INSTRUCTIONS

PROFIBUS INTERFACE

RIGHT FROM THE START

AuCom
MOTOR CONTROL SPECIALISTS

Contents

Product Compatibility

This interface is suitable for use with AuCom CSX, EMX3 and MV soft starters.

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.

1. Warnings

WARNING
For your safety, isolate the soft starter completely from mains voltage before attaching or removing accessories.

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

2. Important User Information

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. Installation

⚠ **CAUTION**

Remove mains and control voltage from the soft starter before attaching or removing accessories. Failure to do so may damage the equipment.

3.1 Installation Procedure

1. Remove control power and mains supply from the soft starter.
2. Fully pull out the top and bottom retaining clips on the interface. [A]
3. Line up the interface with the comms port slot. [B]
4. Push in the top and bottom retaining clips to secure the interface to the starter. [C]
5. Set the interface address to match the address set in the Master configuration tool.
6. Apply control power to the soft starter.
7. Insert the network connector and power up the interface.
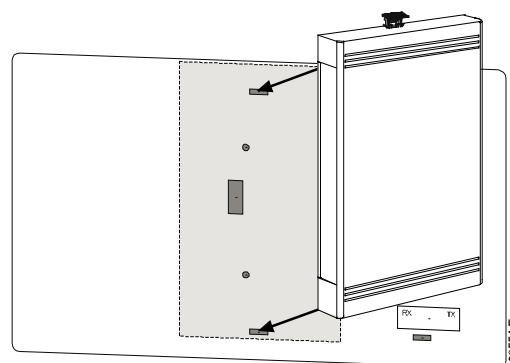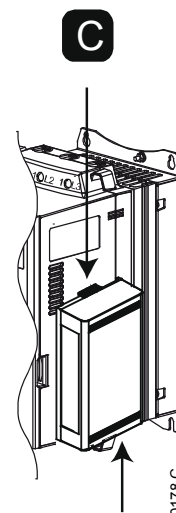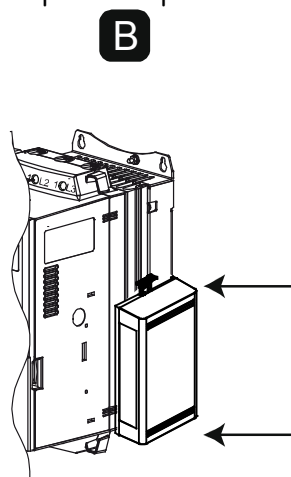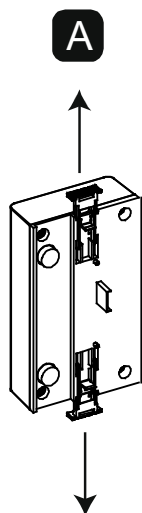
MV:
Plug the interface onto the back of the controller.

To remove the interface:
1. Take the interface off-line.
2. Remove control power and mains supply from the soft starter.
3. Disconnect all external wiring from the interface.
4. Fully pull out the top and bottom retaining clips on the interface. [A]
5. Pull the interface away from the soft starter.
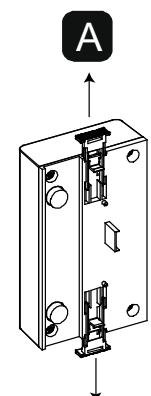
3.2 Connection

The interface connects to the Profibus network via a standard DB9 connector.

The Profibus Interface can be powered either through the network cable or externally (24 VDC).

CSX: For the Profibus Interface to accept fieldbus commands, a link must be fitted across terminals A1-02 on the soft starter.

EMX3 and MV: Input links are required across the stop and reset inputs if the soft starter is being operated in Remote mode. In Local mode, links are not required.

> **NOTE**
> EMX3 and MV: Parameter *Comms in Remote* selects whether the soft starter will accept Start and Stop commands from the Serial Network Master while in Remote Mode. Refer to the soft starter user manual for parameter details.

CSX	EMX3 or MV
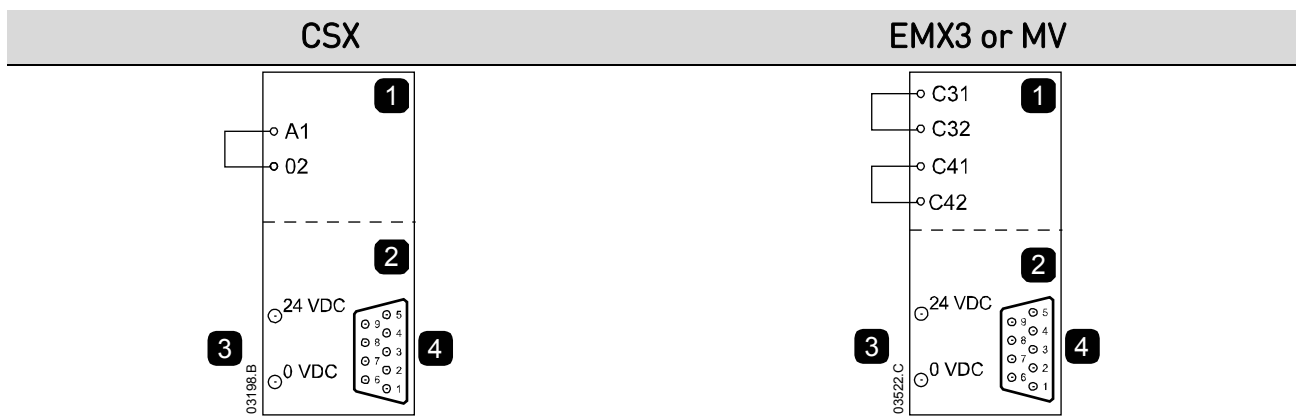
	CSX		EMX3 or MV
1	Soft starter A1, 02: Stop input	**1**	Soft starter (remote mode) C31, C32: Stop input C41, C42: Reset input
2	Profibus Interface	**2**	Profibus Interface
3	External 24 VDC supply required if not powered through bus	**3**	External 24 VDC supply required if not powered through bus
4	DB9 connector to Profibus network	**4**	DB9 connector to Profibus network

| DB9 connector	
Pin No.	**Assignment**
1	Shield
2	24 VDC negative (optional)
3	RxD/TxD-P
4	Not used
5	DGND
6	VP (end of bus slave only)
7	24 VDC positive (optional)
8	RxD/TxD/-N
9	DGND

4. Device Configuration

4.1 Adjustment

Before powering up the Profibus Interface, set the two rotary switches so that the interface address matches the address set in your Master configuration tool.
eg MSD = 2 and LSD = 1 corresponds to address 21.
(The diagram shows the factory default setting for the rotary switches).

The interface automatically detects the network data rate.
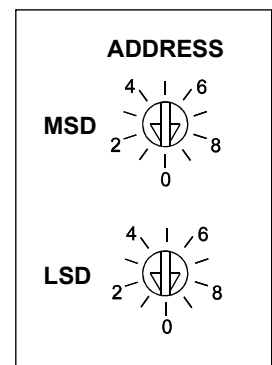
📄 **NOTE**
The Profibus Interface has a slave address range of 0 to 99.

4.2 Configuration

Import the latest .gsd file into your Master configuration tool. This file is available from your supplier.

If your Master uses on-screen icons, two graphic bitmap files are available from the website. SSPM_N.bmp indicates normal mode. SSPM_D.bmp indicates diagnostic mode.

4.3 Communications Timeout

If the Profibus network fails, the device will leave data exchange mode after the network watchdog timeout period has expired. This timeout period is set at the Master configuration tool.

A Communication Timeout parameter in the GSD file sets how soon after this event the soft starter will be forced into a trip state.

The user can adjust the Communication Timeout parameter in the GSD file to any setting between 0 and 100 seconds. The default setting is 10 seconds.

📄 **NOTE**
If the Communication Timeout parameter is set to 0, the current state of the soft starter will remain unchanged on a network failure. This gives the user the option of operating the soft starter via local control, but is NOT failsafe.

5. Feedback LEDs
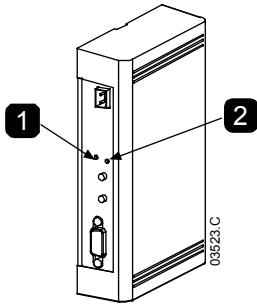
		Off	On
1	Power status (red)	Device not powered up	Device powered up and ready to go online
2	Bus status (green)	No connection, offline or data exchange failure	Device online and in data exchange state

NOTE
If communication fails between the device and the network, the Bus Status LED will go off. When communication is restored, the Bus Status LED will come back on.

NOTE
When a communications failure occurs, the soft starter may trip if the Communication Timeout parameter for the network is set greater than zero. When communication is restored, the soft starter must be reset.

6. Operation

6.1 Data Structures

The GSD file contains three operating modules, supporting data I/O structures as follows:

Data Structure	Basic Module	Extended Module	Parameter Upload/ Download Module
Soft Starter Control I/O Data Structure on page 7	✓	✓	✓
Soft Starter Monitoring I/O Data Structure on page 8	✗	✓	✓
Soft Starter Programming I/O Data Structure on page 11	✗	✗	✓

The Basic Module allows the user to start and stop the soft starter and read limited information on operating status.

The Extended Module defines additional bytes allowing the user to read soft starter operating data such as actual motor current and motor temperature.

The Parameter Upload/Download Module allows the user to read and write soft starter parameter values.

> **NOTE**
> The available features and parameter details may vary according to the model and software version of the starter. Refer to the soft starter user manual for details of parameters and supported features.

6.2 Soft Starter Control I/O Data Structure

Master > Slave control word is structured as follows:

Byte	Bits	Details
0	0 to 1	*Reserved*
	2 to 3	0 = Use soft starter remote input to select motor set 1 = Use primary motor set when starting 2 = Use secondary motor set when starting 4 = *Reserved*
	4	0 = stop action will be a soft stop (as selected on the soft starter) 1 = stop action will be a quick stop (ie coast to stop)
	5 to 7	*Reserved*
1	0	0 = Stop 1 = Start
	1 to 2	*Reserved*
	3	1 = Reset
	4 to 7	*Reserved*

📄 **NOTE**
Bit 4 of byte 0 must be set to 0 for the soft starter to perform a start.

Slave > Master status word is structured as follows:

Byte	Bits	Details
0	0 to 5	Motor current (% FLC)[1]
	6	Local/Remote 0 = Local control 1 = Remote control
	7	1 = Ramping (starting or stopping)
1	0	1 = Ready
	1	1 = Starting, running or stopping
	2	1 = Tripped
	3	1 = Warning
	4 to 7	*Reserved*

[1] Motor current (% FLC) represents current as a percentage of the set motor full load current. A maximum value of 63 represents 200% full load current. To convert this value to a readable percentage, divide by 0.315. For models EMX3-0053B and smaller, current reported via communications is 10 times greater than the actual value (displayed on the keypad).

6.3   Soft Starter Monitoring I/O Data Structure

📄 **NOTE**
For models EMX3-0053B and smaller, current reported via communications is 10 times greater than the actual value (displayed on the keypad).

Master > Slave output bytes are structured as follows.

Byte 2
Operating data request (Data request numbers 1 to 16)

Slave > Master input bytes, in response to an operating data request, are structured as follows:

Byte 2	
Echo data request number	
Byte 3	
Bits 7 to 1 *Reserved*	Bit 0 = 1: Invalid data request number
Byte 4	
Data value (high byte)	
Byte 5	
Data value (low byte)	

📄 **NOTE**
An invalid data request number will result in the invalid data request number bit being set = 1.

Data values are defined as follows:

📄 **NOTE**
Data request numbers 4 (only 'Motor 2 Temperature') to 16 are only valid for EMX3 and MV starters. CSX starters will return zero values. CSX open loop soft starters will read back average current as "2222" and motor 1 temperature as "111" decimal.

Data Request Number	Description	Bits	Details
0	*Reserved*		
1	Product information	0 to 7	Soft starter software version number
		8 to 15	Product type code: 4 = CSX 6 = EMX3 11 = MV
2	Starter state	0 to 3	1 = Ready 2 = Starting 3 = Running 4 = Stopping (including braking) 5 = Not ready (restart delay, restart temperature check, run simulation) 6 = Tripped 7 = Programming mode 8 = Jog forward 9 = Jog reverse
		4	0 = Negative phase sequence 1 = Positive phase sequence (only valid if bit 6 = 1)
		5	1 = Current exceeds FLC
		6	0 = Uninitialised 1 = Initialised
		7	1 = Communication error between device and soft starter
		8 to 15	Refer to *Trip Codes* on page 12.
3	Motor current	0 to 7	Average rms current across all three phases (low byte)
		8 to 15	Average rms current across all three phases (high byte)

Data Request Number	Description	Bits	Details
4	Motor temperature	0 to 7	Motor 1 thermal model (%)
		8 to 15	Motor 2 thermal model (%)
5	% Power factor	0 to 7	100% = power factor of 1
		8 to 15	*Reserved*
6	Power (kW)	0 to 11	Power
		12 to 15	Power scale 0 = Multiply power by 10 to get W 1 = Multiply power by 100 to get W 2 = Power (kW) 3 = Multiply power by 10 to get kW
7	Power (kVA)	0 to 11	Power
		12 to 15	Power scale 0 = Multiply power by 10 to get VA 1 = Multiply power by 100 to get VA 2 = Power (kVA) 3 = Multiply power by 10 to get kVA
8	Voltage	0 to 13	Average rms voltage across all three phases
		14 to 15	*Reserved*
9	Current	0 to 13	Phase 1 current (rms)
		14 to 15	*Reserved*
10	Current	0 to 13	Phase 2 current (rms)
		14 to 15	*Reserved*
11	Current	0 to 13	Phase 3 current (rms)
		14 to 15	*Reserved*
12	Voltage	0 to 13	Phase 1 voltage (medium voltage products only)
		14 to 15	*Reserved*
13	Voltage	0 to 13	Phase 2 voltage (medium voltage products only)
		14 to 15	*Reserved*
14	Voltage	0 to 13	Phase 3 voltage (medium voltage products only)
		14 to 15	*Reserved*
15	Parameter list version	0 to 7	Parameter list minor revision
		8 to 15	Parameter list major version
16	Digital input state	For all inputs, 0 = open, 1 = closed (shorted)	
		0	Start
		1	Stop
		2	Reset
		3	Input A

Data Request Number	Description	Bits	Details
		4	Input B
		5	Input C
		6	Input D
		7 to 15	*Reserved*

6.4 Soft Starter Programming I/O Data Structure

The Soft Starter Programming I/O Data Structure allows the user to upload (read) and download (write) soft starter parameter values over the network.

> ⚠ **CAUTION**
> Do not change the default values of the Factory parameters (parameter group 20). Changing these values may cause unpredictable behaviour in the soft starter.

Outputs

Master > Slave output bytes are structured as follows.

Byte	Bits	Details
3	0 to 7	Parameter number to read/write
4	0	*Reserved*
	1	1 = Read parameter
	2	1 = Write parameter
	3 to 7	*Reserved*
5	0 to 7	High byte parameter value to write to soft starter/ zero data values for read
6	0 to 7	Low byte parameter value to write to soft starter/ zero data values for read

Inputs

Slave > Master input bytes are structured as follows.

Byte	Bits	Details
6	0 to 7	Echo parameter number
7	0	1 = Invalid parameter number
	1	1 = Invalid parameter value
	2 to 7	*Reserved*
8	0 to 7	High byte parameter value read from soft starter
9	0 to 7	Low byte parameter value read from soft starter

6.5 Trip Codes

Trip Code	Description	CSX	CSXi	EMX3	MV
1	Excess start time		●	●	●
2	Motor overload		●	●	●
3	Motor thermistor		●	●	●
4	Current imbalance		●	●	●
5	Frequency	●	●	●	●
6	Phase sequence		●	●	●
7	Instantaneous overcurrent			●	●
8	Power loss	●	●	●	●
9	Undercurrent			●	●
10	Heatsink (starter) overtemperature			●	●
11	Motor connection			●	●
12	Input A trip			●	●
13	FLC too high			●	●
14	Unsupported option (function not available in inside delta)			●	
15	Starter communication (between device and soft starter)	●	●	●	●
16	Network communication (between device and network)	●	●	●	●
17	Internal fault x (where x is the fault code detailed in the table below)			●	●
20[1]	Ground fault			●	●
23	Parameter out of range			●	●
24	Input B trip			●	●
25	Bypass fail (bypass contactor)			●	●
26	L1 phase loss			●	●
27	L2 phase loss			●	●
28	L3 phase loss			●	●
29	L1-T1 shorted			●	●
30	L2-T2 shorted			●	●
31	L3-T3 shorted			●	●
32	Motor 2 overload			●	●
33[2]	Time-overcurrent (Bypass overload)		●	●	
34	SCR overtemperature				●
35	Battery/clock			●	●
36	Thermistor circuit			●	
37	RTD/PT100 A			●	
38[1]	RTD/PT100 B			●	

Trip Code	Description	CSX	CSX*i*	EMX3	MV
39[1]	RTD/PT100 C			●	
40[1]	RTD/PT100 D			●	
41[1]	RTD/PT100 E			●	
42[1]	RTD/PT100 F			●	
43[1]	RTD/PT100 G			●	
45	RTD circuit fail			●	
46	Analog input trip			●	●

[1] Available with EMX3 only if the appropriate option card is fitted.

[2] For EMX3, time-overcurrent protection is only available on internally bypassed models.

Internal Fault X

The table below details the internal fault code associated with trip code 17.

Internal fault	Message displayed on the keypad
70 ~ 72	Current Read Err Lx
73	ATTENTION! Remove Mains Volts
74 ~ 76	Motor Connection Tx
77 ~ 79	Firing Fail Px
80 ~ 82	VZC Fail Px
83	Low Control Volts
84 ~ 98	Internal fault X Contact your local supplier with the fault code (X).

7. Profibus Diagnostic Telegram and Flag

The Profibus Interface supports external diagnostics. The following telegram will be sent to the Master if the soft starter trips or if a parameter is changed at the soft starter.

Diagnostic Telegram Data Structure	
Byte 0	User diagnostic length (Always set = 3)
Byte 1	Trip Code
Byte 2	Changed parameter number

Profibus Trip Code

When the soft starter trips, a diagnostic flag is set at the Master and the trip code is reported in Byte 1. When the soft starter is reset, the diagnostic flag and trip code data are reset = 0, provided the trip condition does not still exist (refer to *Trip Codes* on page 12).

Changed Parameter Number

If a parameter is changed via the keypad, the affected parameter number is reported in Byte 2. When the Master reads or writes the changed parameter, Byte 2 is reset = 0.

A changed parameter number does not set a diagnostic flag.

8. Profibus Freeze Mode

The Profibus Interface supports Freeze Mode.

In Freeze Mode, inputs are only updated with new data from the soft starter when another Freeze action is carried out. An Un-Freeze action returns the device to normal operation.

9. Profibus Sync Mode

The Profibus Interface supports Sync Mode.

In Sync Mode, commands to the soft starter are not processed until another Sync action is carried out. An Un-Sync action returns the device to normal operation.

10. Profibus Clear Mode

If the Master sends a global Clear command, the device will send a Quick Stop command to the soft starter.

11. Specifications

- **Enclosure**

  Dimensions .... 40 mm (W) x 166 mm (H) x 90 mm (D)
  Weight .... 250 g
  Protection IP20

- **Mounting**

  Spring-action plastic mounting clips (x 2)

- **Connections**

  Soft starter .... 6-way pin assembly
     Contacts .... Gold flash
  Network .... DB9 female
  External power supply .... 2-way removable screw type
     Maximum cable size .... 2.5 mm^2

- **Settings**

  Network address
     Setting .... MSD and LSD rotary switches
     Range .... 0 to 99
  Data rate
     Setting .... auto-detect
     Range .... 9.6 kb/s ~ 12.0 Mb/s

- **Power**

  Consumption (steady state, maximum) .... 35 mA @ 24 VDC
  Reverse polarity protected
  Galvanically isolated

- **Certification**

  RCM .... IEC 60947-4-2
  CE .... EN 60947-4-2
  RoHS .... Compliant with EU Directive 2011/65/EU
  Profibus International ....