Remote Operator

**Interface option
for CSXi soft starters

User Guide**

BENSHAW

Applied Motor Controls

710-21967-00A

Product Compatibility

The Remote Operator is suitable for use with CSXi soft starters.

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Contents

1   Disclaimer

The examples and diagrams in this manual are included solely for illustrative purposes. The information contained in this manual is subject to change at any time and without prior notice. In no event will responsibility or liability be accepted for direct, indirect or consequential damages resulting from the use or application of this equipment.

2   Important User Information

Observe all necessary safety precautions when controlling the soft starter remotely. Alert personnel that machinery may start without warning.

It is the installer's responsibility to follow all instructions in this manual and to follow correct electrical practice.

Use all internationally recognised standard practice for RS-485 communications when installing and using this equipment.

3   General Description

The remote operator connects to the soft starter via a Remote Operator Module or Modbus RTU Module.

The Remote Operator provides the following range of functions:

- Operational control (Start, Stop, Reset, Quick Stop)
- Starter status monitoring (Ready, Starting, Running, Stopping, Tripped)
- Performance monitoring (motor current, motor temperature)
- Trip code display
- 4-20 mA analog output (motor current)

4   Installation

This section describes how to install the Remote Operator for basic control and monitoring of a soft starter. The Remote Operator is pre-configured to control a soft starter once control supply power is applied to both devices. For basic operation, no parameter adjustments are required on the Remote Operator or the soft starter.

In order to use the Remote Operator's 4-20 mA analog output to monitor motor current, follow the instructions in the section *4-20 mA Analog Output* on page 6.

4.1   Dimensions

Dimensions are shown in mm (inch).
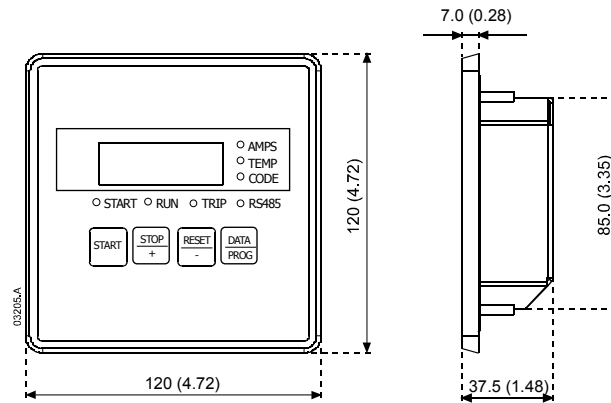
4.2   Mounting

The Remote Operator is rated IP54 or NEMA 12 [1] when mounted correctly in accordance with these instructions. It is intended for use on the flat surface of a panel, with all external wiring connected from behind the panel.

The Remote Operator is supplied with a mounting bracket and four fasteners. The built-in gasket seal guarantees protection from outside the panel.

Select the panel location of the Remote Operator. The required panel cutout is 92 mm x 92 mm. Place the Remote Operator through the cutout and locate the mounting bracket at the rear of the panel onto the four studs. Use the four fasteners to tighten the mounting bracket up to the rear of the panel.

[1] For use on a flat surface of a NEMA 1 or NEMA 12 enclosure.
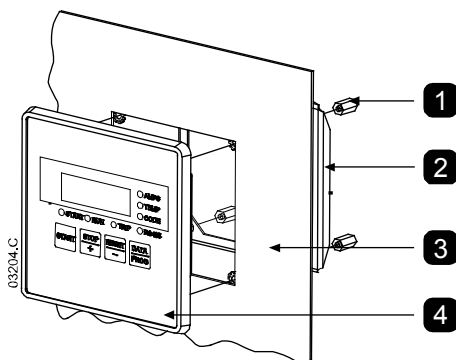
1	Fasteners (x4)
2	Mounting bracket
3	Universal panel cutout (92 mm x 92 mm)
4	Remote Operator

4.3   Electrical Connections

The Remote Operator requires a minimum of three electrical connections - the external power supply, the chassis earth and the RS485 Starter port. All external wiring, except the chassis earth (M4 stud provided), is connected to spring operated clamp connector terminals with a maximum wire size of 2.5 mm^2. No special tools are required.

Grounding and Shielding

Twisted pair data cable with earth shield is recommended. The cable shield should be connected to the GND device terminal at both ends and one point of the site protective earth.

Termination Resistors

In long cable runs prone to excessive noise interference, termination resistors should be installed between the data lines at both ends of the RS-485 cable. This resistance should match the cable impedance (typically 120 Ω). Do not use wire wound resistors.

RS-485 Data Cable Connection

Daisy chain connection is recommended. This is achieved by parallel connections of the data cable at the actual device terminals.

Remote Operator RS-485 Network Connection Specifications

Input impedance:	12 kΩ
Common mode voltage range:	- 7 V to + 12 V
Input sensitivity:	± 200 mV
Minimum differential output voltage:	1.5 V (with max loading of 54 Ω)

4.4   Soft starter connections

The Remote Operator connects to the soft starter via a Remote Operator Module or Modbus Module.

1. Remove control power and mains supply from the soft starter.
2. Fully pull out the top and bottom retaining clips on the module.
3. Line up the module with the comms port slot.
4. Push in the top and bottom retaining clips to secure the module to the starter.
5. Apply control power to the soft starter.
6. Connect the Remote Operator to the module.
7. Apply control voltage to the Remote Operator.
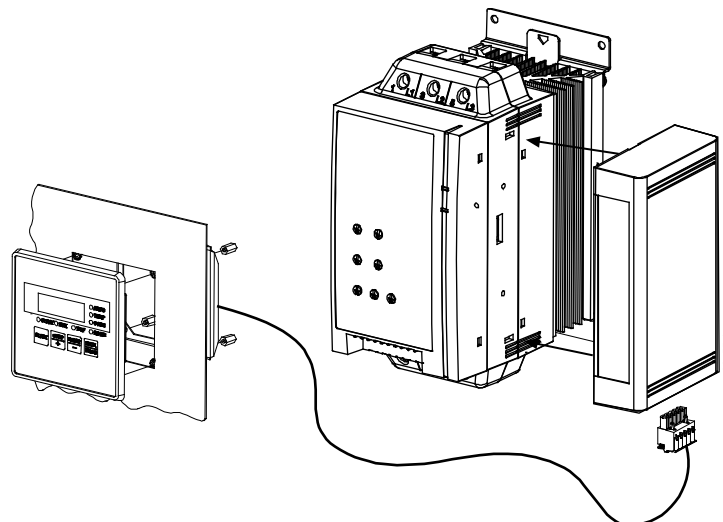
CAUTION
Remove mains and control voltage from the soft starter before attaching or removing accessories. Failure to do so may damage the equipment.
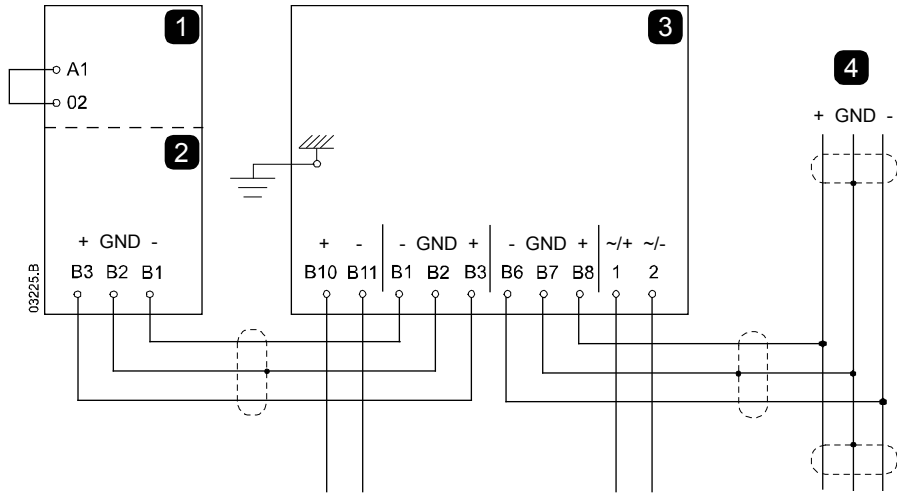
1	Soft starter
2	Serial port (RS485)

3	Remote operator
	B10, B11: 4~20 mA analog output
	B1, B2, B3: RS-485 starter connection
	B6, B7, B8: RS-485 network connection
	1, 2: Supply voltage (18~30 VAC/VDC)
4	RS-485 Serial communication network connection (Modbus RTU or AP ASCII)

For successful operation, links must be fitted across terminals on the starter.

Configuration (Modbus Module only)

The DIP switches on the Modbus Module must be set as follows:
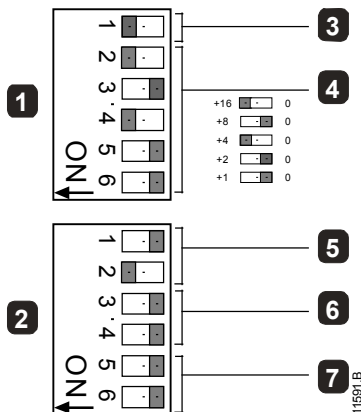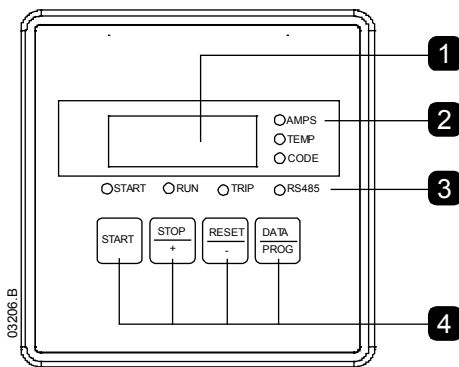
1	DIP Switch A
2	DIP Switch B
3	Protocol = AP ASCII
4	Address = 20
5	Baud Rate = 9600
6	Parity = No parity
7	Timeout = No timeout

The Remote Operator internal parameters must be set as follows:

Parameter 1 (RS485 network baud rate) = set to match Modbus master
Parameter 2 (RS485 network address) = unique number between 1 ~ 99
Parameter 3 (RS485 network timeout) = set as required
Parameter 4 (RS485 network protocol) = AP ASCII

5   Operation

The Remote Operator performs all soft starter functions except programming of the soft starter. The Remote Operator can only be used to program its own parameters.

1	**1**	Display: Indicates the value of the selected data.
2	**2**	Display mode indicator: Indicates the data type shown on the display.
3	**3**	Status LEDs: Indicates the status of the starter and the communication link. Start (green): soft starter is starting, running or stopping Run (green): soft starter is providing full voltage to the motor Trip (red): soft starter has tripped RS485 ON: the serial link between the Remote Operator and the starter is healthy RS485 FLASHING: communication between the Remote Operator and the starter has been lost
4	**4**	Control buttons Start: Starts the motor Stop: Stops the motor [1] Reset: Resets the starter [1] Data/Prog: Selects the data type to be shown on the display (motor current or motor temperature), or accesses Programming Mode.

[1] Simultaneously pressing the **STOP** and **RESET** buttons initiates a quick stop, which immediately removes voltage from the motor, ignoring any soft stop time set on the starter.

5.1   Trip Codes

If the soft starter trips, the CODE and TRIP LEDs illuminate and the relevant trip code is reported on the Remote Operator display.

Code	Description
1-1	Excess start time
1-2	Motor overload
1-3	Motor thermistor
1-4	Current imbalance
1-5	Frequency
1-6	Phase sequence
1-8	Power circuit
1-b	Bypass overload
1-C	Communications failure between module and starter
1-H	Forced communications trip from the network master

6   4-20 mA Analog Output

6.1   Overview

The Remote Operator has a 4-20 mA analog output for monitoring motor current. The 4-20 mA output is available on terminals B10, B11.

The analog output signal spans from 4 mA when the motor current is zero (when the soft starter is not running) to 20 mA when the motor current is 125% of the Motor FLC setting in the Remote Operator (parameter 6).

6.2   Calibration

The Remote Operator Motor FLC parameter (parameter 6) must be adjusted to match the Motor FLC setting in the soft starter.

The lower end of the analog output signal can be calibrated using the Remote Operator Analog Output 4 mA Offset parameter (parameter 7). This is set to give a 4 mA output signal when the motor current is zero.

The 4-20 mA analog output has an accuracy of ±10%. It is not designed for process signal control and should only be used for motor current monitoring and metering.

7   Programming

When the 4-20 mA output is being used, the Remote Operator's Motor FLC and Analog Output 4 mA Offset parameters (Parameters 6 and 7) must be set appropriately (see *Calibration* on page 6). Programming can only be carried out while the soft starter is not running.

7.1   Programming Procedure

1. To enter Programming Mode, hold down the Data/Prog pushbutton for four seconds. The default value of the first parameter will be displayed.
2. Use the Data/Prog pushbutton to advance to the next parameter.
3. Use the Stop and Reset pushbuttons to adjust parameter values.

Programming Mode closes when the Data/Prog pushbutton is pressed after parameter 9.

NOTE
There is a 20 second timeout when the Remote Operator is in Programming Mode. Programming Mode will automatically close if no input is registered for 20 seconds. Any changes already made will be saved.

7.2   Programmable Parameters

The Remote Operator offers the following programmable parameters:

Parameters 1 to 5 only apply when the Remote Operator is being used as a Modbus or AP ASCII network gateway.

Parameter Number	Description	Default Setting	Adjustable Range
1	RS485 network baud rate	4 (9600 baud)	2 = 2400 baud 3 = 4800 baud 4 = 9600 baud 5 = 19200 baud 6 = 38400 baud
2	RS485 network satellite address	20	1 to 99
3	RS485 network timeout	0 seconds (= off)	0 to 100 seconds
4	RS485 network protocol	1 (AP ASCII)	1 = AP ASCII protocol 2 = Modbus RTU protocol
5	Modbus protocol parity	0 (no parity)	0 = no parity 1 = odd parity 2 = even parity 3 = 10-bit transmission
6	Motor FLC (A)	10	1 to 2868
7	Analog output 4 mA offset (%)	100	80 to 120
8	Start, Stop, Quick stop function disable	0	0 = Remote Operator and Network start, stop, quick stop function enabled. 1 = Remote Operator start, stop, quick stop function enabled. Network start, stop, quick stop function disabled. [2] 2 = Remote Operator start, stop, quick stop function disabled. Network start, stop, quick stop function enabled. [1] 3 = Remote Operator start, stop, quick stop function disabled. Network start, stop, quick stop function disabled. [1, 2]
9	*Reserved*	0	0 = off (default)

[1] Remote Operator Reset pushbutton is always enabled.

[2] RS485 Network reset and forced communication trip functions are always enabled.

8   Troubleshooting

8.1   General Faults

Display Indication	Problem	Possible Solution
No display	No control voltage	Check that correct voltage is present at terminals 1, 2.
AMPS or TEMP LED flashing	Soft starter in restart delay mode	Wait for the restart delay (programmed in the soft starter) to elapse.
Four dashes on display and RS485 LED flashing	The Remote Operator has detected a loss of communication on the RS485 link to the soft starter	Verify and solve the cause for loss of communication. If communication is restored before the soft starter trips, the display will return to active status and the RS485 LED will illuminate. If communication is restored after the soft starter has tripped, the display will indicate the trip code. Use the Reset button to reset the soft starter fault.
–	Incorrect or no 4-20 mA analog output signal	- Check the correct voltage is present at terminals 1, 2. - Check that correct polarity is used at terminals B10, B11. - Check that the Motor FLC, Analog Output 4 mA Offset and Current ÷ 10 parameters are set correctly.
–	The motor cannot be started	- Check that control voltage is connected to the soft starter. - Check that terminals A1-02 on the soft starter are linked. - Parameter 8 on the Remote Operator must be set to 0 or 1.

9 Specifications

9.1 General Technical Data

- **Enclosure**

Front Panel Height .... 120 mm
Front Panel Width .... 120 mm
Inside Panel Depth (when mounted) .... 30 mm (max)
Panel Cutout .... 92 mm^2
Weight .... 450 g

- **Power Supply**

Voltage .... 18 - 30 VDC/VAC (50/60 Hz)
Consumption .... 100 mA (max - steady state)
Connection (Terminals 1, 2) .... 2 pole spring clamp connector terminals

- **RS485 Serial Network Port (Optional)**

RS485 Network Interface .... AP ASCII or Modbus RTU protocol (selectable)
Connection (Terminals B6, B7, B8) .... 3 pole spring clamp connector terminals

- **RS485 Serial Starter Port (Soft Starter Connection)**

RS485 Soft Starter Interface .... AP ASCII protocol as standard
Connection (Terminals B1, B2, B3) .... 3 pole spring clamp connector terminals

- **Analog Output**

Motor Current Monitoring Interface .... 4-20 mA (max burden 200 Ω)
Connection (Terminals B10, B11) .... 2 pole spring clamp connector terminals

- **Sundry**

Enclosure Rating .... IP54 or NEMA 12 when correctly panel mounted
Pollution Degree .... Pollution Degree 3
Operating Temperature .... - 5 $^{\circ}$C / + 60 $^{\circ}$C
Relative Humidity .... 5 to 95% (max non-condensing)

This product has been designed as Class A equipment. Use of this product in domestic environments may cause radio interference, in which case the user may be required to employ additional mitigation methods.

- **Approvals**

CE .... EN 60947-4-2

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