Fuji Electric's PX Series fuzzy logic controllers are the leaders in precision control.

Break-through technology

redesigned from the inside out

PX

BREAKTHROUGH TECHNOLOGY. That's what the Fuji PX series fuzzy logic controllers are all about. Faster. Smarter. Tougher. More Versatile. More Features. Redesigned from the ground up. Redeveloped from the inside out. Welcome to the 21st century, and meet the leaders in control technology.

The NEMA 4X protection makes them tough enough to withstand the harshest of environments. Fuji's fuzzy logic algorithm makes them smart enough to learn your process and make rapid, accurate adjustments. Multiple choices for number of buttons, DIN size, configuration, and options make them versatile enough to match your individual needs.

All of the PX controllers use Fuji's patented fuzzy logic algorithm with PID Autotune. These controllers "learn" your process, using the PID parameters as a starting point for all decisions made by the controller. This intelligence allows your process to reach its setpoint in the shortest time possible while virtually eliminating overshoot. The end result is that your process maintains a steady setpoint.

Eight-segment ramp/soak programming, Advanced security options, Versatile programming, Fuzzy logic intelligence, NEMA 4X protection; all of these features come STANDARD in a PX, you don't have to pay more for them. The PX series also offers a wide range of choices for your unique space requirements and programming preferences.

PX SPECIFICATIONS

INPUT

Input signal:
Thermocouple
RTD
Voltage/current: 1–5V DC, 0–5V DC and 4–20mA DC, 0–20mA DC
(Current input is used with supplied 250Ω external resistor)
Input range: See Input Range table below
Burnout: For thermocouple/RTD input, the intended direction of the output is selectable as either upscale or downscale in case of burnout.

INPUT RANGE TABLE:

Input Signal	Input Range (°C)	Input Range (°F)	Description
Thermocouple			
J	0 ~ 800	32 ~ 1472	Cold Junction compensating function built-in.
K	0 ~ 1200	32 ~ 2192	
R	0 ~ 1600	32 ~ 2912	
B	0 ~ 1800	32 ~ 3272	
S	0 ~ 1600	32 ~ 2912	
T	-199 ~ 200	-328 ~ 392	
T	-150 ~ 400	-238 ~ 752	
E	-199 ~ 800	-328 ~ 1472	
N	0 ~ 1300	32 ~ 2372	
PL2	0 ~ 1300	32 ~ 2372	
RTD			
Pt100	-150 ~ 850	-238 ~ 1562	Allowable wiring resistance 10Ω max (per wire)
DC Voltage/Current			
1–5V DC	Scaling Range: -1999–9999		
0–5V DC			
4–20mA DC	For current input, use the 250Ω Shunt		
0–20mA DC	resistor to obtain 1–5V DC or 0–5V DC input.		

CONTROL FUNCTION (STANDARD TYPE)

Control action: On/Off, PID control with auto-tuning
Fuzzy control with auto-tuning
Proportional band (P): 0–999.9% of full scale (FS), setting in 0.1% steps
Integral time (I): 0–3200 sec, setting in 1 sec steps
Differential time (D): 0–999.9 sec, setting in 0.1 sec steps
P, I, D = 0: On/Off
I, D = 0: Proportional Action
Proportional cycle: 1–150 sec, setting in 1 sec steps, relay contact output, SSR/SSC drive output only
Hysteresis width: 0–50% FS, setting in 1 E.U. steps, On/Off action only
Anti-reset-wind-up: 0–100% FS, setting in 1 E.U. steps, auto-setting with auto-tuning
Input sampling cycle: 0.5 sec
Control cycle: 0.5 sec

CONTROL FUNCTION (DUAL OUTPUT TYPE) (HEAT/COOL TYPE)

Heating Proportional band: P x ½ (P= 0–999.9%)
Cooling Proportional band: Heating proportional band x cooling proportional band coefficient
Cooling proportional band coefficient= 0–99.9
0: 2-position action
Integral time: 0–3200 sec for heating and cooling
Differential time: 0–999.9 sec for heating and cooling
P, I, D= 0: 2-position action (without dead band) for heating and cooling
I, D= 0: Proportional action
Proportional cycle: 1–150 sec, relay contact output, SSR/SSC drive output only
Hysteresis width: 2-position action for heating and cooling: 0.5% FS. 2-position action for cooling: 0.5% FS
Anti-reset wind-up: 0–100% FS, setting in 1 E.U. steps, auto-setting with auto-tuning
Overlap/dead band: ±50% of heating proportional band
Input sampling cycle: 0.5 sec
Control cycle: 0.5 sec

OUTPUT (STANDARD TYPE)

Control output: One of the following three types is selected:
(1) Relay contact (SPDT)
220V AC/30V DC, 3A (resistive load)
Mechanical life: 10^7 times (under no load)
Electrical life: 10^5 times (under rated load)
(2) SSR/SSC drive (voltage pulse):
15–30V DC at ON/0.5V DC or less at OFF,
Current 60mA or less
(3) 4–20mA DC: allowable load resistance—600Ω or less

OUTPUT (DUAL OUTPUT TYPE) (HEAT/COOL)

Control output: For dual output type, one of the following three types is selected on both heating and cooling types:
Not available on PXW/Z-4 type
(1) Relay contact SPDT: 220V AC/30V DC, 3A (resistive load)
(2) SSR/SSC drive (voltage pulse)
ON: 15–30V DC
OFF: 0.5V DC or less, max
Current: 60mA or less
(3) 4–20mA DC: allowable load resistance—600Ω or less

(Note: When SSR/SSC drive output for heating/cooling side is selected, the total current should be less than 60mA)

SETTING AND INDICATION

Parameter setting method:
PXW: digital setting with 3 keys
PXZ: digital setting with 8 keys
PV/SV display method:
PXZ-4: PV/SV Red LED display, 4-digit
PXW, PXZ-5, 7, 9: dual PV/SV LED display, 4 digits each, PV= Red, SV=Green
Status display: Control output, alarm output, heater burnout alarm output
Setting accuracy: 0.1% FS
Indication accuracy (at 23°C):
Thermocouple: ± 0.5% FS ± 1 digit ± 1°C
R thermocouple: 0–400°C; ± 1% FS ± 1 digit ± 1°C
B thermocouple: 0–500°C; ± 5% FS ± 1 digit ± 1°C
RTD, voltage, current: ± 0.5% FS ± 1 digit

PX SPECIFICATIONS

ALARM

Alarm output:
Relay contact (SPST), 220V AC/30V DC, 1A (resistive load)
PXW/Z-4 type: 1 point; Other types: 2 points
(Configurable as absolute, deviation, zone, or combination alarms with or without the hold features)
Heater burnout alarm output: Relay contact (SPST), 220V AC/30V DC, 1A (resistive load), PXW/Z-4 type: not available

GENERAL SPECIFICATIONS

Rated voltage: 85–264V AC or 24V AC/DC
Power consumption: 10VA or less (100V AC), 15VA or less (240V AC)
Insulation resistance: 50MΩ or more (500V DC)
Withstand voltage:
Power source-Earth: 1500V AC, 1 min. Other: 1500V AC, 1 min
Earth-relay output: 1500V AC, 1 min
Earth-Alarm output: 1500V AC, 1 min
Between other terminals: 500V AC, 1 min
Input impedance:
Thermocouple: 1MΩ or more
Voltage: 450KΩ or more
Current: 250Ω (external resistor)
Allowable signal source resistance:
Thermocouple: 100Ω or less
Voltage: 1KΩ or less
Allowable wiring resistance: RTD: 10Ω or less per wire
Reference junction compensation accuracy: ± 1°C (at 23°C)
Process variable offset: ± 10% FS
Set variable offset: ± 50% FS
Input filter: 0–900.0 sec, setting in 0.1 sec steps (primary lagging filter)
Noise reduction ratio:
Normal mode noise (50/60Hz): 50dB or more
Common mode noise (50/60Hz): 140dB or more

POWER FAILURE PROCESSING

Memory protection: Non-volatile memory hold. Parameter values remain unchanged with disruption of power. Ramp/soak function has to be re-initiated.

SELF-CHECK

Method: Watchdog timer monitors program error.

OPERATION AND STORAGE CONDITIONS

Operating temperature: -10–50°C
Operating humidity: 90% RH or less (non-condensing)
Storage temperature: -20–60°C

OTHER FUNCTIONS

Parameter mask function: Parameter display is disabled by software
Ramp/Soak function: 4-ramp/4-soak

DELIVERY

PXW/Z-4 type: Controller, panel mounting frame, socket (when specified), rubber gasket, instruction manual
Other types: Controller, panel mounting bracket, rubber gasket, instruction manual

STRUCTURE

Mounting method: Panel flush mounting or surface mounting
Surface mounting: PXW/Z-4 type only
External terminal: PXW/Z-4 type: 8-pin or 11-pin socket
Other types: screw terminal (M3.5 screw)
Case material: Plastic
Dimensions:

PXW/Z-4	1/16 DIN	48 x 48 x 85.7mm
PXW/Z-5	1/8 DIN	52.5 x 100.5 x 95.8mm
PXW/Z-7	72mm	76.5 x 76.5 x 95.8mm
PXW/Z-9	1/4 DIN	100.5 x 100.5 x 95.8mm

Weight:
PXW/Z-4 approx. 150g
PXW/Z-5 approx. 300g
PXW/Z-7 approx. 300g
PXW/Z-9 approx. 400g
Structure: Front panel: NEMA 4X (IEC IP66), Rear case: IEC IP20
Enclosure color: Black (front frame, case)

ACCESSORIES

Sockets: (only for PXW/Z-4 and sold separately)
8-pin sockets: (for PXW/Z-4 without H/L Alarm Option)
PG-08–Screw-down type (terminals on back)
ATX1NS—Solder Type
ATX2PSB—Screw-down type (terminals on back) UL, CSA
TP28X—Screw-down type (terminals on front) UL, CSA
11-pin sockets: (for PXW/Z-4 with H/L Alarm Option)
PG-11—Screw-down type (terminals on back)
TP311SB—Screw-down type (terminals on back)
TP311S—Screw-down type (terminals on front)
PF113A—DIN rail mount (terminals on front) UL, CSA
Heater Break Current Sensing Transformer:
CTL-6-SF—For heater current (1–30A)
CTL-12-S36-8F—For heater current (20–50A)

PX BENEFITS:

Choose among ¼ DIN, ⅛ DIN, 72mm, 1/16 DIN and 1/32 DIN sizes—there's a size available to accommodate your space needs. (see PXV3 for details on the 1/32 DIN controller)

Front panel key choices—choose between user-friendly eight-button or more complex three-button operation

Fuzzy logic control with PID autotune comes standard—the controller uses artificial intelligence to learn your process

NEMA 4X is standard—it's tough enough for the harshest of environments

All parameters are display maskable—hides unused options

8-Segment ramp/soak programming is a standard feature—set four setpoints, four ramp rates, and four soak periods

Advanced security options—prevent unauthorized or accidental changes in parameters

Wide input range—a variety of choices for your input needs

Same low price as the PID autotune controllers—you get more standard features without having to *pay* more for them

Three-year warranty—protects against manufacturing defects

PXZ PROGRAMMING

PRIMARY (SETPOINT) MENU

PARAMETER	ITEM	MEANING	DESCRIPTION
ProG	ProG	Ramp/Soak command	Setting: OFF: Ramp/Soak off RUN: Ramp/Soak on HLD: Ramp/Soak on hold
P	P	Proportional Band	Setting Range: 0–999.9% of input range. For On/Off control set to 0.
I	I	Integral Time (reset)	Setting Range: 0–3200 sec Integral action is off when set to 0.
d	D	Derivative Time (Rate)	Setting Range: 0–999.9 sec Derivative action is off when set to 0.
AL	AL	Low Alarm Setpoint	Settable within the Input Range. Not indicated without the Alarm Output option.
AH	AH	High Alarm Setpoint	Settable within the Input Range. Not indicated without the Alarm Output option.
TC	TC	Cycle Time (Output 1)	Setting range: 0–150 sec Not indicated with current output.
HYS	HYS	Hysteresis (Output 1)	Setting range: 0.0–50% of input range. Applies to ON/OFF control.
Hb	Hb	Heater Break Alarm	Setting range: 0–50.0A. Not indicated without the heater break alarm output option. Not available with 4–20mA output. Alarm is off when set to 0.
AT	AT	Autotuning	Sets PID parameters automatically 0—Autotuning off 1—Standard autotuning 2—Below setpoint autotuning (10% of FS below setpoint.)
TC2	TC2	Cycle Time (Output 2)	Setting range: 0–150 sec Not indicated without control Output 2 option or with current output.
CooL	CooL	Proportional Band Coefficient for Cooling	Setting range: 0–99.9. Not indicated without control Output 2 option. For on/off control on output 2, set to 0.
db	db	Dead Band/ Overlap	Setting range: -50%–50% of heating proportional band. Not indicated without control Output 2 Option.
bAL	bAL	Balance	Position the proportional band with respect to setpoint. Setting range: 0–100%. At 50%, proportional band is centered around setpoint.
Ar	Ar	Anti-Reset Wind-Up	Setting range 0-100% F.S. Limits range of where integration occurs
LoC	LoC	Lock-Out	Program data lock-up (code) 0—All data is selectable 1—All data is locked 2—All data except for main setpoint is locked

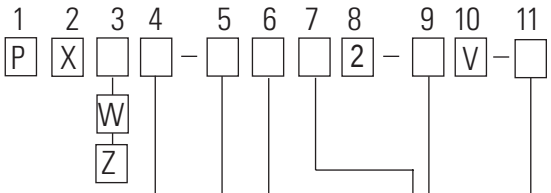
PRIMARY (SETPOINT) MENU, CONTINUED

PARAMETER	ITEM	MEANING	DESCRIPTION
STAT	STAT	Ramp/Soak status	Current Ramp/Soak status is displayed. No setting.
SV-1 to SV-4	SV–1 to SV–4	Ramp target value	Setting range: 0–100% of input range.
TM1r to TM4r	TM1r to TM4r	Ramp segment time	Setting range: 00.00–99 hr 59 min
TM1S to TM4S	TM1S to TM4S	Soak segment time	Setting range: 00.00–99 hr 59 min
Mod	Mod	Ramp/Soak mode	Up to 16 different modes of ramp/ soak operation possible. Setting: 0–15

SECONDARY (SYSTEM) MENU

P-n1	P-n1	Control Action	Setting control action: (code) reverse or direct. Setting sensor break protection: (code) Output ON or OFF.
P-n2	P-n2	Input Type	Setting input type: (code) thermocouple/RTD or current /voltage
P-dF	P-dF	Digital Filter	Setting: 0–900 sec
P-SL	P-SL	Lower Limit of Input Range	Setting range: -1999–9999
P-SU	P-SU	Upper Limit of Input Range	Setting range: -1999–9999
P-AL	P-AL	Alarm Type 2	Setting for alarm action: 0–15
P-AH	P-AH	Alarm Type 1	Setting for alarm action: 0–11
P-An	P-An	Alarm Hysteresis	Setting range: 0–50% of input range
P-dP	P-dP	Decimal Point Position (Resolution)	Setting: 0—None 1—One decimal point (TC, RTD, Linear) 2—Two decimal points (Linear only)
PVOF	PVOF	Process Variable Offset	Setting range: -10%–10% of input range. Both indicated and measured values of process variable are changed.
SVOF	SVOF	Setpoint Variable Offset	Setting range: -50–50% of input range. Indicated setpoint variable is unchanged. Measured setpoint variable is changed.
P-F	P-F	C/F Selection	Setting: Does not apply to current/ voltage input.
FUZY	FUZY	Control type	Setting: ON—fuzzy control, OFF—PID control
dSP1 to dSP7	dSP1 to dSP7	Parameter mask function	Setting: 0–255, refer to the manual

PX MODEL CONFIGURATION



FRONT PANEL SIZE	CODE
1/16 DIN	4
1/8 DIN	5
72mm	7
1/4 DIN	9

KINDS OF INPUT	CODE
Thermocouple (°C)	T
Thermocouple (°F)	R
RTD/Pt100 (°C)	N
RTD/Pt100 (°F)	S
4–20mA DC, 1–5V DC	B
0–20mA DC, 0–5V DC	A

CONTROL OUTPUT 1	CODE
Relay contact (reverse action)	A
Relay contact (direct action)	B
SSR/SSC driver (reverse action)	C
SSR/SSC driver (direct action)	D
4–20mA DC (reverse action)	E
4–20mA DC (direct action)	F

CONTROL OUTPUT 2*	CODE
None	Y
Relay contact (reverse action)	A
Relay contact (direct action)	B
SSR/SSC driver (reverse action)	C
SSR/SSC driver (direct action)	D
4–20mA DC (reverse action)	E
4–20mA DC (direct action)	F

*not available on PXW/Z-4 type

ADDITIONAL FUNCTION	CODE
Heater break alarm*	2
Process alarm & Heater break alarm*	3
None	4
Process alarm	5

*not available on PXW/Z-4 type, or with 4–20mA DC outputs.

POWER SUPPLY OPTION	CODE
24V AC/DC Supply	D

Fine-tuning Autotuning

BY AUTOTUNING, the controller selects what it calculates to be the optimum PID and Anti-Reset parameters for a particular process and stores them in memory for future use. The controller will not need to be reautotuned upon each power up, as long as the system requirements and characteristics remain the same. The autotune parameters selected are good only for the process for which it has been autotuned. If the setpoint, input device, output device (load), or any portion of your system changes, autotune may need to be initiated again.

These factors can upset the autotuning function:

1. The system is affected by process disturbances external to the control loop. Adjacent heater zones, changing material levels, and exothermic reactions are examples of process disturbances which are external to the control loop.

2. The system is dynamic. The process variable changes quickly. Certain pressure and flow applications would be characterized as very dynamic. Because of how the autotune function is performed, a dynamic system, when autotuning, would create considerable overshoot that could jeopardize the process.

3. The system is slow-responding and does not achieve the process value in a timely manner. With such systems, the autotuning function would take a long time to complete and with questionable results.