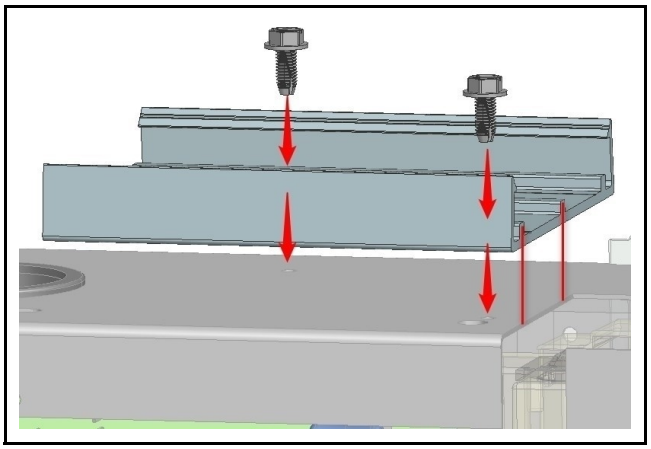

Fig. 5 Installing Mounting Base to the Control Box (SM)

For LM model:

a. Position the front of mounting base 1" from the most forward mounting hole on top of the electrical box.
b. Center the base across top of the electrical box.
c. Mark hole pattern on mounting base. Refer to Fig. 6.
d. Drill 1/8” holes in the mounting base. Refer to Fig. 7.
e. Mount the base using the provided screws (two (2) #8 screws). Refer to Fig. 8.

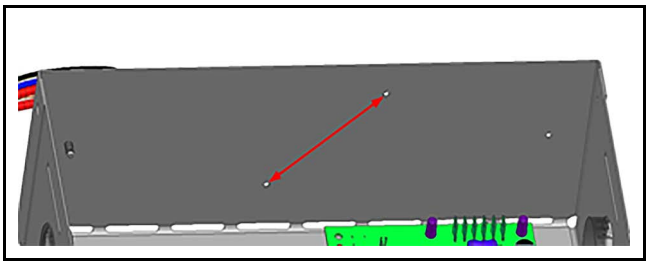

Fig. 6 Holes Locations to be Marked ((LM Control Box Bottom View)

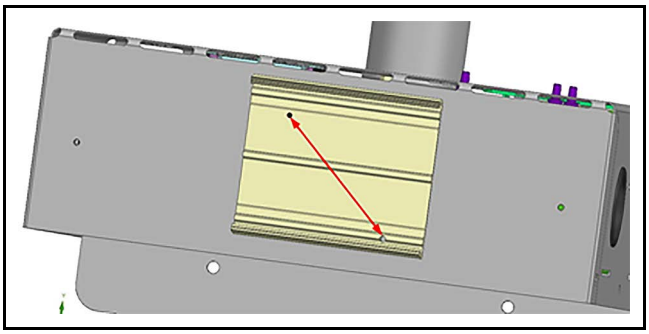

Fig. 7 Location of Drilled Holes on the Mounting Base (LM Control Box Top View)

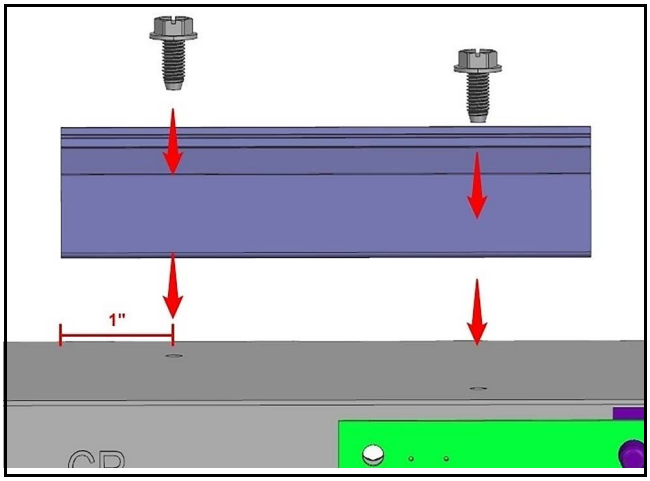

Fig. 8 Installing the Mounting Base to the Control Box (LM)

3. Insert the Smart Start Assist module to bracket so that slot in the module engages with edge clip of mounting bracket. Refer to Fig. 9.

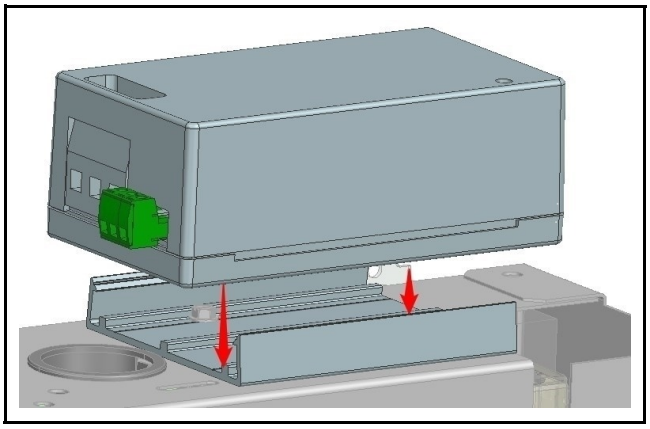

Fig. 9 Installing the Smart Start Module to the Mounting Base

Wiring Instructions

The Smart Start Assist module comes with a termination block located at the front of the device.

The Smart Start Assist kit comes with its own harness with wires labeled according to the terminal block on the Smart Start Assist module for easy identification.

Torque all terminals according to torque specifications of the Smart Start Assist module (refer to Physical Characteristics table on page #4) and contactor (refer to component label for torque requirements).

Electrical Box (e-box) shown in Fig. 10 and Fig. 15 are for reference only. The actual components in the unit's electrical box vary depending on the installed options.

Wiring Instructions for SM Models

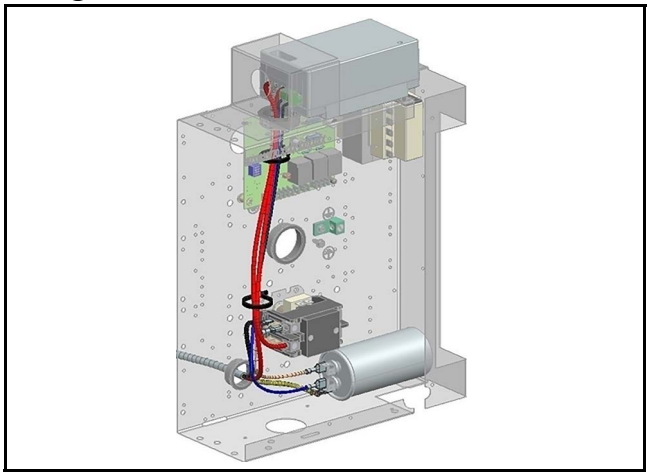

Fig. 10 Overview of Wiring Layout with SSA Installed (SM model)

1. Perform the following at the main unit's control box (refer to Fig. 11):
   a. Disconnect the R-signal wire (red) of compressor harness from T2 terminals side on the compressor contactor.
   b. Pull the compressor wires out of the electrical box to be rewired at a later step.
   c. Disconnect the red wire that connects the run capacitor to the compressor contactor and remove it from the unit.

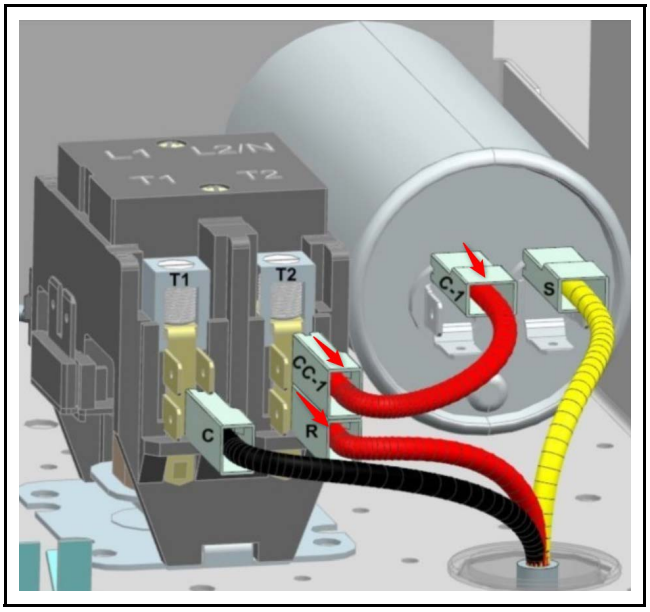

Fig. 11 Wire Removal at the Contactor

2. Locate Smart Start harness provided with the kit, and route harness wires through hole in top of the electrical box. Refer to Fig. 12.

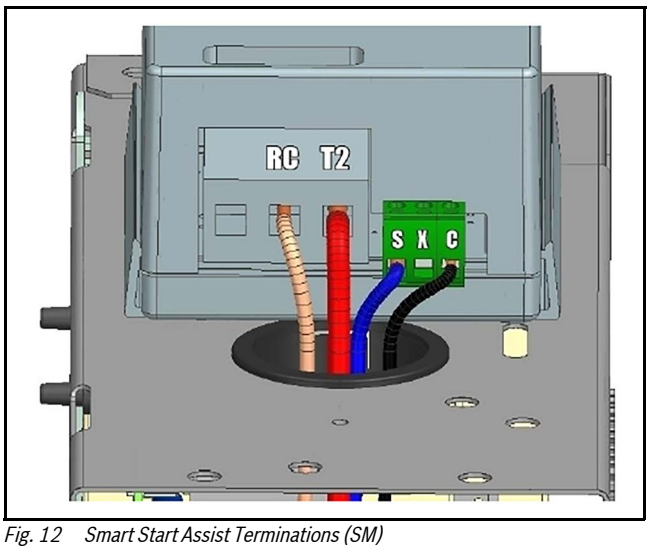

Fig. 12 Smart Start Assist Terminations (SM)

3. Perform the following at the Smart Start Assist module terminals, using Smart Start harness (See Fig. 12):
   a. Insert the TAN RUN CAP wire into the RC terminal
   b. Insert the RED T2 wire into the T2 terminal
   c. Insert the BLUE START CAP wire into the S terminal
   d. Insert the BLACK COMMON wire into the C terminal
4. Perform the following at the compressor contactor, using the Smart Start harness (See Fig. 13):
   a. Connect the BLACK COMMON signal wire to the T1 blade connector of the contactor.
   b. Insert the RED T2 signal wire into the T2 screw-down terminal of the contactor and secure.

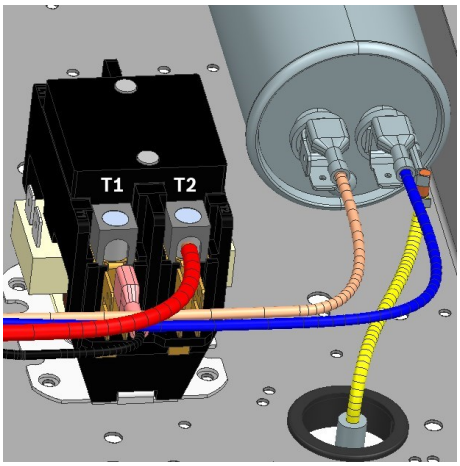

Fig. 13 Wiring at the Contactor and Capacitor

5. Route the R-signal wire of compressor harness through the large hole in top of control box and insert into the Smart Start Assist R connector. Refer to Fig. 14.

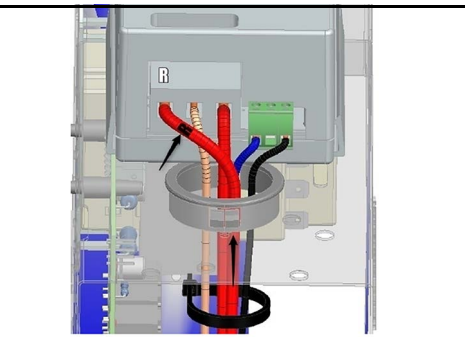

Fig. 14 R-Signal Wiring (SM)

Wiring Instructions for LM Models

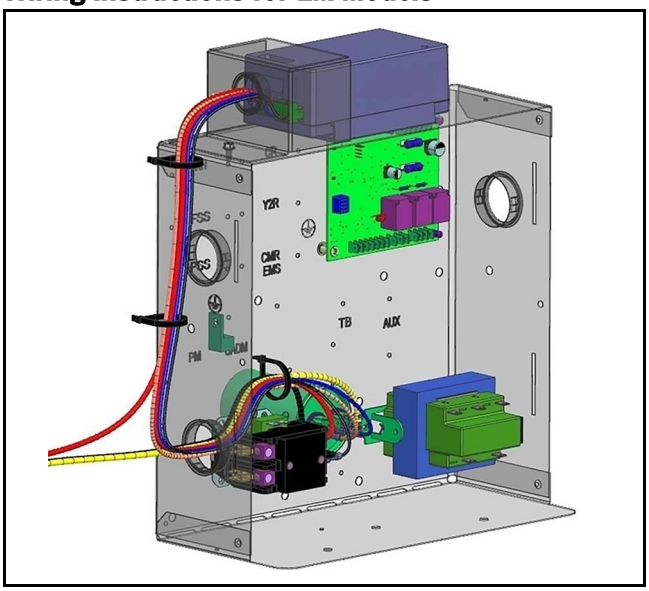

Fig. 15 Overview of Wiring Layout with SSA Installed (LM model)

1. Perform the following at the main unit's control box (refer to Fig. 16):
   a. Disconnect the R-signal wire (red) of compressor harness from T2 terminals side on the compressor contactor.
   b. Pull the compressor wires out of the electrical box to be rewired at a later step.
   c. Disconnect the red wire that connects the run capacitor to the compressor contactor and remove it from the unit.
2. Locate Smart Start Assist metal cover and make sure all wires that are to be terminated on the Smart Start Assist terminal block pass through the 7/8" bushing. Refer to Fig. 15.

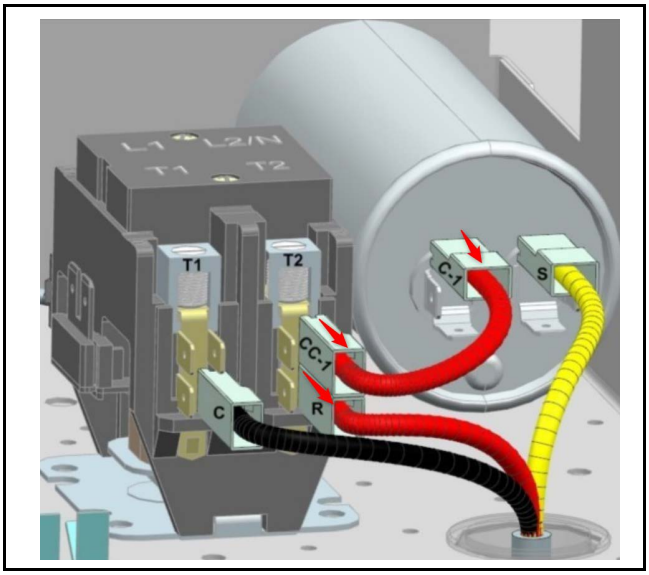

Fig. 16 Wire Removal at the Contactor

3. Perform the following at the Smart Start Assist module terminals, using Smart Start harness (See Fig. 17):
   a. Insert the TAN RUN CAP wire into the RC terminal
   b. Insert the RED T2 wire into the T2 terminal
   c. Insert the BLUE START CAP wire into the S terminal
   d. Insert the BLACK COMMON wire into the C terminal
5. Insert the R-signal wire of compressor harness into the Smart Start Assist R connector. Refer to Fig. 17.

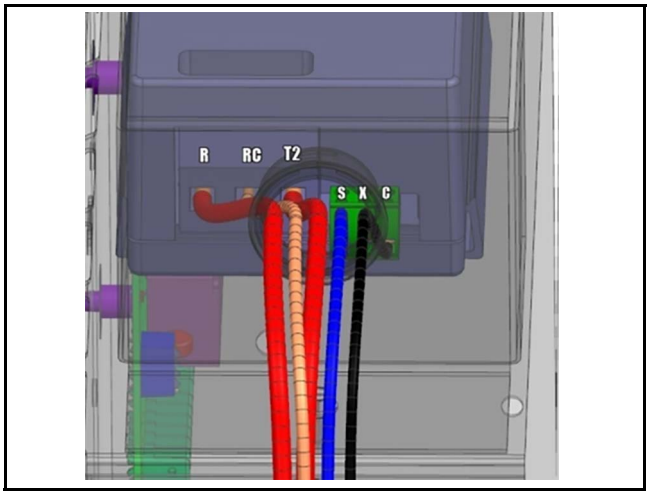

Fig. 17 R-Signal Wiring (LM)

6. Route the wiring out from the hole in sheet metal cover and down the side of the electrical box and then in through the bottom hole towards the compressor contactor and capacitor. Refer to Fig. 18.

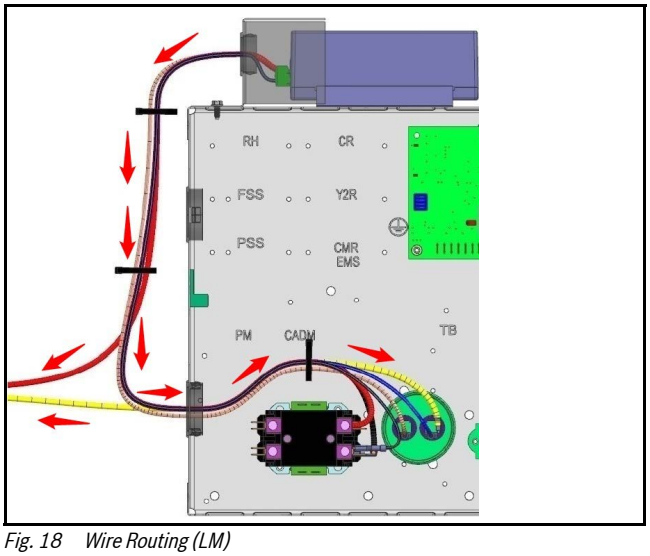

Fig. 18 Wire Routing (LM)

7. Perform the following at the compressor contactor, using the Smart Start harness (See Fig. 19):
   a. Connect the TAN RUN CAP signal wire to the blade connector of the capacitor that is closest to the contactor.
   b. Connect the BLUE START CAP signal wire to the blade connector of the capacitor that is near the edge of the control box.

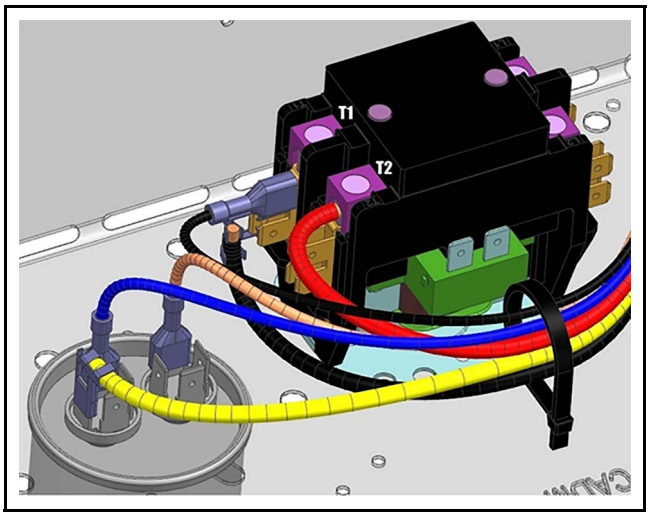

Fig. 19 Wiring at the Contactor and Capacitor (LM)

Performing Functionality Check and Installing Cover

1. Verify that the installation and termination of all the wires match the electrical schematic shown in Fig. 21.

> This diagram is shown as optional in all LM and SM products wiring diagrams. For more detail please reference the LM/SM manual.

2. Secure the sheet-metal cover plate included in the kit to cover the Smart Start Assist terminal block. Refer to Fig. 20.

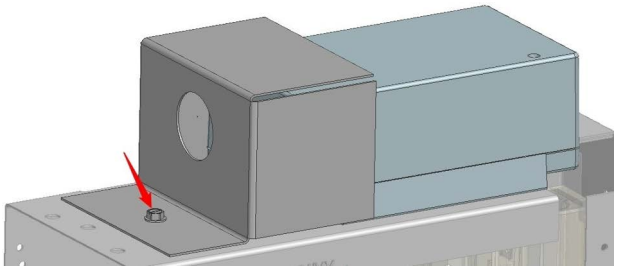

Fig. 20 Sheet Metal Cover Plate

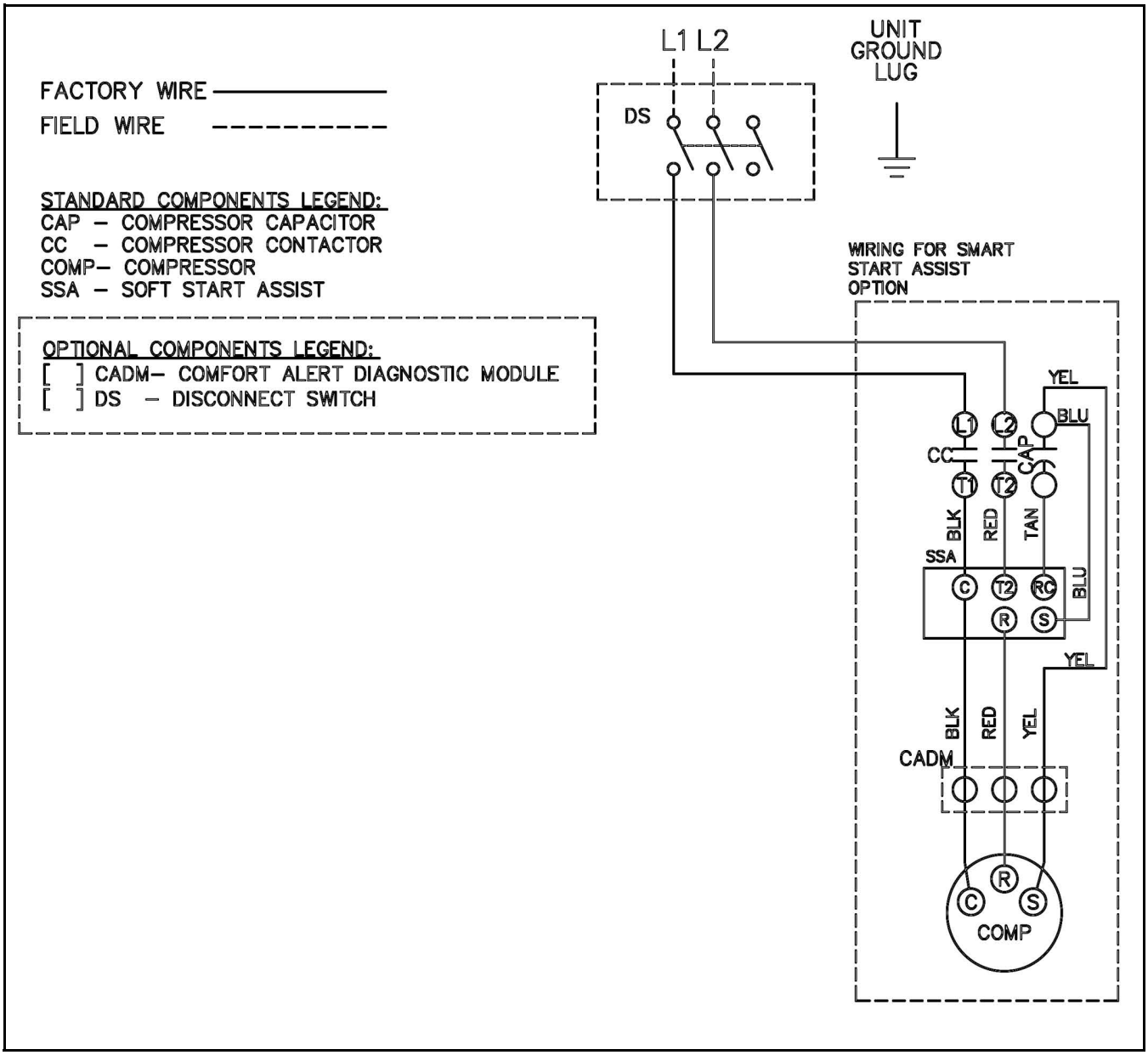

Fig. 21 Smart Start Assist Wiring Schematic

MODES OF OPERATIONS

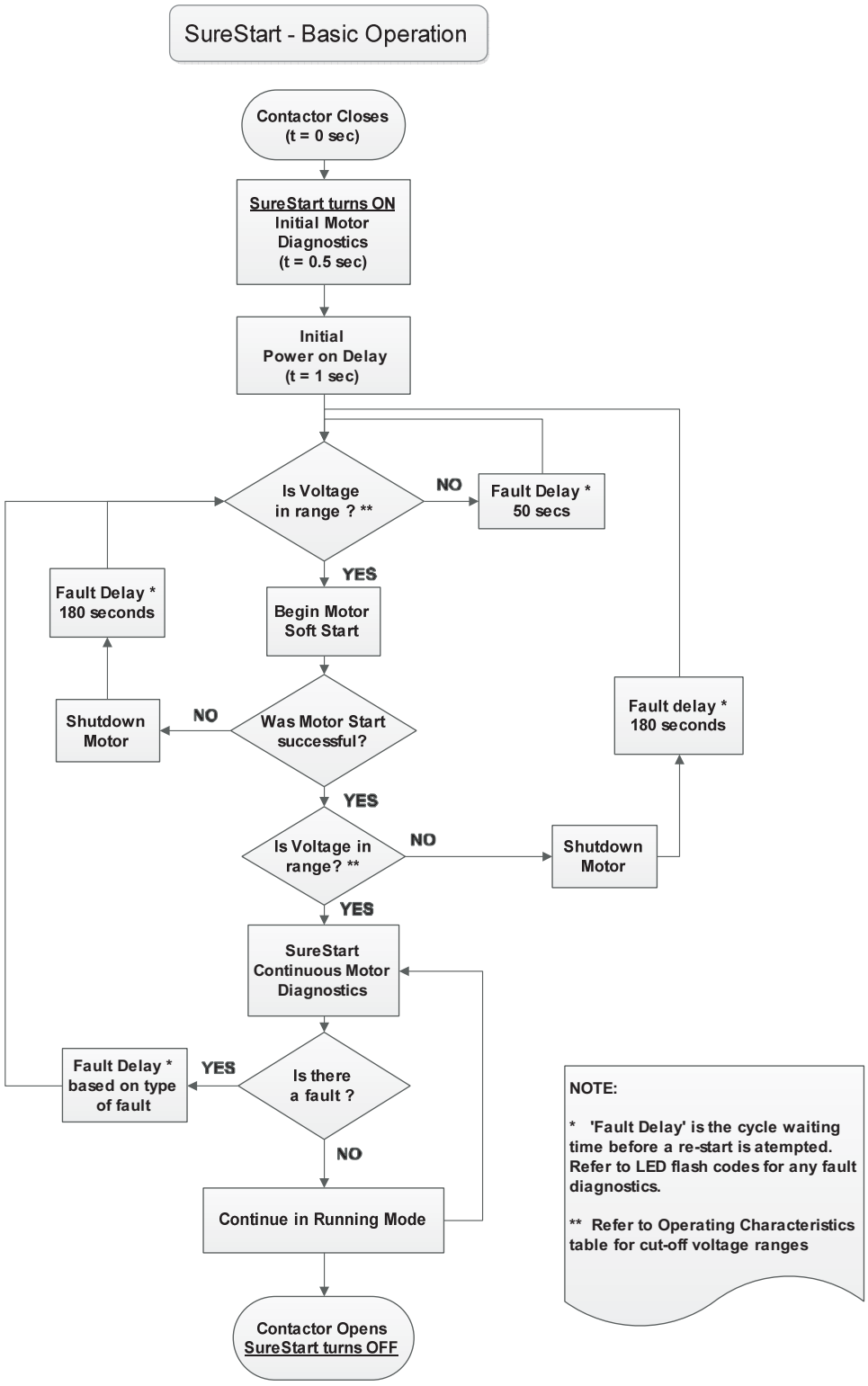

Fig. 22 Smart Start Basic Operation

SOFTWARE CHARACTERISTICS

Characteristics	Single Phase	
	Model #SS1B08-16	Model #SS1B16-32
SOFTWARE FAULT DELAY, SECONDS	300	300
INITIAL POWER-ON DELAY, SECONDS, 60 HZ [50HZ]	1 [2]	1 [2]
POWER-LOSS RESET, MILLISECONDS	100	100
CONTACTOR-CHATTER PROTECTION	Yes	Yes
MOTOR-REVERSAL PROTECTION	Yes	Yes
SOFTWARE OPTIMIZATION	Auto Tune	Auto Tune

Table 1 Software Characteristics

LED FLASH CODES

A Red LED indicator will flash under the following conditions:

- Low Voltage
- Lockout on Three (3) Failed Starts
- Lockout on Over Current
- Cycle Delay/Fault Mode

LED fault indicator is turned off in normal running mode.

Low Voltage (Flash Code = Rapid Flash, 10 per second)

- Displays when “Low-Supply Voltage” is detected before and after a soft start.
- If “Low-Supply Voltage” is detected before a start, a restart is attempted after 50 seconds.
- If “Low-Supply Voltage” is detected after a start, a restart is attempted after 3 seconds.

Lockout on Three (3) Failed Starts (Flash Code = Triple Flash every 3 seconds, 3/3 seconds)

- Displays after a failure to start on Three (3) consecutive start attempts.
- Restart is attempted after 50 minutes
- Standard lockout period is revised to 3 minutes after a successful start.

In circumstances where the compressor may have seized or is unable to start due to failure of other components in the HVAC system, the software checks for three (3) consecutive failed starts.

On the third sequential failed start, the program goes into Lockout for 50 minutes.

On failing to get a good start even after 50 minutes, it will attempt a restart again after duration of 50 minutes.

Once a good start is eventually achieved, it will reset the hard-start counter and will again require three (3) failed starts to force it back into Lockout mode. Lockouts can be cleared anytime through a power reset of the Sure Start Assist device.

Lockout on Overcurrent (Flash Code = Slow Flash, 1 Flash every 3 seconds)

- Displays when “Overcurrent” is detected in running mode of the compressor motor.
- Overcurrent limit is 25A for the 08–16A version and 50A for the 16–32A-rated version.
- It is also displays if internal Klixon of the compressor trips on overheat.
- Restart is attempted after 10 minutes.

To limit the current in the compressors from extending abnormally beyond it stated capacities, Sure Start Assist is also equipped with overcurrent-limit protection. For models rated from 16–32A, it is designed to trip in an overload conditions exceeding 50A. In smaller models, it is designed to cutoff power to the compressor when the current draw exceeds 25A. On an overcurrent lockout, Sure Start Assist attempts a restart automatically after 10 minutes.

Both failed start lockout and overcurrent-limit protection have been designed to prevent the compressor from drawing abnormal currents in conditions not feasible for the compressor operation.

Cycle Delay/Fault Mode (Flash Code = Slow Steady Flash, 1 per second)

- Displays for cycle delay between two consecutive soft starts or other faults mentioned below.
- Restart is attempted after a default period of 3 minutes
- Other possible reasons for this fault mode indicator can be due to:
  - Incorrect wiring during installation
  - A failed soft start attempt
  - Intermittent power loss (duration longer than 100ms)
  - Frequency out of range, or
  - A failed run capacitor

NOTES

Bosch Thermotechnology Corp.
65 Grove Street, Watertown, MA 02472
Phone: +1 (800) 283-3787 | Fax: +1 (603) 965-7568
www.bosch-climate.us.com
Revised 04/2022

8733831984