Hardware Instruction Manual

C4

4-Channel SCR Power Controller with Independent PID Control

CE   c(UL)us

CHROMALOX

Advanced Thermal Technologies

Table of Contents

Important Safeguards

⚠ WARNING

HIGH VOLTAGE (up to 480 VAC) is used in the operation of this equipment; DEATH ON CONTACT may result if personnel fail to observe safety precautions.

Learn the areas containing high-voltage connections when installing or operating this equipment.

⚠ WARNING

Be careful not to contact high-voltage connections when installing or operating this equipment.

Before working inside the equipment, turn power off and ground all points of high potential before touching them.

⚠ CAUTION

The owner/installer must provide all necessary safety and protection devices and follow all current electrical wiring standards and regulations. Failure to do so may compromise the integrity of the controller and/or cause product failure resulting in a safety risk to operational and service personnel.

⚠ CAUTION

This controller utilizes a heat sink which is designed to cool the unit during operation. Under no circumstance should air flow around the controller be compromised in any way. Failure to do so may result in the overheating of the controller, product failure, product temperatures and even fire.

⚠ WARNING

During continuous operation, the heat sink can reach very high temperatures, and keeps a high temperature even after the unit is turned off due to its high thermal inertia.

Higher voltages may be present. DO NOT work on the power section without first cutting out electrical power to the panel. Failure to do so may cause serious injury or death.

⚠ WARNING

ELECTRIC SHOCK HAZARD: Any installation involving control equipment must be performed by a qualified person and must be effectively grounded in accordance with the National Electrical Code to eliminate shock hazard.

1. Initial Instructions

1.1 General Description

The C4 is an extremely compact advanced SCR power controller that provides a unique combination of performance, reliability, and flexibility. The C4 multiple zone SCR power controller manages both single phase and 3-phase industrial heating load applications. Load management options include: Up to 4 independently controlled single phase loads or one 3-phase/3-leg load (with or without an additional single phase load) or up to two 3-phase/2-Leg loads.

Standard features: Output choices range from 30 kW to 80 kW per unit or from 16 to 40 Amps per zone at 480 Vac (for higher amperages the C4X can be used); Four universal main process inputs, two digital inputs, two configurable alarm outputs, Mod-bus RTU/RS485 digital communications, DIN Rail or panel mountable.

Optional features: One or four Current Transformers (input), four analog inputs, integral fuse holder (30 kW & 60 kW only), four configurable outputs, modular Fieldbus Communication protocols including Modbus RTU, Modbus TCP, Ethernet IP, EtherCAT, CANopen, DeviceNet, Profibus, and Profinet. This new Chromalox controller is the ideal PID and power control solution for applications demanding high performance, continuous service, preventative maintenance information, and increasing need for process data and information for quality and process improvement analysis. Industry markets such as, but not limited to:

- Packaging
- Plastics Processing; Extrusion; Thermforming; Injection Molding, Welding & Joining
- Semiconductor
- Material Finishing; Paint Booths;
- Textile
- Multiple zoned furnaces; Tunnel Ovens
- Food Processing

1.2 Features

- 30, 60, 80kW controller size capacity (refer to C4X for higher amperages)
- Solid state relay control

- One or four current transformers
- Fuses-holder (option)
- 4 universal main inputs
- 4 heat/cool independent PID
- 4 main output internally wired to the SSR
- 4 auxiliary analog inputs (option)
- 4 configurable output (option): relay / logic / analog/ TRIAC
- 2 configurable relay alarm output
- 2 digital inputs
- Standard digital communication: Modbus RTU/ RS485
- Optional Fieldbus communication: Profibus DP, CANopen, DeviceNet, Modbus RTU, Ethernet Modbus TCP, Ethernet IP, EtherCAT, ProfiNET
- DIN rail mounting
- Integrated heat sink and fan
- cULus, CE

1.3 Product Inspection

Immediately after unpacking the unit and prior to installing, check the order code and the other data on the label attached to the outside of the container and write them down. If troubleshooting is necessary, you will need to provide this data to a Chromalox customer service representative.

Upon removing package, ensure that there is no physical damage to the controller during shipment, and that the package also contains the "Configuration and Programming" manual.

If there are signs of damage or if any parts are missing, notify your Chromalox representative immediately.

Read through all installation sections in detail within this document before installing the C4 on any piece of equipment or in a control panel enclosure. Spacing requirements must be honored for proper operation and safety.

2. Dimensions and Weights

Models without Fuse Holder

0.75 (19.6)

1.4 (35)

5.5 (140)

3.85 (92.5)

5.5 (140)

5.75 (147)

0.16 (4)

4 (101.5)

0.16 (4)

5.2 (132)

4.3 (109.5)

0.75 (19.5)

1.4 (35)

5.75 (147)

3.65 (92.5)

3.25 (52)

4.3 (109.5)

5.5 (140)

1.55 (42)

4.4 (111.5)

5.5 (140)

7.2 (182)

7.7 (155)

4 (101.5)

0.16 (4)

0.16 (4)

5.2 (132)
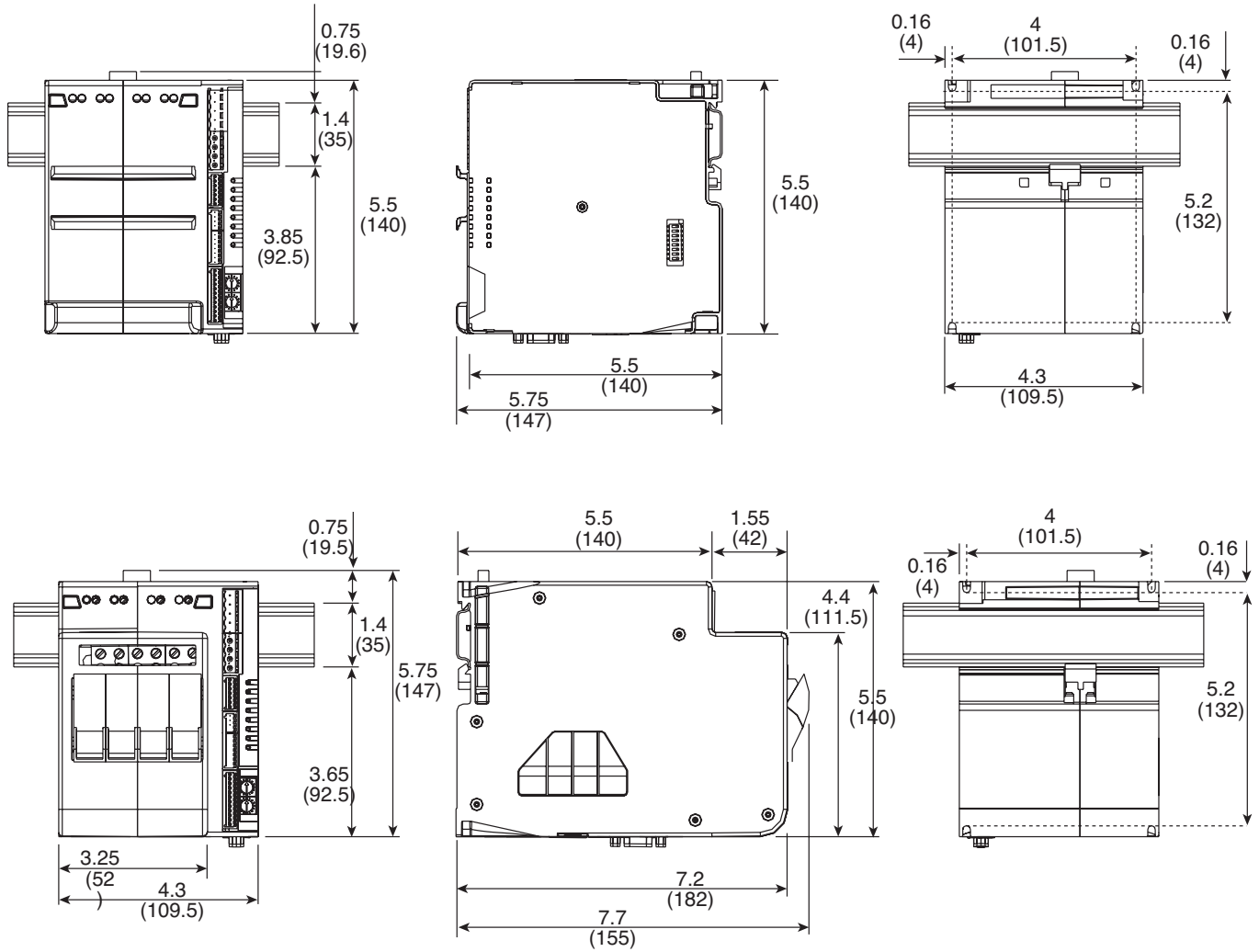
3. Installation

To ensure proper performance, maximum safety and reliability, it is essential to install the unit correctly. This includes proper mounting, spacing, hardware and wiring. See below:

- Maximum surrounding air temperature is 40°C in "Open Type Equipment" which is suitable for use in pollution degree 2. For temperature >40°C refer to the Derating Curves.

- Install the unit vertically (max 10° inclination from vertical axis).

Spacing

To ensure maximum reliability, the device must be correctly installed in the panel in such a way as to obtain adequate heat exchange between the heat sink and the surrounding air under conditions of natural convection. Under no circumstance shall any component, including cable channels, compromise minimum thermal spacing dimensions. Air must be able to flow vertically on the heat sink without any obstacles.

Solid state devices dissipate heat which may impact installation room temperature. Exchange with external air or an air conditioner may be necessary to transfer heat outside the panel.

- Minimum vertical distance between unit and panel wall: 3.9" (100 mm)

- Minimum horizontal distance between unit and panel wall: 0.8" (20 mm)

- Minimum horizontal distance between adjacent power control units: 0.4" (10 mm)


Mounting

C4 Models to be installed on a DIN Rail . Rear panel dimensions are on previous page.

To install C4 onto a DIN Rail:

1. Depress DIN mounting spring. ❶
2. Position controller on the DIN Rail at a slight angle.
3. Lower controller on to DIN Rail. ❷
4. Release the mounting spring.

To remove from DIN Rail:

1. Depress DIN mounting spring. ❶
2. Rotate bottom of controller off of the DIN Rail. ❷
3. Remove from DIN Rail.

Install Controller

PRESS

ROTATE

Proper position for operation

Remove controller

PRESS

ROTATE
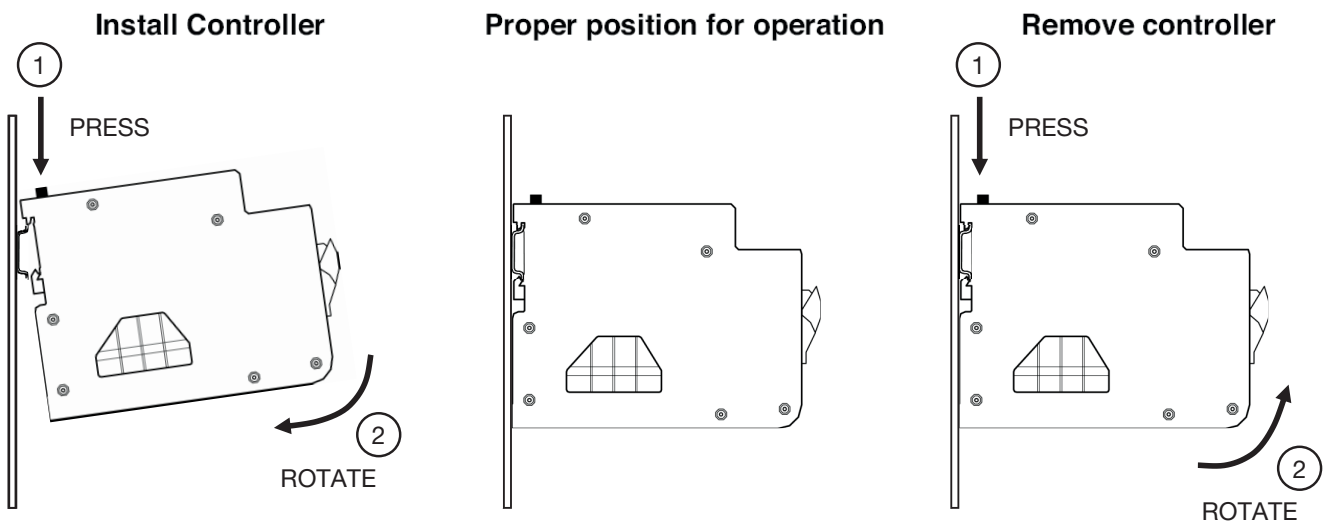
4. Installation – Wiring

This section covers the C4 wiring installation instructions for the power supply, inputs, outputs and interfaces.

Electrical Power Supply

- The controller DOES NOT have an On/Off switch. The user must install a switch or isolator that conforms to all codes and electrical safety requirements (CE mark) to cut off the power supply upstream of the controller. The switch must be installed in the immediate vicinity of the controller and with-in reach of the operator. A single switch can be used for multiple devices.

- The earth connection must be made with a specific lead.

- If the product is used in applications with risk of harm to persons or damage to machines or materials, it MUST be equipped with auxiliary alarm device(s). It is advisable to provide the ability to check for tripped alarms during regular operation. DO NOT install the product in rooms with hazardous (inflammable or explosive) atmosphere; it may be connected to elements that operate in such atmosphere only by means of appropriate interfaces that conform to current safety standards..

Notes on Electrical Safety and Electromagnetic Compatibility

CE MARKING: EMC (electromagnetic compatibility) conformity in compliance with Directive 2004/108/CE and following modifications. Series C4 controllers are mainly intended for industrial use, installed on panels or control panels of production process machines or systems. For purposes of electromagnetic compatibility, the most restrictive generic standards have been adopted, as shown on the tables.

LV (low voltage) conformity Directive 2006/95/CE. EMC compliance has been verified with respect to the information in Tables 1 and 2.

Recommended Installation for purposes of EMC
Instrument power supply

- The power supply for the electronic instrumentation on the panels must always come directly from a cut/off device with fuse for the instrument part.

- Electronic instrumentation and electromechanical power devices such as relays, contactors, solenoids, etc., MUST ALWAYS be powered by separate lines.

- When the power supply line of electronic instruments is heavily disturbed by switching of SCR power groups or by motors, you should use an isolation transformer only for the controllers, grounding its sheathing.

- It is important for the system to be well grounded. Voltage between neutral and ground must not be > 1 V and resistance must be < 6Ω (Ohms).

- If the grid voltage is highly unstable, use a voltage stabilizer.

- In proximity of high frequency generators or arc welders, use adequate grid filters.

- The power supply lines must be separate from instrument input and output lines.

- Supply from Class II or from limited energy sources.

Input and output connections

Before connecting or disconnecting any connection, always check that the power and control cables are isolated from voltage. Appropriate devices must be provided: fuses or automatic switches to protect power lines.

- Connected outside circuits must be doubly isolated.

- To connect analog or linear inputs, strain gauges, TC, RTD, etc., you have to:
  - physically separate the input cables from those of the power supply, outputs, and power connections.
  - use braided and shielded cables, with sheathing grounded at a single point.

- To connect the control outputs and alarm outputs (contactors, solenoids, motors, fans, etc.), install RC (series of capacitors and resistors) groups parallel to inductive loads that work in AC.

  (Note: all condensers must conform to VDE standards (class X2) and support voltage of at least 220Vac. Resistances must be at least 2W).

- Install a 1N4007 diode parallel to the coil of inductive loads that work in DC.

Installation Notes

Use the extra rapid fuse indicated in Table 15.1 later in this manual, according to the wiring schematic examples and controller rating. Additionally, the applications with solid state units require a safety automatic switch to disengage the load power line during certain alarm events.

5. Emission, Immunity and Safety Standards

Table 1: EMC Emission

AC semiconductor motor controllers and conductors for non-motor loads	EN 60947-4-3	
Emission enclosure compliant in firing mode single cycle and phase angle if external filter fitted	EN 60947-4-3 CISPR-11 EN 55011	Class A Group 2

Table 2: EMC Immunity

Generic standards, immunity standard for industrial environments	EN 60947-4-3	
ESD immunity	EN 61000-4-2	4 kV contact discharge 8 kV air discharge
RF interference immunity		10 V/m amplitude modulated 80 MHz-1 GHz 10 V/m amplitude modulated 1.4 GHz-2 GHz
Conducted disturbance immunity		10 V/m amplitude modulated 0.15 MHz-80 MHz
Burst immunity	EN 61000-4-4	2 kV power line 2 kV I/O signal line
Surge immunity	EN 61000-4-4/5	PPower line-line 1 kV (level 2) Power line-earth 2kV (level 3) Signal line-earth 1kV (level 2)
Magnetic fields immunity	EN 61000-4-8	100 A/m (level 5)
Voltage dips, short interruptions and voltage immunity tests	EN 61000-4-11	100%U, 70%U, 40%U,

Table 3: LVD Safety

|		
Safety requirements for electrical equipment for measurement, control and laboratory use	EN 61010-1 UL 508	

ATTENTION

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

Per UL, the SCCR (Short Circuit Current Rating) is 100kA for models: C4 - XXXXX - 0 - XX Suitable for use on a circuit capable of delivering not more than 100RMS kA symmetrical, 480VAC when protected only by listed cartridge fuses manufactured by BUSSMAN type DFJ200 non renewable (JDDZ) 200A class J current limiting fuses.

The CE declaration of conformity is available on request.

6. Controller Overview

6.1 Layout
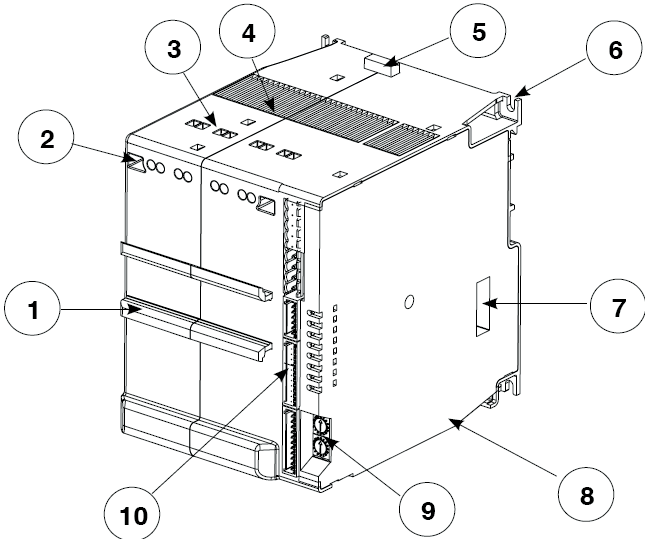
|	
1.	Front DIN rail mount for the C4-OP programming module. This mount is only present on models without fuse holders.
2.	Screwdriver access to power connection screws.
3.	Power supply connection terminals
4.	Heat sink ventilation screen: DO NOT OBSTRUCT
5.	Spring clamp release for rear DIN rail.
6.	Fastening slots for additional mounting security.
7.	DIP switches for controller function / load configuration.
8.	Communication ports (Port1, Port2).
9.	Rotary switches for setting node address or number
10.	Input signal & low voltage power supply terminals (J1, J2, J3, J4)
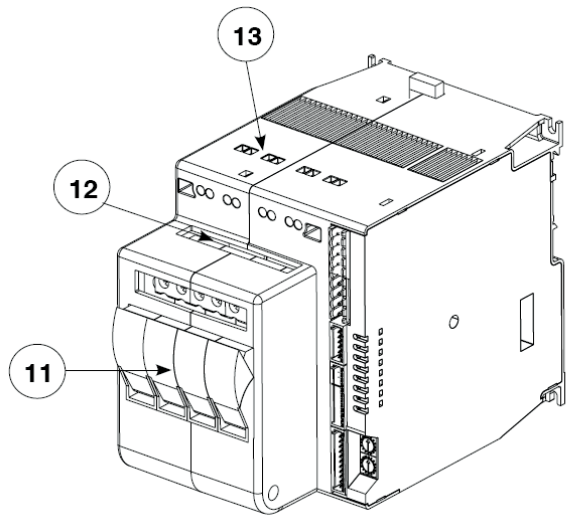
11.	Fuse holders. (Only available on 30KW and 60KW models).
12.	Terminals for fuse holder connection (F1, F2, F3, F4/N)
13.	Terminals for load power connection (U1, U2, U3, U4)
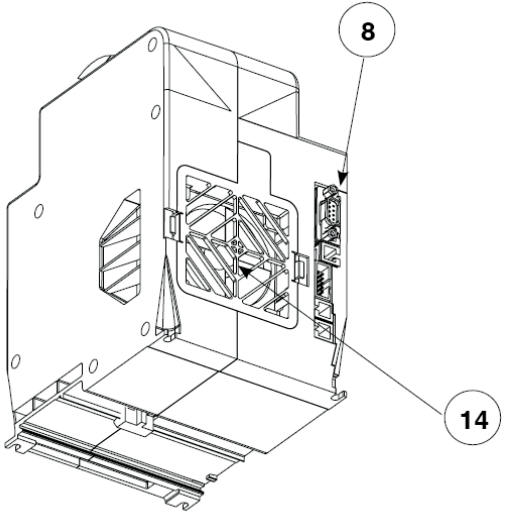
14.	Air intake / fan protection screen: DO NOT OBSTRUCT

6.2 Cooling Fan

Fan Air Direction

15 →

14 →
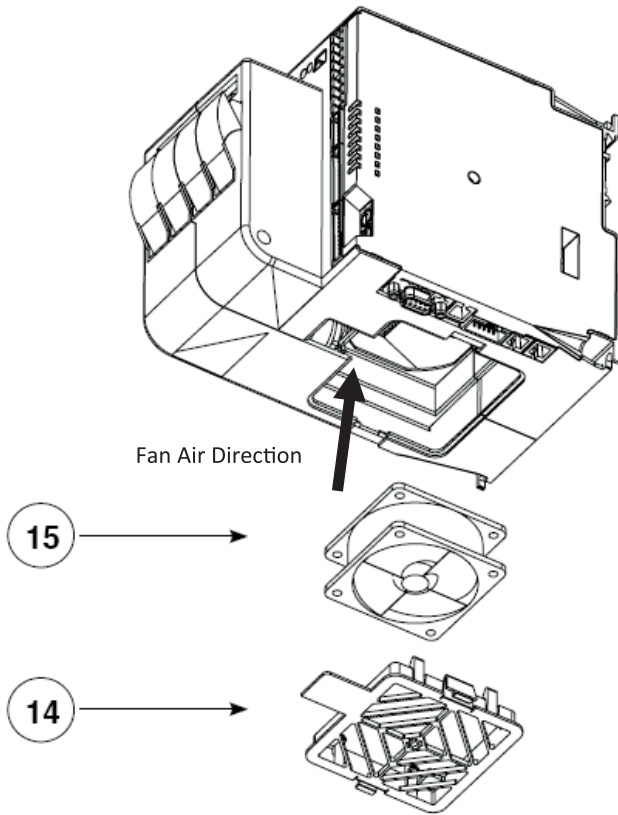
PERIODIC CLEANING

Every 6-12 months (depending on the dust level of the installation) blow a compressed air jet downward through the upper rectangular cooling grilles (on the side opposite the fan). This will clean the internal heat dissipater and the cooling fan.

IN CASE OF OVERHEAT ALARM

If periodic cleaning does not eliminate the problem, do as follows:

a. Remove the fan support grille by detaching the two support tabs
b. Disconnect the fan connector from the board
c. Check the condition of the fan
d. Clean or replace the fan
   NOTE: Ensure that the air flow arrow on the fan is pointing towards the heat sink e Insert the connector into the board
f. Insert the fan support grille until it attaches
g. Power up the device and check fan rotation when at least one load is on
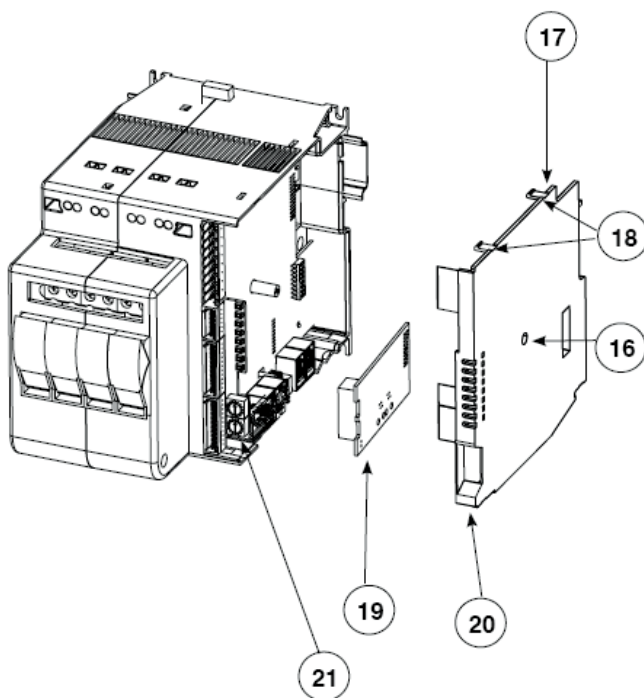
⚠️ *Before and during the inspection/ maintenance, cut power to the fan controller and verify that the system is isolated for operator safety.*

14	Support Grill
15	Fan

6.3 Inserting a New Field Bus Interface Card

17

18

16

19   **20**

21

To insert a communication module, the Field Bus Interface Board compartment must be accessed.

Follow these steps:

1. Remove the Fieldbus compartment cover screw (16)
2. With a flat screwdriver, gently apply pressure at (18)
3. Remove compartment cover (17)
4. Insert Fieldbus card (19) into the proper connector (21)
5. Remove applicable communication port tab (20) on cover (17)
6. Carefully replace compartment cover (17)
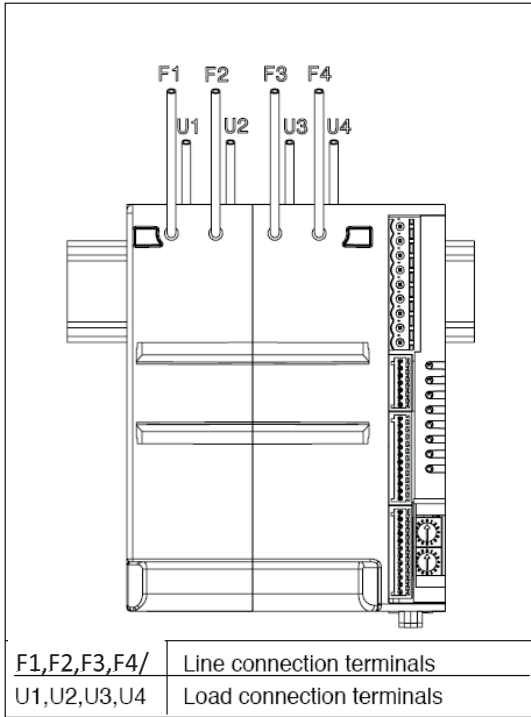7. Tighten compartment cover screw (16)

⚠️ *Before attempting board replacement, ensure that power to the controller has been cut and verify that the system is isolated for operator safety.*
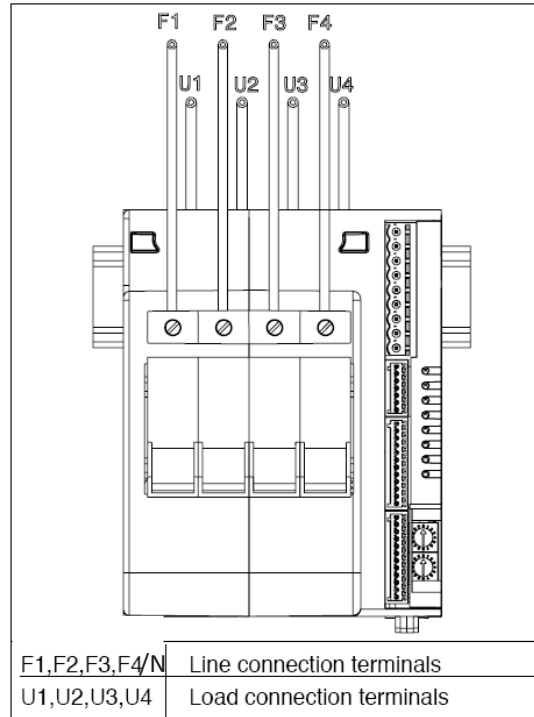
7. Connections and Indication

7.1 Power Connections

Model without fuse holder

Model with fuse holder

F1,F2,F3,F4/	Line connection terminals
U1,U2,U3,U4	Load connection terminals

F1,F2,F3,F4/N	Line connection terminals
U1,U2,U3,U4	Load connection terminals

7.2 Power Wiring Considerations

Model	30kW		60kW		80kW	
Max Current	**16 Amps**		**30 Amps**		**40 Amps**	
Solid Wire	0.2 - 6mm²	24 - 10 AWG	0.2 - 6mm²	24 - 10 AWG	0.5 - 16mm²	20 - 6 AWG
Stranded Wire	0.2 - 4mm²	24 - 10 AWG	0.2 - 4mm²	24 - 10 AWG	0.5 - 10mm²	20 - 7 AWG
Soldered, Pin Insulated Tube	0.25 - 4mm²	23 - 10 AWG	0.25 - 4mm²	23 - 10 AWG	0.5 - 10mm²	20 - 7 AWG
Torque Force	0.5 - 0.6Nm	0.5 - 0.6 Nm	1.2 - 1.5Nm	4.4 - 5.3 In-lb	4.4 - 5.3 In-Lb	10.6 - 13.3 In-Lb

7.3 Input & Output Connections

- Use adequately compensated cable for thermocouple inputs. Maintain polarity by avoiding junctions on the cables.

- If using a grounded thermocouple, the connection must be at a single point.

- For RTD inputs, use copper extension cables and avoid junctions on the cables. Resistance must not exceed 20 Ohm.

- For 2-wire RTDs, make the connection indicated instead of the third wire.

- Refer to the applicable Connectors Detail starting in section 7.6
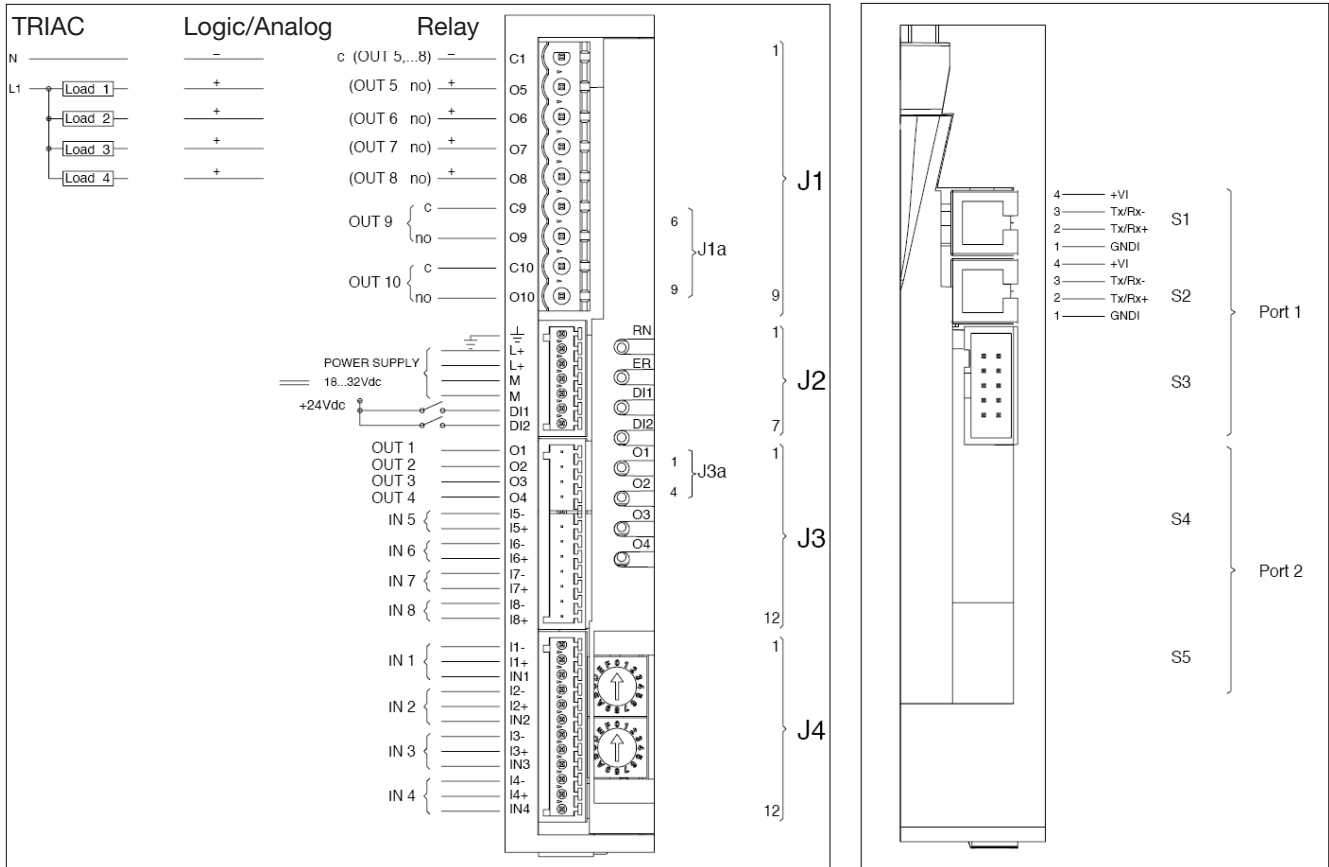
7.4 LED Logic

LED	Description	Color
RN	RUN - Flashes during regular operation	Green
ER	ERROR (Fault Condition) - Illuminates when a fault is present Lo = Process Variable value < Lo.S HI = Process Variable value > Hi.S Sbr = Sensor interrupted or input values over maximum limits Err = RTD third wire interrupted for Pt100 or input values below minimum ER = (red) flashing: Alarm temperature OVER_HEAT (STATUS.STRUMENTO 4 bit 1)	Red
DI1	State of digital input 1: DI1	Yellow
DI2	State of digital input 2: DI2	Yellow
O1	State of output 1: O1	Yellow
O2	State of output 2: O2	Yellow
O3	State of output 3: O3	Yellow
O4	State of output 4: O4	Yellow

7.5 Rotary Switches

Switch	Drescription
X10	Defines Address of Controller Module
X1	Available address: 00...99

7.6 Connector Detail

7.6.1 Connector J1 / J1a (Note: If Auxiliary Outputs O5 - O8, are present, connector J1a becomes J1.)
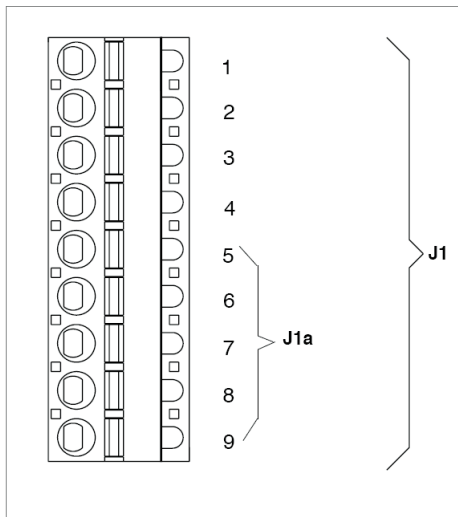
	0.2 - 2.5mm^2	24-14 AWG
	0.25 - 2.5mm^2	23-14 AWG

Outputs 5 - 8: Logic or Analog Output Type

Logic outputs: 18 - 36Vdc, max 20mA

Analog outputs: Voltage (default): 0 - 10V, 2 - 10V, max 25mA or Current: 0 - 20mA, 4 - 20mA, max 500Ω

Wiring Schematic for Outputs 5 - 8, both Logic & Analog Outputs
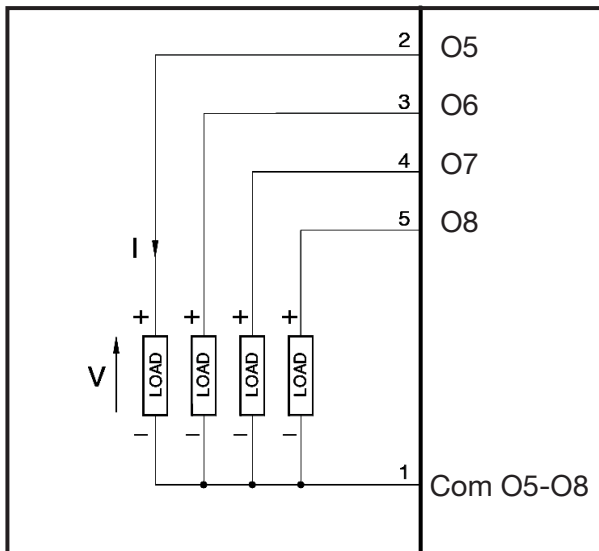
PIN Legend

PIN	Name	Description	Polarity (Logic or Analog)
1	Com O5-O8	Outputs Common	(–)
2	O5	Output 5	(+)
3	O6	Output 6	(+)
4	O7	Output 7	(+)
5	O8	Output 8	(+)

When the optional Auxiliary Output type "A" (Analog) is selected, one must choose whether the output is Voltage-based (default) or Current-based. This selection is carried out via proper jumper placement on the board as follows:

voltage

current
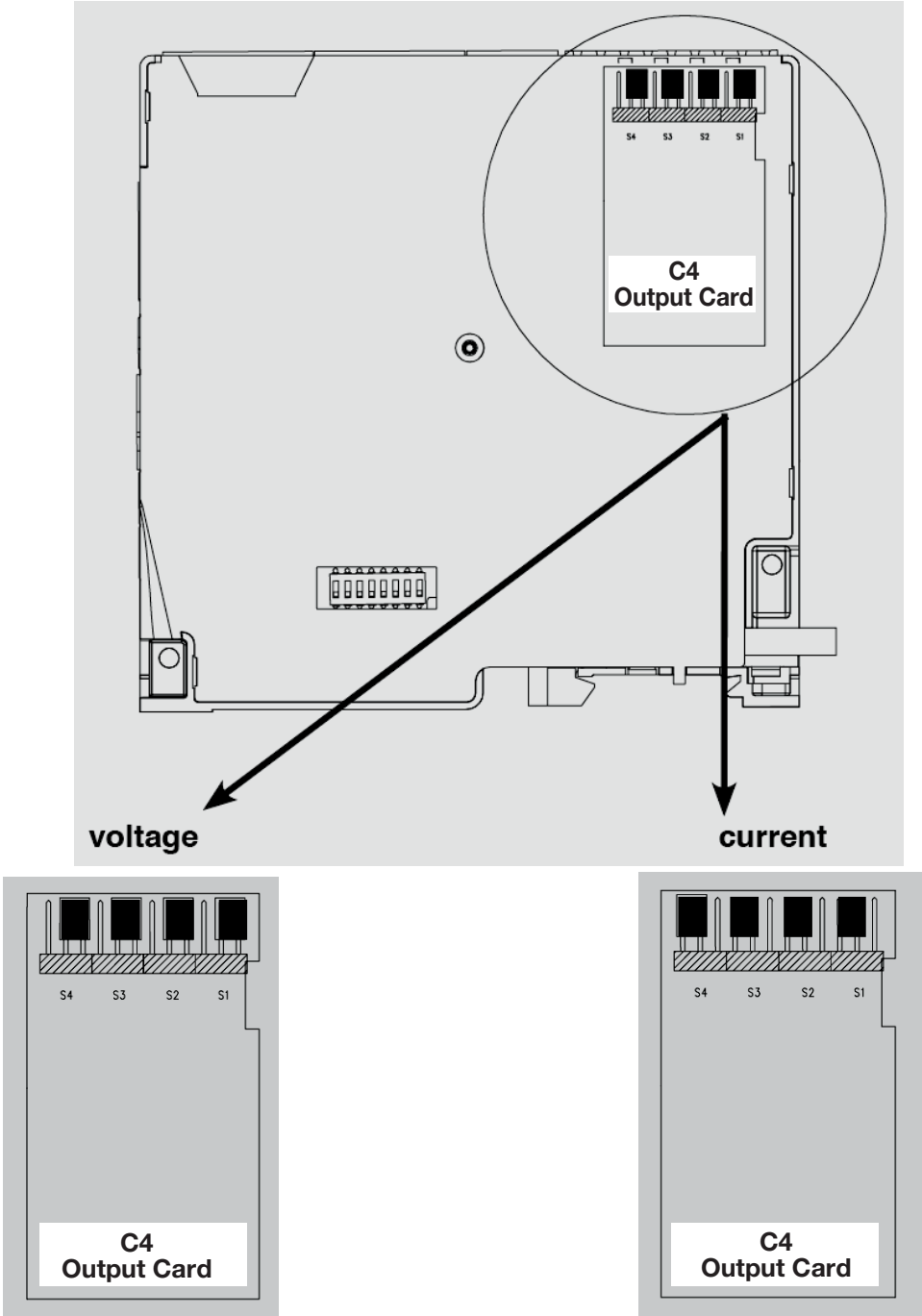
Outputs 5 - 8: TRIAC Type

TRIAC outputs: Voltage: 24...230Vac, max 1A

Wiring Schematic for Outputs 5 - 8, TRIAC Outputs
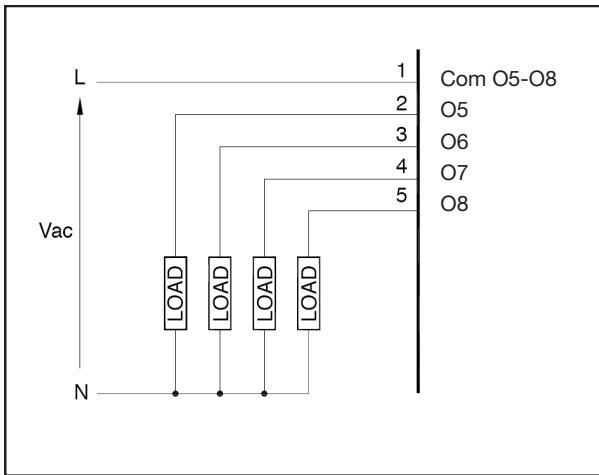
PIN Legend

PIN	Name	Description
1	Com O5-O8	Outputs Common
2	O5	Output 5
3	O6	Output 6
4	O7	Output 7
5	O8	Output 8

Outputs 5 - 8: Relay Type

Outputs Out 5 - Out 8, Relay outputs: Ir = 3A max, NO (normally open)

V = 250V/30 Vdc $\cos\varphi$ = 1; I = 12A max

Wiring Schematic for Outputs 5 - 8, Relay Outputs
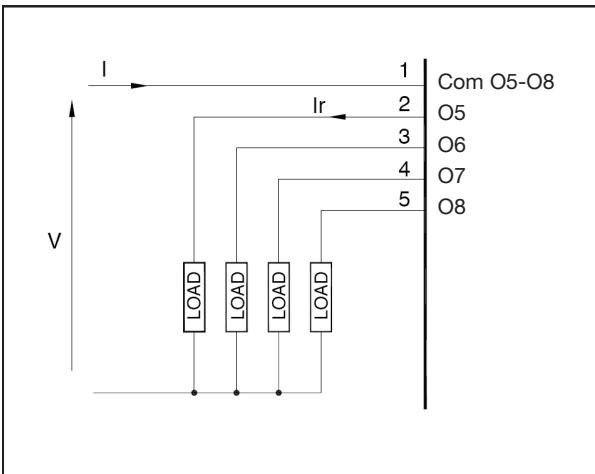
PIN Legend

PIN	Name	Description
1	Com O5-O8	Outputs Common
2	O5	Output 5
3	O6	Output 6
4	O7	Output 7
5	O8	Output 8

Outputs 9, 10: Relay Type

Outputs Out 9, Out 10, Relay outputs: 5A max

$V = 250V/30Vdc \cos\varphi = 1; I = 5A$ max

Wiring Schematic for Outputs 9 & 10, Relay Outputs
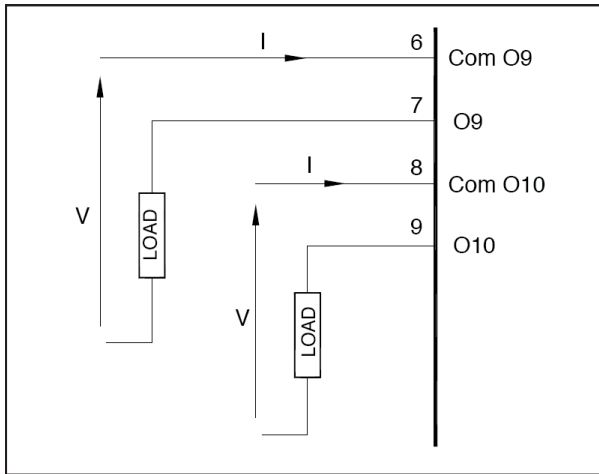
PIN Legend

PIN	Name	Description
1	Com O9	Output Common O9
2	O9	Output O9
3	Com O10	Output Common O10
4	O10	Output O10

7.6.2 Connector J2 (Power Supply, Digital Input 1 & Digital Input 2)
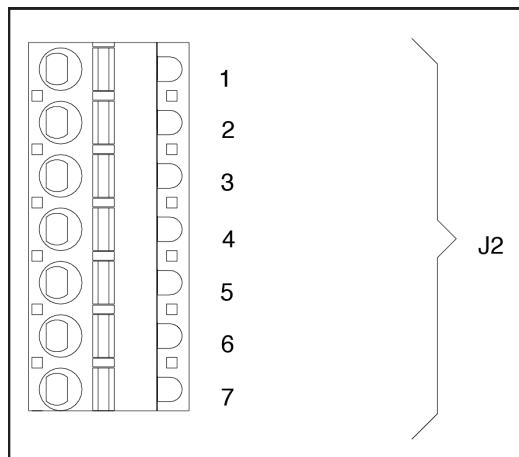
	0.14 - 0.5mm²	28-20AWG
	0.25 - 0.5mm²	23-20AWG

Wiring Schematic for J2 - Power Supply, Digital Inputs
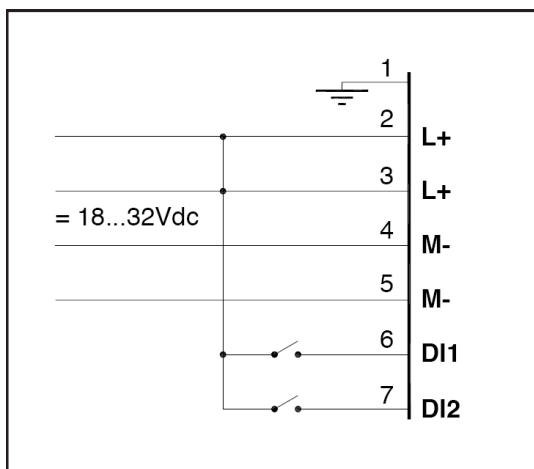
PIN Legend

PIN	Name	Description
1	⏚	Ground
2	L+	Power Supply 18 - 32 Vdc
3	L+	Power Supply 18 - 32 Vdc
4	M-	Power Supply 18 - 32 Vdc
5	M-	Power Supply 18 - 32 Vdc
6	DI1	Digital Input 1
7	DI2	Digital Input 2

7.6.3 Connector J3 (Auxiliary Inputs)
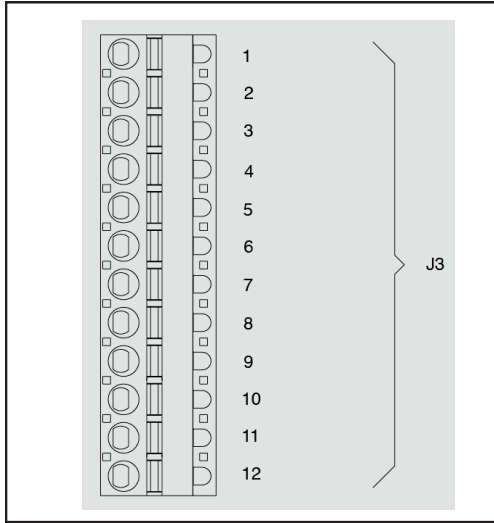
	0.14 - 0.5mm²	28-20 AWG
	0.25 - 0.5mm²	23-20 AWG

Wiring Schematic for J3 - Auxiliary Inputs
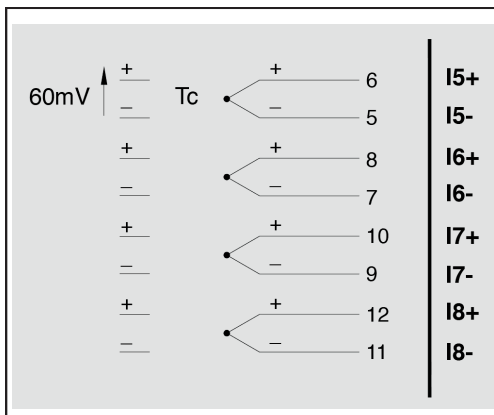
PIN Legend

PIN	Name	Description
1	-	No Connection
2	-	No Connection
3	-	No Connection
4	-	No Connection
5	I5+	Auxiliary Input 5
6	I5-	Auxiliary Input 5
7	I6+	Auxiliary Input 6
8	I6-	Auxiliary Input 6
9	I7+	Auxiliary Input 7
10	I7-	Auxiliary Input 7
11	I8-	Auxiliary Input 8
12	I8+	Auxiliary Input 8

7.6.4 Connector J4 (Inputs 1 - 4)
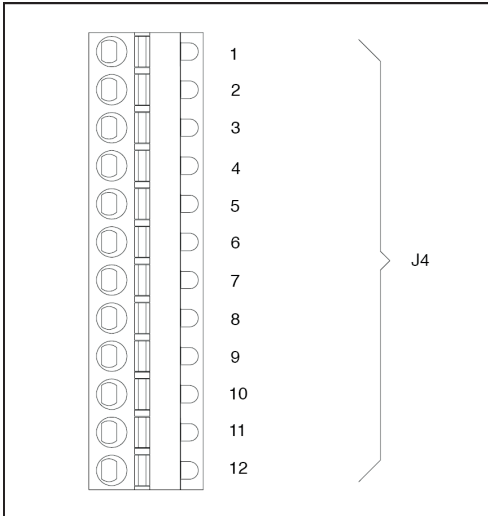
	0.14 - 0.5mm²	28-20 AWG
	0.25 - 0.5mm²	23-20 AWG

Inputs 1 - 4

Wiring Schematic for 60mV TC or Linear (Analog) input
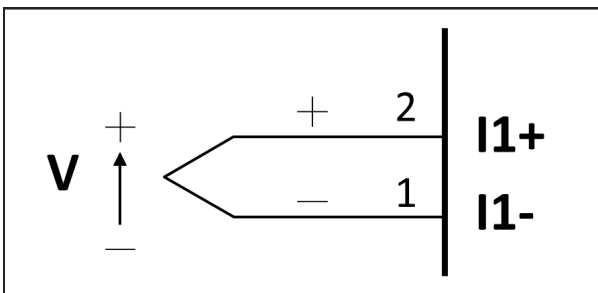
Wiring Schematic for RTD (Pt100) input
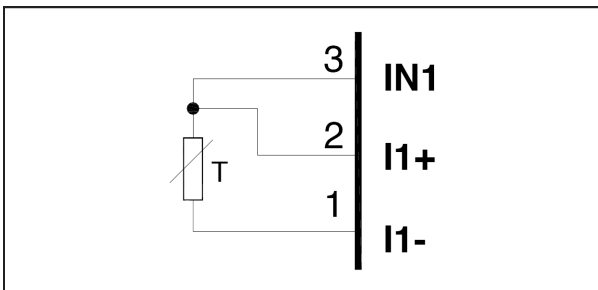
Wiring Schematic for 1V / 20mA Linear (Analog) input
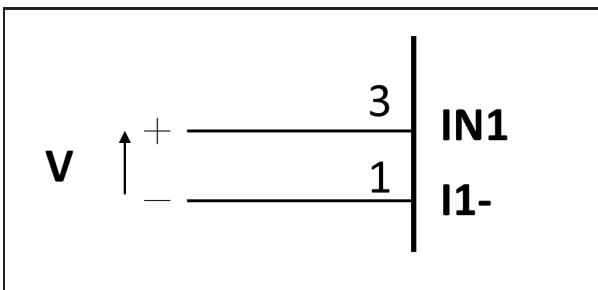
PIN Legend

PIN	60mV/Tc Linear Input	1V/20mA Linear Input	Pt100 Input
1	I1-	I1-	I1-
2	I1+		I1+
3		IN1+	IN1
4	I2-	I2-	I2-
5	I2+		I2+
6		IN2+	IN2
7	I3-	II3-	13-
8	I3+		I3+
9		IN3+	IN3
10	I4-	I4-	I4-
11	I4+		I4+
12		IN4+	IN4

7.7 Dip-Switch Configuration
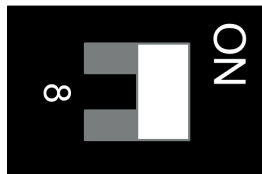
Dip Switch Legend

Dip Switch	Function	Description
1	Load Connection	See Load Configuration Table Below.
2		
3		
4	No Function	
5	Frequency	ON: 60 Hz OFF: 50 Hz
6	Factory Default	ON: Resets Controller to Factory Settings
7	Simulation	ON: Simulation Mode
8	RS485 Communications	ON: When the device is the ONLY RS-485 device or when it is the LAST RS-485 device

Load Configuration Table

Dip Switch			Load Connection Type
1	**2**	**3**	
OFF	OFF	OFF	4 independent zones (4 single-phase loads)
ON	OFF	OFF	Zone 1: 3-phase load, star (wye) connection, with neutral
OFF	ON	OFF	Zone 1: 3-phase load, open delta connection
ON	ON	OFF	Zone 1 & 3: Two 3-phase loads, star (wye) connection, without neutral
OFF	OFF	ON	Zone 1 & 3: Two 3-phase loads, closed delta connection
ON	OFF	ON	No Function
OFF	ON	ON	No Function
ON	ON	ON	No Function

7.8 Serial Communication Ports

7.8.1 Port1 (Standard Local Bus): Connectors S1, S2, S3

Modbus RTU/RS485 Serial Interface
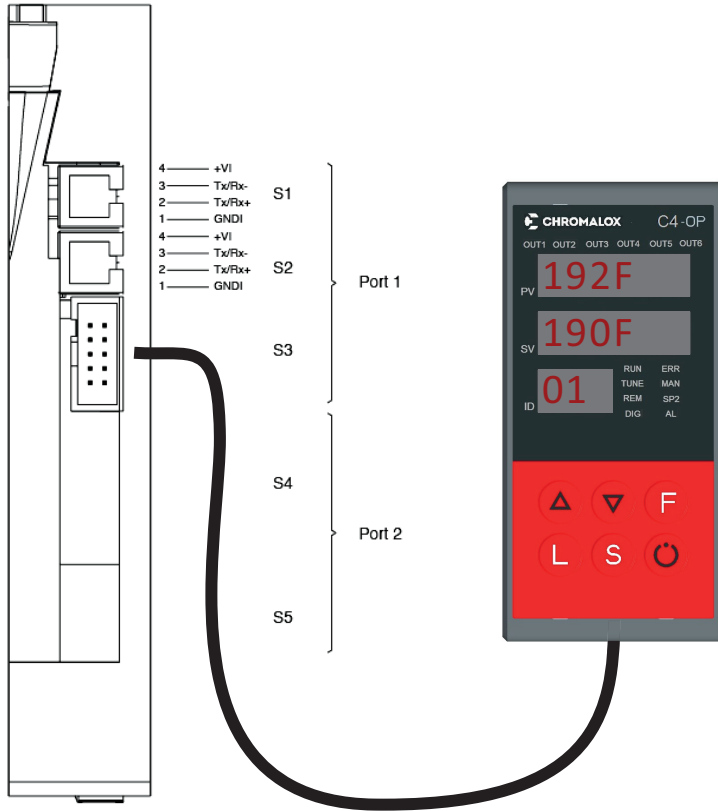
Connector S3 accepts the C4-OP local interface terminal. See the C4-OP Section for more detail.

Connector S1/S2 RJ10 4-4 Pin	Pin	Name	Description	Note
	1	GND1 (**)	-	(*) Enable #8 DIP Switch on last device on Modbus RS485 line
	2	Tx/Rx+	Data reception/transmission (A+)	
	3	Tx/Rx-	Data reception/transmission (B-)	(**) Connect the GND signal to Modbus devices with a line distance > 300 ft. (100 m)
	4	+V Reserved	-	
Cable Type: Flat telephone cable for pin 4-4 conductor 28 AWG				

7.8.2 Port2 (Optional Fieldbus): Connectors S4, S5

A. Modbus RTU/RS485, Modbus RTU/RS485

S5 Female RJ10 Connector

S4 Female RJ10 Connector

End of line Modbus Termination Dip Switch*
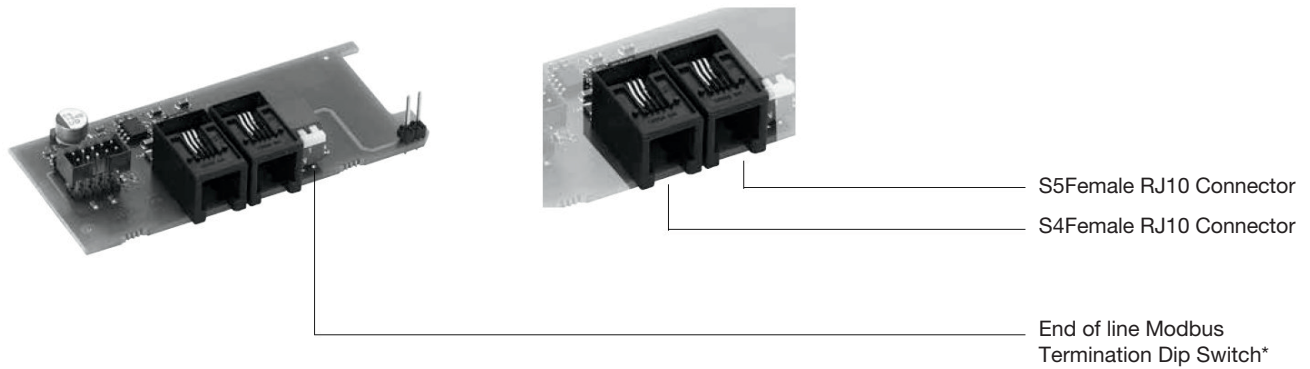
Connector S4/S5 RJ10 4-4 Pin	Pin	Name	Description	Note
	1	GND1 (**)	-	(*) Enable Fieldbus DIP Switch on last device on Modbus RS485 line
	2	Tx/Rx+	Data reception/transmission (A+)	
	3	Tx/Rx-	Data reception/transmission (B-)	(**) Connect the GND signal to Modbus devices with a line distance > 300 ft (100 m)
	4	+V Reserved	-	
Cable Type: Flat telephone cable for pin 4-4 conductor 28 AWG				

B. Modbus RTU/RS485, Profibus DP Interface

S5 Female DB9 Connector

S4 Female RJ10 Connector

Yellow LED

Red LED

Green LED

Connector S4 RJ10 4-4 Pin	Pin	Name	Description	Note
	1	GND1 (**)	-	(**) Connect the GND signal to Modbus devices with a line distance > 300 ft. (100 m)
	2	Rx/Tx+	Data reception/transmission (A+)	
	3	Rx/Tx-	Data reception/transmission (B-)	
	4	+V Reserved	-	

Cable Type: Flat telephone cable for pin 4-4 conductor 28 AWG

Connector S5 D-Sub 9 Pins Male	Pin	Name	Description	Note
	1	Shield	EMC Production	Connect the terminal resistances as shown in the figure.
	2	M24V	Output Voltage - 24V	
	3	RxD/TxD-P	Data reception/transmission	
	4	n.c.	n.c.	
	5	DGND	Data Ground	
	6	VP	Positive Power Supply +5V	
	7	P24V	Output Voltage +24V	
	8	RxD/TxD-N	Data Reception/Transmission	
	9	n.c.	n.c.	

Cable Type: Shielded 1 pair 22 AWG conforming to PROFIBUS.

C. Modbus RTU/RS485, CANopen Interface

S5 Male DB9 Connector
S4 Female RJ10 Connector

Red LED
Green LED

Connector S4 RJ10 4-4 Pin	Pin	Name	Description	Note
	1	GND1 (**)	-	(**) Connect the GND signal among Modbus devices with a line distance > 300 ft. (100 m)
	2	Rx/Tx+	Data reception/transmission (A+)	
	3	Rx/Tx-	Data reception/transmission (B-)	
	4	+V Reserved	-	

Cable Type: Flat telephone cable for pin 4-4 conductor 28 AWG

Connector S5 D-Sub 9 Pins Female	Pin	Name	Description	Note
	1	-	Reserved	Connect the terminal resistances as shown in the figure.
	2	CAN_L	CAN_L bus line (domination low)	
	3	CAN_GND	CAN Ground	
	4	-	Reserved	
	5	(CAN_SHLD)	Optional CAN Shield	
	6	(GND)	Optional Ground	
	7	CAN_H	CAN_H bus line (domination High)	
	8	-	Reserved	
	9	(CAN_V+)	Optional CAN external positive supply (dedicated for supply of transceiver and optocouplers, if galvanic isolation of the bus node applies)	

Cable Type: Shielded 2 pairs 22/24 AWG conforming to CANopen.

D. Modbus RTU/RS485, DeviceNet Interface

- S5Male Connector
- S4Female RJ10 Connector
- Red LED
- Green LED

Connector S4 RJ10 4-4 Pin	Pin	Name	Description	Note
	1	GND1 (**)	-	(**) Connect the GND signal to Modbus devices with a line distance > 300 ft. (100 m)
	2	Rx/Tx+	Data reception/transmission (A+)	
	3	Rx/Tx-	Data reception/transmission (B-)	
	4	+V Reserved	-	
Cable Type: Flat telephone cable for pin 4-4 conductor 28 AWG				

Connector S5 D-Sub 9 Pins Male	Pin	Name	Description	Note
	1	V-	Negative Power Supply	Connect a 120Ω / 1/4W resistance between the "CAN_L" and "CAN_H" signals at each end of the DeviceNet network.
	2	CAN_L	Low Signal	
	3	SHIELD	Shield	
	4	CAN_H	High Signal	
	5	V+	Positive Power Supply	
Cable Type: Shielded 1 pair 22 AWG conforming to PROFIBUS.				

E. Modbus RTU/RS485, Modbus TCP/Ethernet Interface

S5Female RJ45 Connector

S4Female RJ10 Connector

Yellow LED

Green LED

Connector S4 RJ10 4-4 Pin	Pin	Name	Description	Note
	1	GND1 (**)	-	(**) Connect the GND signal among Modbus devices with a line distance > 300 ft. (100 m)
	2	Rx/Tx+	Data reception/transmission (A+)	
	3	Rx/Tx-	Data reception/transmission (B-)	
	4	+V Reserved	-	
Cable Type: Flat telephone cable for pin 4-4 conductor 28 AWG				

Connector S5 RJ45	Pin	Name	Description	Note
	1	TX+	Data + Transmission	
	2	TX-	Data - Transmission	
	3	RX+	Data + Reception	
	4	n.c.		
	5	n.c.		
	6	RX-	Data - Reception	
	7	n.c.		
	8	n.c.		
Cable Type: Use standard category 6 cable according to TIA/EIA-568A.				

Modbus RTU/RS485, Ethernet IP Interface or Modbus RTU/RS485, EtherCAT Interface or Modbus RTU/RS485, ProfiNET Interface

H4 and H6 LEDs

H4 and H6 LEDs are visible on the front side
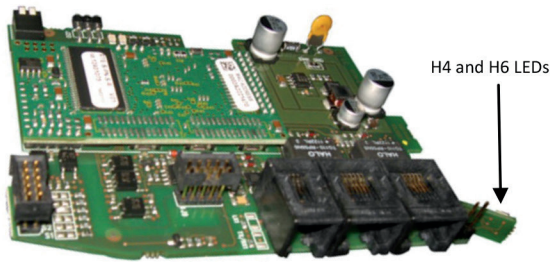
LED Logic - Ethernet IP Fieldbus Module

H1	LED GREEN Module State	
H2	LED RED Module State	
H7	LED RED Network State	
H8	LED GREEN Network State	
H4	LED Bicolor GREEN (H1) RED (H2)	
H6	LED Bicolor GREEN (H8) RED (H7)	
J1	Connector	Port ETH0
J3	Connector	Port ETH1
J2	Connector	Serial Modbus
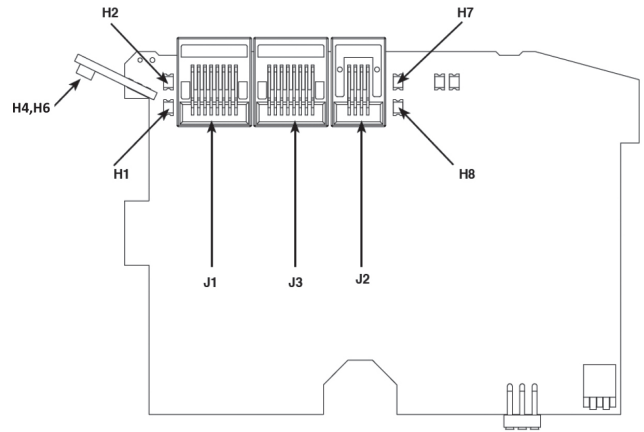
LED Logic - EtherCAT Fieldbus Module

H1	LED GREEN Link/Activity	Port ETH0
H2	LED RED Run	Run
H7	LED RED Run	Run
H8	LED GREEN Link/Activity	Port ETH1
H4	LED Bicolor GREEN (H1) RED (H2)	Port ETH0
H6	LED Bicolor GREEN (H8) RED (H7)	Port ETH1
J1	Connector	Port ETH0 (IN)
J3	Connector	Port ETH1 (OUT)
J2	Connector	Serial Modbus

LED Logic - ProfiNet Fieldbus Module

H1	LED GREEN Link	Port ETH0
H2	LED RED Signal	Port ETH0
H7	LED RED Activity	Port ETH1
H8	LED GREEN Link	Port ETH1
H4	LED Bicolor GREEN (H1) RED (H2)	Port ETH
H6	LED Bicolor GREEN (H8) RED (H7)	Port ETH
J1	Connector	Port ETH0
J3	Connector	Port ETH1
J2	Connector	Serial Modbus

Connector J2 RJ10 4-4 Pin

| Pin	Name	Description	Note
1	GND1 (**)	-	(**) It is adviseable to also connect the GND signal between Modbus devices with a line distance > 300 ft. (100 m)
2	Tx/Rx+	Data reception/ transmission (A+)	
3	Tx/Rx-	Data reception/ transmission (B-)	
4	+V Reserved	-	

Cable Type: Flat telephone cable for pin 4-4 conductor 28 AWG

Connector J1 and J3 RJ45

Pin	Name	Description	Note
1	TX+	Data Transmission +	
2	TX-	Data Transmission -	
3	RX+	Data Reception +	
4	n.c.		
5	n.c.		
6	RX-	Data Reception -	
7	n.c.		
8	n.c.		

Cable Type: Use standard category 5 cable according to TIA/EIA-568B

7.8.3 Connection Example: Communication Ports

A. Supervisory PC/PLC with multiple C4 Modules, with C4-OP.

May need to use Autobaud to synchronize communications.
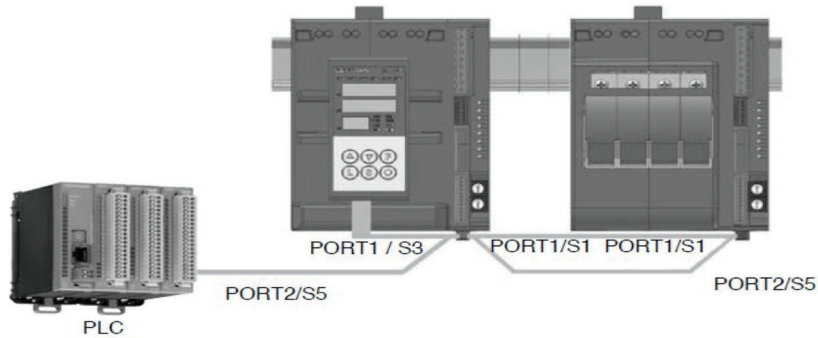
B. HMI Connection via Modbus RTU (RS-485) to four C4 Modules

May need to use Autobaud function to synchronize communications.
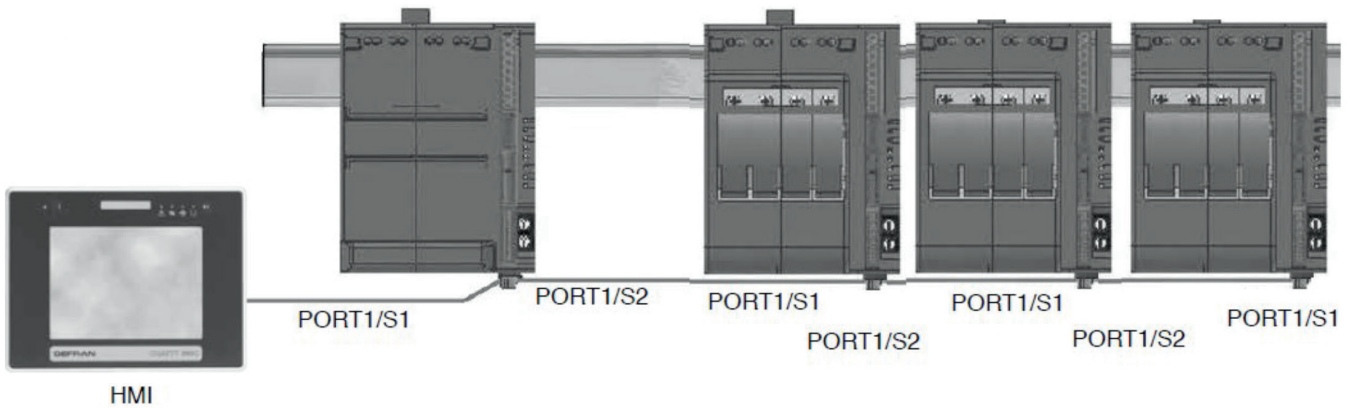
C. SCADA System with fieldbus interface, Single Master Setup

May need to use AutoNode Sequence to set communications.
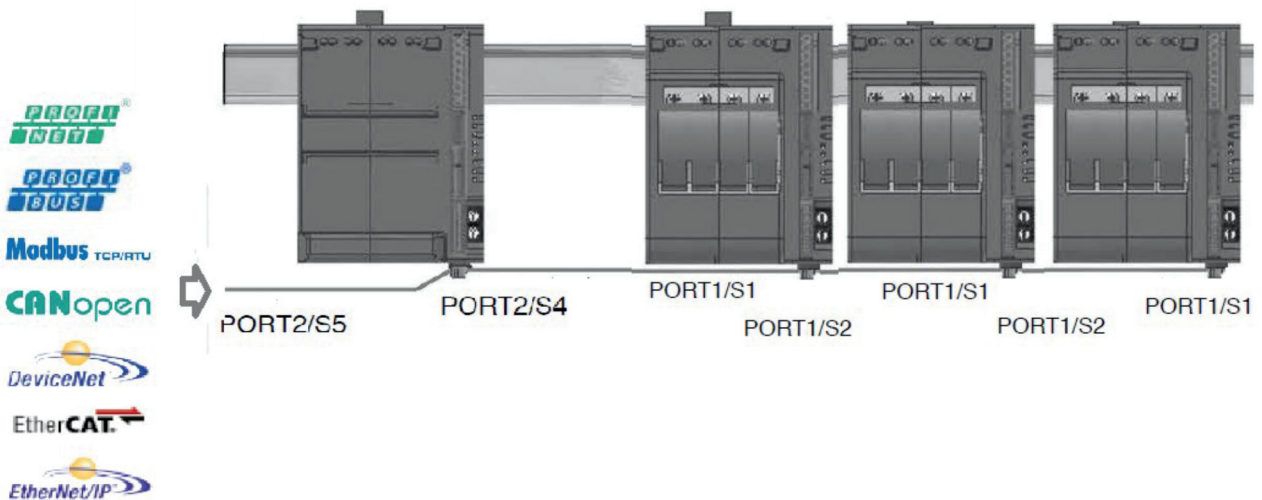
D. C4 with Multiple Master Communications Ports

This configuration will allow two masters to simultaneously operate. This will allow the fieldbus to operate, while allowing the 2nd port to be used for local information, verification of process, or for configuration tool C-PWR software to be utilized.

Use Autonode to set communications.
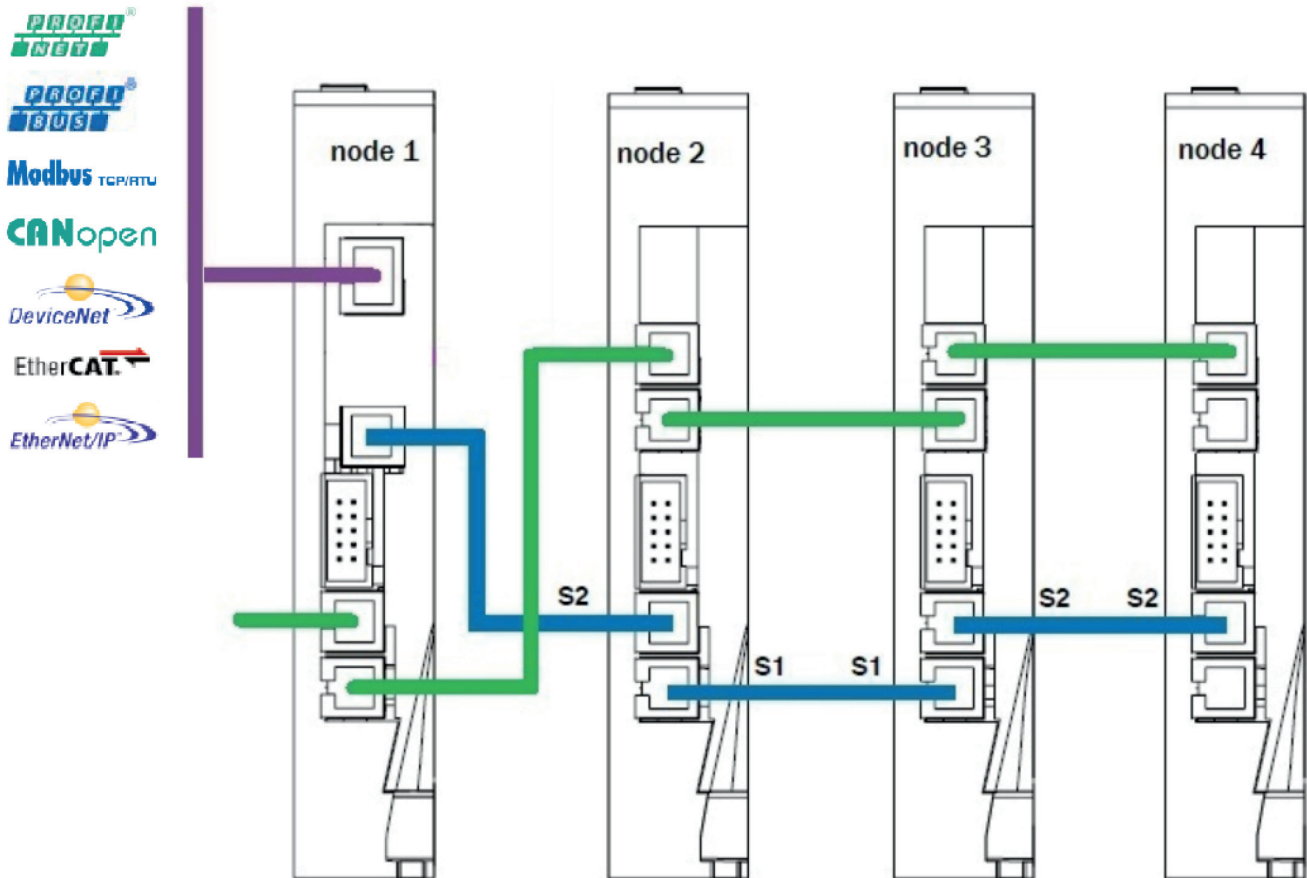
C4 or C4-IR Fieldbus Network

Purple: Fieldbus Network wiring to Master Unit.
           SW7 must be set to "off" on all units.

Blue: Fieldbus Network Slave Unit connection via RS-485.

Green: 2nd Master Communications Port for local master or configuration
           using C-PWR Software

E. C4 with a Single Master Communication Port

Use Autonode Sequence for configuration. See section 12.2
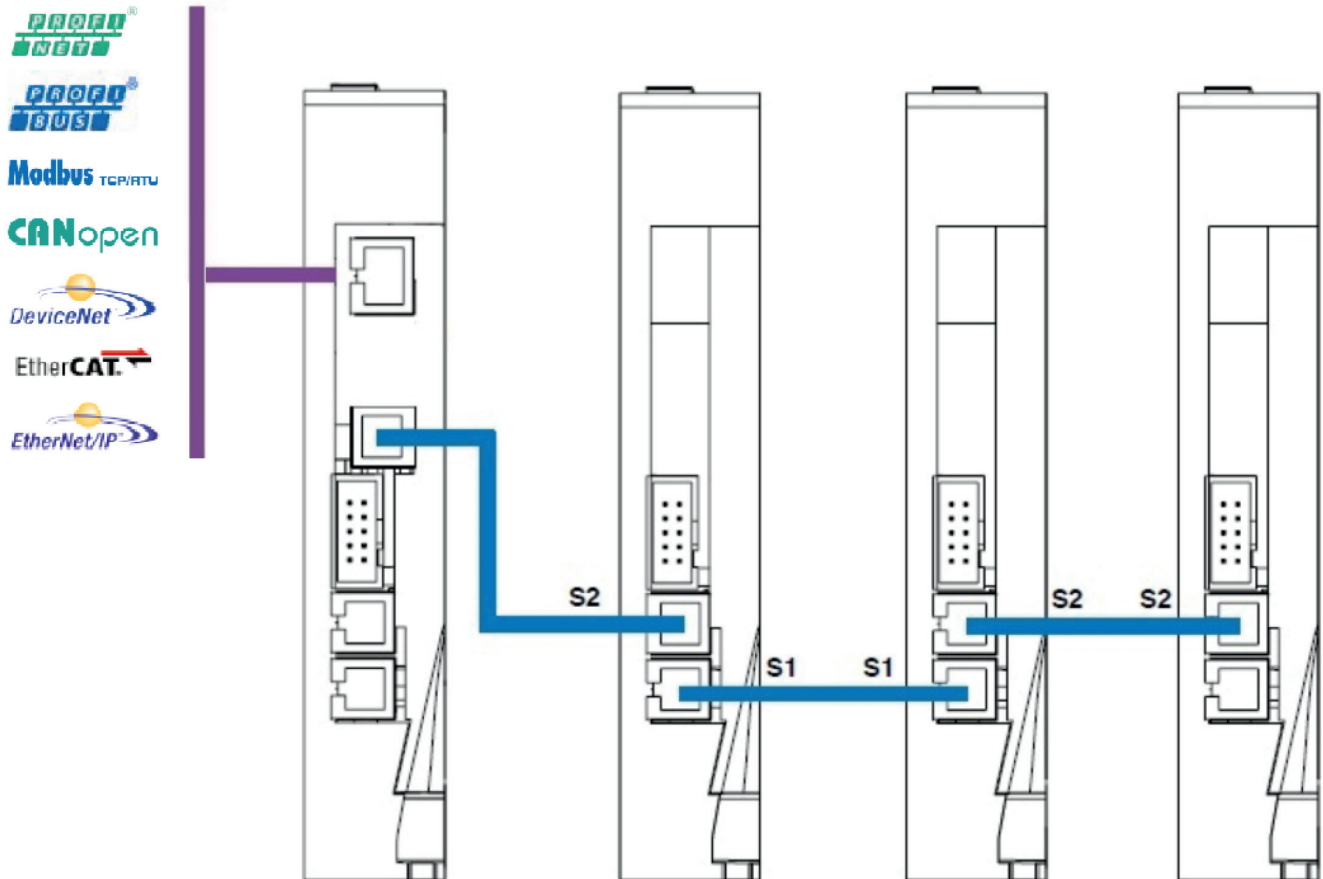
C4 or C4-IR Fieldbus Network

Purple: Fieldbus Network wiring to Master Unit.
SW7 must be set to "off" on all units.

Blue: Fieldbus Network Slave Unit connection via RS-485.

C-PWR Configuration Tool can be used via RS-485 ports only. Fieldbus connection must be broken to utilize configuration.

Single Master systems can be expanded to two master systems in field.
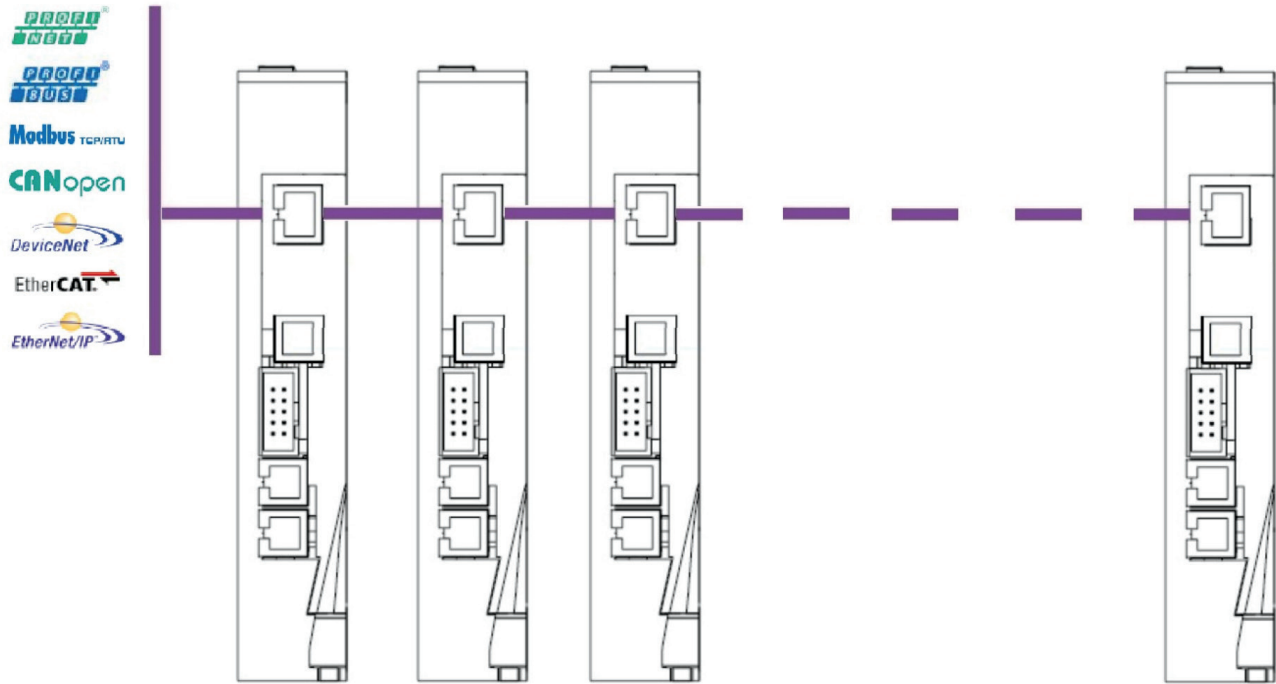
C4 or C4-IR Fieldbus Network
Purple: Fieldbus Network wiring to Master Unit.
SW7 must be set to off on all units.

C4 or C4-IR Fieldbus Network

Purple: Fieldbus Network wiring to Master Unit. SW7 must be set to "off" on all units.

8. Load Connection Example

The following wiring diagrams and electrical equations are provided as a reference for this manual. The three phase equations shown can be applied to any balanced Delta or Wye (star) circuit. The terms used in the equations are identified below:

Vl = Line Voltage
Vp = Phase Voltage
Il = Line Current (Amps)
Ip = Phase Current (Amps)

Wt = Total Watts
R1 = R2 = R3 = Element Resistance
Wc = Wattage per Circuit (Equal Circuits)
Rc = Circuit Resistance in Ohms Measured Phase to Phase

3Ø Delta
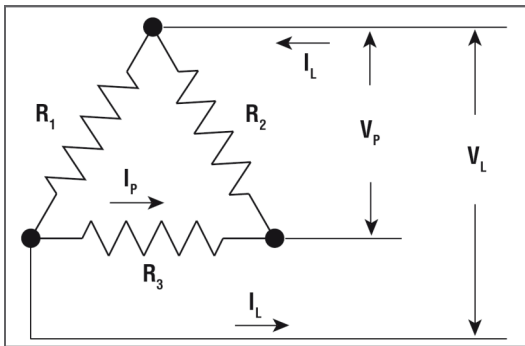
$V_P = V_L$ $V_L = V_P$
$W_T = 1.73\ I_L \times V_L$ $W_T = 3\ (V_L^2 \div R_1)$
$I_P = I_L \div 1.73$ $I_L = I_P \times 1.73$
$R_C = (2 \times V_L^2) \div W_C$ $R_C = V_L^2 \div 0.5 W_C$
$W_C = 1.73\ I_L \times V_L \div \#\ \text{CIRCUITS}$

3Ø Wye (Star)
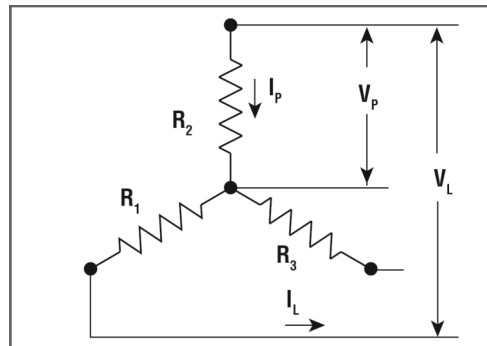
$V_P = V_L \div 1.73$ $V_L = V_P \times 1.73$
$W_T = 1.73\ I_L \times V_L$ $W_T = V_L^2 \div R_1$
$I_P = I_L$ $I_L = I_P$
$R_C = (2 \times V_L^2) \div W_C$ $R_C = V_L^2 \div 0.5\ W_C$
$W_C = 1.73\ I_L \times V_L \div \#\ \text{CIRCUITS}$

⚠ CAUTION

The model C4 has specific dipswitch settings for the various load configurations. Incorrectly setting with a mismatch load configuration could result in unpredicted results. Please refer to section 7.7 or the Load Connection examples for these proper dipswitch settings.

Open Delta & Wye

Three phase heating circuits are most efficient when operated under balanced conditions. If it is necessary to operate an unbalanced load, the equations below can be used to calculate the circuit values for open three phase Delta or Wye circuits. The terms used in the equations are identified below:

3Ø Open Delta
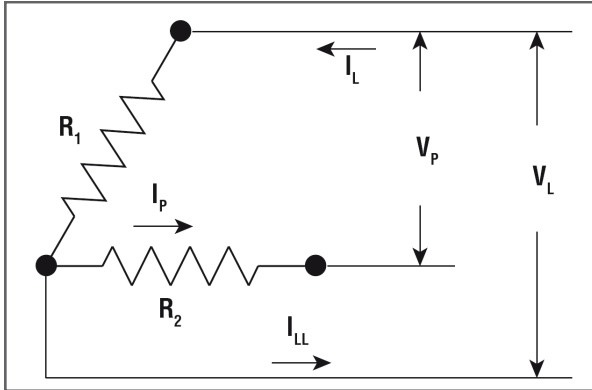
$V_P = V_L$ $V_L = V_P$

$W_T = 2V_L \times I_L$ $W_T = 2(V_L^2 \div R1)$

$I_P = I_L$ $I_L = I_P$

$W_C = 2V_P \times I_P$ $I_{LL} = 1.73 \times I_P$

Note:
The loss of a phase or failure of an element in a three (3) element Delta circuit will reduce the wattage output by 33%

3Ø Open Wye (Star)
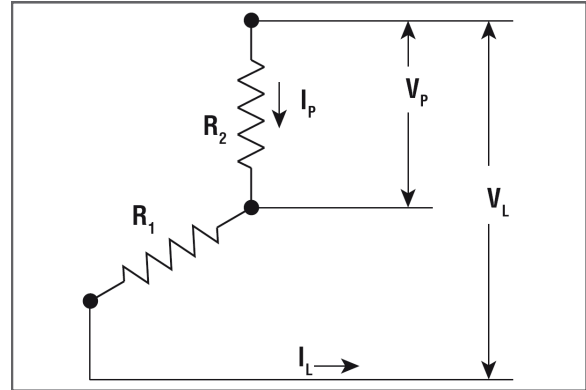
$V_P = V_L \div 2$ $V_L = V_P \times 2$

$W_T = I_L \times V_L$ $W_T = V_L2 \div 2R1$

$I_P = I_L$ $I_L = I_P$

$R_C = V_L2 \div W_C$

Note:
The loss of a phase or failure of an element in a three (3) element Wye circuit will reduce the wattage output by 50%. Heating elements are basically in series on single phase power.

## 8.1 4 Single-Phase Loads, 3-phase line with neutral

> ### ⚠CAUTION
>
> *The model C4 has specific dipswitch settings for the various load configurations. Incorrectly setting with a mismatched load configuration could result in unpredicted results. Please refer to section 7.6 or the Load Connection examples for these proper dipswitch settings.*

Dip Switch			
1	**2**	**3**	**Load Connection Type**
OFF	OFF	OFF	4 independent zones (4 single phase loads)

Physical Wiring Diagram

Schematic with Fuse & SCR Location
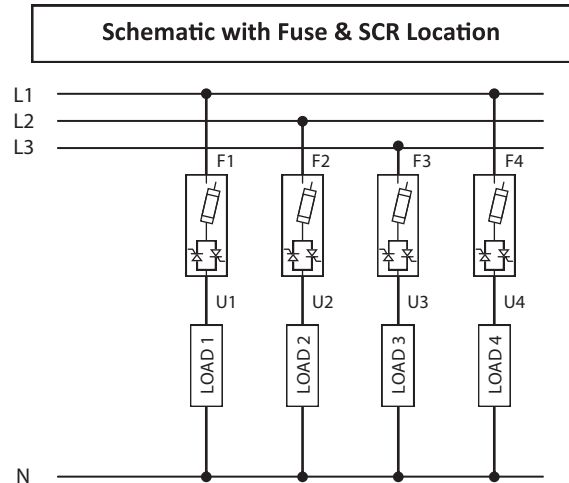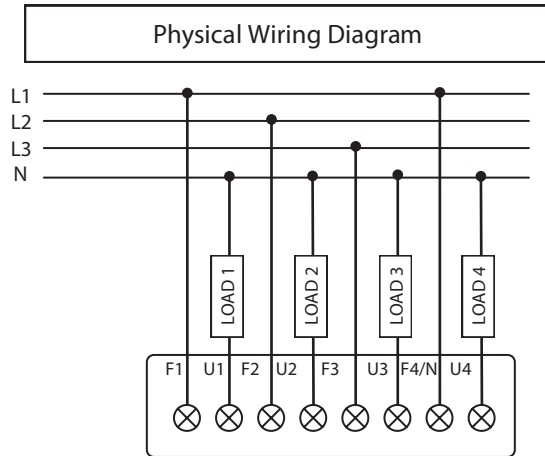
8.2 4 Single-Phase Loads, 3-phase line without neutral
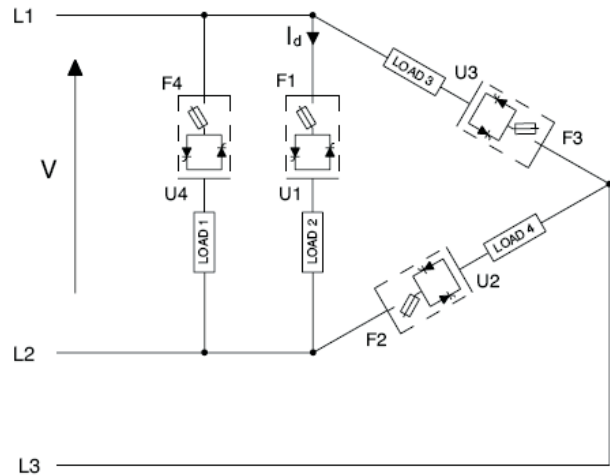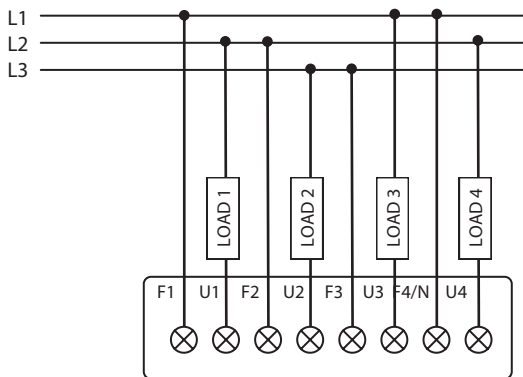
Dip Switch			
1	**2**	**3**	**Load Connection Type**
OFF	OFF	OFF	4 independent zones (4 single phase loads)

$$Id = \frac{P}{V\cos\varphi}$$

V = line voltage
Id = load current
P = total power

If resistive load $\cos\varphi = 1$

8.3 Two 3-Phase Loads, Closed Delta
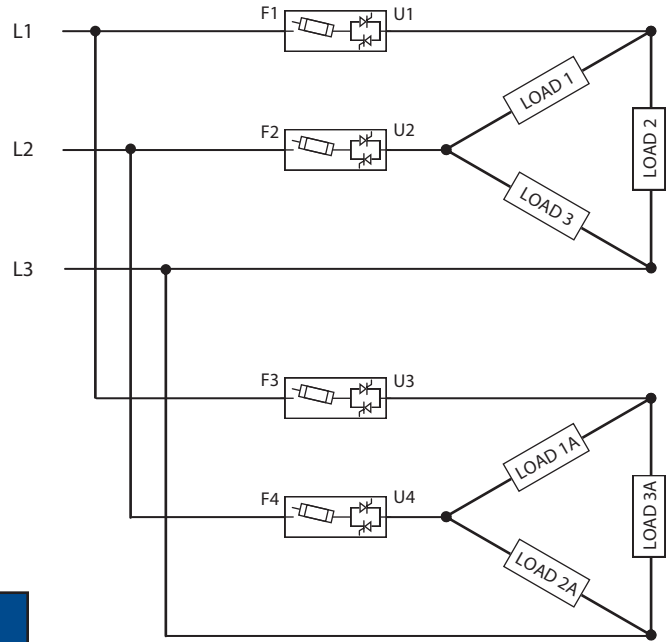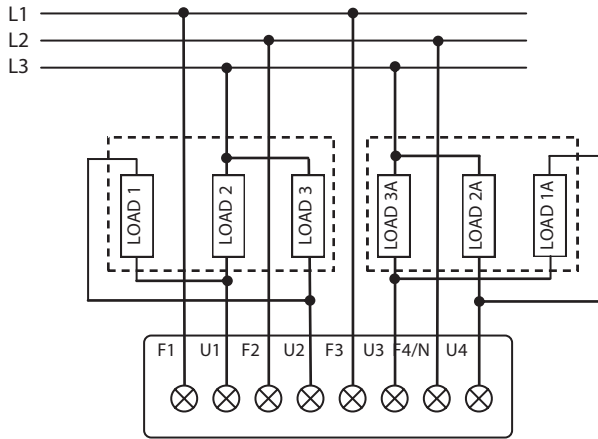
Dip Switch			Load Connection Type
1	**2**	**3**	
OFF	OFF	ON	Zone 1 & 3: Two 3-phase loads, closed delta connection

8.4 Two 3-phase loads, star (wye) without neutral
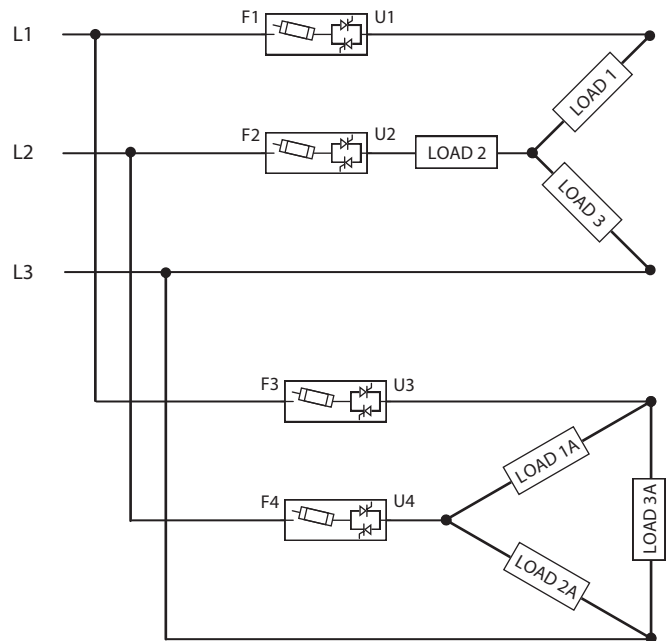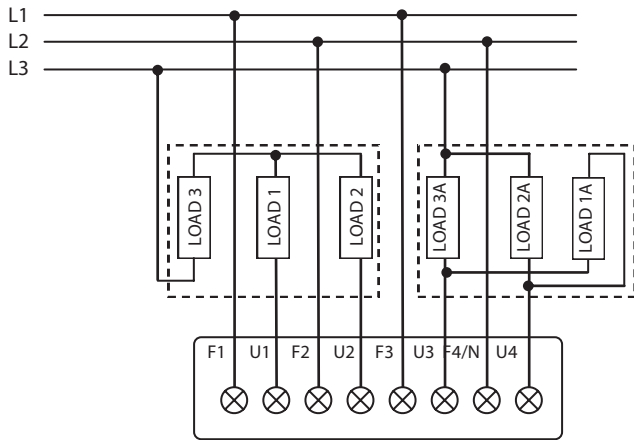
Dip Switch			Load Connection Type
1	**2**	**3**	
ON	ON	OFF	Zone 1 & 3: Two 3-phase loads, star (wye) connection, without neutral

8.5 One 3-phase load active, One 3-phase load inactive, Wye without neutral
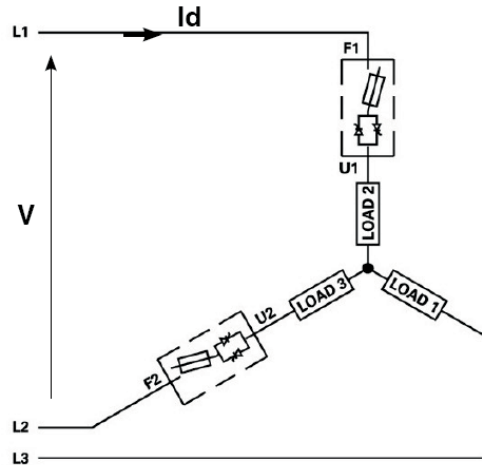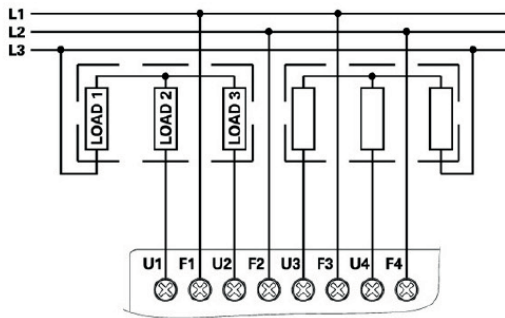
Dip Switch			
1	2	3	Load Connection Type
ON	OFF	ON	Zone 1: 3-phase load, star (wye) connection, with neutral

$$Id = \frac{P}{\sqrt{3} \cdot V}$$

V =   line voltage
Id =   load current
P =   total power

8.6 One 3-phase load, inside delta
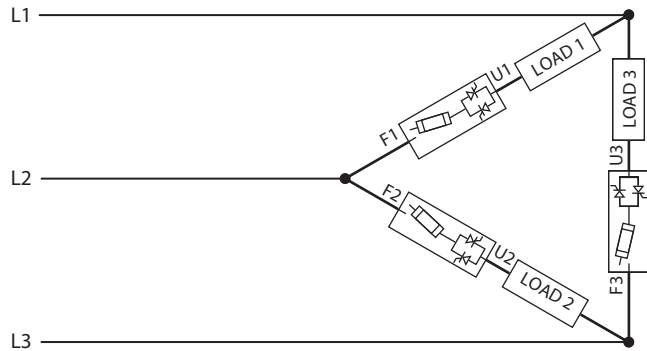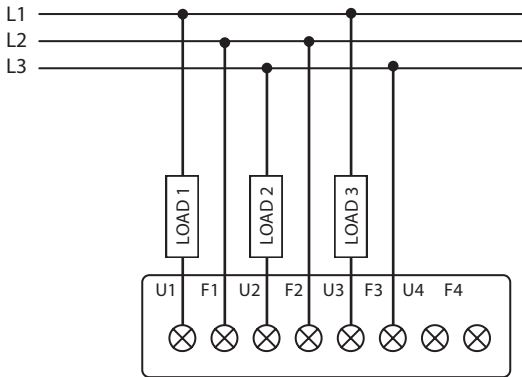
Dip Switch			
1	2	3	Load Connection Type
OFF	ON	OFF	Zone 1: 3-phase load, open delta connection

9. Inductive and Transformer Coupled Load Guidelines

The model C4 should not be used for Inductive or Transformer Coupled Loads. The model C4-IR is capable of being used for these types of loads. Please refer to the C4-IR Hardware Manual for more details.

---

10. Communications Port (Modbus RTU/RS485)

A network typically has a Master that "manages" communication by means of "commands," and Slaves that carry out these commands.

Parameter	Default	Range
ID	1	1...99
BaudRate	19.2kbits/s	1,2...57.6k bits/s
Parity	None	Parity/Odd Parity/None
StopBits	1	-
DataBits	8	-

C4 modules are considered Slaves to the network master, which is usually a supervision terminal or a PLC.

They are positively identified by means of a node address (ID) set on rotary switches (tens + units).

A maximum of 99 C4 modules can be installed in a serial network, with node address selectable from "01" to "99" in standard mode in which each C4 identifies 4 zones with sequential node address starting with the code set on the rotary switches.

C4 modules have a ModBus serial (Serial 1) and, optionally (see order code) a Fieldbus serial (Serial 2) with one of the following protocols: Modbus RTU, Profibus DP, CAN open, DeviceNet, and Ethernet Modbus TCP.

The ModBus RTU port 1 has the following factory settings (default):

| Procedures | Position of Rotary Switches | | Description |
	Tens	Units	
AutoBaud	0	0	It enables to set the correct BaudRate Value
AutoNode*	A	0	It enables to transfer the correct node (ID) address (tens)

The following procedures are indispensable for the Modbus protocol. For the other protocols, see the specific manuals. The use of rotary switches (A...F) letters is for particular procedures described in the following paragraphs.

Section 11 Autobaud Function

11.1 Autobaud Port 1 Sequence

11.2 Autonode Sequence for Fieldbus Use Function

Adapt the serial communication speed and parity of the C4 modules to the connected supervision terminal or PLC. If a fieldbus card (port 2) is used then port 1 settings must remain at factory settings.

Green LED L1 "STATUS" mentioned in the procedure can vary its behavior based on parameter Ld.1, which is set to a default value of 16.

Procedure

1. Connect the serial cables for all modules on the network to serial 1 and to the supervision terminal.

2. Set the rotary switch on the C4 modules to be installed, or on all modules present in case of first installation, to position "0+0".

3. Check that the green "STATUS" LEDs flash at high frequency (10Hz).

4. The supervision terminal must transmit a series of generic "MODBUS" read messages to the network.

5. The procedure is over when all of the green L1 "STATUS" LEDs on the C4 modules flash at a normal frequency (2Hz) (if parameter 197 Ld. 1 = 16 as default).

The new speed parameter is saved permanently in each C4; therefore, the "AUTOBAUD SERIAL 1" sequence does not have to be run at subsequent power-ups.

When the rotary switch is turned, the green "STATUS" LED stays on steadily for about 6 seconds, after which it resumes.
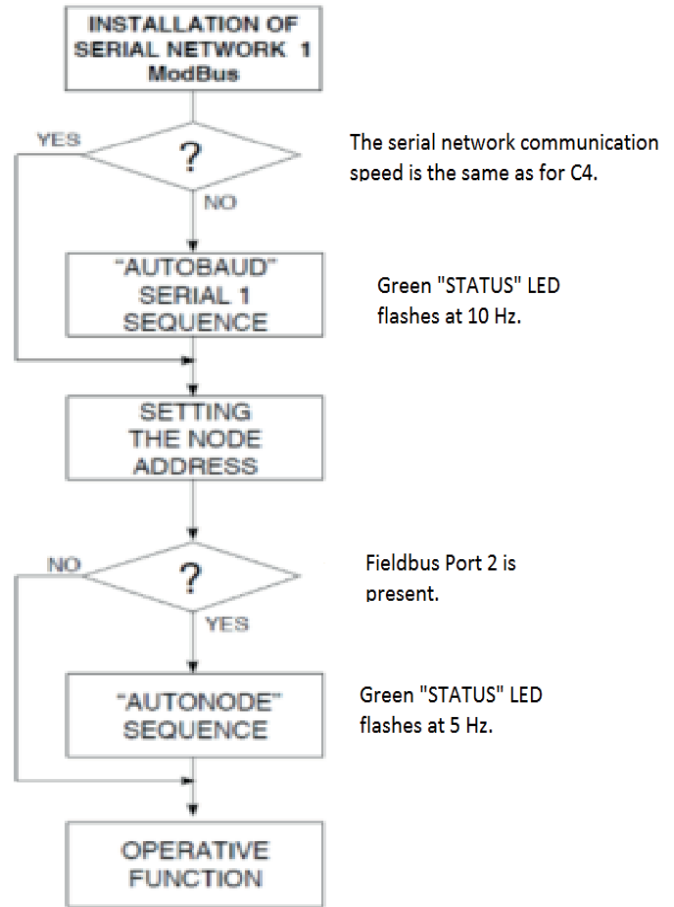
11.2 Autonode Sequence for Fieldbus Use

Function

Autonode should be run for all field bus installations.

The L1 "STATUS" green LED mentioned in the procedure can vary its behavior according to the Ld.1 parameter which is 16 as default.

Procedure

1. Connect the serial cables to all the module in the serial 1 network, disconnect supervision or C4-OP terminals.

2. Turn the rotary switches from the set node address to the position "A + 0".

3. Check that the "STATUS" green LED is blinking at an average frequency (5Hz) for 10 seconds and then that it returns to normal blinking (2Hz).

4. Turn the rotary switches in the position of the node address.

12. Specifications

INPUTS	

IN1 Analog Process Inputs

Function	Acquisition of process variable
Max. Error	0,2% f.s. ± 1 scale point at room temperature of 25°C
Thermal drift	< 100 ppm/°C f.s.
Sampling time	120 ms
Thermocouple Tc (ITS90)	J,K,R,S,T (IEC 584-1 ,CEI EN 60584-1, 60584-2) Fault cold junction comp 0,1°/°C
Resistance thermometer RTD (ITS90)	Pt1 00 (DIN 43760) MMax line resistance 20ohm
Voltage	linear: 0, . .. ,60mV, Ri>1 Mohm 0, ... , 1V, Ri> 1 Mohm a 32 segment custom linearization can be inserted
Current	Linear: 0/4 ... 20mA, Ri =50ohm a 32 segment custom linearization can be inserted

IN5, ... ,1N8 Auxiliary Analog Inputs (option)

Function	Acquisition of variables
Accuracy	1% f.s. + 1 scale point at room temperature of 25°C
Sampling time	480 ms
Thermocouple Tc (ITS90)	J,K,R,S,T (IEC 584-1, CEI EN 60584-1, 60584-2) Fault cold junction comp 0,1°/°C
Voltage	linear: 0, ... ,60mV, Ri>1 Mohm

IN9, ... IN12 Inputs Internal Current Transformers CT

Function	Read internal CTs; (The acquisition of current values is valid for voltages in a range of 90 ... 530Vac)
Accuracy	1% f.s. ± 1 scale point at room temperature of 25°C
Sampling time	60 ms

DI1 ... DI2 Digital Inputs

Function	Configurable (default: disabled)
Type	PNP, 24 VDC, 8mA 3500V isolation

OUTPUTS	

OUT1, ... , OUT4 Heat Control Outputs Connected Directly to Solid State Power Units

Function	Configurable (default: heat control) Control state is displayed by LED (01 , . .. ,02)

OUT5, ... , OUT8 Cool Control Outputs (option)

Function	Configurable (default: cool control)
Relay Type	3A NO Contact, 250V/30Vdc COSφ =1
Continuous Type	0/2 .. . 10V, (default) max 25mA protection against short circuit 0/4 . .. 20mA, max. load 500ohm 1500V isolation
Logic Type	24 Vdc, > 18V a 20mA
Triac Type	230V/max 4A AC51 (1 A for every channel)

OUT9, ... , OUT10 Alarms

Function	Configurable (default: alarms)
Relay Type	5A NO Contact, 250V/30Vdc COSφ =1

COMMUNICATIONS

PORT 1 (present)

Function	Local serial communication
Protocol	ModBus RTU
Baudrate	Settable to 1,2...57.6kbits/s, (default 19.2 kbit/s)
Address	Node Settable by rotary switch
Type	RS485 1500V isolation, double connector RJ10 telephone type 4-4

PORT 2 (Fieldbus Option)

Function	Fieldbus serial communication
Protocol	ModBus RTU, type RS485, baudrate 1,2...57.6 kbit/s CANOpen 10K….1Mbit/s DeviceNet 125K...0.5Mbit/s Profibus DP 9.6K...12 Mbit/s Ethernet Modbus TCP, Ethernet IP 10/100Mbps EtherCAT, ProfiNET 100Mbps

POWER (SOLID STATE POWER UNITS, 4 UNITS)			
Rated Voltage	480VAC		
Work Voltage	Range 24...530 Vac		
Non- repetitive Voltage	1200Vp		
Zero Switching Voltage	<20V		
Rated Frequency	50/60Hz self-setting		
Rated Current AC51	30KW	60KW	80KW
4 x 16A	4 x 30A	4 x 40A	
Non- Repetitive Overcurrent (t=20 msec)	400A	600A	1150A
I²t For Fusion (t=1...10 msec)	645A's	1010A's	6600A's
Critical Dv/dt with output Deactivated	1000V/usec		
Rated Isolation Voltage	4000V		

FUNCTIONS	
Safety	Detects short circuit or open probe circuit, probe, power supply failure, LBA alarm, HB alarm
Selection °C/°F	Configurable
Linear scale range	-1999 ... 9999
Control Actions	4 control loops: Double action (heat/cool) PID, on-off Self-tuning at power-up, Continuous Autotuning, One-shot Autotuning
pb-dt-it	0,0 ... 999,9 % - 0,00 ... 99,99 min - 0,00 ... 99,99 min
Action - Control Outputs	heat/cool - ON/OFF, PWM, GTT
Heat/Cool Max. Power Limitation	0,0 ... 100,0%
Cycle Time – Softstart	0 ... 200 s - 0,0 ... 500,0 min Softstart at phase slicing
Fault Power Setting	-100,0 ... 100,0%

Shut-Down Function	Maintains sampling of process variable PV; when active, disables control
Configurable Alarms	Alarm is assigned to an output, configurable as: maximum, minimum, symmetrical, absolute/deviation, LBA, HB
Alarm Masking	Exclusion at power-up, latch, reset by digital input
Diagnostics	SCR in short circuit (presence of current with control OFF) SCR open (presence of voltage on SCR with control ON) Load interrupted or no voltage (no current, no voltage on SCR with control ON)
Connection and Load Types Selection with Dip-Switches	4 loads single-phase, 2 loads 3-phase, star without neutral controlled on two phases 2 loads 3-phase, closed triangle controlled on two phases 1 load 3-phase, star with neutral controlled on one phase 1 load 3-phase, open triangle controlled on one phase (with 3-phase load, 4 CTs are needed if diagnostics is required)

GENERAL DATA

Power Supply	24VDC +/-25%, max 8VA
Indicators	Eight LEDS: RN CPU in run state ER Fault Signal DI1, DI2 state of digital inputs O1,...O4 state of outputs
Protection	IP20
Work/Storage Temperature	0 - 50°C (see dissipation curves) / -20°C...70°C
Relative Humidity	20 - 85% RH non-condensing
Ambient Work Conditions	Indoor use, altitude up to 2000m
Installation	DIN RAIL EN50022 or panel using screws
Installation Instructions	Installation category II, Pollution level 2, double isolation Max surrounding air temperature 50°C (for UL) Open type equipment
Weight(s)	
Models 30KW, 60KW, 80KW	1200g
Models 30KW, 60KW, with fuse holder	1600g

VOLTAGE/CURRENT CONSIDERATIONS

C4	Current (Amp)	Voltage (VAC)			Power (kW)	
	Max. Per Channel	Range	Nominal	Working	Per Channel	Controller Total
164 (4x16A)	16	24 - 530	480	120	1.9	7.7
				208	3.3	13.3
				240	3.8	15.4
				277	4.4	17.7
				400	6.4	25.6
				480	7.7	30.7
304 (4x30A)	30			120	3.6	14.4
				208	6.2	25.0
				240	7.2	28.8
				277	8.3	33.2
				400	12.0	48.0
				480	14.4	57.6
404 (4x40A)	40			120	4.8	19.2
				208	8.3	33.3
				240	9.6	38.4
				277	11.1	44.3
				400	16.0	64.0
				480	19.2	76.8

DISSIPATING CURVES
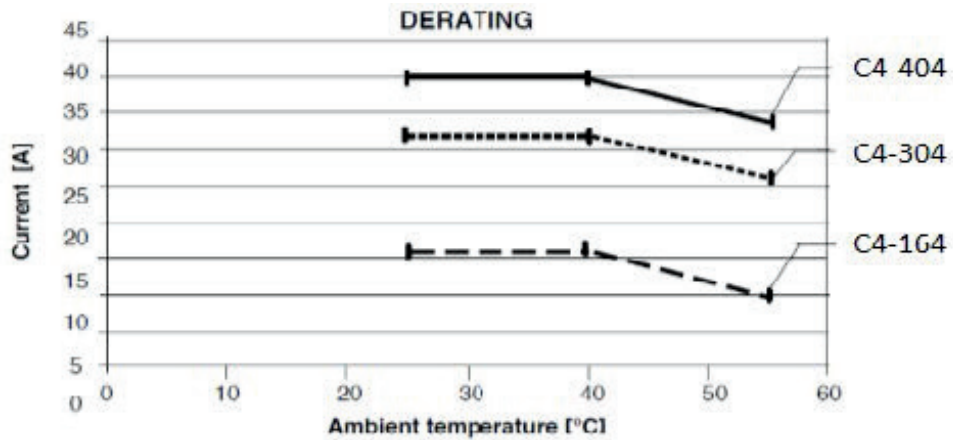
13. Ordering Information

Model	C4 SCR Power Controller					
C4						

	Code	Current Per Loop @ 40°C (104°F) Ambient, continuous service (110 Vac to 480 Vac) (See note 3)
	164	16 Amps/Loop
	304	30 Amps/Loop
	404	40 Amps/Loop

		Code	Auxiliary Outputs
		0	None
		R	Relay
		D	Logic
		A	Analog
		T	Triac

			Code	Auxiliary Inputs
			1	One Current Transformer
			2	4 Current Transformers
			3	1 Current Transformer + 4 Linear Inputs
			4	4 Current Transformers + 4 Linear Inputs (See Note 1)

				Code	Fusing
				0	None
				F	Fuse holder & Extra rapid fuses (See Note 2)

					Code	Second Fieldbus Option
					00	None
					MR	Modbus RTU (RS485)
					ET	Modbus TCP/Ethernet
					ER	Ethernet IP, Real Time[1]
					PB	Profibus DP
					PN	ProfiNET[1]
					EC	EtherCAT[1]
					CN	CANopen
					DN	DeviceNet
					EM	Euromap 66

C4-	304	D	4 -	F	00	Typical Model Number

[1]Not available with EC, PN & ER Fieldbus Codes.
[2]Not available with 404 Current Code
[3]Refer to the C4X for higher amperages

Accessories

Description	PCN
Communication Cable, USB to RS485	309180
Connection Cable For Serial Modbus (RJ10)	307096
C4-OP Operator Terminal w/ Connection Cable (0.2m)	307117
C4-OP 24VDC 12W Stabilized Power Supply w/ Adapter	0081-10091

14. Configuration and Programming

14.1 C-PWR Configuration Software Program

See C-PWR Configuration Software Program instruction manual for proper program installation.

14.2 C4/C4X/C4-IR Programming Manual

See C4/C4X/C4-IR Programming Manual for complete controller set-up of communications, inputs, outputs, alarms and control modes.

15. Accessories

15.1 Fuses and Fuse Holders

| | I²T Extra Rapid Fuses | | | | | | Fuse Holder | |
C4 Model	Fuse Rating, Amps	I²T	Power Dissipation	Fuse Size	Manufacturer's Model Code	Part No.	Part No.	Fuse Holder Rating (UL)
C4-164	16A	645A²s	3.5W	10x38	FUS-016	0024-07824	0024-12124	30A@600V
C4-304	30A	1010A²s	4.8W	10x38	FUS-030	0024-07825	0024-12124	30A@600V

15.2 Fieldbus Cards

Fieldbus Type	Part No.	Model No. (Fieldbus Card)	Manufacturer's Model Code	Description
Modbus RTU	0149-50103	C4-MOD	F032357	Card for Modbus RTU protocol (serial 2)
Profibus DP	0149-50104	C4-PROFI	F032358	Card for Profibus DP protocol (serial 2)
CANopen	0149-50105	C4-CAN	F032359	Card for CANopen protocol (serial 2)
DeviceNet	0149-50106	C4-DNET	F032360	Card for DeviceNet protocol (serial 2)
Modbus TCP/IP	0149-50107	C4-ETH	F033532	Card for Ethernet Modbus TCP protocol (serial 2)
EtherCat	0149-50108	C4-ETH2	F049411	Card for EtherCat protocol (serial 2)
Profinet	0149-50109	C4-ETH4	F054949	Card for Profinet protocol (serial 2)
Ethernet IP (Real-Time)	0149-50110	C4-ETH5	F058234	Card for Real Time Ethernet/IP protocol

Additional Spare Parts

Part No.	Manufacturer's Model Code	Description
0149-50099	F032861	Connection cable for serial Modbus (RJ10) 0.3M
0149-50100	F032862	Connection cable for serial Modbus (RJ10) 1M
0149-50101	F032863	Connection cable for serial Modbus (RJ10) 2M
0149-50102	F032864	Connection cable for serial Modbus (RJ10) 5M
0149-50111	VEN-61	Fan (flow 39m3/h) for C4-164
0149-50112	VEN-62	Fan (flow 56m3/h) for C4-304 and C4-404
0149-50113	GRI-4	Grill fan for C4
0149-50114	FLT-4	Filter for fan
0149-50115	COUT4-9	9-Terminal Connector (J1) For C4 Controller
0149-50116	COUT4-4	4-Terminal Connector (J1a) For C4 Controller
0149-50117	CSIG4-7	7-Terminal Connector (J2) For C4 Controller
0149-50118	CSIG4-12	12-Terminal Connector (J4) For C4 Controller
0149-50119	CSIG4-4	4-Terminal Connector (J3a) For C4 Controller

15.3 Configuration Software and Cabling

Configuration kit for C4 product line by means of PC with USB (Windows environment). Software is compatible with all C4 models. Download free at www.Chromalox.com

- Allows you to read and write all of the parameters of a single C4 device
- Easy and rapid configuration
- Saving and management of parameter recipes
- On-line trend and saving of historical data

Description	Part No.
Communication Cable, USB to TTL	309171
Communication Cable, USB to RS485	309180

15.4 C4-OP

Operator terminal for in-field configuration of the entire C4 product line.

Two types of terminals: - for installation on DIN guide
                        - for panel installation

See C4-OP Hardware Manual for more details.

Limited Warranty:
Please refer to the Chromalox limited warranty applicable to this product at
http://www.chromalox.com/customer-service/policies/termsofsale.aspx.

**Chromalox, Inc.
1347 Heil Quaker Boulevard
Lavergne, TN 37086
(615) 793-3900
www.chromalox.com**