

INSTRUCTIONS

MODBUS TCP CARD

RIGHT FROM
THE START



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Product Compatibility

The Modbus TCP Card is suitable for use with EMX4e and EMX4i soft starters.

Warnings



WARNING

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



WARNING

Inserting foreign objects or touching the inside of the starter while the expansion port cover is open may endanger personnel, and can damage the starter.

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.

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1. Important User Information

1.1 Safety

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.

Close attention is required to the electrical installation and the system design to avoid hazards either in normal operation or in the event of equipment malfunction. System design, installation, commissioning and maintenance must be carried out by personnel who have the necessary training and experience. They must read this safety information and this guide carefully.

1.2 Product Design

The Modbus TCP Card allows a AuCom soft starter to connect to an Ethernet network and be controlled or monitored using an Ethernet communication model.

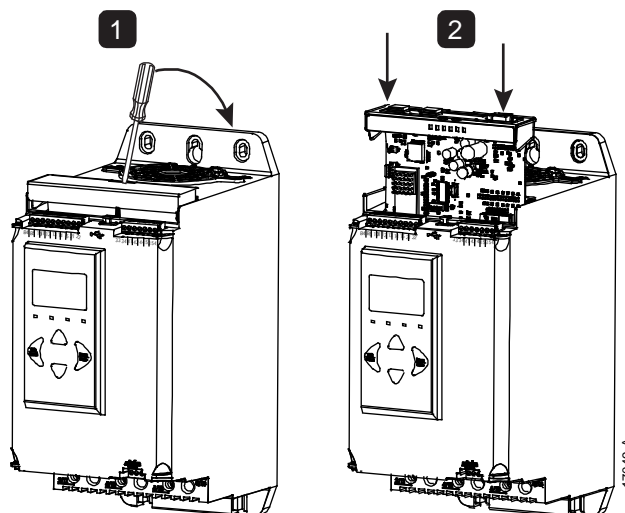
The Modbus TCP Card operates at the application layer.

Familiarity with Ethernet protocols and networks is required to operate the Modbus TCP Card successfully. For difficulties using this device with third party products, including PLCs, scanners and commissioning tools, contact the relevant supplier.

2. Installation

2.1 Installation Procedure

1. Push a small flat-bladed screwdriver into the slot in the centre of the expansion port cover, and ease the cover away from the starter.
2. Line up the card with the expansion port. Gently push the card along the guide rails until it clicks into the starter.



2.2 Network Connection

Ethernet Ports

The Modbus TCP Card has two Ethernet ports. If only one connection is required, either port can be used.

Cables

Use Category 5, 5e, 6 or 6e cable to connect to the Modbus TCP Card.

EMC Precautions

To minimise electromagnetic interference, Ethernet cables should be separated from motor and mains cables by 200 mm.

If the Ethernet cable must cross motor or mains cables, the crossing should be at an angle of 90°.

2.3 Enabling Network Control

The soft starter will only accept commands from the Modbus TCP Card if parameter 1A *Command Source* is set to Network.



NOTE

If the reset input is active, the starter will not operate. If a reset switch is not required, fit a link across terminals 10, 11 on the soft starter.

2.4 Network Establishment

The controller must establish communications directly with each device before the device can participate in the network.

2.5 Addressing

Each device in a network is addressed using a MAC address and an IP address, and can be assigned a symbolic name associated with the MAC address.

- The device can be assigned a static IP address during configuration, or can be configured to accept a dynamic IP address (via DHCP).
- The symbolic name is optional and must be configured within the device.
- The MAC address is fixed within the device and is printed on a label on the front of the module.

3. Device Configuration

Network communication parameters for the card must be set via the soft starter.

**NOTE**

The Error LED flashes whenever the device is receiving power but is not connected to a network. The Error LED will flash throughout the configuration process.

Parameter	Parameter name	Default
11H	<i>Gateway Address</i>	192
11I	<i>Gateway Address 2</i>	168
11J	<i>Gateway Address 3</i>	0
11K	<i>Gateway Address 4</i>	100
11L	<i>IP Address</i>	192
11M	<i>IP Address 2</i>	168
11N	<i>IP Address 3</i>	0
11O	<i>IP Address 4</i>	2
11P	<i>Subnet Mask</i>	255
11Q	<i>Subnet Mask 2</i>	255
11R	<i>Subnet Mask 3</i>	255
11S	<i>Subnet Mask 4</i>	0
11T	<i>DHCP</i>	Disable
11U	<i>Location ID</i>	0

**NOTE**

The Modbus TCP Card also supports DHCP addressing.

4. Operation

The Modbus TCP Card must be controlled by a Modbus client (such as a PLC) which complies with the Modbus Protocol Specification. For successful operation, the client must also support all functions and interfaces described in this document.

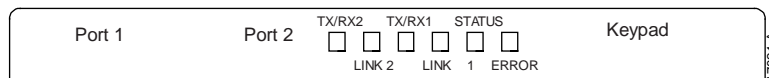
4.1 Device Classification

The Modbus TCP Module is a Modbus server and must be managed by a Modbus client over Ethernet.

4.2 Configuration

The Modbus TCP Module must be configured directly in the PLC. No additional files are required.

4.3 Feedback LEDs



LED name	LED Status	Description
Error	Off	No error.
	Flashing	System error.
	On	Communication error.
Status	Off	Module is not powered up.
	Slow flash	Ready but not configured.
	Fast flash	Communication has been established.
Link x	Off	No network connection.
	On	Connected to a network.
TX/RX x	Flashing	Operating normally.
	Off	No network connection.

5. Modbus Registers



NOTE

All references to registers mean the registers within the module unless otherwise stated.

5.1 Compatibility

The Modbus TCP Card supports two modes of operation.

- In Standard Mode, the device uses registers defined in the Modbus Protocol Specification.
- In Legacy Mode, the device uses the same registers as AuCom's Modbus device. Some registers differ from those specified in the Modbus Protocol Specification.

The mode of operation is determined by the values of bit 15 in register 40001.

- Standard Mode: set Bit 15 = 1. Bits 0~7 of register 40001 are used for command.
- Legacy Mode: set Bit 15 = 0. The remaining bits of register 40001 are reserved.

Examples

10000000 00000001 = start the motor (Standard Mode).

10000000 00000000 = stop the motor (Standard Mode).

00000000 xxxxxxxx = switch to Legacy Mode. The device will ignore the remaining bits in register 40001 and will check the value in register 40002.

5.2 Ensuring Safe and Successful Control

Data written to the Ethernet/IP Card will remain in its registers until the data is overwritten or the device is reinitialised.

If the soft starter may be controlled via Command Override (parameter 7A) or may be disabled via the reset input (terminals 10, 11) fieldbus commands should be cleared from the registers. If a command is not cleared, it will be re-sent to the starter once fieldbus control resumes.

5.3 Configuring Soft Starter Parameters

Parameter management is always multiple write of the entire parameter block.

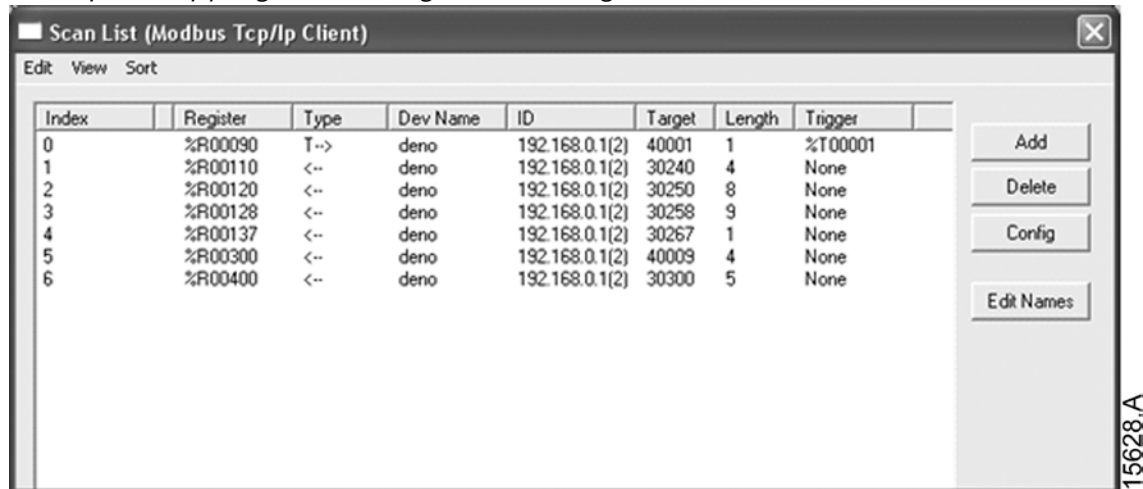
When configuring parameters in the soft starter, the PLC must be programmed with the correct values for all parameters. The Modbus TCP Card will update every parameter in the starter to match the values in the PLC.

5.4 Standard Mode

PLC Configuration

The PLC must be configured to map registers within the module to addresses within the PLC.

Example mapping of PLC registers to registers within the Modbus TCP Card (Target):



Command and Configuration Registers (Read/Write)

Register	Description	Bits	Details
40001	Command (single write)	0 to 7	To send a command to the starter, write the required value: 00000000 = Stop 00000001 = Start 00000010 = Reset 00000100 = Quick stop (coast to stop) 00001000 = Forced communication trip 00010000 = Start using Parameter Set 1 ¹ 00100000 = Start using Parameter Set 2 ¹ 01000000 = <i>Reserved</i> 10000000 = <i>Reserved</i>
		8 to 14	<i>Reserved</i>
		15	Must = 1
40002	<i>Reserved</i>	0 to 7	
40003	<i>Reserved</i>	0 to 7	
40004	<i>Reserved</i>	0 to 7	
40005	<i>Reserved</i>	0 to 7	
40006	<i>Reserved</i>	0 to 7	
40007	<i>Reserved</i>	0 to 7	
40008	<i>Reserved</i>	0 to 7	

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Register	Description	Bits	Details
40009 ² ~ 40200	Parameter management (single/multiple read or multiple write)	0 to 7	Manage soft starter programmable parameters

¹ Ensure that the programmable input is not set to Motor Set Select before using this function.

² Refer to *Parameter Lists* on page 16 for a complete parameter list. The first product parameter is always allocated to register 40009. The last product parameter is allocated to register 40XXX, where XXX = 008 plus total number of available parameters in the product. The Modbus TCP Card can read or write a maximum of 125 registers in one operation. These registers support multiple write (Modbus function code 16). Attempting to write to a single register will return an error code 01 (Illegal function code).

Status Reporting Registers (Read Only)



NOTE

Jog is only available with EMX4i.

Register	Description	Bits	Details
30003	Starter state	0 to 3	1 = Ready 2 = Starting 3 = Running 4 = Stopping (including braking) 5 = Restart delay (including temperature check) 6 = Tripped 7 = Programming mode 8 = Jog forward 9 = Jog reverse
		4	1 = Positive phase sequence (only valid if bit 6 = 1)
		5	1 = Current exceeds FLC
		6	0 = Uninitialised 1 = Initialised
		7	<i>Reserved</i>
30004 ¹	Trip code	0 to 7	Refer to Trip Codes on page 14
30005 ²	Motor current	0 to 7	Average 3-phase motor current (A)
30006	Motor temperature	0 to 7	Motor thermal model (%)
30007	<i>Reserved</i>		
30008	<i>Reserved</i>		

Register	Description	Bits	Details
30600	Version	0 to 5	Binary protocol version
		6 to 8	Parameter list major version
		9 to 15	Product type code
30601	<i>Reserved</i>		
30602	<i>Reserved</i>		
30603	<i>Reserved</i>		
30604	Starter state	0 to 4	0 = <i>Reserved</i> 1 = Ready 2 = Starting 3 = Running 4 = Stopping 5 = Not ready (restart delay, restart temperature check, run simulation, reset input is open) 6 = Tripped 7 = Programming mode 8 = Jog forward 9 = Jog reverse
		5	1 = Warning
		6	0 = Unintialised 1 = Initialised
		7	Command source 0 = Remote Keypad, Digital Input, Clock 1 = Network, Smart Card, Smart Card + Clock
		8	<i>Reserved</i>
		9	0 = Negative phase sequence 1 = Positive phase sequence
		10 to 15	<i>Reserved</i>
		30605 ²	Current
14 to 15	<i>Reserved</i>		
30606	Current	0 to 9	Current (% motor FLC)
		10 to 15	<i>Reserved</i>
30607	Motor temperature	0 to 7	Motor thermal model (%)
		8 to 15	<i>Reserved</i>
30608	<i>Reserved</i>		
30609	% Power factor	0 to 7	100% = power factor of 1
		8 to 15	<i>Reserved</i>
30610	<i>Reserved</i>		
30611 ²	Current	0 to 13	Phase 1 current (rms)
		14 to 15	<i>Reserved</i>

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Register	Description	Bits	Details
30612 ²	Current	0 to 13	Phase 2 current (rms)
		14 to 15	<i>Reserved</i>
30613 ²	Current	0 to 13	Phase 3 current (rms)
		14 to 15	<i>Reserved</i>
30614	<i>Reserved</i>		
30615	<i>Reserved</i>		
30616	<i>Reserved</i>		
30617	Parameter list version number	0 to 7	Parameter list minor revision
		8 to 15	Parameter list major version
30618	Digital Input state	0 to 15	For all inputs, 0 = open, 1 = closed (shorted) 0 = Start/Stop 1 = <i>Reserved</i> 2 = Reset 3 = Input A 4 = Input B 5 to 15 = <i>Reserved</i>
30619 ¹	Trip code	0 to 7	Refer to Trip Codes on page 14
		8 to 15	<i>Reserved</i>
30620~ 30631	<i>Reserved</i>		

¹ Bits 10~15 of register 30614 report the soft starter's trip or warning code. If the value of bits 0~4 is 6, the soft starter has tripped. If bit 5 = 1, a warning has activated and the starter is continuing to operate.

² For models EMX4x-0064B and smaller this value will be 10 times greater than the value displayed on the keypad.

³ Product type code:

12 = EMX4e

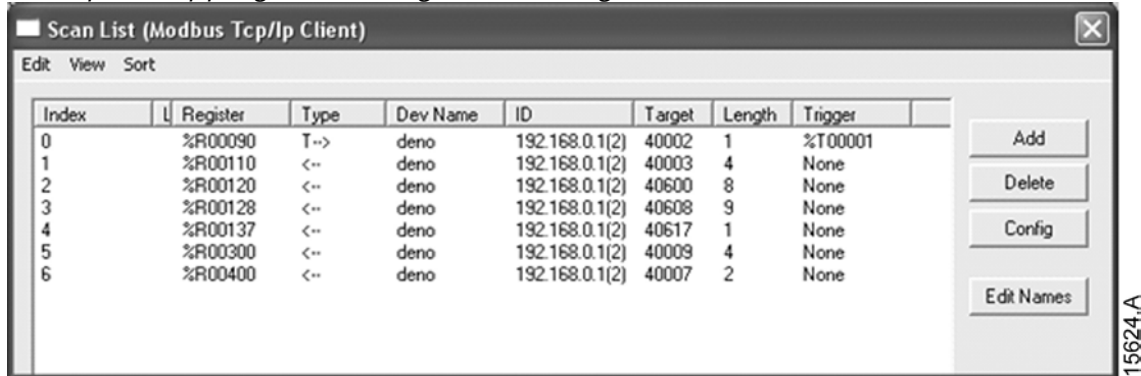
13 = EMX4i

5.5 Legacy Mode

PLC Configuration

The PLC must be configured to map registers within the module to addresses within the PLC.

Example mapping of PLC registers to registers within the Modbus TCP Card (Target):



Registers

Register	Description	Bits	Details
40001	<i>Reserved</i>	0 to 14	<i>Reserved</i>
		15	Must be zero
40002	Command (single write)	0 to 2	To send a command to the starter, write the required value: 1 = Start 2 = Stop 3 = Reset 4 = Quick stop (coast to stop) 5 = Forced communication trip 6 = Start using Parameter Set 1 7 = Start using Parameter Set 2
		3 to 7	<i>Reserved</i>
40003	Starter state	0 to 3	1 = Ready 2 = Starting 3 = Running 4 = Stopping (including braking) 5 = Restart delay (including temperature check) 6 = Tripped 7 = Programming mode 8 = Jog forward 9 = Jog reverse
		4	1 = Positive phase sequence (only valid if bit 6 = 1)
		5	1 = Current exceeds FLC

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Register	Description	Bits	Details
		6	0 = Uninitialised 1 = Initialised
		7	<i>Reserved</i>
40004	<i>Reserved</i>		
40005 ¹	Motor current	0 to 7	Average 3-phase motor current (A)
40006	Motor temperature	0 to 7	Motor thermal model (%)
40007	<i>Reserved</i>		
40008	<i>Reserved</i>		
40009 ³ ~ 40200	Parameter management (single/multiple read or multiple write)	0 to 7	Manage soft starter programmable parameters
40600	Version	0 to 5	Binary protocol version
		6 to 8	Parameter list version number
		9 to 15	Product type code ²
40601	<i>Reserved</i>		
40602	<i>Reserved</i>		
40603	<i>Reserved</i>		
40604	Starter state	0 to 4	0 = <i>Reserved</i> 1 = Ready 2 = Starting 3 = Running 4 = Stopping 5 = Not ready (restart delay, restart temperature check, run simulation, reset input is open) 6 = Tripped 7 = Programming mode 8 = Jog forward 9 = Jog reverse
		5	1 = Warning
		6	0 = Uninitialised 1 = Initialised
		7	Command source 0 = Remote Keypad, Digital Input, Clock 1 = Network, Smart Card, Smart Card + Clock
		8	<i>Reserved</i>
		9	1 = Positive phase sequence
		10 to 15	<i>Reserved</i>

Register	Description	Bits	Details
40605 ¹	Current	0 to 13	Average rms current across all three phases
		14 to 15	<i>Reserved</i>
40606	Current	0 to 9	Current (% motor FLC)
		10 to 15	<i>Reserved</i>
40607	Motor temperature	0 to 7	Motor thermal model (%)
		8 to 15	<i>Reserved</i>
40608	<i>Reserved</i>		
40609	% Power factor	0 to 7	100% = power factor of 1
		8 to 15	<i>Reserved</i>
40610	<i>Reserved</i>		
40611 ¹	Current	0 to 13	Phase 1 current (rms)
		14 to 15	<i>Reserved</i>
40612 ¹	Current	0 to 13	Phase 2 current (rms)
		14 to 15	<i>Reserved</i>
40613 ¹	Current	0 to 13	Phase 3 current (rms)
		14 to 15	<i>Reserved</i>
40614	<i>Reserved</i>		
40615	<i>Reserved</i>		
40616	<i>Reserved</i>		
40617	Parameter list version number	0 to 7	Parameter list minor revision
		8 to 15	Parameter list major version
40618	Digital Input state	0 to 15	For all inputs, 0 = open, 1 = closed (shorted) 0 = Start/Stop 1 = <i>Reserved</i> 2 = Reset 3 = Input A 4 = Input B
40619	Trip code		Refer to Trip Codes on page 14
40620~ 40631	<i>Reserved</i>		

¹ For models EMX4x-0064B and smaller this value will be 10 times greater than the value displayed on the keypad.

² Product type code:

12 = EMX4e

13 = EMX4i

³ Refer to *Parameter Lists* on page 16 for a complete parameter list. The first product parameter is always allocated to register 40009. The last product parameter is allocated to register 40XXX, where XXX = 008 plus total number of available parameters in the product. The Modbus TCP Card can read or write a maximum of 125 registers in one operation. These registers support multiple write (Modbus function

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code 16). Attempting to write to a single register will return an error code 01 (Illegal function code).

5.6 Trip Codes

Trip Code	Description
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 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 module and soft starter)
16	Network communication (between module and network)
17	Internal fault x (where x is the fault code detailed in the table below)
23	Parameter out of range
24	Input B trip
26	L1 phase loss
27	L2 phase loss
28	L3 phase loss
29	L1-T1 shorted
30	L2-T2 shorted
31	L3-T3 shorted
33	Time-overcurrent (Bypass overload)
34	SCR overtemperature
35	Battery/clock
36	Thermistor circuit
49	Low control volts
56	Keypad disconnected
57	Zero speed detect
58	SCR ITSM
59	Instantaneous overcurrent
60	Rating capacity

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).

5.7 Parameter Lists

EMX4i

Parameter Name	Parameter Name
1 Command Source	100 Input B Trip
2 Motor Full Load Current	101 Input B Trip Delay
3 Locked Rotor Time	102 Input B Initial Delay
4 Locked Rotor Current	103 Reset/Enable Logic
5 Motor Service Factor	104 Input A Name
6 Start Mode	105 Input B Name
7 Start Ramp Time	106 Relay A Function
8 Initial Current	107 Relay A On Delay
9 Current Limit	108 Relay A Off Delay
10 Adaptive Start Profile	109 Relay B Function
11 Kickstart Time	110 Relay B On Delay
12 Kickstart Level	111 Relay B Off Delay
13 Jog Torque	112 Low Current Flag
14 Stop Mode	113 High Current Flag
15 Stop Time	114 Motor Temperature Flag
16 Adaptive Stop Profile	115 Main Contactor Time
17 Adaptive Control Gain	116 Analog Output A
18 Multi Pump	117 Analog A Scale
19 Start Delay	118 Analog A Maximum Adjustment
20 DC Brake Torque	119 Analog A Minimum Adjustment
21 DC Brake Time	120 Language
22 Brake Current Limit	121 Temperature Scale
23 Soft Brake Delay	122 Graph Timebase
24 Start Mode-2	123 Graph Maximum Adjustment
25 Start Ramp Time-2	124 Graph Minimum Adjustment
26 Initial Current-2	125 Current Calibration
27 Current Limit-2	126 Adjustment Lock
28 Adaptive Start Profile-2	127 User Parameter 1
29 Kickstart Time-2	128 User Parameter 2
30 Kickstart Level-2	129 Modbus Address
31 Jog Torque-2	130 Modbus Baud Rate
32 Stop Mode-2	131 Modbus Parity
33 Stop Time-2	132 Modbus Timeout
34 Adaptive Stop Profile-2	133 Devicenet Address
35 Adaptive Control Gain-2	134 Devicenet Baud Rate
36 Multi Pump-2	135 Profibus Address
37 Start Delay-2	136 Gateway Address

Parameter Name	Parameter Name
38 DC Brake Torque-2	137 Gateway Address 2
39 DC Brake Time-2	138 Gateway Address 3
40 Brake Current Limit-2	139 Gateway Address 4
41 Soft Brake Delay-2	140 IP Address
42 Auto-Start/Stop Mode	141 IP Address 2
43 Sunday Mode	142 IP Address 3
44 Sunday Start Time	143 IP Address 4
45 Sunday Stop Time	144 Subnet Mask
46 Monday Mode	145 Subnet Mask 2
47 Monday Start Time	146 Subnet Mask 3
48 Monday Stop Time	147 Subnet Mask 4
49 Tuesday Mode	148 DHCP
50 Tuesday Start Time	149 Location ID
51 Tuesday Stop Time	150 Auto-Reset Count
52 Wednesday Mode	151 Auto-Reset Delay
53 Wednesday Start Time	152 Pressure Sensor Type
54 Wednesday Stop Time	153 Pressure Units
55 Thursday Mode	154 Pressure at 4 mA
56 Thursday Start Time	155 Pressure at 20 mA
57 Thursday Stop Time	156 Flow Sensor Type
58 Friday Mode	157 Flow Units
59 Friday Start Time	158 Flow at 4 mA
60 Friday Stop Time	159 Flow at 20 mA
61 Saturday Mode	160 Units per Minute at Max Flow
62 Saturday Start Time	161 Pulses per Minute at Max Flow
63 Saturday Stop Time	162 Units per Pulse
64 Current Imbalance	163 Depth Sensor Type
65 Current Imbalance Delay	164 Depth Units
66 Undercurrent	165 Depth at 4 mA
67 Undercurrent Delay	166 Depth at 20 mA
68 Overcurrent	167 High Flow Trip Level
69 Overcurrent Delay	168 Low Flow Trip Level
70 Excess Start Time	169 Flow Start Delay
71 Restart Delay	170 Flow Response Delay
72 Current Imbalance	171 High Pressure Trip Level
73 Undercurrent	172 High Pressure Start Delay
74 Overcurrent	173 High Pressure Response Delay
75 Excess Start Time	174 Low Pressure Trip Level
76 Input A Trip	175 Low Pressure Start Delay
77 Input B Trip	176 Low Pressure Response Delay

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Parameter Name	Parameter Name
78 <i>Network Communications</i>	177 <i>Pressure Control Mode</i>
79 <i>Remote Keypad Fault</i>	178 <i>Start Pressure Level</i>
80 <i>Frequency</i>	179 <i>Start Response Delay</i>
81 <i>Motor Overtemperature</i>	180 <i>Stop Pressure Level</i>
82 <i>Motor Thermistor Circuit</i>	181 <i>Stop Response Delay</i>
83 <i>Shorted SCR Action</i>	182 <i>Depth Trip Level</i>
84 <i>Battery/Clock</i>	183 <i>Depth Reset Level</i>
85 <i>Pressure Sensor</i>	184 <i>Depth Start Delay</i>
86 <i>Flow Sensor</i>	185 <i>Depth Response Delay</i>
87 <i>Depth Sensor</i>	186 <i>Temperature Sensor Type</i>
88 <i>High Pressure</i>	187 <i>Temperature Trip Level</i>
89 <i>Low Pressure</i>	188 <i>Tracking Gain</i>
90 <i>High Flow</i>	189 <i>Pedestal Detect</i>
91 <i>Low Flow</i>	190 <i>Bypass Contactor Delay</i>
92 <i>Flow Switch</i>	191 <i>Current Rating</i>
93 <i>Well Depth</i>	192 <i>Screen Timeout</i>
94 <i>RTD/PT100 B</i>	
95 <i>Input A Function</i>	
96 <i>Input A Trip</i>	
97 <i>Input A Trip Delay</i>	
98 <i>Input A Initial Delay</i>	
99 <i>Input B Function</i>	

EMX4e

Class 100 and Class 101 Objects (Read/Write)

Parameter Name	Parameter Name
1 Command Source	100 Location ID
2 Motor Full Load Current	101 Auto-Reset Count
3 Locked Rotor Time	102 Auto-Reset Delay
4 Locked Rotor Current	103 Pressure Sensor Type
5 Motor Service Factor	104 Pressure Units
6 Start Mode	105 Pressure at 4 mA
7 Start Ramp Time	106 Pressure at 20 mA
8 Initial Current	107 Flow Sensor Type
9 Current Limit	108 Flow Units
10 Adaptive Start Profile	109 Flow at 4 mA
11 Stop Mode	110 Flow at 20 mA
21 Stop Time	111 Units per Minute at Max Flow
13 Adaptive Stop Profile	112 Pulses per Minute at Max Flow
14 Adaptive Control Gain	113 Units per Pulse
15 Multi Pump	114 Depth Sensor Type
16 Start Delay	115 Depth Units
17 Current Imbalance	116 Depth at 4 mA
18 Current Imbalance Delay	117 Depth at 20 mA
19 Undercurrent	118 High Flow Trip Level
20 Undercurrent Delay	119 Low Flow Trip Level
21 Overcurrent	120 Flow Start Delay
22 Overcurrent Delay	121 Flow Response Delay
23 Excess Start Time	122 High Pressure Trip Level
24 Restart Delay	123 High Pressure Start Delay
25 Current Imbalance	124 High Pressure Response Delay
26 Undercurrent	125 Low Pressure Trip Level
27 Overcurrent	126 Low Pressure Start Delay
28 Excess Start Time	127 Low Pressure Response Delay
29 Input A Trip	128 Pressure Control Mode
30 Input B Trip	129 Start Pressure Level
31 Network Communications	130 Start Response Delay
32 Remote Keypad Fault	131 Stop Pressure Level
33 Frequency	132 Stop Response Delay
34 Motor Overtemperature	133 Depth Trip Level
35 Motor Thermistor Circuit	134 Depth Reset Level
36 Pressure Sensor	135 Depth Start Delay
37 Flow Sensor	136 Depth Response Delay

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Parameter Name	Parameter Name
38 <i>Depth Sensor</i>	137 <i>Temperature Sensor Type</i>
39 <i>High Pressure</i>	138 <i>Temperature Trip Level</i>
40 <i>Low Pressure</i>	139 <i>Tracking Gain</i>
41 <i>High Flow</i>	140 <i>Pedestal Detect</i>
42 <i>Low Flow</i>	141 <i>Bypass Contactor Delay</i>
43 <i>Flow Switch</i>	142 <i>Current Rating</i>
44 <i>Well Depth</i>	143 <i>Screen Timeout</i>
45 <i>RTD/PT100 B</i>	
46 <i>Input A Function</i>	
47 <i>Input A Trip</i>	
48 <i>Input A Trip Delay</i>	
49 <i>Input A Initial Delay</i>	
50 <i>Input B Function</i>	
51 <i>Input B Trip</i>	
52 <i>Input B Trip Delay</i>	
53 <i>Input B Initial Delay</i>	
54 <i>Reset/Enable Logic</i>	
55 <i>Input A Name</i>	
56 <i>Input B Name</i>	
57 <i>Relay A Function</i>	
58 <i>Relay A On Delay</i>	
59 <i>Relay A Off Delay</i>	
60 <i>Relay B Function</i>	
61 <i>Relay B On Delay</i>	
62 <i>Relay B Off Delay</i>	
63 <i>Low Current Flag</i>	
64 <i>High Current Flag</i>	
65 <i>Motor Temperature Flag</i>	
66 <i>Main Contactor Time</i>	
67 <i>Analog Output A</i>	
68 <i>Analog A Scale</i>	
69 <i>Analog A Maximum Adjustment</i>	
70 <i>Analog A Minimum Adjustment</i>	
71 <i>Language</i>	
72 <i>Temperature Scale</i>	
73 <i>Graph Timebase</i>	
74 <i>Graph Maximum Adjustment</i>	
75 <i>Graph Minimum Adjustment</i>	
76 <i>Current Calibration</i>	
77 <i>Adjustment Lock</i>	

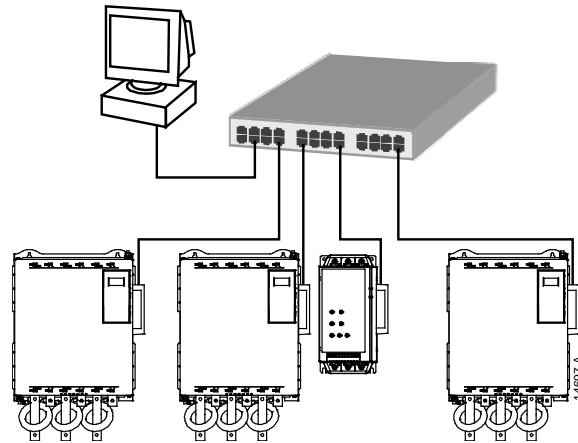
Parameter Name	Parameter Name
78 <i>User Parameter 1</i>	
79 <i>User Parameter 2</i>	
80 <i>Modbus Address</i>	
81 <i>Modbus Baud Rate</i>	
82 <i>Modbus Parity</i>	
83 <i>Modbus Timeout</i>	
84 <i>Devicenet Address</i>	
85 <i>Devicenet Baud Rate</i>	
86 <i>Profibus Address</i>	
87 <i>Gateway Address</i>	
88 <i>Gateway Address 2</i>	
89 <i>Gateway Address 3</i>	
90 <i>Gateway Address 4</i>	
91 <i>IP Address</i>	
92 <i>IP Address 2</i>	
93 <i>IP Address 3</i>	
94 <i>IP Address 4</i>	
95 <i>Subnet Mask</i>	
96 <i>Subnet Mask 2</i>	
97 <i>Subnet Mask 3</i>	
98 <i>Subnet Mask 4</i>	
99 <i>DHCP</i>	

6. Network Design

The Modbus TCP Card supports star, line and ring topologies.

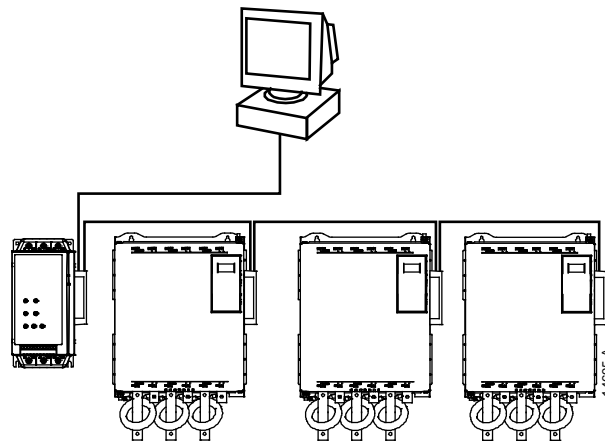
6.1 Star Topology

In a star network, all controllers and devices connect to a central network switch.



6.2 Line Topology

In a line network, the controller connects directly to one port of the first Modbus TCP Card. The second Ethernet port of the Modbus TCP Card connects to another module, which in turn connects to another module until all devices are connected.



NOTE

The Modbus TCP Card has an integrated switch to allow data to pass through in line topology. The Modbus TCP Card must be receiving control power from the soft starter for the switch to operate.



NOTE

If the connection between two devices is interrupted, the controller cannot communicate with devices after the interruption point.



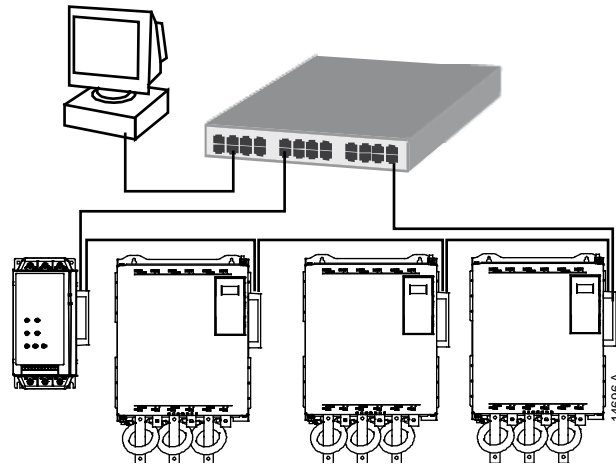
NOTE

Each connection adds a delay to communication with the next module. The maximum number of devices in a line network is 32. Exceeding this number may reduce the reliability of the network.

6.3 Ring Topology

In a ring topology network, the controller connects to the first Modbus TCP Card, via a network switch. The second Ethernet port of the Modbus TCP Card connects to another device, which in turn connects to another device until all devices are connected. The final device connects back to the switch.

The Modbus TCP Card supports beacon based ring node configuration.

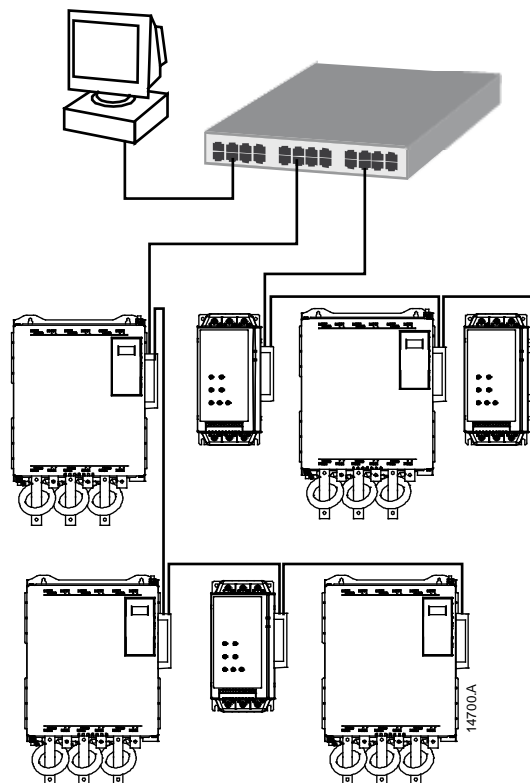


NOTE

The network switch must support loss of line detection.

6.4 Combined Topologies

A single network can include both star and line components.



7. Specifications

Connections

Soft starter 6-way pin assembly
Contacts Gold flash
Network RJ45

Settings

IP address Automatically assigned, configurable
Device name Automatically assigned, configurable

Network

Link speed 10 Mbps, 100 Mbps (auto-detect)
Full duplex
Auto crossover

Power

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

Certification

RCM IEC 60947-4-2
CE EN 60947-4-2

