FUJI ELECTRIC

COULTON

# PXZ4 CONTROLLER

# CONTROLLER  MODEL  PXZ 4

## Contents

## Introduction

This new series of digital controllers have been designed for the 21st century based on microprocessor, CMOS and surface mount technology.  The controller has been designed and manufactured in accordance with ISO 9000 quality standards.

The controllers have CE, UL, IP55 certification as standard and are available with IP66 / NEMA 4X enclosure rating.

## Features

The PXZ4 series controllers have exceptional performance with a wide range of features:-

- RTD, T/C dc Volts or mA inputs.
- On/Off action or PID with autotune.
- Ramping and soak set point.
- LED Indication of PV, SV and alarm status.
- 1/16 DIN (48 x 48mm panel space).
- Self check watchdog timer.
- Non volatile retention of all preset data.

## Specification

### Input:

| | |
|---|---|
| T/C Type | J, K, R, B, S, T, E, N and PL-11, |
| RTD type | Pt100 |
| Voltage | 1-5V dc input |
| Current | 4-20mA (via 250Ω resistor) |

### Control:

| | |
|---|---|
| Type | PID or On/off control with autotune / fuzzy logic. |
| Proportional Band (P) | 0 - 999.9% . |

Note,If P = 0  output is on/ off action

| | |
|---|---|
| Integral Time (I) | 0 - 3200 sec |
| Derivative Time (d) | 0 - 999.9 sec |
| Proportional Cycle (Tc) | 0 - 150 sec |
| Hysteresis width (Hys) | 0 - 50% FS (2 position action only) |
| Autotuning (AT) | Off / standard/Low PV |
| Anti-reset wind up (Ar) | 0 - 100% FS |
| SV Ramp Function | 0 - 100% FS – (4 ramp and 4 soak) |
| SV Ramp rate/soak time | 0 - 99 hr 59 m |
| Lock setting (LOC) | off / all / all except SV |

# Specification Cont'd

## Control Output:
Contact type:          S.P.D.T.
                       3 Amp 220Vac / 30V dc.

SSR type:              Approx 24v dc.
4-20mA type:           Approx 4 to 20mA dc

## Alarm Output:
Rating                 1 amp at 220V ac
                       30V dc resistive load
Functions:             selectable (15off)

## Accuracty @23$^0$C:
T/C types:             ±0.5%FS ±1digit ±1$^0$C
R type T/C:            ± 1%FS ±1digit ± 1$^0$C
B type T/C:            ± 5%FS ±1digit ± 1$^0$C
RTD type:              ± 0.5%FS ±1 digit
Setting Accuracy:      0.1% FS or better
Display of PV / SV:    4 digit 7 seg LED
Decimal point:         Selectable for position

## General
Event Storage:         SV + PID @ power off
Self Diagnosis:        Watchdog timer.

## Enclosure
Waterproof type (part No. code D) = IP66 / NEMA4X
Standard type = Front Panel IP55 (rest IP20)

## Ambient Conditions
Operating              +10  to 50 $^0$C
                       90% RH (non condensing)
Storage                -20  to  +60 $^0$C

Insulation category:   2
Pollution degree:      II

**Electrical**

| | |
|---|---|
| Mains supply: | 85 to 264V ac 50 / 60 Hz |
| Power Consumption: | <10VA at 100V ac |
| | <15VA at 240V ac |
| Insulation Resistance: | $\geq$ 20 M ohm at 500V dc |
| Isolation Rating | 1500V ac 1 min |
| Power to earth | 1500V ac 1 min |
| Earth to relay | 1500V ac 1 min |
| Earth to alarm output | 1500V ac 1 min |
| Power to other | 500V ac 1 min |

| | |
|---|---|
| Input Impedance: | |
| T/C | >1M |
| Voltage | >400K |
| Current | 250R(external resistor) |

| | |
|---|---|
| Allowable Signal Source resistance: | |
| T/C | <100R |
| Voltage: | <1K |

| | |
|---|---|
| Allowable Wiring Resistance: | |
| RTD: | <10R per wire |
| CJ compensation Accuracy: | $\pm$ 1% at 23$^0$C |
| PV Offset: | $\pm$10% at FS |
| SV Offset: | $\pm$ 50% FS |
| Input Filter: | 0 - 900.0 seconds |
| Noise Reduction Ratio: | |
| Normal mode | 50 / 60 Hz: >50 dB |
| Common mode | 50 / 60 Hz: >140dB |
| Enclosure Colour/material | |
| IP55 version | Ivory GPR Plastic |
| IP66 version | Black GPR Plastic |
| Dimensions: | 48 x 48 x 86mm |
| Weight: | Approx 150 gm |
| *Connections:* | |
| PXZ4 with alarms | 11 pin connector |
| PXZ4 without alarm | 8 pin octal connector |

# Ordering code

| PXZ4 | | | Y1- | | V000- | | 48 X 48 mm single display PV/SV |
|---|---|---|---|---|---|---|---|
| | | | | | | | **INPUT SIGNAL TYPE** |
| | T | | | | | | Thermocouple °C |
| | N | | | | | | RTD/pt 100 °C |
| | B | | | | | | 4-20mA dc (external resistor) |
| | A | | | | | | 1- 5 V dc |
| | | | | | | | **CONTROL OUTPUT (heating control)** |
| | | A | | | | | Relay contact SPDT |
| | | C | | | | | SSR/SSC drive voltage |
| | | E | | | | | 4 - 20mA dc |
| | | | | | | | **ADDITIONAL FUNCTIONS** |
| | | | | 0 | | | No alarm and no SV ramp |
| | | | | 1 | | | With alarm |
| | | | | 4 | | | No alarm but with SV ramp |
| | | | | 5 | | | With alarm and SV ramp |
| | | | | | | | **FRONT PANEL IP RATING** |
| | | | | | | - | IP55 |
| | | | | | | D | IP66 |

# Scope of supply

Your PZX4 is supplied boxed with a panel mounting clamp and this instruction manual. A 250R resistor is included with controllers that were ordered for a 4-20mA input. A rubber gasket is also supplied with the black coloured IP66 controllers. Please check that you have ordered the correct model for your application, but please note that some functions are re-programmable. E.g. from T/C to RTD; heating to cooling; and °C to °F. Please amend the model number on controller label once a change has been made. Contractors are especially asked to pass on the instruction manuals to the end user.

# SAFETY PRECAUTIONS

PXZ4 controllers have been designed for safe continuous working and carry a CE mark approval, however the controller should only be installed, used and maintained by suitably qualified persons.

| |
|---|
| **Warning !** Suggests that mishandling can result in personal death or serious injury to personnel. |
| **Caution !** Suggest that the mishandling can result in damage to property or equipment. |

## 1.  Warning !
### 1.1  Precautions in wiring
External protective circuit which includes a mains isolator and fuse (Fuse rating 250V, 1A) should be provided to protect against a faulty or defective controller.

### 1.2 Power Supply
To prevent failure, ensure that the controller is supplied with the correct mains voltage.

To prevent electric shock and damage to the controller, keep the power off until all wiring is completed.

### 1.3 Hazardous areas
This controller is not certified for hazardous area use.

### 1.4 Maintenance precautions
Always turn the power off before working on the controller wiring. The 1-year warranty is void if the controller is dismantled or modified in any way.

# 2. Caution !
## 2.1 Handling Precautions
**Do not** operate the controller where:-
Ambient temperature <0 and >50$^0$C.
Ambient humidity <45 and >85% RH
Condensation can form
Corrosive gases are present (e.g. sulphide ammonia)
Combustible gases are present.
Vibration or shock is likely.
Water, oil, chemicals, steam or water vapour may is present.
A place where the unit is exposed to dust, salt air or air containing iron particles.
Interference from static electricity, magnetism and noise is present.
The controller is exposed to direct sunlight.

## 2.2. Precautions in wiring connection
For thermocouple type inputs, use compensating cable of the correct type. Ensure that both ends of the cable are connected with the correct polarity. Failure to do so will result in the controller reading read low by approximately twice the ambient temperature.

For RTD type inputs, use 3 or 4 wire connections. Use wires of equal length with low and equal resistance also avoid bad terminal connections that could introduce additional resistance into the circuit.

If the control output wiring is affected by electrical noise, install a suitable filter or anti surge device. Follow the manufacturer's instructions for installation particularly concerning proper earthing of the filter.

For the contact output type controller a short set-up time delay occurs after power up before the output is correctly set. If this contact output is part of an external interlock circuit use a 5-second time delay relay to protect the external circuit.

## 3. Requirement for key operation/ abnormal operation

Prior to operation, be sure to check the alarm functions since an incorrect setting could result in a failure of an alarm operation.

A display of UUUU or LLLL will appear in case of a break in the input. Be sure to turn off the power when a sensor is replaced.

## Installation
Overall Dimensions and Panel Cut out Detail



Panel thickness: 1 to 8 mm

Mounting bracket
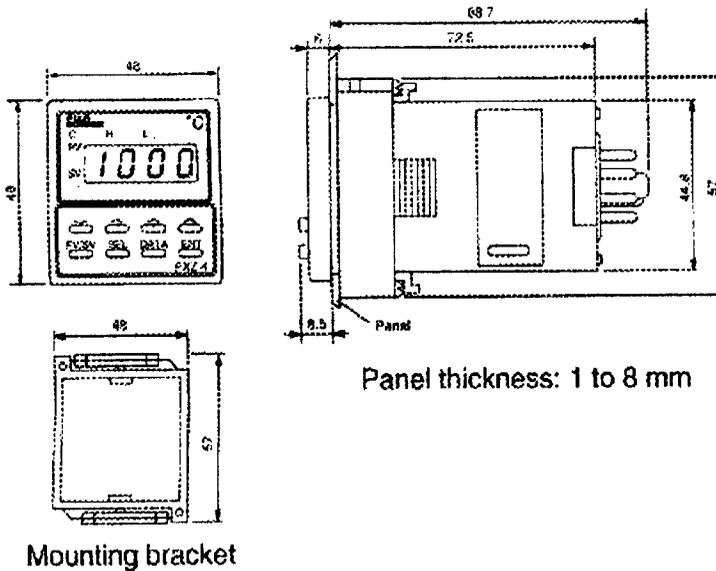
Insert the controller into the front of the panel. Place the nylon-clamping bracket over the back of the controller, with the screws facing forward. Push the clamping bracket towards the back of the panel as far as possible. If required the bracket can be tightened using the 2 screws. Do not over tighten otherwise the bracket may be deformed.
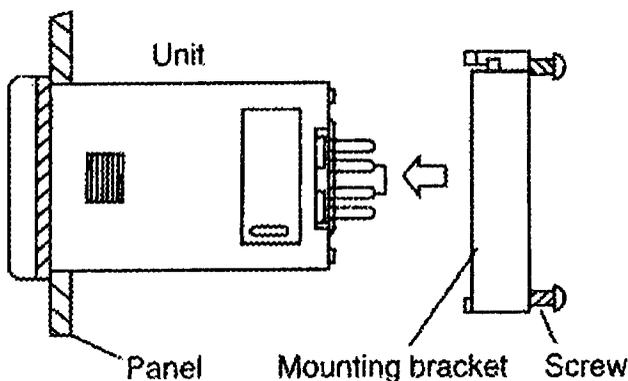


Check that the gasket is not displaced. (IP66 versions only)

### Caution in the grouped installation:
We recommended that a cooling fan is fitted in the panel to ensure that the temperature within the panel is maintained below the 50$^0$C operating limit.
Ensure that the spacing allows for the type of socket chosen.

# Wiring Caution!

## Connections:

The input signal wires should be screened and should be routed separately to mains and control output wiring, to avoid interference.

## Connecting a high current load

When the electrical load on the control output is high and approaching the full rating of the output relay contacts and also when the switching cycles are likely to be quickly repeated such as for proportional actions, the life of the output relay will be shortened. Under such circumstances alternative switching systems are recommended. Either use a supplementary relay / contactor or change to SSR / SSC output controller and use an associated solid state relay. Settings of proportional control cycle (TC) and Hysteresis (HYS) need to be adjusted according to the application eg:

* For relay output TC should be 30 seconds or longer
* For SSR TC should be 2 seconds or longer

## Isolation:

Always use a non-grounded T/C or RTD sensors as the circuitry is NOT electrically isolated from the input.

## Terminal Connections:

The PXZ series controllers all utilise a standard 8 or 11 pin socket. (8pin without alarm and 11pin with alarms).

We recommend the use of screened multistrand $0.75mm^2$ wire terminated with M3.5 crimp spade terminals.

## Connection details

| Type | Pin1 | Pin2 | Pin3 |
|------|------|------|------|
| RTD | White | Red | Red |
| T/C | +ive | - ive | |
| Voltage | + ive | - ive | |
| $-20mA | + ive | - ive | |

Outputs:

| Pin No. | Output Type | | |
|---|---|---|---|
| | Contact | 4-20 mA | SSR |
| 4 | Common | + ve | + 24 V |
| 5 | N.O. | - ve | - 0 V |
| 6 | N.C. | | |

Note:

NO= Normally open, close on energise

eg: in heating when PV is less than SV.

NC= Normally closed / open on energise.



8 pin style (de-energised)



11 pin style (de-energised)
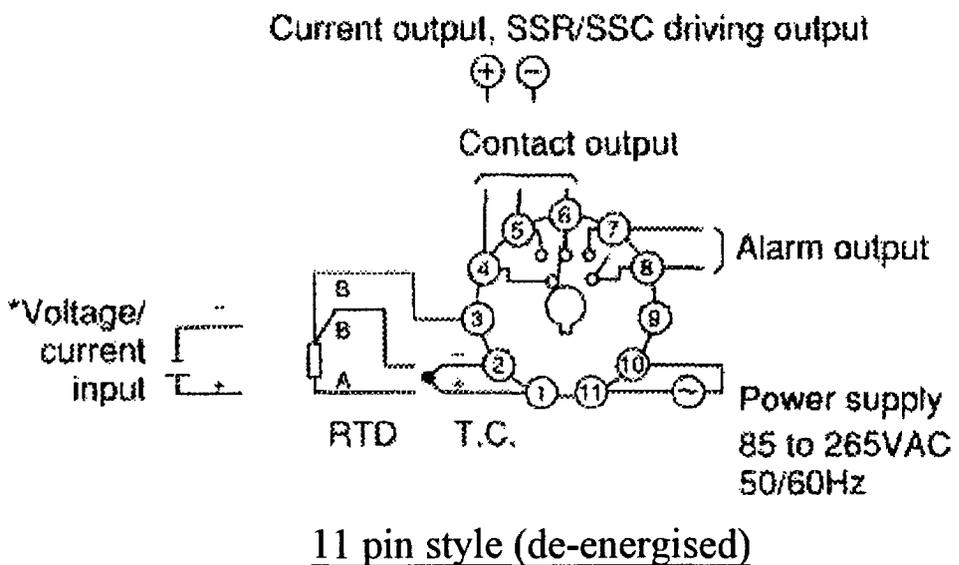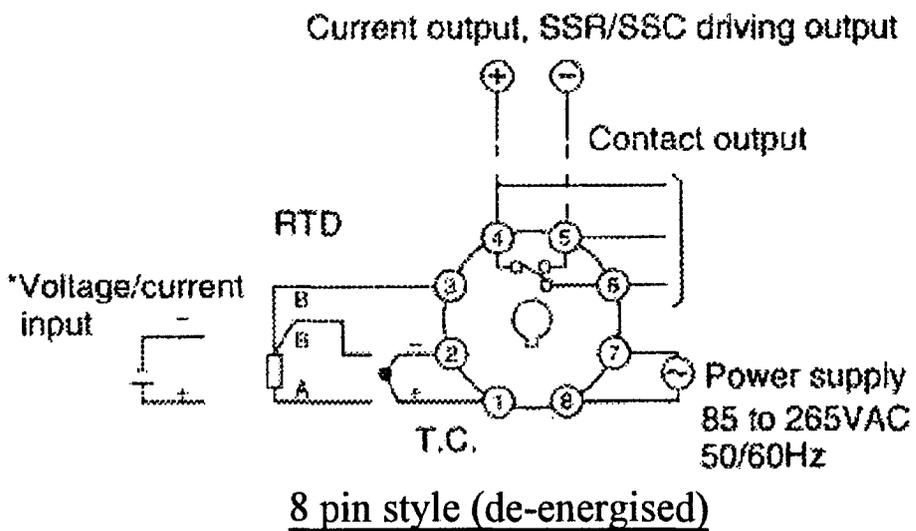
**Caution!**

Take care not to connect mains power until all wiring is finished and tested. Ensure mains power is disconnected before inserting withdrawing controller from its socket.

## Controller Functions

The name of each key and indicator is associated with its function.

The more you use the controller the quicker you will become familiar with its functions.

Caution! Do not press keys with a sharp object.
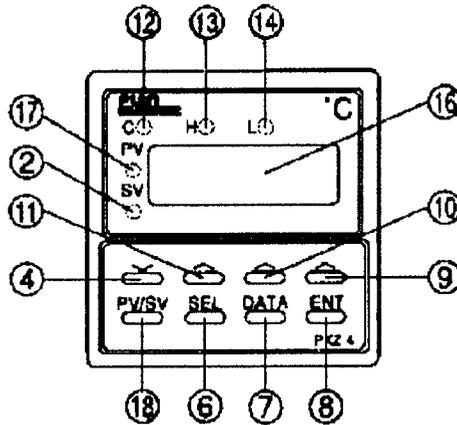


| Item | Name | Function |
|------|------|----------|
| 17 | PV Lamp | Lit when process value is displayed. |
| 2 | SV Lamp | Lit while the set value is selected. |
| 18 | PV/SV Key | Toggles between PV and SV . |
| 6 | Select Key | Selects parameter functions. |
| 7 | Data Key | Show the data for selected parameter. |
| 8 | Enter Key | Stores new data after changes. |
| 14 | Low Limit Lamp. | Lit when a low alarm is active. |
| 13 | High Limit Lamp | Lit when a high alarm is active. |
| 12 | Control Lamp | Lit when the control output is active. |
| 9 | Up Key | Selects a 1's digit and increases it. |
| 10 | Up Key | Selects the 10's digit and increases it. |
| 11 | Up Key | Selects the 100's digit and increases it |
| 4 | Down Key | Decreases a selected digit. |

When power is first applied the display will show only four decimal points. When the self-check is complete the current process valve (PV) is displayed.

Certain parameters will now need setting by the user, to ensure correct operation. There are three levels of settings SV, Block 1 and Block 2

# Initial Set up Procedure

During Initial Set up, it is important that SV and input types are adjusted for each particular application. Other parameters like P, alarm point, and LOC will add useful functionality but are not essential.

Use the following procedures for selecting and changing parameters, which will customise your controller.

## SETTING SV

The Set point will be compared with the process value to determine whether the control output should operate. The chosen value must lie between P-SL and P-SU.

Press the PV/SV key once (SV indicator will light).
To change a digit press the ^ key directly beneath it.
To increase, press the ^ key
To decrease press the ∨ key until the correct value is shown.
Change the next digit in the same way.
Finally store the new value by pressing ENT key.

## Block 1 Parameters

To enter block1, press and hold the SEL key for 1-2 seconds.
The displays will show "P"
Step through the parameters by pressing the SEL key.
Pressing the V key will move back one parameter step.
To change a setting, press the data key to show the setting.
Then change the value using either the up or down key.
Store the new setting by pressing the enter key.
The controller will automatically display the next parameter.

## Note:

The controller will return to normal control mode and display the Process value if no adjustments are made within 30sec

## Block1 Parameters

| Parameter | Settings | Factory set | Remarks |
|---|---|---|---|
| Proportional Band (P) | 0-999.9% | 3.0 | If P=0 Control is on/off |
| Integral Time (I) | 0-3200 sec | 240 | I=0 Integral =off |
| Derivative Time (D) | 0-999.9 sec | 60 | D=0 Derivative = off |
| Lower alarm Limit (AL) | Within the input range. | 10 | Not displayed On 8 pin version. |
| Upper alarm Limit (AH) | Within the input range. | 10 | Not displayed On 8 pin version. |
| Hysteresis (HYS) | 0-50% FS | 0.3 | |
| Autotuning (AT) | 0,1 or 2 | 0 | 0=No Autotuning 1=Autotuning STD 2=Autotuning lo PV |
| Key Lock (LOC) | 0,1 or 2 | 0 | 0=No lock 1=All locked 2=Only SV can be changed. |

**Tip:**
If the decimal point feature is to be used. The parameter should be changed first to avoid errors eg: if SV is set at $50^0C$ and then the decimal point is set to one place this automatically changes SV to $5.0^0C$!

## Block2-Parameters.

To select Block2 parameters when the normal PV display is shown, press and hold the select key for approx. 5 seconds and the display will change to P-n1.

To select Block2 parameters when a Block1 parameter is being displayed, press select key for 2 seconds and the display will change to P-n1.

To return to Block1 from Block2, press and hold the select key for 2 seconds.

## Block2 Parameters

| Parameter code | Description | factory setting | Remarks |
|---|---|---|---|
| P-n1 Control Action | 0,1,2,3 | 0 | 0=Rev, low b/out*. 1=Rev, high b/out* 2=Direct,low b/out* 3=Direct,high b/out* |
| P-n2 Input Type | 1-13 or 16 | 3 | See table 2 of input type codes. |
| P-df Time constant | 0 – 201 sec | 20 | |
| P-SL Range low limit | See table 2. | 0 | |
| P-SU Range upper limit | See table2 | 1200 | (P-SU) - (P-SL) = FS |
| P-AL Alarm type 2 | 0 - 15 | 9 | See table 3 |
| P-AH Alarm type 1 | 0 - 11 | 5 | See table 3 |
| P-An Alarm hysteresis | 0 – 255 | 1 | |
| P-dP Decimal Point | 0-2, none | 0 | |
| PUOF PV offset | -10 to + 10%FS | 0 | |
| FUZY Contorl type | ON, OFF | OFF | ON= PID+Fuzzy OFF= PID only |
| dSP1 to dSP7 Skip | Specific to model. | | Do not change. |

*Controller simulates either high or low input on sensor fail.

**Table 2 - Input Range and Codes (P-n2)**

| Input Signal | Input Range ($^0$C) P - SL to P - Su | Input Range ($^0$F) P – SL to P - Su | P-n2 Code |
|---|---|---|---|
| Resistance Bulb Pt100$\Omega$ | - 150 to 850 | - 238 to 1562 | 1 |
| Thermocouple | | | |
| J | 0 to 400 | 32 to 752 | 2 |
| K | 0 to 800 | 32 to 1472 | 2 |
| K | 0 to 800 | 32 to 1472 | 3 |
| R | 0 to 1200 | 32 to 2192 | 3 |
| B | 0 to 1600 | 32 to 2912 | 3 |
| S | 0 to 1800 | 32 to 3272 | 4 |
| T | 0 to 1600 | 32 to 2912 | 5 |
| T | -199 to 200 | - 328 to 392 | 6 |
| E | -150 to 400 | - 238 to 752 | 7 |
| E | 0 to 800 | 32 to 1472 | 7 |
| N | 199 to 800 | - 328 to 1472 | 8 |
| PL2 | 0 to 1300 | 32 to 2372 | 8 |
| | 0 to 1300 | 32 to 2372 | 12 |
| | | | 13 |
| 1 to 5V DC | Scaling range; - 1999 to 9999 | | 16 |
| 4 - 20mA DC | For 4-20mA input use a 250 resistor. | | |

When the last parameter has been set satisfactorily you can return to normal PV indication and control by pressing the PV/SV key twice. Alternativeley the controller will switch back automatically after 30 seconds of inactivity.

Your controller is now ready for start up and for auto - tuning if this function is desired.

Please check the control action and that all alarms work correctly. Observe the process for several hours to be satisfied that the control settings chosen are correct. We recommend that the LOC function is used to prevent unauthorised changes to settings and parameter codes.

**Alarm codes**

| | P–AH (AL1) | P-AL (AL2) | Kind of Alarm |
|---|---|---|---|
| Absolute Alarm | 0 | 0 | No alarms |
| | 1 | 1 | High |
| | 2 | 2 | Low |
| | 3 | 3 | High (no hold) |
| | 4 | 4 | Low  (hold) |
| Deviation Alarm | 5 | 5 | High dev |
| | 6 | 6 | Low dev |
| | 7 | 7 | High/low dev |
| | 8 | 8 | High dev (no hold) |
| | 9 | 9 | Low dev (hold) |
| | 10 | 10 | High/low dev (hold) |
| Zone | 11 | 11 | High/low range dev  (ALM1/2 individual) |
| | | 12 | High/low range abs |
| | | 13 | High/low range dev |
| | | 14 | High range abs and low range dev |
| | | 15 | High range dev and low range abs |

Note:
1) When the Alarm is active the contacts are closed.
2) Alarms that have a hold function will only operate if the PV goes from non alarm zone to alarm zone. eg: when heating with low alarm hold. At initial power up the alarm will not operate until the PV=SV and then PV drops into the low alarm zone.
3) Deviation alarms points move in relation to the SV. E.g. SV=$100^0$ and deviation alarm = $10^0$ , then alarm will operate at $90^0$ and $110^0$. An absolute alarm setting of $105^0$ will operate at this point regardless of the SV setting.
4) A Zone alarm means that alarm is on (contacts closed) when measured value is within the AH and AL band.  Should power fail the contacts open.

# Suggested initial settings

Before use certain settings and parameters need to be checked and adjusted if necessary.

**Input Type, code P-n2.** This must be set correctly according to the type of input signal used, see table page 15.

**Input Range, P-SL and P-SU.** Can be set within the range for the appropriate input type. The values chosen will limit the SV range, so as to prevent unauthorised or dangerous settings, and improve the accuracy of reading because the full scale (FS) factor is difference between P-SU and P-SL

**Proportional Band, code P.** For many applications only an on/off switching action is required as in a simple thermostat, particularly with electric heaters. In such cases P should be reduced to 0.0. Then PID control is not possible. PID control (P settings greater than zero) is normally only used with 4-20mA variable output control such as with control valves or inverters for speed control.

**Hysteresis or Dead Band, code HYS.**
Adjusts the control dead band and is set as a percentage of the FS. A small a figure will create cycling or chattering of the control output around the set point with a shortened life for the output relay. Larger settings will slow down the control action but increase the swing of temperature. A compromise should be used e.g.: if the allowable dead band is $2^0$ ( $\pm 1^0$ ) when FS = $100^0$C, then HYS = 1.0% or for $5^0$ ($\pm 2.5^0$) when FS = $1000^0$ then HYS = 0.25%.

**Decimal Point, code P-dP.** For control settings less than 100 it may be beneficial to utilise the decimal point selection which will increase accuracy and improve control. This feature allows one or two places for the decimal i.e.: for 100.0 the P-dP code = 1 or for 100.00 the P-dP code = 2. Important reminder- please ensure that the decimal point position is set before other parameters to avoid errors later.

**Set Value SV.** This value determines the control point and must be set in all cases.

**Alarm settings P-AL and P-AH.** When the controller model supplied has alarm facilities as in the 11 pin versions the factory settings are normally deviation type alarm set to operate at $10^0$ above and below the set value. Then the alarm contacts close at $10^0$ either side of whatever the control set value is. To change to different alarm points change P-AL & P-AH according to table 3.

**Control Action, code   P-n1.** Experience shows that most applications use reverse action where the control output is on (relay contacts closed) when measured value PV is less than SV such as in heating applications. An alternative action called direct action is used for cooling where the control output is on when PV is greater than SV. This setting also determines the burnout direction which, should the input signal be interrupted such as by a burnt out thermocouple or broken wiring, simulates a low or high signal to drive the controller low or high. Please see Block 2 parameters on page 14..

# Auto tunning code (AT)

Once the system is set up with initial values for set value (SV), alarm settings (P-AH and P-AL), proportional time cycle (TC). The auto-tune feature can then be used compute the best PID parameters automatically.

Note: his procedure is not relevant when proportional band, (P), is set to zero (ie on/off action)

Two levels of autotune are possible as shown below.

| | No autotune | autotune on basis of SV | autotune on basis of lowPV |
|---|---|---|---|
| Setting (AT) | 0 | 1 | 2 |

Note: Where overshoot is not acceptable, autotune on a basis of low PV.

**How to start Autotune**
Set the parameter, (AT) to either code 1 or 2 using the ∧ key, then press the **ENT** key to start the process.
The decimal point at bottom right of display will stop blinking when the process is finished.
The controller sets (AT) back to zero and stores the new settings for P, I and D. However, should the tuning process take more than four hours then something is wrong. So the wiring and parameter settings must be checked for errors, also check the control action (reverse for heating and direct for cooling) and whether the input signal matches the controller setting.

**CAUTION !** Do not use autotune when large variations in PV would cause disruption to the process, or when the process being controlled is fast acting such as with pressure or flow. Repeat autotune when a significant change in the control loop occurs which includes changes in set value, P-SL and P-SU, and when the controlled equipment physically changes. Also note that should the autotune process be interrupted by power cut off the process must be restarted manually.

## Ramp Function

*This facility is only available for model types PXZ4\*\*Y1-4V000 and -5V000.*
It allows up to 4 stages of ramp and soak as shown in the diagram below. Once set, the controller will automatically change the set point value with elapsed time from start up in accordance with the preset pattern.

## Start up Proceedure

Your controller is now ready for start up and for autotuning if this function is required. Please check the control action and that all alarm functions work correctly. Observe the process for several hours to be satisfied that the control settings chosen are correct. Then it may be prudent to record all settings and to engage the lock feature to prevent any unauthorised changes in the future.

## Fault Finding

Most problems are caused through incorrect settings and it is recommended that this manual be read through carefully. The following problemost common problems are listed below:

**1) No display.** First, check the mains supply. If OK, switch off temporarily and then back on whilst observing the display to see if 4 red dots appear then go out. If yes then there is an internal controller fault.

**2) Incorrect Temperature Indicated.** Check code setting for P-n2 is correct. Check for correct polarity of both the connections to controller and any intermediate extension cable. Open or short circuit input will result in a display of LLLL or UUUU. In case of RTD probe ensure that wiring is correct to terminals 1,2 and 3.

If all is in order, yet there remains a small known error of a few degrees the error can be cancelled out by use of the PV offset parameter in block 2.

**3) Excessive Chattering of Control Output Relay.**
Increase P setting for PID control applications or
Set P to 0 and increase HYS settings for On/off pplications.

**4) Sudden failure .**
If the controller has been working and suddenly fails it suggests investigation of all parameter settings to compare with the initial recorded settings. In the unlikely event that no parameter changes show up the controller should be taken out of service and returned to your local distributor as a warranty claim, if less than 18 months old. Regrettably this type of controller is uneconomic to repair and if it is outside warranty a new replacement should be obtained. Upon fitting a replacement, consider reducing the number of relay operations by changing parameters, P, TC, Hys, P-dF or, in case of alarm relay problems, P-An.

5) Incorrect wiring. When a RTD probe is used ensure that terminal 3 is wired in circuit - usually red wire to pin 2 and pin 3, white wire(s) to pin 1. Should a low cost 2 wire device be used then terminal 3 must be linked to terminal 2.

## Maintenance

Occasionally clean the front face of the instrument with a soft damp cloth taking care not to press any keys if the unit is powered up.

Ensure that all electrical connections remain secure. Check from time to time the working of the control action and alarms to see that they are operating correctly and not excessively.

## Warranty

These controllers carry a warranty effective for 18 months from the manufactured date shown on the label, providing it has been installed, set up and used correctly. Since there is no internal clock the controller is year 2000 compliant.

## Repair

We consider that these controllers are uneconomic to repair and no attempt should be made by the user to effect any repair work himself.

Information in this manual is given in good faith but the Company can not be held liable for any claims arising from the use of such information. The information is subject to change without notice.

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**PRESSURE TRANSMITTERS \***
**DIFFERENTIAL PRESSURE TRANSMITTERS\***
**PRESSURE SWITCHES**
**TEMPERATURE CONTROLLERS**
**TEMPERATURE PROBES and POCKETS**
**TEMPERATURE TRANSMITTERS \***
**TEMPERATURE SWITCHES**
**LEVEL TRANSMITTERS \***
**ORIFICE PLATES, VENTURI and NOZZLES**
**FLOW TRANSMITTERS \***
**ULTRASONIC FLOWMETERS**
**CHART RECORDERS**
**SINGLE LOOP PROCESS CONTROLLERS**
**OXYGEN ANALYSERS**

\*Products that are available with smart outputs.

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