

General Specifications

Model UP27 Program Controller

OUTLINE

The UP27 program controller allows setting of up to 15 patterns (a maximum of 60 segments per pattern). UP27 features universal input, output and power, and high accuracy of $\pm 0.1\%$.

A single instrument can accept thermocouples, RTDs, or DC voltage. Its control output can be ON-OFF control, relay time proportional PID, voltage pulse time proportional PID, 4 to 20 mA continuous PID, selectable by the user using rotary switches. UP27 has an auto-tuning function and also an overshoot suppressing function "SUPER" as standard.

Available options include analog retransmission (4 to 20 mA) function of process variables, RS-422A communications function, remote setting input, and an internal transmitter power supply.



DISPLAY

Process variable (PV) display ①	4-digit (red), 7-segment LED (Parameter symbol and error code are also displayed.)
Display range	For thermocouple and RTD input: -5 to 105% of instrument range (See Table 1 on p. 2.)
Display content indicator ②	3-digit (red), 5 x 7 dot-matrix LED
Setpoint (SP) display ③	4-digit (red), 7-segment LED (Parameters are also displayed.)
Display resolution	Same as the instrument range resolution For 9999 type.....1 For 999.9 type.....0.1

- The process variable display shows the input range code and output type code for approx. 2 sec after turning the power ON.
- Numbers ①, ②, and ③ in the table indicate the locations in the display unit. (See Note 1 on p.5.)

Even indication lamps: 6 (red)

PVE1 and PVE2 : Lights if PV event 1 and 2 occur respectively.
TME1 TME2, TME3, and TME4 : Lights when time events 1, 2, 3, and 4 occur respectively.

Status indication lamps: 6 (green)

PRG : Lights during program operation.
LOC : Lights in fixed-value control operation (local) mode.
RST : Lights when program operation stops (is reset).
AT : Flashes during auto-tuning.
MAN : Lights during MAN (manual) operation.
HLD : Lights in hold status during running of program.

Program monitor: 1 set (green)

lights when the currently running program is in ascending ramp, lights when in soak, and lights when in descending ramp.

OPERATION KEYS

Setting keys (8)	PT.No.	PT. NO. Selects the pattern number to be operated.
	RUN	Starts operation.
	RESET	Stops program operation.
	SET/ENT	Used to select a parameter or register a set value.
	MODE	Selects the operation mode such as hold, advance, AUTO, or MAN.
	DISP	Used to change an operation display or return from the menu display to operation display.

	Up key: Increases a set value.
	Down key: Decreases a set value. A negative value can also be set.
Setpoint resolution	Same as the instrument range resolution (See Table 1 on p. 2.)

INPUT

Universal Measured Input

● Input Type/Instrument Range Selection

Changing internal DIP switch ⑧ (No.1), internal rotary switch A (Figure 1), and terminal connection allows the instrument to select the desired type and instrument range from among those listed in Table 1.

● Measured input bias

Desired correction can be made on measured input.

Variable bias range	-100.0 to 100.0% of instrument range width
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● Measured input filter

A first-order lag filter is available to eliminate noise contained in input.

Filter setting range	OFF or 1 to 120 sec (time constant) (OFF: non-filtering status)
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● Burnout (action at thermocouple/RTD input break)

If burnout

- The process variable display shows **boUt**.
- Control output is less than 0% (or OFF).
- When the measured value upper limit alarm is set, alarm is generated (lamp: lit, relay output: ON).

● Other input specifications

Input sampling period	200 ms
Input resistance	TC 1 MΩ or more DC voltage Approx. 1 MΩ
Allowable signal source resistance	TC 250 Ω or less DC voltage 2 kΩ or less
Allowable wiring resistance	RTD 10 Ω or less/wire (Provided that there are no variations between three wires.)
Allowable input voltage	TC Within ±10V DC voltage Within ±10V
Noise rejection ratio	Normal mode 40 dB (50/60 Hz) or more Common mode 120 dB (50/60 Hz) or more
Applicable standard	TC IEC/DIN (L and U)/JIS RTD IEC/DIN/JIS '89 JPt100, Pt100

Table 1 Input Range Code

Input type and instrument range				DIP switch No. 1 (Note 1)	Input range code (Note 2)
TC	JIS	K	-200~1200°C -300~2300°F	ON	0
		K	-199.9~999.9°C 0~2300°F		1
		K	-199.9~500.0°C -199.9~999.9°F		2
		J	-199.9~800.0°C -300~1500°F		3
		T	-199.9~400.0°C -199.9~750.0°F		4
		T	0.0~400.0°C -300~750°F		5
		T	-199.9~200.0°C -199.9~400.0°F		6
		B	0~1800°C 32~3300°F		7
		S	0~1700°C 32~3100°F		8
		R	0~1700°C 32~3100°F		9
		N	0~1300°C 32~2400°F		A
		W	0~2300°C 32~4200°F		B
	E	-199.9~800.0°C -300~1500°F	C		
	DIN	L	-199.9~800.0°C -300~1500°F		D
U		-199.9~400.0°C -300~750°F	E		
U		0.0~400.0°C -199.9~750.0°F	F		
RTD (Note 3)	JPt100	-199.9~500.0°C -199.9~999.9°F	OFF	0	
		0.0~200.0°C 32.0~400.0°F		1	
		0.0~100.0°C 32.0~200.0°F		2	
	Pt100	-100.0~100.0°C -199.9~200.0°F		3	
		-199.9~640.0°C -300~1180°F		4	
		-199.9~500.0°C -199.9~999.9°F		5	
		0.0~200.0°C 32.0~400.0°F		6	
		0.0~100.0°C 32.0~200.0°F		7	
		-100.0~100.0°C -199.9~200.0°F		8	
DC Voltage	-10~10mV	Scaling is available within the following four ranges. -1999~9999 -199.9~999.9 -19.99~99.99 -1.999~9.999	9		
	0~10mV		A		
	0~100mV		B		
	0~1V		C		
	0~5V		D		
	1~5V		E		
	0~10V		F		

Note 1: Set the bits of DIP switch ⑧ (No.1) to either ON or OFF.

Note 2: Same as rotary switch A setting position number.

Note 3: JIS '89 JPt100, JIS '89 Pt100/DIN

OUTPUT

Universal Control Output

● Output selection

Use of internal Dip switch (Figure 1) and changing terminal connection allows selection of any desired output in Table 2.

Retransmission Output

(Option: **/RET** is added to the model.)

● One of measured value, setpoint, and control output is output as analog current signal. (Measured values and setpoints can be scaled.)

Output signal	4 to 20 mA DC
Allowable load resistance	600 Ω or less
Accuracy	±0.3% (of output span)

Table 2 Output Type Code

Control output type	Specifications	DIP switch
Time-proportional PID (relay) output	Contact rating: 250V AC, 3A (resistive load) Cycle time: 1 to 240 sec (selectable)	ON 1 OFF
Time-proportional PID (voltage pulse) output	ON voltage: Approx. 12V DC or more OFF voltage: 0.1V DC or less (load resistance: 600Ω or more) Cycle time: 1 to 240 sec (selectable)	ON 1 OFF
Continuous PID output	Output current: 4 to 20mA DC (Load resistance: 600Ω or less) Accuracy: ±0.3% (of output span) Output update period: 200ms	ON 1 OFF
ON/OFF relay output	Contact rating: 250V AC, 3A (resistive load) Output update period: 200ms	ON 1 OFF

CONTROL

Program Pattern

- Number of program patterns: 15
- Program pattern number external contact selectable (standard)
Eternal contact rating: 12V DC or more, 10 mA or more
- Total number of segments: 192
(Maximum of 60 segments/pattern)
- Program repetition count: 999 (infinite count available)
- Segment time: 0 to 99 hr. 59 min or 99 min 59 sec
- Wait zone: 0 to 10%
- Wait time: OFF, 1 min to 99 hr. 59 min or 1 sec to 99 min 59 sec

Automatic Tuning

Provided as standard. When activated, auto-tuning automatically sets PID constants (limit cycle method).

Overshoot Suppressing Function "SUPER"

Provided as standard. SUPER ON/OFF is available by setting parameter.

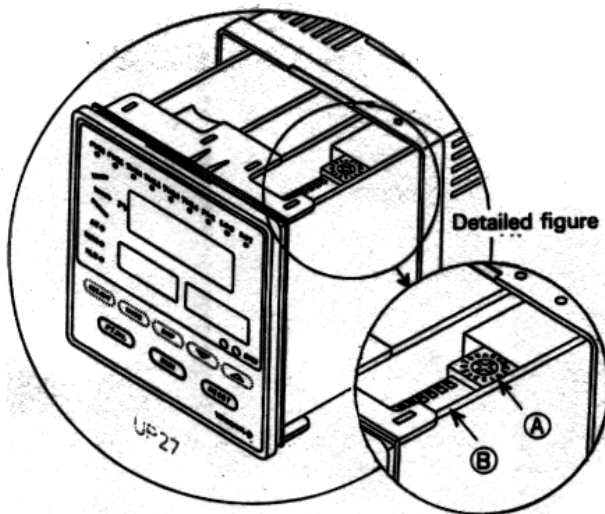
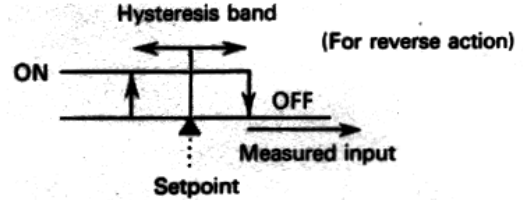


Figure 1 Rotary Switches A and DIP Switch B

PID constants

Proportional band (P)	0.1 to 300.0%
Integral time (I)	OFF, 1 to 3600 sec
Derivative time (D)	OFF, 1 to 3600 sec

- Change to ON/OFF control is available using the internal DIP switch. In ON/OFF control, only the ON/OFF control hysteresis band is displayed as an operation parameter.



ON/OFF control hysteresis band	EU (0.0%) S to EU (100.0%) S 0 to 100% of instrument range width
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- If integral time is set to OFF, manual reset is also available as a control parameter.

Manual reset	-5.0 to 105.0% (of output)
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Direct/reverse action change

Change to direct/reverse action can be accomplished using setup parameters. At factory shipment, reverse action is selected.

AUTO/MAN selection

Balance-less, bump-less switching is available.

Control Auxiliary Constant

Cycle time	1 to 240 sec
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Output Update Cycle

Update cycle	200 ms	
Resolution	Relay output time proportional PID	10 ms
	Voltage pulse output time proportional PID	
	Continuous output PID	0.05% (of output)

COMMUNICATION

- Parameters that can be changed using key can also be changed in communication.

(Option: /RS422 is added to the model.)

NOTICE: When the UP27 receives a set command, data are stored in the EEPROM. The EEPROM's life expectancy (memory cell life) is about 100,000 writes. So, use the set command only when stored data must be changed; do not write data unnecessarily.

Applicable standard	Conforms to EIA RS-422A	Max. no. of units connected	16 (available addresses: 01 to 16 Address 99: For coordinated operation)
Communication method	4-Wire, half-duplex multi-drop connection Start-stop. Non-procedural transmission	Communications distance	500 m (max.)
Communication speed	The following are selectable using a parameter. 150, 300, 600, 1200, 2400, 4800, and 9600 bps.	Bit configuration	Start bit: 1 bit Data bit: 7 or 8 bits Stop bit: 1 or 2 bits Parity bit: None, odd number, or even number

SENSOR SUPPLY POWER

(Option: /LPS is added to the model.)

Max. output current	30 mA
Output voltage	21.6 to 28.0 V DC

Note: /LPS is not available if digital communication is simultaneously performed, overlaying the signal line.

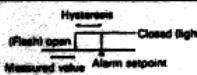
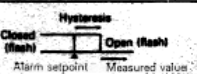
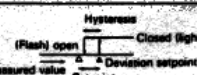
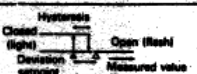
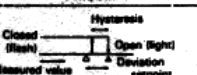
ALARM

PV Event


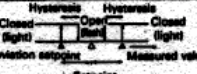
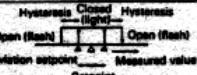
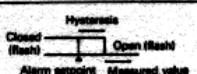
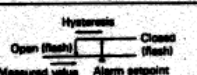
- Number of PV events: 2 (standard)
- Indication lamp: LED (red)
- Output type: Relay contact

Contact capacity 250V AC, 1A (resistive load)

- PV event (alarm) 1 and 2 can be independently set to determine the alarm type by using an alarm type code in the table. If OFF is set, the relevant event number's alarm does not function.

Alarm type	Alarm action ("Open/Closed" shows relay contact state; (Light)/(Flash) indicates lamp state.)	Alarm type code Contact closed if alarm occurs Contact open if alarm occurs
No alarm		OFF
Measured value upper limit		1
Measured value lower limit		2
Deviation upper limit		3
Deviation lower limit		4
De-energizing if deviation upper limit alarm occurs		5

Note: UP27 has no alarm with waiting action.

Alarm type	Alarm action ("Open/Closed" shows relay contact state; (Light)/(Flash) indicates lamp state.)	Alarm type code Contact closed if alarm occurs Contact open if alarm occurs
No alarm		OFF
De-energizing if deviation lower limit alarm occurs		6
Deviation upper and lower limits		7
Within upper or lower limit deviation		8
Measured value upper limit de-energizing		9
Measured value lower limit de-energizing		10

Time Event

- Number of time events: 4 (standard)
- Lamp display: LED (red)

- Output type: Open collector contact

Contact rating 24V DC or less, 50 mA or less

GENERAL SPECIFICATIONS

Measuring Accuracy

Input type	Input	Accuracy
TC (ANSI, DIN, JIS)	B*1 S R	±0.15% of F.S. ±1 digit
	K*2 J*2 T*3 N	±0.10% of F.S. ±1 digit
	W	±0.20% of F.S. ±1 digit
	E*2 L (DIN)*2 U (DIN)*2	±0.1% of F.S. ±1 digit
	Pt100*4 JPt100*4	±0.10% of F.S. ±1 digit
	DC voltage DCV mVDC*5	±0.10% of F.S. ±1 digit

*digit means minimum display unit.

- *1 Range of 0 to 400°C : ±5% of F.S. ±1 digit
Range of 400 to 600°C : ±0.20% of F.S. ±1 digit
- *2 0°C or below : ±0.20% of F.S. ±1 digit
- *3 Range of 0 to 200°C : ±0.15% of F.S. ±1 digit
- *4 Range of 0 to 100°C : ±0.30% of F.S. ±1 digit
Range of 0 to 200°C : ±0.20% of F.S. ±1 digit
Range of -100 to 100°C : ±0.20% of F.S. ±1 digit
- *5 Range of 0 to 10mV : ±0.20% of F.S. ±1 digit
Range of 0 to 1V : ±0.20% of F.S. ±1 digit

For thermocouple input, the value given includes no reference junction compensation error.

Power Supply, Withstand Voltage, Insulation Resistance, and Ground

Power supply	Voltage	100 to 240 V AC (universal power supply)*1
	Frequency	50/60 Hz common
Power consumption		Approx. 12 VA (100 V) Approx. 16 VA (200 V) (1 A time lag fuse is recommendable if an external fuse is required.)
Memory hold		Non-volatile memory
Withstand voltage		Power terminal to ground: 1500 V AC for 1 min Input terminal to ground: 1000 V AC for 1 min Output terminal to ground: 1500 V AC for 1 min
Insulation resistance		Each terminal to ground: 500 V DC at 20 MΩ or more
Grounding		Through resistance of 100 Ω or less

*1 Allowable supply voltage range: 90 to 250 V AC

Relation between Input and Output Isolation

Isolation is accomplished between measured input and control output, measured input and transmission output, and measured input and remote setting input. However, control output to transmission output is not isolated.

GENERAL SPECIFICATIONS

Environmental Conditions

Normal operating conditions (design conditions where instrument continuously operates correctly)	Ambient temperature	0 to 50°C
	Ambient humidity	20 to 90% R.H. (non-condensing)
	Reference junction temperature compensation error	0 to 50°C: $\pm 1^\circ\text{C}$
	Magnetic field	400 AT/m or less
	Warm-up time	30 min or more
Effects on operating conditions	Ambient temperature effect	Input stability Within ($\pm 1\mu\text{V}/^\circ\text{C}$ or $\pm 0.01\%/^\circ\text{C}$, whichever is greater) Output stability Within (4 to 20 mA DC) $\pm 0.05\%/^\circ\text{C}$
	Power supply variation	Input stability Within ($\pm 1\mu\text{V}/10\text{V}$ or $\pm 0.01\%/10\text{V}$, whichever is greater) Output stability Within (4 to 20 mA DC) $\pm 0.05\%/10\text{V}$
Transit/storage conditions	Temperature	-25 to 70°C
	Humidity	5 to 95% R.H. (non-condensing)

Construction, Dimensions, and Weight

Construction	Dustproof, drip-proof construction (front panel)
Mounting	Flash mounting (See DIMENSIONS on p. 7.)
Case	Plastic molding (ABS resin)
Dimensions	96W×96H×100D mm
Weight	Approx. 1 kg

Power Failure Recovery Operation

Operation in the event of power failure is classified as given below depending on whether power failure time is 2 sec or less.

Power failure of 2 sec or less	Instrument continues normal operation as if there were no power failure.	
Power failure of more than 2 sec	Alarm action	Keep the former status
	Setting parameters	Set parameters are kept secured
	Auto-tuning	Auto-tuning is canceled.
	Control operation	One of the following occurs in accordance with specified restart code (by setting RST: setup parameter). For code "0" Controller continues the operation before power failure. For code "1" Controller enters MAN (manual) mode. However, output applies the preset output value. For code "2" Controller enters RESET mode. However, output applies the preset output value.

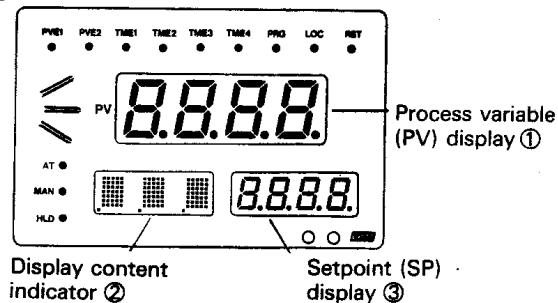
- If power failure occurs during setting using a key, error code [XX04] may appear.

Self-Diagnosis

UP27 performs the following self-check and on detecting error, displays the relevant error code.

Error content	Error code	Display position (Note 1)
Input burnout	b.o.u.t	①
Over-scale (105% or more of measurement range)	o.b.r	①
Under-scale (-5% or less of measurement range)	-o.b.r	①
RAM error	FAIL	①
ROM error	FAIL	①
Program overrun	FAIL	①
System data error	E002	①
Output type selection error (if any code other than 0 to 3 is selected)	E003	①
EEPROM protect error	XX01 (Note 2)	③
Input range data error	XX02	③
Set parameter error	XX04	③
Backup data error	XX10	③
Reference junction compensation failure	r.j.c (Note 3)	①
EEPROM error	Display content indicator flashes.	②
Sub-CPU error	All OFF	-
Auto-tuning time-out	E200	①
A/D converter error	E300	①

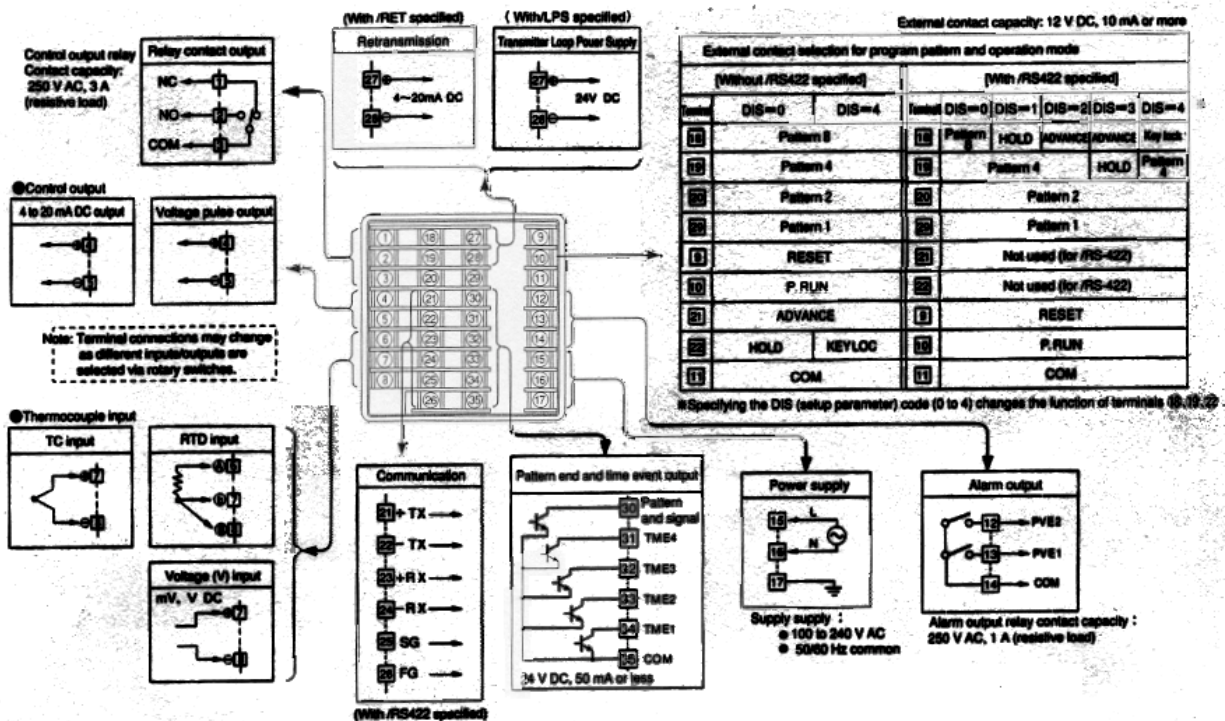
Note 1: The arrangement of the display unit is as follows:



Note 2: XX stands for symbol (value) of the operating power frequency and option designation status.

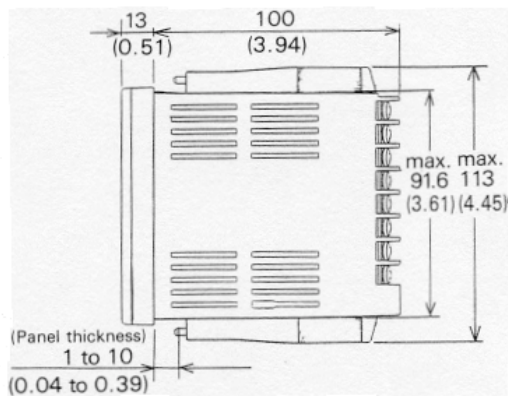
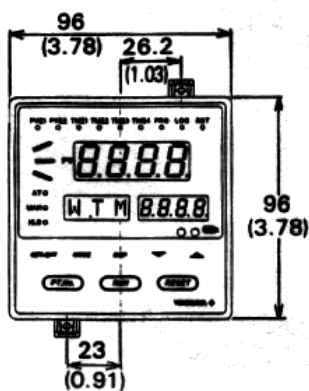
Note 3: Measured value and r.j.c are displayed alternately.

TERMINAL ARRANGEMENT DIAGRAM

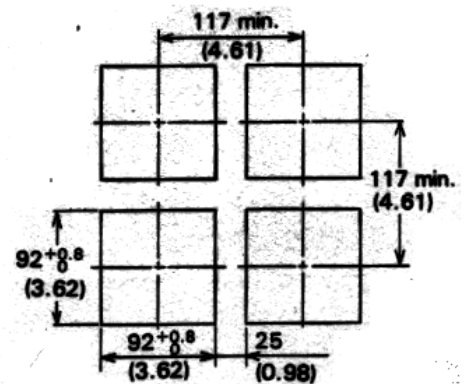


DIMENSIONS

Units: mm (approx. inch)



<Panel cut size>



MODEL AND SUFFIX CODE

Ordering Information

- (1) Model
- (2) Option code if required

Note: UP27 is factory shipped in the following condition.

Measured input: Thermocouple K (−200 to 1200°C)
[DIP switch No.1: ON, Rotary switch A: Code 0]

Control output: Time proportional PID (relay output)
[Dipswitch B: No.5, No.6: ON]

Model and Suffix Code Table

Model	Suffix code	Description
UP27	Program controller
Option codes	/RET	Retransmission output (4 to 20 mA DC)
	/RS422	RS-422A communication interface
	/LPS	Transmitter power supply

Note: /RET are not available when /LPS is specified.

SAFETY STANDARD

SAFETY STANDARD:	CSA C22.2 No.142/UL 508
POWER SUPPLY:	100-240 V AC, 50/60 Hz, 0.2 A Max.
CONTROL OUTPUT RELAY CONTACT:	Max. 250 V AC, 3A
ALARM OUTPUT RELAY CONTACT:	Max. 250 V AC, 1A
AMBIENT TEMPERATURE:	0 to 50°C
MOUNTING LOCATION:	Non-Hazardous Location, Indoor. Mounting in an indoor (controlled environment) instrument panel.