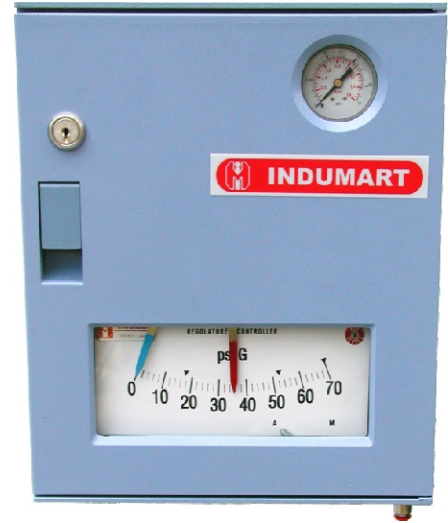




SERIES: 93

- PRESSURE OR TEMPERATURE INPUT
- PNEUMATIC CONTROL OUTPUT
- PROPORTIONAL, INTEGRAL, DERIVATIVE, DIFFERENTIAL GAP & ON/OFF CONTROL
- DIRECT OR REVERSE ACTION
- PANEL, SURFACE OR PIPE MOUNTING
- ELECTRICAL ALARMS (RELAYS)
- AUTO MANUAL REMOTE PANEL
- IP-54 ENVIRONMENTAL PROTECTION



INTRODUCTION

The 93 Series Pneumatic Indicating Controllers are highly reliable instruments equipped with either a heavy-duty temperature sensing system, an accurate pressure sensing element, or a flow measuring system. They are used to indicate a direct pressure input and to provide a pneumatic output signal for control.

The 93 Series can be equipped with single term (P), two-term (P+I) or (P+D), three-term (PID), on/off or differential gap control actions to provide pneumatic control output(s). To enable accurate matching to plant conditions, the proportional band, integral time and derivative time are adjustable over a wide range.

For applications that the control output must be switched to its maximum at a certain point, and be switched to its minimum at another point, choose the differential gap control action. The switching gaps are equally spaced and adjustable between 1% and 100% of the range. The output value is indicated by a pressure gauge visible on the face of the instrument.

The controller is housed in a strong moulded case that can be panel, surface or pipe mounted. A gasketed door protects internal components from harsh industrial environments and offers IP-54 protection. A sturdy acrylic window allows the 6" scale, indicating the input value, and the pressure gauge, indicating the values of output signals, to be viewed with the transmitter's door closed.

Internal or external Auto/Manual (AM) control can be ordered as an option.

Bumpless Internal Auto Manual Switch

This bumpless type switch with high sensitivity ball transfer indicator balances manual pressure from the internal reducer with automatic pressure from the controller.

Auto Manual Remote Panel

Optional Automatic/Manual panel with switch, regulator and indicator for pneumatic supply of 0 to 30 psi (2 bar) to the valve is available.

Electrical Control (Alarm Contacts)

The Series 93 controllers may be specified with two electrical alarms, adjustable from 0 to 100% of scale. The electrical contacts are SPST magnetic type. The relays are insulated for up to 2000 V with a maximum load of 10VA.

Pneumatic Set Unit

For remote set or cascade operation, it is adjustable over full scale with high and low limit stops. It will not be supplied, if integral desaturation or electric contacts are specified.

Pneumatic Set Unit with Local/Remote Transfer Switch

This unit is the same as above, but has switch and reducer for control of local or remote set points. It is not available when the electric contacts or the integral desaturation are specified.

Integral Desaturation (Anti Wind up)

This is used in batch process control with $\pm 0.5\%$ of scale range set point desaturation accuracy. Setting limits are adjustable between 0.7 and 1.4 bar (10 to 20 psi) and air consumption is 62 l/h.

SPECIFICATIONS

General

Case	Die cast aluminium alloy finished with epoxy resin
Protection Class	IP-54, IP-55 (optional)
Window	Acrylic
Mounting	Surface or flush panel; pipe mounting is an option
Ambient Temp.	-20...+60°C

Controller

Output	3...15 psi (0.2...1 bar)
Action	Direct or reverse
Air Consumption	5.6 litres per minute maximum

Pressure System

Measuring Element	AISI 316 or Brass bellows, AISI 316 spiral tube
Accuracy	±1% f.s.
Repeatability	≤0.25%
Dead Zone	≤0.2%
Zero Drift	0.035% / °C (within ambient temperature limits)
Process Connection	¼" NPTf for up to 100 bar ½" NPTm for <100 bar
Process Temp.	-20...+100°C for up to 6 mH2O -20...+120°C for over 1 bar
Connection	Suitable for ¼" NPTf receivers

Receiver Pressure System

Measuring Element	Phosphor bronze bellows
Accuracy	±1% f.s.
Repeatability	≤0.25%
Dead Zone	≤0.1%
Zero Drift	0.01% / °C for 6m capillary (within ambient temperature limits)
Graduation	0...100 linear, 0...10 sq. root
Connection	Suitable for ¼" NPTf receivers

Temperature System

Measuring Element	Thermal Bourdon tube temperature compensated
Accuracy	±1% f.s.
Repeatability	≤0.2%
Dead Zone	≤0.1%
Zero Drift	0.015% / °C for 3m capillary 0.033% / °C for 6m capillary (within ambient temperature limits)
Capillary Bulb	3 or 6 m length, AISI 316 cover Ø=12mm; AISI 316 230 psi (16 bar) rating
Immersion Length	Adjustable within 350 and 130 mm
Fittings	Adjustable compression gland, stainless steel, ½" thread
Pneumatic Conn.	¼" NPTf
Air Supply	20 psi (1.4 bar)

Flow System

Measuring Element	Differential pressure element
Diaphragm	316 St. Steel
Range	25 kPa and 100 kPa;
Differential Cell	AISI 316
Static Pressure	20 MPa
Unilateral Pressure	20 MPa
Connection	½" NPTf on the adapters ¼" NPTf on process chamber
Filling Liquid	Silicon Fluid
Ambient Temp.	-20...+80°C
Process Temp.	-20...+120°C
Zero Drift	0.35% per 10°C
Filling Liquid	Silicon fluid

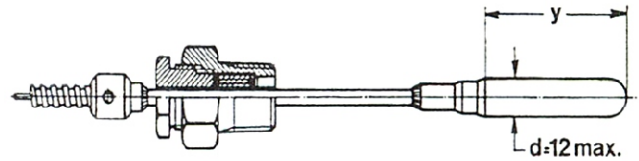
Note: for other ranges please refer to Series 83

STANDARD PRESSURE RANGES				
Code	Measuring Element	Standard Range	Over Range	
11	Brass Bellows	0...0.4 mH2O	100%	
12		0...0.6		
13	Brass or AISI 316 Bellows	0...1 mH2O	150%	
14		0...1.6		
15		0...2.5 mH2O		
16		0...4		
17		0...6		
21	Brass Bellows	-0.4...0 mH2O	100%	
22		-0.6...0		
23	Brass or AISI 316 Bellows	-1.0...0 mH2O	150%	
24		-1.6...0		
25		-2.5...0 mH2O		
26		-4...0		
27		-6...0		
31	Phosphor Bronze Bellows	20...100 kPa	100%	
32		3...15 psi		
33		0.2...1.0 kg/cm ²		
41	AISI 316 Spiral Tube	-1...0 bar	100%	
42		-1...+0.6		
43		-1...1.5		
44		-1...3		
45		-1...5		
51		0...1		
52		0...1.6		
53		0...2.5		
54		0...4		
55		0...6		
56		0...10		
61		0...16 bar		50%
62		0...25		
63		0...40		30%
64		0...60 bar		
65		0...100		15%
66	0...160			
67	0...250 bar			
68	0...400			
69	0...600			

STANDARD TEMPERATURE RANGES

Code	Scale °C	Over Range	y (mm)
B	-20...+40	20%	160
C	0...+60		
D	-30...+70	20%	105
E	0...+100		
F	+20...+120		
G	+40...+140	15%	75
H	-20...+140		
K	0...+160		
L	+40...+200		
M	0...+200	15%	65
N	+50...+250		
P	0...+300	15%	110
R	+100...+400		

Standard Bulb



Special stainless steel bulbs for air and gases in spiral form with semi-bendable extension and adjustable threaded connection is available. Pressure rating for these bulbs is 230 psi (16 bar) and may be used for up to 200° temperature.

THERMOWELLS

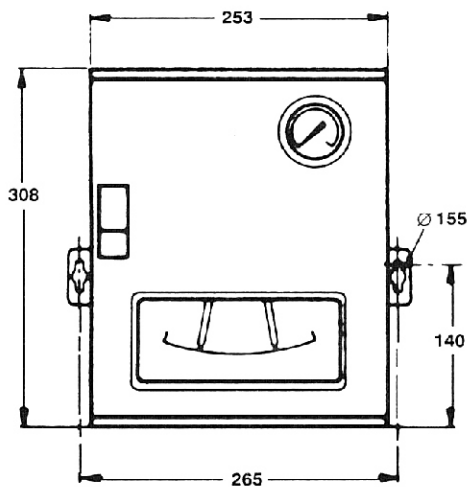
Thermowells should be used to protect the bulbs from corrosive atmospheres, and to simplify removal and replacement of the sensing elements. A full range of threaded and flanged thermowells are available made of stainless steel, etc. For details, see our temperature catalogue.

OPTIONS & ACCESSORIES

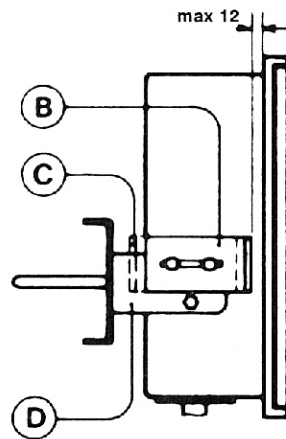
- IP-55 Casel
- Alarm Contacts
- Lock with the key
- Pneumatic Set Unit
- Anti Vibration Supports
- Remote Diaphragm Seal
- Integral Action Desaturator
- Mounting Bracket for 2" Pipe
- Internal or External Auto/Manua
- External Knob for Set Point Control
- Stop for Pressure Element which allows overpressure 5 times the end scale value

Code	Control Action	Range
1	on/off	125% of output for 1% change in input
2	proportional	2 to 200%
3	proportional + standard integral	P: 4 to 400% I: 0.1 to 25 minutes
4	proportional + integral + derivative	P: 4 to 400% I: 0.1 to 25 minutes D: 0.05 to 5 minutes
5	proportional + derivative	P: 2 to 200% D: 0.05 to 5 minutes
6	differential gap	1% to 100% of Range
7	proportional + rapid integral	P: 4 to 400% IR: 0.05 to 5 minutes
8	proportional + rapid integral + derivative	P: 4 to 400% IR: 0.05 to 5 minutes D: 0.05 to 5 minutes

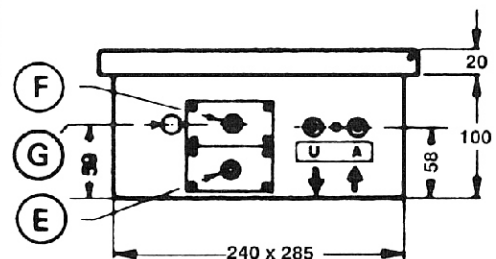
DIMENSIONS AND FIXING (mm)



Panel cut out: 245 x 294 mm



- B) Panel mounting
- C) Wall mounting
- D) Bracket mounting
- E) Sensing element connection
- F) Setpoint connection
- G) Compression gland for cable entry



ORDER CODES

Indicating Pressure Controller Model **93P** -

MEASURING ELEMENT

- Brass bellows (for up to 6 mH2O or 600 mbar)
- AISI 316 bellows (see the pressure table)
- Phosphor bronze bellows (receiver only; see the pressure table)
- AISI 316 spiral tube (1 bar and up)

- 1
2
3
4

CONTROL ACTION

- ON/OFF
- Proportional (P)
- Proportional + Integral (P+I) standard
- Proportional + Integral + Derivative (P+I+D)
- Proportional + Derivative (P+D)
- Differential Gap
- Proportional + Rapid Integral (P+RI) - for over 6 mH2O spans only
- Proportional + Rapid Integral + Derivative (P+RI+D) - for over 6 mH2O spans only

- 1
2
3
4
5
6
7
8

RANGE

From the Standard Pressure Range Table enter a 2-digit number in the blanks

OPTIONS & AUXILIARY DEVICES (1)

- Without
- Pneumatic set with remote control
- External knob for set point control
- Electric contacts min. & max.
- Electric contacts and external knob for setting
- Integral action desaturator
- Integral action desaturator and external knob set

- 0
1
2
3
4
5
6

OPTIONS & AUXILIARY DEVICES (2)

- Without
- Internal, bumpless A/M control
- L/R control for pneumatic set
- L/R control for pneumatic set and external A/M control

- 0
1
2
3

ACCESSORIES

- Without
- Bracket HP for 2" pipe mounting
- Lock with key
- Bracket HP + lock with key
- IP-55 case
- IP-55 case + lock with key
- IP-55 case + bracket HP
- Anti-vibration support
- Anti-vibration support + lock with key
- Special

- 0
1
2
3
4
5
6
7
8
9

EXTRA FEATURES

- Without
- Degreasing for oxygen service
- 0-10 square root graduation (for 3...15 psi, 0.2...1 bar, 0.2...1 kg/cm² element only)
- Remote diaphragm seal (consult factory for suitable seal)
- Overrange stop for pressure (only for elements measuring 6 mH2O max.)
- Overrange stop for Vacuum (only for elements measuring 6 mH2O max.)
- Special

- 0
1
2
3
4
5
9



INDUMART INC.

1-15 W. Pearce St., Richmond Hill, Ont. L4B 1H6, Canada
 Phone: (905) 707-9998 Fax: (905) 707-8484 E-mail: Sales@Indumart.com

ORDER CODES

Indicating Temperature Controller Model **93T** -

MEASURING ELEMENT

- Gas filled AISI 316 element (standard)
- Special AISI 316 element for air and gases (option)

1
2

CONTROL ACTION

- ON/OFF
- Proportional (P)
- Proportional + Integral (P+I) standard
- Proportional + Integral + Derivative (P+I+D)
- Proportional + Derivative (P+D)
- Differential Gap
- Proportional + Rapid Integral (P+RI)
- Proportional + Rapid Integral + Derivative (P+RI+D)

1
2
3
4
5
6
7
8

RANGE

From the Standard Temperature Range Table a code in the box

OPTIONS & AUXILIARY DEVICES (1)

- Without
- Pneumatic set with remote control
- External knob for set point control
- Electric contacts min. & max.
- Electric contacts and external knob for setting
- Integral action desaturator
- Integral action desaturator and external knob set

0
1
2
3
4
5
6

OPTIONS & AUXILIARY DEVICES (2)

- Without
- Internal, bumpless A/M control
- L/R control for pneumatic set
- L/R control for pneumatic set and external A/M control

0
1
2
3

ACCESSORIES

- Without
- Bracket HP for 2" pipe mounting
- Lock with key
- Bracket HP + lock with key
- IP-55 case
- IP-55 case + lock with key
- IP-55 case + bracket HP
- Anti-vibration support
- Anti-vibration support + lock with key
- Special

0
1
2
3
4
5
6
7
8
9

CAPILLARY & MAX. IMMERSION LENGTH

- 3 m Capillary and 350 mm length (standard)
- 6 m Capillary and 350 mm length (standard)
- 3 m Capillary and 300 mm length (option)
- 6 m Capillary and 300 mm length (option)
- Special

1
2
3
4
9

CONNECTION TO PROCESS

- ½" NPTm
- ¾" NPTm
- ¾" Gas m
- ¾" Gas f

1
2
3
4



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