

## **Controller's & Indicator's**



#### What is a Controller?

A Controller is a device that is used to control an equipment by comparing a process signal with a set point and performing calculations according to the deviation between those values. Devices that can handle process signals such as Temperature, Humidity, Pressure and Flow Rate are called Controllers.



#### Difference between ON/OFF and PID Controller

- PID Controller can provide output in both the form, Analog and Digital, whereas an ON/OFF controller provides output in digital form only
- ON/OFF Controllers are used in applications where some deviation can be accepted without hampering the process., whereas PID Controllers are used in applications where a very less amount of deviation is accepted
- In ON-OFF control method process can not be stable at set-point and the PID controller can adjust its output to match the power that is required to keep the process stable at the setpoint
- PID Controllers are costlier than ON/OFF Controllers, due to more features that they provide and the precision with which PID controllers operates





#### **Control Methods**

#### What is ON/OFF Control Action?

ON/OFF Controller is the simplest form of temperature control device. The output from the device is either ON or OFF, with no middle state. An ON/OFF Controller will switch the output only when the temperature crosses the set point.

For ex.: For heating control, the output is ON when the temp. is below the set point, and OFF above set point.





#### What is PID Control Action?

A PID Controller is an instrument used by control engineers to regulate temperature, flow, pressure, speed and other process variables in industrial control systems. PID controllers use a control loop feedback mechanism to control process variables and are the most accurate and stable controller.



PID control is a well-established way of driving a system towards a target position or control parameters. It's practically ubiquitous as a means of controlling temperature and finds application in a myriad of chemical and scientific processes as well as automation. PID control keeps the actual output from a process as close to the target or setpoint output as possible.



#### **PID Controller Working Principle**

The working principle behind a PID Controller is that the proportional ("P"), integral ("I"), and derivative

("D) terms must be individually adjusted or 'tuned'. Based on the difference between these values a correction factor is calculated and applied to the input.

**For example:** If an oven is cooler than required, the heat will be increased.





- **Proportional Tuning** involves correcting a target proportional to the difference. Thus, the target value is never achieved because as the difference approaches zero, so does the applied correction
- Integral Tuning attempts to remedy this by effectively cumulating the error result from the "P" action to increase the correction factor. For example: If the oven remained below temperature, "I" would act to increase the heat delivered. However, rather than stop heating when target is reached, "I" attempts to drive the cumulative error to zero, resulting in an overshoot
- Derivative Tuning attempts to minimize this overshoot by slowing the correction factor applied as the target is approached.





Fail Safe: Designed to go in safe mode when process fails

Knowledge: Backed by vast application knowledge for Industries

Communication: Easy to manage and interface with PLC, SCADA and IIoT



Configurable: Input & output signal type is configurable, helps reduce inventory

Service: Rugged, Reliable & Repeatable Controller with 10 years service support



## **Technical Specifications- Controllers**

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		5040	5040-XP	5002U-P	LC5296-AT	LC5296L-AT	LC5296-XP-AT	LC5296-DC	LC5296-XP-DC	5006RN	TC5396	TC596	TC548	TC548E	LC5248E-AT	LC5296V-AT	LC5296H
						5296 100		-5296 -5296			- <u>\$396</u>	- 596 ·	0598 		<b>Manifus</b> United <b>5248</b> - Correction Correction	5295 5295	
Mounting		Panel	Wall	Panel	Panel	Panel	Wall	Panel	Wall	Panel	Panel	Panel	Panel	Panel	Panel	Panel	Panel
Panel Cut	Panel Cut Out (HXW)		-	92.5 x 92.5	92.5 x 92.5	92.5 x 92.5		92.5 x 92.5		92.5 x 92.5	92 x 92	92 x 92	45 x 45	45 x 45	44 x 44	92x45	45 x 92
Dimension (HXWXD)		96 x 96 x 110	340 x 186 x 165	96 x 96 x 110	96 x 96 x 75	96 x 96 x 75	340 x 186 x 110	96 x 96 x 75	340 x 186 x 110	96 x 96 x 75	100 x 100 x 55	100 x 100 x 55	50 x 50 x 74	50 x 50 x 74	48 x48 x 120	96x48x85	48 x 96 x 85
Character	PV	0.56"	0.56"	0.56"	0.56"	0.56"	0.56"/ 0.8"	0.56"	0.56"/ 0.8"	0.56"	0.8"	0.56"	0.4"	0.4"	0.4",	0.36",	0.56"/ 0.8"
Height	SV	0.4"	0.4"	0.4"	0.4"	0.4"	0.4"/0.56"	0.56"	0.4"/0.56"	Х	0.56"	X	Х	0.31″	0.28″	0.31″	X
	TC, RTD	± 0.1% of F.S ± 1° C	± 0.1% of F.S ± 1° C	TC (E,J,K,T,C,J,N,C,G), RTD: ± 0.1% of F.S ± 1 °C	±0.25% of FS ±1 count	±0.25% of FS ±1 count	±0.25% of FS ±1 count	±0.25% of FS ±1 count	±0.25% of FS ±1 count	±0.25% of FS ±1 count	±0.25% of FS ±1 count	±0.25% of FS ±1 count	±0.25% of FS ±1 count				
Accuracy	TC (B,R,S)			: ± 0.2% of F.S ± 1 °C													
	Current, Voltage	± 0.1% of F.S ± 1 count	± 0.1% of F.S ± 1 count	± 0.1% of F.S ± 1 count	± 0.1% of F.S ± 1 count	± 0.1% of F.S ± 1 count	± 0.1% of F.S ± 1 count	± 0.1% of F.S ± 1 count	± 0.1% of F.S ± 1 count	± 0.1% of F.S ± 1 count	± 0.1% of F.S ± 1 count				± 0.1% of F.S ± 1 count	± 0.1% of F.S ± 1 count	± 0.1% of F.S ± 1 count
	Process Value Input	Thermocouple (E, J, K, T, B, R, S, N) RTD (Pt100), Current, Voltage	Thermocouple (E, J, K, T, B, R, S, N) RTD (Pt100), Current, Voltage	Thermocouple (E, J, K, T, B, R, S, N,C,G) RTD (Pt 100), Current, Voltage	Thermocouple (E, J, K, T, B, R, S), RTD (Pt100), Current, Voltage	Thermocouple (E, J, K, T, B, R, S), RTD (Pt100), Current, Voltage	Thermocouple (E, J, K, T, B, R, S), RTD (Pt100), Current, Voltage	Thermocouple (E, J, K, T, B, R, S), RTD (Pt100), Current, Voltage	Thermocouple (E, J, K, T, B, R, S), RTD (Pt100), Current, Voltage	Thermocouple (J, K, T, R, S), RTD (Pt100), Current, Voltage	Thermocouple (E, J, K, T, B, R, S), RTD (Pt100), Current, Voltage	Thermocouple (E, J, K, T, B, R, S), RTD (Pt100)	Thermocouple (E, J, K, T, B, R, S), RTD (Pt100)	Thermocouple (E, J, K, T, B, R, S), RTD (Pt100)	Thermocouple (E, J, K, T, B, R, S), RTD (Pt100), Current, Voltage	Thermocouple (E, J, K, T, B, R, S), RTD (Pt100), Current, Voltage	Thermocouple (J, K, T, R, S), RTD (Pt100), Current, Voltage
Input	Remote Setpoint Input	4 to 20 mA, 0-20mA, 0-5V, 1-5V	4 to 20 mA, 0-20mA, 0-5V, 1-5V	x	×	x	х	Х	Х	Х	x	x	х	×	X	x	X
	ZV Input	Potentiometer 100 to 2K Ohm	Potentiometer 100 to 2K Ohm	X	x	x	X	Х	Х	Х	x	X	х	×	X	x	×
	Digital Input	4	4	х	х	х	X	х	X	X	х	х	х	X	х	х	X
	Relay	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Control Output	SSR	•	•	x	•	•	•	x	x	x	•	•	•	•	•	•	x
	Linear	•	•	X	•	X	•	X	Х	Х	•	x	X	x	•	•	x
	Motorized Valve	•	•	х	•	x	•	Х	Х	Х	•	X	Х	x	•	•	x
	Re-transmission Output	t Upto 2*	Upto 2*	Upto 2*	Upto 2*	х	Upto 2*	Upto 2*	Upto 2*	Upto 2*	Upto 2*	X	х	x	Upto 2*	Upto 2*	Upto 2*
Output	Alarm	Upto 4 *	Upto 4 *	3	Upto 2*	2	Upto 4*	1	1	Upto 2*	Upto 2*	Upto 2*	2				
Output	Digital Output	4	4	×	x	x	x	x	x	x	×	x	×	×	x	х	X
	LPS	•	•	•	•	x	•	•	•	•	•	х	x	x	•	•	•
Control Method	ON/OFF	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	PID	•	•	х	•	•	•	Х	x	Х	•	•	•	•	•	•	Х
Communication	RS-485	•	•	•	•	x	•	•	•	•	•	X	x	x	•	•	•
Power Supply	85-265 VAC / 100-300 VDC	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	18-36 VDC	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•



#### 5040 Single Loop PID Controller

# 5040 5040-XP

- User friendly menu driven hardware and software configuration
- Truly universal Input / Output including valve positioner
- One model for all applications, reduces inventory
- Field proven for critical Ratio/Cascade applications Right fit for combustion control
- Favourite page selection for frequently used parameter
- 4 Digital input and 4 digital output options available

#### **Pulp Consistency Control- Paper Industries**



#### **Boiler Suction Control- Power Plant**









#### LC5296-XP-AT/ LC5296-XP-DC- Flame Proof PID & Dual Channel ON/OFF Controller



• CMRI and CCOE certifications complies to all statutory requirements of hazardous locations group IIA, IIB & IIC

- Touch sensitive keys operation and programming
  - Dual compartment option for Re-transmission (Field Prog.) and/or RS-485 add-on options
- 2 x Isolated Retransmission- Saves additional signal isolator requirement
- TPS with current limit- Saves external TPS, provides isolation and protection
- The configuration meets all ON/OFF and PID applications in hazardous areas
- Multitude of alarm types meets most critical applications

#### 5002U-P ON/OFF Controller

- Simple user interface- Preferred in processes like heat treatment, ideal for metal treatment applications
- Fail safe: Protects process in case of failure
- Four relay for control and alarm, Re-transmission and RS-485 comm. to interface PLC/DCS and remote monitoring system
- Field proven in harsh environments
- Up to 4 independent programmable relay output



5002U-P

#### LC5296-AT | LC5296V-AT | 5006RN | TC5396 | TC548E - PID and ON/OFF Controller



LC5296-AT



LC5296-V-AT







5006-RN

TC5396

TC548E

- Advanced, Efficient & Economical PID Controller
  - Large and bright display
- 4 Relay/2 relay/SSR output for control / alarm / trip
  - Retransmission field programmable and/or RS-485 add-on options

-ININ

- 2 X Isolated Re-transmission (Optional)
- Saves additional signal isolator requirement
  - TPS with current limit
- Features, options and configurability meets 80% of PID applications
  - Highest performance / price ratio











Belling / Socketing Machine / Cutting Sealing Machine





#### **Furnace Temperature Controller**



5002U-P

Sealed Quench Furnace

## Compressor Coolant Temperature Controller





TC548E PID-ON/OFF Controller

## **Overview of Indicator Offerings**

#### What is a Digital Panel Indicator

Digital panel indicator receives the measurement signal as Input in the form of Voltage / Current / RT / TC / Humidity / Pressure / Flow Rate / Level / Load Cell / pH / Pulses / mV etc., process it and displays after necessary scaling/linearization which is configurable from keypad / touch-pad.

They can also act as interfaces by performing operations such as comparisons with user-set values, and transmitting data to computers / PLC / DCS.

Masibus Indicators are easy to use and have good visibility in the field with wide variety of display size 0.3'' / 0.56'' / 2'' / 4'' / 6'' and no. of digits 4 / 5 / 6.



#### Indicator with Alarm and Trip

Indicator monitors a process signal (such as one representing temperature, pressure, level or flow) and compares it against a preset limit. If the process signal moves to an undesirable high or low condition, the alarm activates a relay output which

could be utilized for alarm declaration, maintain a normal & safe operation.

In all our Indicators we have separate relay output for alarm and trip condition.

Once a signal crosses the alarm condition, alarm relay gets activated. On reaching trip condition, trip relay gets activated. Both output could be latched by the initial configuration of the indicators (For selected models).

The latching could be made reset by acknowledgment.





**Configurable:** Input & output signal type is configurable, helps reduce inventory



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		409-4IN	409-6IN	408-2IN	LPI-1-LED	LPI-1-XP	LC5296H	406	406L	408-M	409	1006H	1008S	1008S-XP	40005E	CDU LED	CDU LCD	FDU	PHI-22-XP
		409 9	4096	<b>4080</b>			<b>1-5296</b> 8 <b>Caselins</b> Laws	100 B	8 •- 4068 **		- <u>18808</u> : = 299						A State	2 28- 2 29- 2 29-	
Mounting		Rack / Panel / Wall	Wall	Panel	Panel/ Wall	Wall / Pipe	Panel	Panel	Panel	Panel	Panel	Panel	Panel	Wall	Panel	Wall	Wall		
Panel Cut Out (HXW)		444 (+0.8) x175 (+0.8)	-	92 x 188	-		45 x 92	45 x 92	45 x 92	45 x 92	92 x 46	44 x 92	92 X 92		137 x 68.5				
Dimension (HXWXD)		IP 20: 440 x 175 x 70 IP 65: 500 x 300 x120	405 x 250 x 90 (With Clamp)	96 x 192 x 70	Panel: 96 x 48 x 68 mm Wall: 122 x 88 x44 mm	112 x 115 x146	48 x 96 x 85	48 x 96 x 85	48 x 96 x 85	48 x 96 x 85	96 x 48 x 112	48 x 96 x 110	96 x 96 x 125	340 x 186 x 110	144 x 72 x 165	150 x 150 x 50	163 x 174 x 50	160 x 210 x 80	IIA/IIB : 150 x 150 x 120 IIC : 180 x 165 x 140
Display Range		-1999 to 9999	-1999 to 9999	-1999 to 9999	-1999 to 9999	-1999 to 9999	-1999 to 9999	-1999 to 9999	-1999 to 9999	-1999 to 9999	-19999 to 99999	0 to 999999	0 to 99999	0 to 99999	-1999 to 9999	-999 to 999	-999 to 999	-1000 to 1000	-1999 to 9999
Character Height		4"	6"	2"	0.56"	0.56"	0.56"/ 0.8"	0.56"	0.56"	0.8"	0.56"	0.56"	0.56"	0.56"	0.3",	0.56"	3.5" TFT LCD	0.56"	0.8"
Accuracy		±0.1% of FS ± 1digit	±0.1% of FS ± 1digit	TC, RTD : ±0.25% of FS ± 1° C Current, Voltage : ±0.1% of FS ± 1digit	±0.1% of FS ± 1digit	±0.1% of FS ± 1digit	TC, RTD : ±0.25% of FS ± 1° C Current, Voltage : ±0.1% of FS ± 1 digit	TC, RTD : ±0.25% of FS ± 1° C Current, Voltage : ±0.1% of FS ± 1digit	± 0.1% of F.S ± 1 count	TC, RTD : ±0.25% of FS ± 1° C Current, Voltage : ±0.1% of FS ± 1digit	±0.1% of FS ± 1digit	± 0.25% of full scale ± 1 count	±0.025% FS	±0.025% FS	±(0.1% of FS ± 1 count)	DP: ± 2% of FS (Unidirectional) RH: ±2.5% (0 to 90% RH) ±3.5% (90 to 100% RH) T: ±0.4° C	DP: ± 2% of FS (Unidirectional) RH: ±2.5% (0 to 90% RH) ±3.5% (90 to 100% RH) T: ±0.4° C	± 2% of FS	pH: ±0.05 temp.: ±0.25% of FS ±1°
Input		Thermocouple (E, J, K, T, B, R, S), RTD (Pt100), Current, Voltage, Resistance	Thermocouple (E, J, K, T, B, R, S), RTD (Pt100), Current, Voltage, Resistance	Thermocouple (J, K, T, B, R, S), RTD (Pt100), Current, Voltage	4-20mA	4-20mA		Thermocouple (J, K, T, R, S), RTD (Pt100), Current, Voltage	4-20mA 0-20mA 1-5V 0-5V 0-10V	Thermocouple (J, K, T, R, S), RTD (Pt100), Current, Voltage	Thermocouple (E, J, K, T, B, R, S), RTD (Pt100), Current, Voltage, Resistance	0/4-20mA, 0/1-5V DC, Pulse Input*	0/4-20mA	0/4-20mA	Thermocouple (E, J, K, T, B, R, S, N), RTD (Pt100, Cu-53, Ni-120), 0/4 to 20mA 0/1 to 5V DC -10 to 20 mV DC 0 to 100 mV DC 0 to 10V DC	Differential Pressure (DP) Humidity (RH) Temperature (T)	Differential Pressure (DP) Humidity (RH) Temperature (T)	Integral Differential Pressure (DP)	pH:, RTD (Pt-100)
	Serial Input	•	•	х	-	-	х	-	-	-	•	х	Х	x	х	x	x	Х	x
	DI	х	Х	Х	х	Х	х	Х	х	Х	Х	•	4	4	х	•	•	•	×
Output	Re-transmission Output	1	1	Upto 2*	-	-	1	x	Х	х	٠	•	•	•	1	x	x	Х	Upto 2*
	Alarm	2	2	2	-	-	2	Х	Х	Х	•	•	•	•	4	Х	Х	Х	2
	LPS	•	•	•	-	-	•	•	Х	•	•	x	х	X	•	•	•	Х	•
Communication	RS-485	•	•	•	-	-	•	Х	Х	Х	٠	•	•	•	Upto 2*	•	•	•	•
	85-265VAC / 100-300 VDC	•	•	•	-	-	•	•	•	•	•	•	•	•	•	-	-	٠	•
Power Supply	18-36 VDC	-	-	-	-	-	•	•	•	•	•	•	•	•	-	•	•	•	•
	Loop Powered	-	-	-	•	٠	-	-	-	-	-	-		-	-	-	-	-	-

## pH Indicator & Load Cell Indicator

#### PHI-22-XP Flame Proof pH Indicator



- 5 Point calibration
- Slope/offset adjustment
- Built-in-diagnostics
- Electrode performance indicator
- Auto/manual temperature compensation
- Certified for use in zone 1 of gas group I, IIA & IIB hazardous areas, optionally IIC certified compact flame proof housing
- Re-transmission signal and RS-485 can be opted for interfacing with PLC/ SCADA/ Recorder etc.

#### 409-W Load Cell Indicator



- Selectable load cell input ranges
- 5 Digit 0.56" LED display
- Local cell excitation voltage selectable from 5 to 15V DC (Factory set)
- Tare adjustment through keypad/DI
- User selectable gross and net values
- RS-485 interface (Optional) for connecting PLC/DCS





#### 409-4IN / 409-6IN Large Display Indicators



Relay Accept/Reject Billet

409-4IN

#### LPI-1/LPI-1-XP- Loop Powered Indicator & Ex-Proof Loop Powered Indicators



- 4-Digit LED display
- Accuracy 0.1% of FS
- Loop powered with low voltage drop
- Reverse scaling for indication range
- Square root extraction
- Easy configuration with pushbuttons
- Compact and IP65 front/housing



- Panel and wall mount or pipe mount for Ex-Proof options
- IIA/IIB, Zone 1 & 2 PESO certification on FLP versions

LC5296H / 408-M / 406 / 406L- Process Indicator & 40005E Bar Graph indicator



- Retransmission (Field Programmable) and/or RS-485 add-on options
  - One model for many applications, interface with PLC, SCADA, IIoT and other platforms
- Two relay output option
  - For alarm and ON/OFF control
- TPS with current limit
  - Inbuilt power supply for transmitter, saves external power supply
- Input High/Low Programmable
  - Settable input signal from 0 to 20mA/0 to 10V DC to connect non std. output type sensor

Flow Rate Indicator & Totalizer

#### 1008S/1006H Flow Rate Indicator & Totalizer | 1008S-XP:- Ex-Proof Flow Rate Indicator & Totalizer



- Accurate, Pressure & Temperature compensation, fast sampling and totalize with precision even fast changing flow rates
- 4 Relay output 2 Relay for flow rate alarm & 2 relay for pre/final batch total
- 4-Digital I/P- Batch start/stop, batch / integration total zero
- Mass flow measurement with additional Pressure and Temperature I/P
- Gas/ liquid flow measurement- Superheated steam flow measurement & Saturated steam flow measurement
- Five segment linearization on flow Input for nonlinear type of input
- Retransmission output easy interface with PLC / DCS / SCADA systems
  - Ex-Proof enclosure, touch sensitive keys operation, full operation and programmable without opening in a compact size



#### Mass Flow Measurement

## **Clean Room Indicator & Filter Display Unit**

**Clean Room Display Unit** 



CDU

### Filter Display Unit



- Variant for combination of Temperature, Humidity and DP Indication
- Variant of internal sensor, external sensor, wireless sensor, analog sensor
- Backed by Masibus 21CFR Software with Auto Backfilling via DNP 3.0 avoiding data loss
- 3.5" TFT touchscreen LCD variant
- Soft Input for AHU status
- Digital input for door open/close
- Ex-Proof enclosure- Touch sensitive keys operation
- 3 Channel differential pressure Indicator
  PRE/FINE/HEPA filter monitoring of AHU
- Software programmable filter ranges
- 3 Programmable Hi/Lo alarms with audio/visual annunciation
- RS-485 Modbus RTU communication for PLC, SCADA, etc.
- Digital I/P for AHU OFF/TRIP status with LED indication
- Soft status available in Modbus



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