1/16 - 1/8 - 1/4 DIN LIMIT CONTROLLERS CONCISE PRODUCT MANUAL (59333-3)

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

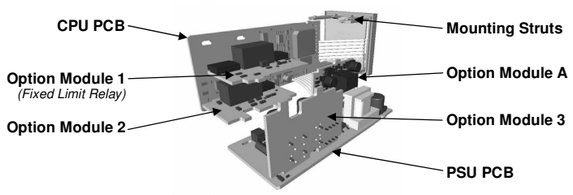
1. INSTALLATION

The models covered by this manual have three different DIN case sizes *(refer to section 9)*. Some installation details vary between models. These differences have been clearly shown.

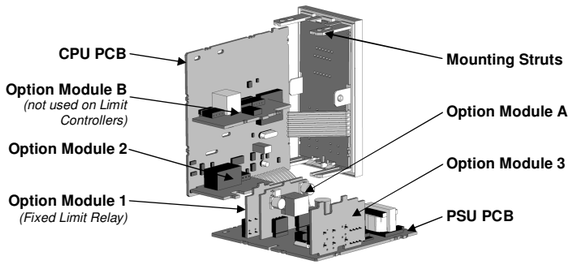
Note: The functions described in sections 2 thru 8 are common to all models.

Installing Option Modules

1/16 Din Size Instruments



1/8 & 1/4 Din Size Instruments



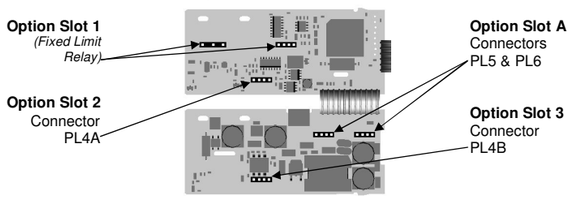
To access module A, first detach the PSU and CPU boards from the front by lifting first the upper, and then lower mounting struts. Gently separate the boards.

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.

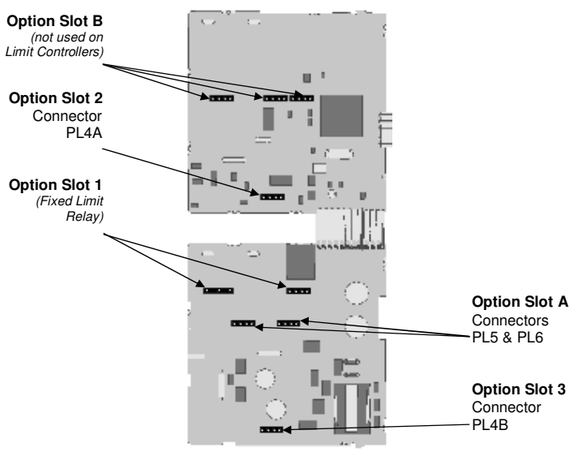
Note: Option modules are automatically detected at power up.

Option Module Connectors

1/16 Din Size Instruments



1/8 & 1/4 Din Size Instruments

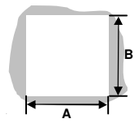


Panel-Mounting

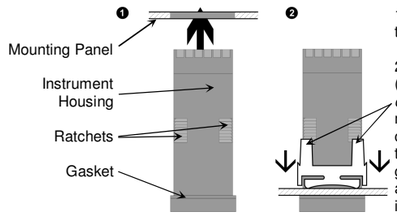
The mounting panel must be rigid, and may be up to 6.0mm (0.25inch) thick. Cut-out sizes are:

Cut-Out Dim A	Cut-Out Dim B
1/16 & 1/8 Din = 45mm	1/16 Din = 45mm
1/4 Din = 92mm	1/8 & 1/4 Din = 92mm

For *n* multiple instruments mounted side-by-side, cut-out A is 48*n*-4mm (1/16 & 1/8 Din) or 96*n*-4mm (1/4 Din)



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.

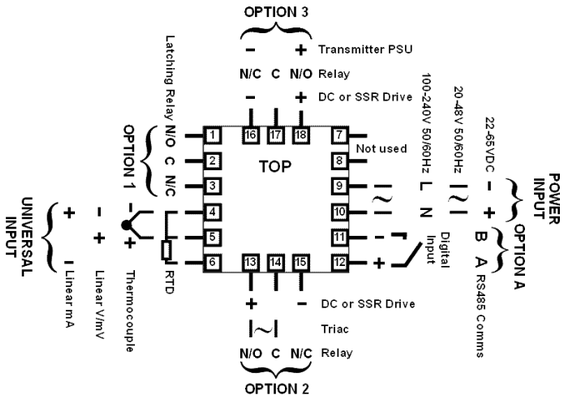
CAUTION: For an effective IP66 seal against dust and moisture, ensure gasket is well compressed against the panel, with the 4 tongues located in the same ratchet slot.

Rear Terminal Wiring

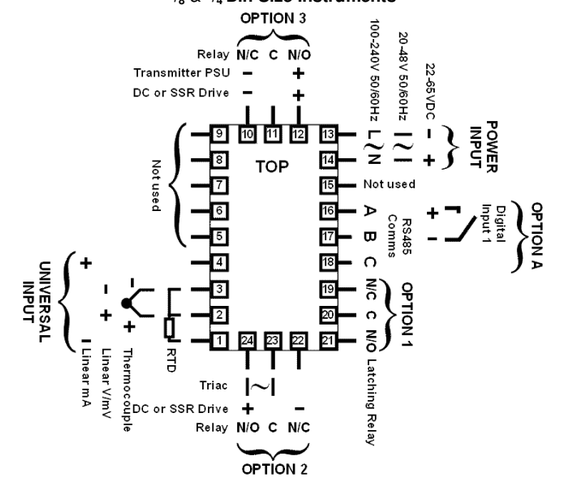
USE COPPER CONDUCTORS (EXCEPT FOR T/C INPUT)

Single Strand wire gauge: Max 1.2mm (18SWG)

1/16 Din Size Instruments



1/8 & 1/4 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 6 of this manual. Access to other menus is denied until configuration mode is completed

2. 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	`10`
Configuration	`Conf`	`SLCt`	Configure the instrument for use	`20`
Product Info	`inFo`	`SLCt`	Check manufacturing information	None

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

3. CONFIGURATION MODE

First 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 RESET 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 (available from your supplier) for further details.
Parameters marked * are repeated in Setup Mode.

Parameter	Lower Display	Upper Display	Adjustment range & Description	Default Value
Input Range/Type	`inPt`	*See following table for possible codes*		`JC`

Code	Input Type & Range	Code	Input Type & Range	Code	Input Type & Range
`bC`	B: 100 - 1824 ºC	`LC`	L: 0.0 - 537.7 ºC	`P24F`	PtRh20% vs 40%: 32 - 3362 ºF
`bF`	B: 211 - 3315 ºF	`LF`	L: 32.0 - 999.9 ºF		
`CC`	C: 0 - 2320 ºC	`nC`	N: 0 - 1399 ºC	`PtC`	Pt100: –199 - 800 ºC
`CF`	C: 32 - 4208 ºF	`nF`	N: 32 - 2551 ºF	`PtF`	Pt100: –328 - 1472 ºF
`JC`	J: –200 - 1200 ºC	`rC`	R: 0 - 1759 ºC	`Pt.C`	Pt100: –128.8 - 537.7 ºC
`JF`	J: –328 - 2192 ºF	`rF`	R: 32 - 3198 ºF	`Pt.F`	Pt100: –199.9 - 999.9 ºF
`J.C`	J: –128.8 - 537.7 ºC	`SC`	S: 0 - 1762 ºC	`0_20`	0 - 20 mA DC
`J.F`	J: –199.9 - 999.9 ºF	`SF`	S: 32 - 3204 ºF	`4_20`	4 - 20 mA DC
`KC`	K: –240 - 1373 ºC	`tC`	T: –240 - 400 ºC	`0_50`	0 - 50 mV DC
`KF`	K: –400 - 2503 ºF	`tF`	T: –400 - 752 ºF	`10_50`	10 - 50 mV DC
`K.C`	K: –128.8 - 537.7 ºC	`t.C`	T: –128.8 - 400.0 ºC	`0_5`	0 - 5 V DC
`K.F`	K: –199.9 - 999.9 ºF	`t.F`	T: –199.9 - 752.0 ºF	`1_5`	1 - 5 V DC
`LC`	L: 0 - 762 ºC	`P24C`	PtRh20% vs. 40%: 0 - 1850 ºC	`0_10`	0 - 10 V DC
`LF`	L: 32 - 1403 ºF			`2_10`	2 - 10 V DC

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

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`
Process Variable Offset	`OFFS`	±Span of controller (*see **CAUTION** note at end of section*)		`0`
Limit Action	`Ctrl`	`Hi`	High Limit. *Limit relay is energised when process "safe" (PV < Limit Setpoint)*	`Hi`
		`Lo`	Low Limit. *Limit relay is energised when process "safe" (PV > Limit Setpoint)*	
Setpoint Upper Limit	`SPuL`	Current Setpoint to Scale Range maximum		R/max
Setpoint Lower Limit	`SPLL`	Scale Range minimum to Current Setpoint		R/min
Alarm 1Type	`AL1`	`P_Hi`	Process High Alarm	`P_Hi`
		`P_Lo`	Process Low Alarm	
		`dE`	Deviation Alarm	
		`bAnd`	Band Alarm	
		`nonE`	No alarm	
High Alarm 1 value*	`PHA1`	Scaled Range Minimum to scaled Range Maximum in display units		Range Max
Low Alarm 1 value*	`PLA1`			Range Min
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`

Parameter	Lower Display	Upper Display	Adjustment range & Description	Default Value
Alarm 2 Type*	`AtA2`	Options as for alarm 1		`P_Lo`
High Alarm 2 value*	`PhA2`			Range Max
Low Alarm 2 value*	`PLA2`			Range Min
Band Alarm 2 value*	`bAL2`			`5`
Dev. Alarm 2 Value*	`dAL2`			`5`
Alarm 2 Hysteresis*	`AHY2`			`1`
Output 2 Usage	`USE2`	`LAtC`	Limit Output Relay	`A1_d`
		`A1_d`	Alarm 1, Direct	
		`A1_r`	Alarm 1, Reverse	
		`A2_d`	Alarm 2, Direct	
		`A2_r`	Alarm 2, 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	
		`An_d`	Limit Annunciator, Direct	
		`An_r`	Limit Annunciator, Reverse	
		`rEtS`	Retransmit Limit SP Output	`rEtP`
		`rEtP`	Retransmit PV Output	
Linear Output 2 Range	`tyP2`	`0_5`	0 to 5 V DC output 1	`0_10`
		`0_10`	0 to 10 V DC output	
		`2_10`	2 to 10 V DC output	
		`0_20`	0 to 20 mA DC output	
		`4_20`	4 to 20 mA DC output	
Retransmit Output 2 Scale maximum	`roSH`	-1999 to 9999 (display value at which output will be maximum)		Range max
Retransmit Output 3 Scale minimum	`roSL`	-1999 to 9999 (display value at which output will be minimum)		Range min
Output 3 Usage	`USE3`	As for output 2		`A1_d`
Linear Output 3 Range	`tyP3`	As for output 2		`0_10`
Retransmit Output 3 Scale maximum	`roSH`	-1999 to 9999 (display value at which output will be maximum)		Range max
Retransmit Output 3 Scale minimum	`roSL`	-1999 to 9999 (display value at which output will be minimum)		Range min
Display Strategy	`diSP`	`EnAb`	PV is visible in Operator mode	`EnAb`
		`diSA`	PV not visible in Operator mode	
		`SAFE`	Displays `SAFE` in Operator mode when Limit Output is not active	
Serial Communications Protocol	`Prot`	`ASCI`	ASCII	`MAbn`
		`MAbn`	Modbus with no parity	
		`MAbE`	Modbus with Even Parity	
		`MAbo`	Modbus with Odd Parity	
Serial Communications Bit Rate	`bAud`	`1.2`	1.2 kbps	`4.8`
		`2.4`	2.4 kbps	
		`4.8`	4.8 kbps	
		`9.6`	9.6 kbps	
		`19.2`	19.2 kbps	
Comms Address	`Addr`	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		`20`

Notes: Output 1 is always a Latching Limit Relay output.
If Option Slot A has the Digital Input module fitted, this always functions as a Remote Reset, duplicating the function of the Reset) key RESET.

As these functions cannot be changed, no Configuration menus are required.

CAUTION: ***Process Variable Offset can be used to modify the measured value to compensate for probe errors. Positive values increase the reading, negative values are subtracted. This parameter is effectively, a calibration adjustment and MUST be used with care.***
There is no front panel indication of when this parameter is in use.

4. SETUP MODE

Note: Configuration must be completed before adjusting Setup parameters.
First select Setup mode from Select mode *(refer to section 2)*. The Setup LED **S** will light while in Setup mode. 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 depends on how instrument has been configured.

Parameter	Lower Display	Upper Display Adjustment Range & Description	Default Value
Limit Setpoint value	SP	Scaled Range Minimum to scaled Range Maximum	R/max if CtrL=H , R/min if CtrL=Lo
Limit Hysteresis	HYSt	1 LSD to full span in display units, on the safe side of the limit SP	1
Input Filter Time Constant	F iLt	OFF or 0.5 to 100.0 secs (*see **CAUTION** note below*)	2.0
High Alarm 1 value	PhA 1	Scaled Range Minimum to scaled Range Maximum	R/max
Low Alarm 1 value	PLA 1		R/min
Deviation Alarm 1 Value	dAL 1	±Span from SP in display units	5
Band Alarm 1 value	bAL 1	1 LSD to span from setpoint	5
Alarm 1 Hysteresis	AHY 1	1 LSD to full span in display units	1
High Alarm 2 value	PhA2	Scaled Range Minimum to scaled 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
Setup Lock Code	SLoc	0 to 9999	10

Note: Operator mode screens follow, without exiting from Setup mode.

CAUTION: ***An excessively large filter time could significantly delay detection of a limit condition. Set this value to the minimum required to remove noise from the process variable***

5. 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_1	Un ,	Universal input
Option 1 type *(fixed)*	OPn 1	rLY	Latching Limit Relay
Option 2 module type fitted	OPn2	nonE	No option fitted
		rLY	Relay output
		SSr	SSR drive output
		tr ,	Triac output
		L in	Linear DC voltage / current output
Option 3 module type fitted	OPn3	nonE	No option fitted
		rLY	Relay output
		SSr	SSR drive output
		L in	Linear DC voltage / current output
		dc24	Transmitter power supply
Auxiliary Option A module type fitted	OPnA	nonE	No option fitted
		r485	RS485 communications
		d iG ,	Digital Input for remote reset
Firmware type	FWJ	Value displayed is firmware type number	
Firmware issue	155	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	

6. ERROR/FAULT INDICATIONS

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	CHHJ	Normal	Process variable input > 5% over-range
	Normal	CHHJ	*as above if Display Strategy =* **SAFE**
Input Under Range	CLLJ	Normal	Process variable input > 5% under-range
	Normal	CLLJ	*as above if Display Strategy =* **SAFE**
Input Sensor Break	OPEN	Normal	Break detected in process variable input sensor or wiring
	Normal	OPEN	*as above if Display Strategy =* **SAFE**
Option 1 Error	Err	OPn 1	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
Option B Error		OPnb	Option B not used on Limit Controllers this error is shown if any module is fitted

7. 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.

Upper Display	Lower Display	Display Strategy and When Visible	Description
PV Value	Limit SP Value	d iSP = EnAb *(initial screen)*	PV and Limit Setpoint values *Read only*
Limit SP Value	*(Blank)*	d iSP = d iSA *(initial screen)*	Limit Setpoint value *Read only*
SAFE or rSEt	*(Blank)* or PV Value	d iSP = SAFE. *(Initial Screen)*	Displays rSEt and PV if Limit Output is active or SAFE and *blank* if not active. *Read only*
High Limit Hold	H iHd	CtrL = H ,	Highest PV value since this parameter was last reset. *To reset, press ▽ for 5 seconds, display = ---- when reset*
Low Limit Hold	LoHd	CtrL = Lo	Lowest PV value since this parameter was last reset. *To reset, press ▽ for 5 seconds, display = ---- when reset*
Exceed Time Value	t ,	Always available Format *mm.ss to 99.59 then mmm.s (10 sec increments) Shows* CHHJ *if ≥999.9*	Accumulated time of Limit SP exceed conditions since this parameter was last reset. *To reset, press ▽ for 5 seconds, display = ---- when reset*
Active Alarm Status	ALSt	When one or more alarms are active. ALM **ALM** indicator will also flash	An2 1 — Alarm 2 active, Alarm 1 active, Annunciator active

Exceed Condition
An Exceed Condition is when the Process Variable exceeds the Limit Setpoint value (i.e. PV > SP when set for high limit action, PV < SP for low limit action). The EXCEED LED is on during this condition, and is extinguished once it has passed.

Limit Output Function
Limit Output relay(s) de-energise whenever an Exceed condition occurs, causing the process to shut down. The OUT LED is on when the relay is de-energised. The relay remains latched off even if the Exceed condition is no longer present. Only giving a reset instruction (**after** the exceed condition has passed) will re-energise the relay, allowing the process to continue. The OUT LED then turns off.

Limit Annunciator Outputs
An Annunciator output will activate when an Exceed condition occurs, and will remain active until a reset instruction is received, or the Exceed condition has passed. Unlike the Limit Output, an Annunciator can be reset even if the Exceed condition is present. When an Annunciator is active, the ALM LED will flash and the Alarm Status screen is available.

Resetting Limit Outputs & Annunciators
A reset instruction can be given by pressing the RESET key, via the Digital Input (if fitted) or via a Comms command if an RS485 Communications module is fitted. Annunciators will deactivate. Limit Outputs will only re-energise if the Exceed condition has passed.

CAUTION: ***Ensure that the cause of the Exceed condition has been rectified before resetting the Limit Output.***

8. SERIAL COMMUNICATIONS

Refer to the full user guide (available from your supplier) for details.

9. 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. *Limit outputs turn off (goes into Exceed condition), high alarms activate for thermocouple/RTD sensor break, low alarms activate for mA/V DC sensor break.*
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.

DIGITAL INPUT

Volt-free(or TTL):	Open(2 to 24VDC) =No Reset. Closed(<0.8VDC) = Reset (edge triggered).
Isolation:	Reinforced safety isolation from inputs and other outputs.

OUTPUTS

Limit Relay

Contact Type & Rating:	Latching limit control relay. Single pole double throw (SPDT); 5A resistive at 120/240VAC. Slot 1 position fixed for this function, optional function for Slot 2 & 3 relay modules,
Lifetime:	>100,000 operations at rated voltage/current.
Isolation:	Basic Isolation from universal input and SSR outputs.

Alarm Relays

Contact Type & Rating:	Slot 2 or 3 position non-latching alarm relay. 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.

DC

Resolution:	8 bits in 250mS (10 bits in 1s typical, >10 bits in >1s typical).
Isolation:	Reinforced safety isolation from inputs and other outputs.

Transmitter PSU

Power Rating:	20 to 28V DC (24V nominal) into 910Ω minimum resistance.
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 & FM 3545, 1998
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.
Front 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, 1/4 Din = 96 x 96mm.
Depth Behind Panel:	1/16 Din = 110mm, , 1/8 & 1/4 Din = 100mm.
Weight:	0.21kg maximum.

SUPPLEMENTARY INFORMATION FOR CSA

-Compliance shall not be impaired when fitted to the final 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.