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CNP Series
1/16-1/8 DIN CONTROLLER

1 YEAR WARRANTY

CE

INSTRUCTION SHEET

M5438/0914

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FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:
1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

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1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of theproduct, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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1/16 - 1/8 DIN CONTROLLER CONCISE PRODUCT MANUAL

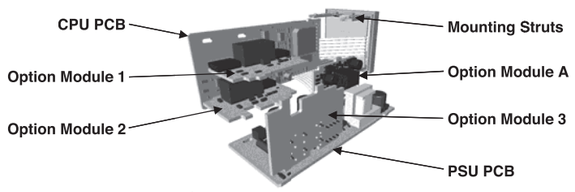
CAUTION: Installation should be only performed by technically competent personnel. Local Regulations regarding electrical installation & safety must be observed.

1. INSTALLATION

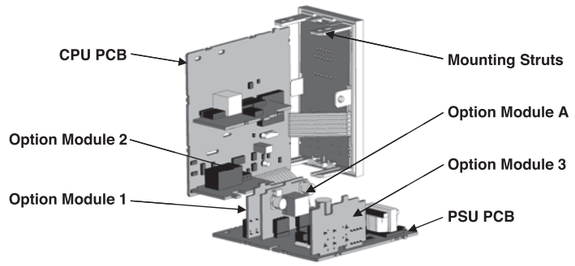
The models covered by this manual have two different DIN case sizes *(refer to section 10)*. Some installation details vary between models. These differences have been clearly shown.
Note: The functions described in sections 2 thru 9 are common to all models.

Installing Option Modules

1/16 Din Size Instruments



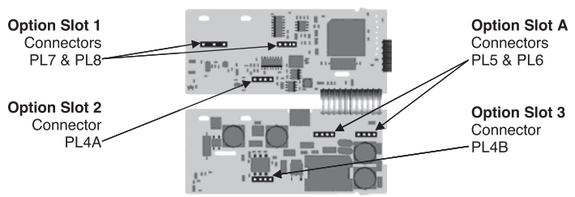
1/8 Din Size Instruments



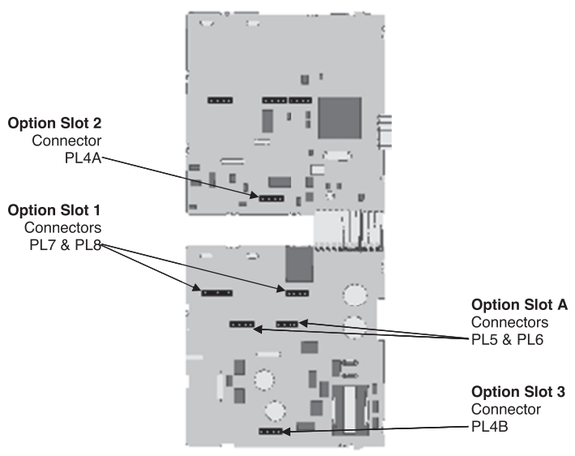
To access modules 1, A or B, first detach the PSU and CPU boards from the front by lifting first the upper, and then lower mounting struts. Gently separate the boards.
a. Plug the required option modules into the correct connectors, as shown below.
b. Locate the module tongues in the corresponding slot on the opposite board.
c. Hold the main boards together while relocating back on the mounting struts.
d. Replace the instrument by aligning the CPU and PSU boards with their guides in the housing, then slowly push the instrument back into position.
Note: Option modules are automatically detected at power up.

Option Module Connectors

1/16 Din Size Instruments



1/8 Din Size Instruments

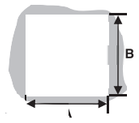


Panel-Mounting

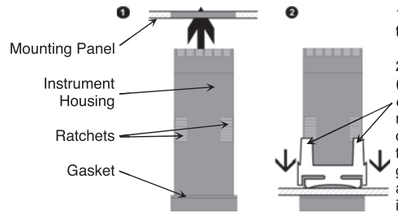
The mounting panel must be rigid, and may be up to 6.0mm (0.25inch) thick. Cut-out sizes are:

Cut-Out Dim A	Cut-Out Dim B
1/16 & 1/8 Din = 45mm	1/16 Din = 45mm 1/8 Din = 92mm

For *n* multiple instruments mounted side-by-side, cut-out A is 48*n*-4mm.



Tolerance +0.5, -0.0mm



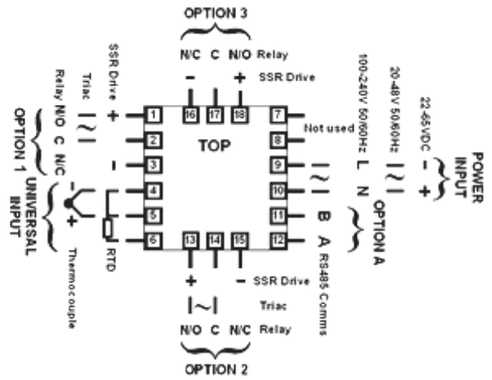
1. Insert instrument into the panel cut-out.
2. Hold front bezel firmly (*without pressing on display area*), and re-fit mounting clamp. Push clamp forward, using a tool if necessary, until gasket is compressed and instrument held firmly in position.

CAUTION: For an effective IP66 seal against dust and moisture, ensure gasket is well compressed against the panel, with the 4 tongues located in the same ratchet slot.

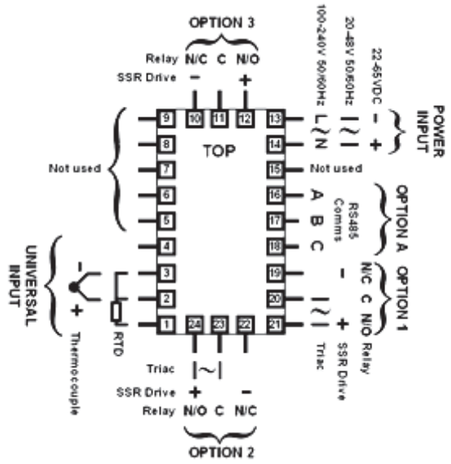
Rear Terminal Wiring

USE COPPER CONDUCTORS (EXCEPT FOR T/C INPUT)
Single Strand wire gauge: Max 1.2mm (18SWG)

1/16 Din Size Instruments



1/8 Din Size Instruments



These diagrams show all possible option combinations. The actual connections required depends on the exact model and options fitted.

CAUTION: Check information label on housing for correct operating voltage before connecting supply to Power Input
Fuse: 100 – 240V ac – 1amp anti-surge
24/48V ac/dc – 315mA anti-surge

Note: At first power-up the message Goto ConF is displayed, as described in section 8 of this manual. Access to other menus is denied until configuration mode is completed

2. OPERATOR MODE

This mode is entered at power on, or accessed from Select mode *(see section 2)*.
Note: All Configuration mode and Setup mode parameters must be set as required before starting normal operations.
Press ↵ to scroll through the parameters, then press △ or ▽ to set the required value.
Note: All Operator Mode parameters in Display strategy 6 are read only (see d iSP in configuration mode), they can only be adjusted via Setup mode.

Upper Display	Lower Display	Display Strategy and When Visible	Description
PV Value	Active SP Value	1 & 2 *(initial screen)*	PV and target value of selected SP *Local Setpoints are adjustable in Strategy 2*
PV Value	Actual SP Value	3 & 6 *(initial screen)*	PV and actual value of selected SP (e.g. ramping SP value). *Read only*
PV Value	*(Blank)*	4 *(initial screen)*	Process variable only *Read only*
Active SP Value	*(Blank)*	5 *(initial screen)*	Target value of selected setpoint only. *Read only*
SP Value	SP	1, 3, 4, 5 & 6	Target value of SP *Adjustable except in Strategy 6*
Actual SP Value	SPrP	P is not blank	Actual (ramping) value of selected SP. *Read only*
Ramp Rate	rP	SPr enabled in Setup mode	SP ramping rate, in units per hour *Adjustable except in Strategy 6*
Active Alarm Status	ALSt	When one or more alar s are active. LOW or BAND indicator will also flash	L2 1 — Alarm 2 active Alarm 1 active Loop Alarm active

Operating Mode Selection

Press ⏻, then press △ or ▽ to select operating mode.

Cntr	OFF	Control and alarms off
	Auto	Controller in Automatic mode
	MAn	Controller in Manual mode

Manual Control

While in Manual Control mode, the LOW and BAND indicators will flash and the lower display will show P*xxx* (where *xxx* is the current manual power level). Switching to/from manual mode is via Bumpless Transfer. Press △ or ▽ to set the required output power.
Caution: Manual power level is not restricted by the OPuL power limit.

3. SELECT MODE

Select mode is used to access the configuration and operation menu functions.
It can be accessed at any time by holding down ↵ and pressing △.
In select mode, press △ or ▽ to choose the required mode, press ↵ to enter.
An unlock code is required to prevent unauthorised entry to Configuration, & Setup modes. Press △ or ▽ to enter the unlock code, then press ↵ to proceed.

Mode	Upper Display	Lower Display	Description	Default Unlock Codes
Operator	OPtr	SLCt	Normal operation	None
Set Up	SEtP	SLCt	Tailor settings to the application	44
Configuration	ConF	SLCt	Configure the instrument for use	44
Product Info	inFo	SLCt	Check manufacturing information	None
Auto-Tuning	AtUn	SLCt	Invoke Pre-Tune or Self-Tune	44

Note: The Instrument will always return automatically to Operator mode if there is no key activity for 2 minutes.

4. CONFIGURATION MODE

Firs select Configuration mode from Select mode *(refer to section 2)*.
Press ↵ to scroll through the parameters, then press △ or ▽ to set the required value. Press ⏻ to accept the change, otherwise parameter will revert to previous value. To exit from Configuration mode, hold down ↵ and press △, to return to Select mode.
Note: Parameters displayed depends on how instrument has been configured. Refer to user guide (availa le from your supplier) for further details. Parameters marked * are repeated in Setup Mode.

Parameter	Lower Display	Upper Display	Adjustment range & Description	Default Value
Function	Func	HEA T	*Heat Only*	HE AT
		CO L	*Heat/Cool*	
		I ND C	*Indicator Only*	
Input Range/Type	inPt	*See following table for possible codes*		JC

Code	Input Type & Range	Code	Input Type & Range	Code	Input Type & Range

Parameter	Lower Display	Upper Display	Adjustment range & Description		Default Value
BC	B: 100 - 1824 °C	LC	L: 0.0 - 537.7 °C	24 FP	PtRh20% vs 40%: 32 - 3362 °F
BF	B: 211 - 3315 °F	LF	L: 32.0 - 999.9 °F		
CC	C: 0 - 2320 °C	NC	N: 0 - 1399 °C	PTC	Pt100: –199 - 800 °C
CF	C: 32 - 4208 °F	NF	N: 32 - 2551 °F	tF P	Pt100: –328 - 1472 °F
JC	J: –200 - 1200 °C	RC	R: 0 - 1759 °C	PT.C	Pt100: –128.8 - 537.7 °C
JF	J: –328 - 2192 F	RF	R: 32 - 3198 °F	Pt.F	Pt100: –199.9 - 999.9 °F
J.C	J: –128.8 - 537.7 °C	SC	S: 0 - 1762 °C	0_20	0 - 20 mA DC
J.F	J: –199.9 - 999.9 °F	SF	S: 32 - 3204 °F	4_20	4 - 20 mA DC
KC	K: –240 - 1373 °C	TC	T: –240 - 400 °C	0_50	0 - 50 mV DC
KF	K: –400 - 2503 °F	TF	T: –400 - 752 °F	10.5	10 - 50 mV DC
K.C	K: –128.8 - 537 7 °C	T.C	T: –128.8 - 400.0 °C	0_5	0 - 5 V DC
K.F	K: –199.9 - 999 9 °F	T.F	T: –199.9 - 752.0 °F	1_5	1 - 5 V DC
LC	L: 0 - 762 °C	P2HC	PtRh20% vs. 40%: 0 - 1850 °C	0_10	0 - 10 V DC
LF	L: 32 - 1403 °F			2_10	2 - 10 V DC

Note: Decimal point shown in table indicates temperature resolution of 0.1°

Parameter	Lower Display	Upper Display	Adjustment range & Description	Default Value
Scale Range Upper Limit	ruL	Scale Range Lower Limit +100 to Range Maximum		Range max (Lin=1000)
Scale Range Lower Limit	rLL	Range Minimum to Scale Range Upper Limit -100		Range min (Linear=0)
Decimal point position	dPoS	0=XXXX, 1=XXX.X, 2=XX.XX, 3=X.XXX (non-temperature ranges only)		1
Primary Output Control Action	CtrL	rEu	Reverse Acting	rEu
		dir	Direct Acting	
Alarm 1Type	AL1	P_H i	Process High Alarm	Controller P_ Io Indicator P_H i
		P_Lo	Process Low Alarm	
		dE	Deviation Alarm	
		bAnd	Band Alarm	
		nonE	No alarm	
High Alarm 1 value*	PhA1	Range Minimum to Range Maximum in display units		300
Low Alarm 1 value*	PLA1			130
Band Alarm 1 value*	bAL1	1 LSD to span from setpoint in display units		5
Dev. Alarm 1 value*	dAL1	+/- Span from setpoint in display units		5
Alarm 1 Hysteresis*	AHY1	1 LSD to full span in display units		1
Alarm 2 Type*	AL2	Options as for alarm 1		Controller bAnd Indicator nonE
High Alarm 2 value*	PhA2			Range Max
Low Alarm 2 value*	PLA2			Range Min
Band Alarm 2 value*	bAL2			10
Dev. Alarm 2 Value*	dAL2			5
Alarm 2 Hysteresis*	AHY2			1
Loop Alarm	LAEn	d iSA (disabled) or EnAb (enabled)		EnAb
Loop Alarm Time*	LAt i	1 sec to 99 mins. 59secs		99.59
Alarm Inhibit	Inh i	nonE	No alarms Inhibited	nonE
		AL1	Alarm 1 inhibited	
		AL2	Alarm 2 inhibited	
		both	Alarm 1 and alarm 2 inhibited	
Output 1 Usage	USE1	Pr i	Primary Power	Pr i
		SEc	Secondary Power	
		A1_d	Alarm 1, Direct	
		A1_r	Alarm 1, Reverse	
		A2_d	Alarm 2, Direct	
		A2_r	Alarm 2, Reverse	
		LP_d	Loop Alarm, Direct	
		LP_r	Loop Alarm, Reverse	
		Or_d	Logical Alarm 1 OR 2, Direct	
		Or_r	Logical Alarm 1 OR 2, Reverse	
		Ad_d	Logical Alarm 1 AND 2, Direct	
		Ad_r	Logical Alarm 1 AND 2, Reverse	
		AA_d	Alarm 1 OR 2 OR Sensor Break, Direct	
		AA_r	Alarm 1 OR 2 OR Sensor Break, Reverse	
Output 2 Usage	USE2	As for output 1		SEc or A2_d

Parameter	Lower Display	Upper Display	Adjustment range & Description	Default Value
Output 3 Usage	USE3	As for output 1		Controller AA_d Indicator A1_d
Display Strategy	d iSP	1, 2, 3, 4, 5 or 6 *(refer to section 8)*		1
Serial Communications Protocol	Prot	ASC I	ASCII	rtu
		rtu	Modbus with no parity	
		tbE	Modbus with Even Parity	
		tbo	Modbus with Odd Parity	
Serial Communications Bit Rate	bAud	1.2	1.2 kbps	9.6
		2.4	2.4 kbps	
		4.8	4.8 kbps	
		9.6	9.6 kbps	
		19.2	19.2 kbps	
Comms Address	Addr	1	1 to 255 (Modbus), 1 to 99 (ASCII)	1
Comms Write	CoEn	r_Wd	Read/Write	r_Wd
		r_O	Read only	
Configuration Lock Code	CLoc	0 to 9999		Wd

5. SETUP MODE

Note: Configuration must be completed before adjusting Setup parameters.

First select Setup mode from Select mode *(refer to section 2)*. Press ↵ to scroll through the parameters, then press △ or ▽ to set the required value.

To exit from Setup mode, hold down ↵ and press △ to return to Select mode.

Note: Parameters displayed depend on how instrument has been configured.

Parameter	Lower Display	Upper Display Adjustment Range & Description	Default Value	
Input Filter Time Constant	FiLt	OFF or 0.5 to 100.0 secs	2.0	
Process Variable Offset	OFFS	±Span of controller	0	
Primary Power	PPWd	Current power levels *(read only)*	N/A	
Secondary Power	SPWd			
			Heat	Heat/Cool
Primary Proportional Band	Pb_P	0.0% (ON/OFF) and 0.5% to 999.9% of input span	0 .50	5 .50
Secondary Proportional Band	Pb_S			5 .50
Automatic Reset (Integral Time)	ArSt	1 sec to 99 mins 59 secs and OFF	20 .00	6 .30
Rate (Derivative Time)	rAtE	00 secs to 99 mins 59 secs	5 .00	1 .30
Overlap/Deadband	OL	-20 to +20% of Primary and Secondary Proportional Band	0	
Manual Reset (Bias)	b iAS	0%*(-100% if dual control)* to 100%	25	
Primary ON/OFF Differential	d iFP	0.1% to 10.0% of input span centered about the setpoint. (*Entered as a percentage of span*)	0.5	
Secondary ON/OFF Diff.	d iFS			
Prim. & Sec. ON/OFF Differential	d iFF			
Setpoint Upper Limit	SPuL	Current Setpoint to Range max	R/max	
Setpoint Lower limit	SPLL	Range min to Current Setpoint	R/min	
Primary Output Power Limit	OPuL	0% to 100% of full power	100	
			Heat	Heat/Cool
Output 1 Cycle Time	Ct 1	0.5, 1, 2, 4, 8, 16, 32, 64, 128, 256 or 512 secs.	4	4
Output 2 Cycle Time	Ct2			
High Alarm 1 value	PhA1	Range Minimum to Range Maximum	300	
Low Alarm 1 value	PLA1		130	
Deviation Alarm 1 Value	dAL1	±Span from SP in display units	5	
Band Alarm 1 value	bAL1	1 LSD to span from setpoint	5	
Alarm 1 Hysteresis	AHY1	1 LSD to full span in display units	1	
High Alarm 2 value	PhA2	Range Minimum to Range Maximum	R/max	
Low Alarm 2 value	PLA2		R/min	
Deviation Alarm 2 Value	dAL2	±Span from SP in display units	5	
Band Alarm 2 value	bAL2	1 LSD to span from setpoint	5	
Alarm 2 Hysteresis	AHY2	1 LSD to full span in display units	1	
Loop Alarm Time	LAt i	1 LSD to full span in display units	99.59	
Auto Pre-tune	APt	d iSA (disabled) or EnAb (enabled)	d iSA	
Setpoint ramp adjustment shown in Operator Mode	SPr			

Parameter	Lower Display	Upper Display Adjustment Range & Description	Default Value
SP Ramp Rate Value	rP	1 to 9999 units/hour or Off (blank)	Off
Setpoint Value	SP	Scale range upper to lower limits.	Scale Range Minimum
Setup Lock Code	SLoc	0 to 9999	44

6. AUTOMATIC TUNING MODE

First select Automatic tuning mode from Select mode *(refer to section 2)*.

Press ↵ to scroll through the modes, then press △ or ▽ to set the required value.

To exit from Automatic tuning mode, hold down ↵ and press △, to return to Select mode.

Pre-tune is a single-shot routine and is thus self-disengaging when complete.

If APt in Setup mode = EnAb, Pre-tune will attempt to run at every power up*.

Parameter	Lower Display	Upper Display	Default Value
Pre-Tune	Ptun	On or OFF. Indication remains OFF if automatic tuning cannot be used at this time*	OFF
Self-Tune	Stun		
Tune Lock	tLoc	0 to 9999	44

**** Note: Automatic tuning will not engage if either proportional band = 0. Also, Pre-tune will not engage if setpoint is ramping, or the PV is less than 5% of input span from the setpoint.***

7. PRODUCT INFORMATION MODE

First select Product information mode from Select mode *(refer to section 2)*.

Press ↵ to view each parameter. To exit from Product Information mode, hold down ↵ and press △ to return to Select mode.

Note: These parameters are all read only.

Parameter	Lower Display	Upper Display	Description
Input type	In_ I	Un i	Universal input
Option 1 module type fitted	OPn1	nonE	No option fitted
		rLY	Relay output
		SSr	SSR drive output
		tr i	Triac output
Option 2 module type fitted	OPn2	As Option 1	
Option 3 module type fitted	OPn3	nonE	No option fitted
		rLY	Relay output
		SSr	SSR drive output
Auxiliary Option A Module type fitted	OPnA	nonE	No option fitted
		r485	RS485 communications
Firmware Type	FWJ	Value displayed is firmware type number	
Firmware Issue	ISS	Value displayed is firmware issue number	
Product Revision Level	PrL	Value displayed is Product Revision level	
Date of manufacture	dOM	Manufacturing date code *(mmyy)*	
Serial number 1	Sn 1	First four digits of serial number	
Serial number 2	Sn2	Middle four digits of serial number	
Serial number 3	Sn3	Last four digits of serial number	

8. MESSAGES & ERROR INDICATIONS

These messages indicate that an error has occurred or there is a problem with the process variable signal or its wiring.

Caution: Do not continue with the process until the issue is resolved.

Parameter	Upper Display	Lower Display	Description	
Instrument parameters are in default conditions	Goto	ConF	Configuration & Setup required. This screen is seen at first turn on, or if hardware configuration has been changed. Press ↵ to enter the Configuration Mode, next press △ or ▽ to enter the unlock code number, then press ↵ to proceed	
Input Over Range	[HH]	Normal	Process variable input > 5% over-range	
Input Under Range	[LL]	Normal	Process variable input > 5% under-range	
Input Sensor Break	OPEN	Normal	Break detected in process variable input sensor or wiring	
RSP Over Range	Normal	[HH] **	RSP input over-range	** *also seen wherever RSP value would be displayed*
RSP Under Range	Normal	[LL] **	RSP input under-range	
RSP Break	Normal	OPEN **	Break detected in RSP input signal	
Option 1 Error	Err	OPn1	Option 1 module fault	
Option 2 Error		OPn2	Option 2 module fault	
Option 3 Error		OPn3	Option 3 module fault	
Option A Error		OPnA	Option A module fault or RSP in both A & B	
Option B Error		OPnb	Option B module fault	

9. SERIAL COMMUNICATIONS

Refer to the Modbus Communications User Manual (Available from your supplier) for details.

10. SPECIFICATIONS

UNIVERSAL INPUT

Thermocouple Calibration:	±0.1% of full range, ±1LSD (±1°C for Thermocouple CJC). BS4937, NBS125 & IEC584.
PT100 Calibration:	±0.1% of full range, ±1LSD. BS1904 & DIN43760 *(0.00385Ω/Ω/°C)*.
DC Calibration:	±0.1% of full range, ±1LSD.
Sampling Rate:	4 per second.
Impedance:	>10MΩ resistive, except DC mA (5Ω) and V (47kΩ).
Sensor Break Detection:	Thermocouple, RTD, 4 to 20 mA, 2 to 10V and 1 to 5V ranges only. *Control outputs turn off.*
Isolation:	Isolated from all outputs (except SSR driver). Universal input must not be connected to operator accessible circuits if relay outputs are connected to a hazardous voltage source. Supplementary insulation or input grounding would then be required.

OUTPUTS

Relay

Contact Type & Rating:	Single pole double throw (SPDT); 2A resistive at 120/240VAC.
Lifetime:	>500,000 operations at rated voltage/current.
Isolation:	Basic Isolation from universal input and SSR outputs.

SSR Driver

Drive Capability:	SSR drive voltage >10V into 500Ω min.
Isolation:	Not isolated from universal input or other SSR driver outputs.

Triac

Operating Voltage:	20 to 280Vrms (47 to 63Hz).
Current Rating:	0.01 to 1A (full cycle rms on-state @ 25°C); derates linearly above 40°C to 0.5A @ 80°C.
Isolation:	Reinforced safety isolation from inputs and other outputs.

SERIAL COMMUNICATIONS

Physical:	RS485, at 1200, 2400, 4800, 9600 or 19200 bps.
Protocols:	Selectable between Modbus and West ASCII.
Isolation:	Reinforced safety isolation from all inputs and outputs.

OPERATING CONDITIONS (FOR INDOOR USE)

Ambient Temperature:	0°C to 55°C (Operating), –20°C to 80°C (Storage).
Relative Humidity:	20% to 95% non-condensing.
Altitude	<2000m
Supply Voltage and Power:	100 to 240VAC ±10%, 50/60Hz, 7.5VA (*for mains powered versions*), or 20 to 48VAC 50/60Hz 7.5VA or 22 to 65VDC 5W (*for low voltage versions*).

ENVIRONMENTAL

Standards:	CE, UL, ULC, CSA
EMI:	Complies with EN61326 (Susceptibility & Emissions).
Safety Considerations:	Complies with EN61010-1, UL61010-1 & CSA 22.2 No 1010.1 92 Pollution Degree 2, Installation Category II.
Panel Sealing:	Front to IP66 when correctly mounted – *refer to section 1.* Rear of panel to IP20.

PHYSICAL

Front Bezel Size:	1/16 Din = 48 x 48mm, 1/8 Din = 96 x 48mm.
Depth Behind Panel:	1/16 Din = 110mm, , 1/8 Din = 100mm.
Weight:	0.21kg maximum.

SUPPLEMENTARY INFORMATION FOR CSA

-Compliance shall not be impaired when fitted to the finall installation.
-Designed to offer a minimum of Basic Insulation only.
-The body responsible for the installation is to ensure that supplementary insulation suitable for Installation Category II is achieved when fully installed.
-To avoid possible hazards, accessible conductive parts of the final installation should be protectively earthed in accordance with EN6010 for Class 1 Equipment.
-Output wiring should be within a Protectively Earthed cabinet.
Sensor sheaths should be bonded to protective earth or not be accessible.
-Live parts should not be accessible without the use of a tool.
-When fitted to the final installation, an IEC/CSA APPROVED disconnecting device should be used to disconnect both LINE and NEUTRAL conductors simultaneously.
-A clear instruction shall be provided not to position the equipment so that it is difficult to operate the disconnecting device.