MARSH BELLOFRAM®

ElectroPneumatics

Compact Card-Mounted Pressure Controls

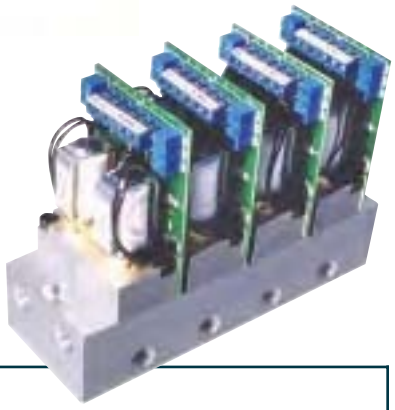
Digital Servo Pressure Controls

MB Process Electronic Controls

TYPE 3000 OVERVIEW

TYPE 3000 SECTION CONTENTS

Type 3410S



Type 3110
Manifold Mount

T3000 ELECTRO-PNEUMATIC TRANSDUCERS		PACKAGING				
		DIN-mount Circuit Card	Weatherproof Enclosure			
		Low Flow (1.2 scfm)	Low Flow (1.2 scfm)	Medium Flow (15 scfm)	High Flow (60 scfm)	Very High Flow (175 scfm)
USER INTERFACE	Analog 0-10V 4-20mA	T3110, T3120 or T3111 or 3411	T3210 or T3220	T3211, T3221 or T3311	T3212 or T3222	T3215
	Serial RS-485, RS-232, USB	T3410S or T3420S	T3510S or T3520S	T3511S or T3521S	T3512S or T3522S	
	Keypad/Display Programmer	Contact Factory	T3510P or T3520P	T3511P or T3521P	T3512P or T3522P	
	DeviceNet	T3410D or T3420D	T3510D or T3520D	T3511D or T3521D	T3512D or T3522D	
MOUNTING		DIN tray, manifold, panel	DIN tray, manifold, panel	In-line, DIN-rail, panel bracket, or manifold	In-line, DIN-rail or panel bracket	In-line or panel bracket

FEATURES AND CAPABILITIES

The Type 3000 series of electro-pneumatic transducers offers an innovative set of features and capabilities. Each electronic pressure regulator utilizes a pair of reliable quick-firing solenoid valves and an onboard pressure sensor to precisely control downstream pressure and at the same time achieve excellent accuracy and stability.

Feed-and-bleed transducers are inherently resistant to shock, vibration, and orientation. To size the regulator for the application, a selection of external volume boosters up to 2000 scfm are available.

- Analog control signals: 0-10v, 4-20 ma, etc.
- Remote sensor feedback
- Monitor output
- High/Low logic output
- Digital signal processing
- PID tuning
- Deadband adjustment
- Serial, keypad/display, DeviceNet interfaces

THEORY OF OPERATION

T3000 transducers utilize proven feed-and-bleed technology. The Supply solenoid valve feeds supply pressure to the downstream application. The Exhaust solenoid valve bleeds off overpressure. By monitoring the onboard pressure sensor (or the user-supplied remote sensor on two-loop units), the electronics rapidly fire one solenoid or the other to maintain the desired setpoint.

Standard Type 3000s hold output pressure upon loss of electrical power, as long as there are no downstream flow demands. Special versions are available for Fail High or Low operation.

Type 3110

Type 3510S

Type 3211

OUR LATEST MODEL

TYPE 3311 ECONOMICAL WEATHERPROOF REGULATOR

The T3311 regulates pressure in proportion to a 0-10V or 4-20mA control signal. Output pressure ranges include 0-30, 0-60, 0-100, and 0-150 psi (0-2, 0-4, 0-7, and 0-10 bar). The T3311 is CE-rated and vibration resistant. Mounting options include panel, DIN rail, and in-line.

The keypad / display interface allows the user to: 1) Select displayed pressure units (psig or bar); and 2) Select minimum (zero) and maximum (span) output pressure. The keypad is internally mounted for tamper-resistance.

The T3311 includes a 4-pin 12mm micro-style cordset with a 3' (1m) cord. Other lengths are available. Electrical connections include DC power, ground, Control Signal, and Monitor Output.

For additional details on the Type 3311 see page 105.

Type 3311

GLOSSARY

ANALOG MONITOR OUTPUT (AO) – V or mA signal for customer monitoring of actual output pressure

DEADBAND – If the error between desired and actual output is less than the deadband setting, the transducer will ignore the error.

DIGITAL COMMUNICATIONS – Customers can digitally communicate with the T3400 and T3500 via Serial (RS-485, RS-232, and USB), keypad/display, or DeviceNet interfaces

LOGIC OUTPUT – High/Low signal for customer monitoring of setpoint status (at setpoint or searching for setpoint).

LOOP 1 – The onboard pressure sensor, which measures output pressure.

LOOP 2 – Optional remote sensor, which measures Process Variable

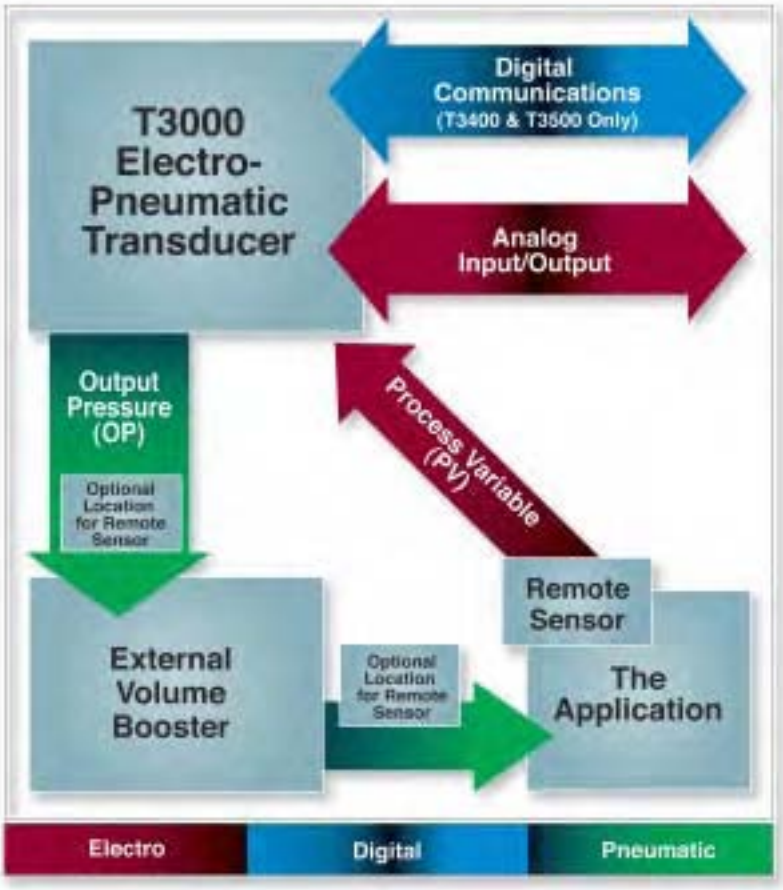
OUTPUT PRESSURE (OP) – The regulated quantity on a one-loop unit

PID TUNING – Mathematical Proportional-Integral-Derivative functions that act on the error between desired and actual output, to increase accuracy, speed of response, and stability.

PROCESS VARIABLE (PV) – The regulated quantity on a two-loop unit (remote pressure, flow, position, etc.)

REMOTE SENSOR – The customer can supply and configure their own remote sensor for regulation of pressure, flow, position, etc.

SETPOINT (SP) – The desired output.



RECOMMENDED SUPPLY PRESSURE

For optimum performance the following maximum pressures must be observed:

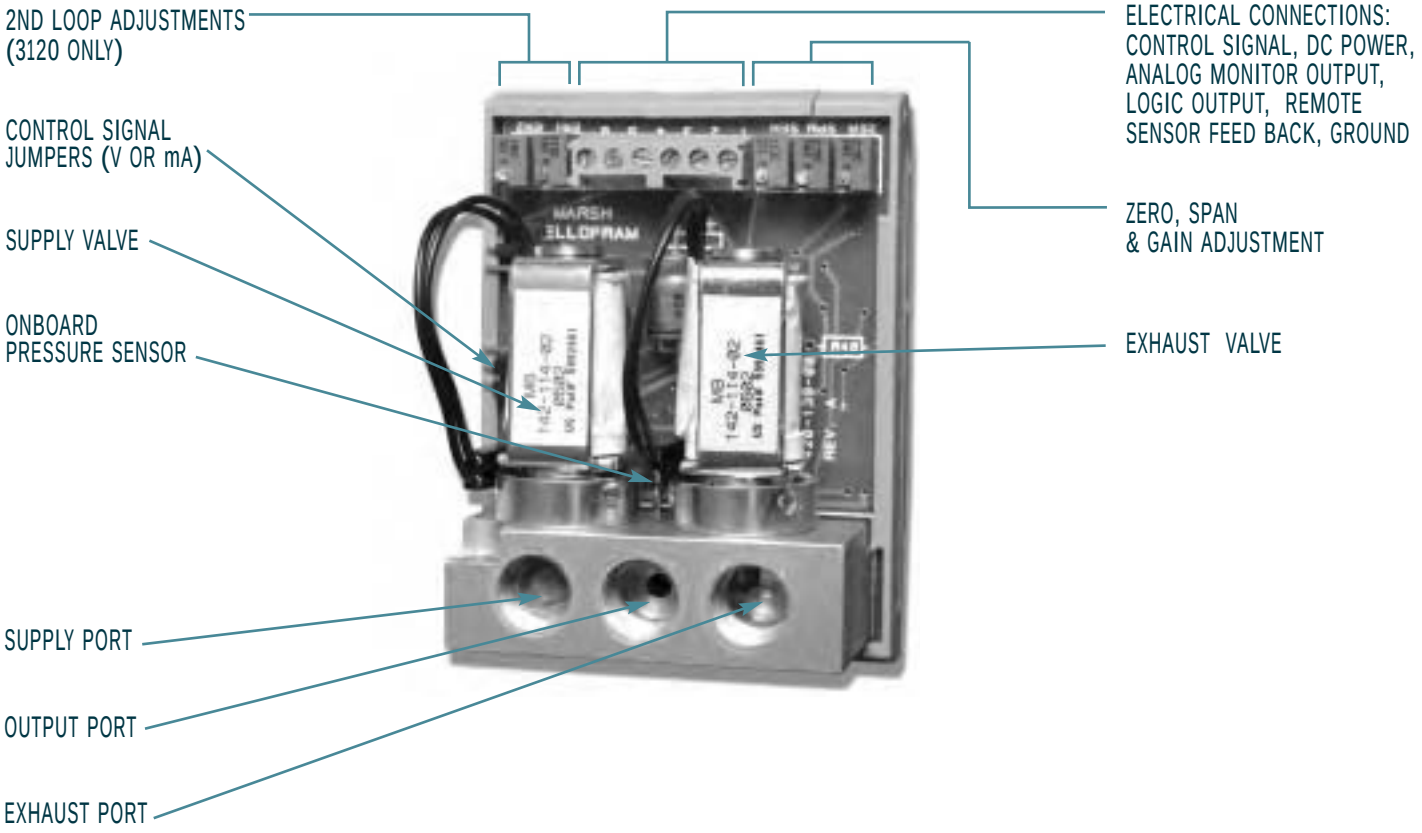
TYPE 3000 SUPPLY PRESSURES

MAXIMUM OUTPUT (PSIG)	MAXIMUM SUPPLY (PSIG)
Up to 5	20
>5 to 15	30
>15 to 30	60
>30 to 100	165
>100 to 150	200
>150 to 300	350 (31X0, 32X0, 34X0 & 35X0 only)
>300 to 600	650 (31X0, 32X0, 34X0& 35X0 only)

TYPE 3110/TYPE 3120 ANALOG CIRCUIT-CARD REGULATORS

The compact Type 3110 (one-loop) and 3120 (two-loop) Circuit-Card Pressure Regulators are perfect for size-conscious OEM's, without sacrificing any of the high-end performance normally associated with full-size I/P's.

Industry-standard analog control signals (0-10V or 4-20 mA) are user-selectable (V or mA) and configurable (zero & span). Industry-standard analog monitor output signals (0-10V or 4-20 mA optional) are available for user-monitoring of actual output pressure. Industry-standard logic output signals (high or low) are available for user-monitoring of setpoint status – 'at setpoint' or 'still searching'.



TYPE 3200 ANALOG WEATHERPROOF REGULATORS

(3210, 3220, 3211, 3221, 3212, 3222)

The Type 3200 is an analog Weatherproof Pressure Controller that is available in three different flow versions: precise low-flow manifold (Type 3210 or Type 3220), 15 scfm medium flow (Type 3211 or Type 3221), or 60 scfm high-flow (Type 3212 or Type 3222).

The low flow manifold has dual output ports (side and bottom). The bottom output port can be factory-mounted to external volume boosters up to 2000 scfm (944 l/sec).

The 15 scfm medium flow version is available bottom-ported for manifold mounting.

PERFORMANCE	T3100	T3200
Full-Scale Accuracy	0.5%	0.5%
ELECTRICAL INPUTS		
Supply Voltage	15-24VDC (12VDC option)	15-24VDC (12VDC option)
Standby Supply Current	80 mA	80 mA
Maximum Supply Current	250 mA	325 mA
E/P Control*	0-10V (10K ohms)	0-10V (10K ohms)
I/P Control*	4-20 mA (250 ohms)	4-20 mA (250 ohms)
2nd-loop Remote Sensor Feedback	T3120: 0-10V (4-20 mA option)	T3220, T3221, T3222: 0-10V (4-20mA option)
ELECTRICAL OUTPUTS		
Monitor Output	0-10V (4-20 mA option)	0-10V (4-20mA option)
Logic Output	TTL	CMOS, TTL, Open-Collector
PNEUMATIC INPUTS		
Supply Pressure	See Chart on Page 87	See Chart on Page 87
PNEUMATIC OUTPUTS		
Full-scale Atmospheric Pressure Ranges	1, 5, 15, 30, 100, 150, 300, 500, 1000 psig	1, 5, 15, 30, 100, 150, 300 (T3210, T3220: also 500, 1000psig)
Vacuum Pressure Ranges	vac-15psig vac-135psig	T3210, T3220: vac-15psig vac-135psig
Forward Flow Capacity	1.25 scfm	T3210, T3220: 1.25 scfm T3211, T3221: 15 scfm T3212, T3222: 60 scfm
Exhaust Flow Capacity	1.25 scfm	T3210, T3220: 1.25 scfm T3211, T3221: 7 scfm T3212, T3222: 15 scfm
ENVIRONMENTAL		
Operating Temperature	32-141° F (0-60°C)	32-141° F (0-60°C)
Media-Wetted Materials	Aluminum, copper alloys, nickel, buna-n, silicon, 316SS	Aluminum, copper alloys, nickel, buna-n, silicon, 316SS
Required Accessories		6-pin micro cordset
Recommended Accessories	Manifold, Power Supply, Control Knob, Remote Pressure Sensor, External Volume Booster	DIN-rail Bracket, Panel Bracket, Power Supply, Control Knob, Remote Pressure Sensor, External Volume Booster

*Field-Selectable I/P or E/P control

ANALOG TYPE 3000 -- ORDERING INFORMATION

Type 3110 & Type 3120		# Loops		Logic Output	Analog Control Signal	Lower Limit of Output Pressure	Pressure Units	Upper Limit of Output Pressure	Mounting	Supply & Output Ports		Options
	1	1	0	T	E	0	G	600	D	0	0	0 0
		2			I		A		P	1		14
							V		M	2		
							W					

Type 3210 & Type 3220		# Loops		Logic Output	Analog Control Signal	Lower Limit of Output Pressure	Pressure Units	Upper Limit of Output Pressure	Mounting	Supply & Output Ports		Options
	2	1	0	M	E	0	G	600	P	0	1	0 0
		2		T	I		A			1		14
				0			V			2		Z2 etc.
							W					

Type 3211 & Type 3221		# Loops		Logic Output	Analog Control Signal	Lower Limit of Output Pressure	Pressure Units	Upper Limit of Output Pressure	Mounting	Supply & Output Ports		Options
	2	1	1	M	E	0	G	150	P	0	1	0 0
		2		T	I		W		M	1		14
				O						2		

Type 3212 & Type 3222		# Loops		Logic Output	Analog Control Signal	Lower Limit of Output Pressure	Pressure Units	Upper Limit of Output Pressure	Mounting	Supply & Output Ports		Options
	2	1	2	M	E	0	G	150	P	0	1	0 0
		2		T	I					1		14
				0						2		
										3		
										4		
										5		

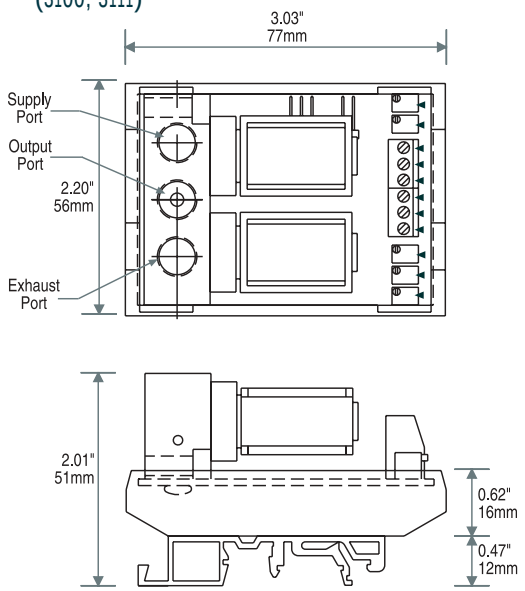
# LOOPS	1=1 2=2
ANALOG CONTROL SIGNAL	E=0-10V I=4-20mA
LOWER LIMIT OF OUTPUT PRESSURE	For pressures taking more than 1 digit, contact factory
PRESSURE UNITS	G=psig A=psia absolute V=vacuum W=inches of water column
UPPER LIMIT OF OUTPUT PRESSURE	Use all 3 digits (eg., 030 for 30 psig)
MOUNTING	T3100 D=DIN tray P=Panel-Mount M=Manifold-Mount (150 psig maximum output) (For flush panel mounting, specify P option and order 161-520-000 bracket)
	T3200 P=Pipe (in-line) M=Manifold-Mount (Order panel bracket & DIN rail clip separately) For Manifold-Mount (no threads), specify 0 for Supply & Output Ports

SUPPLY & OUTPUT PORTS	T3100 0=1/8" NPT 1=1/8" BSPT 2=1/8" BSPP
	T3200 0=1/4" NPT 1=1/4" BSPT 2=1/4" BSPP 3=3/8" NPT 4=3/8" BSPT 5=3/8" BSPP
OPTIONS	00=none 14=12VDC supply X2, X3, Z2, Z3, Z4, N3, N4, N6, N8, Q6, Q8, QA, QB, QC, V2, V3 (External Volume Booster Contact factory for other options.)
LOGIC OUTPUT	M=CMOS T=TTL O=Open-Collector

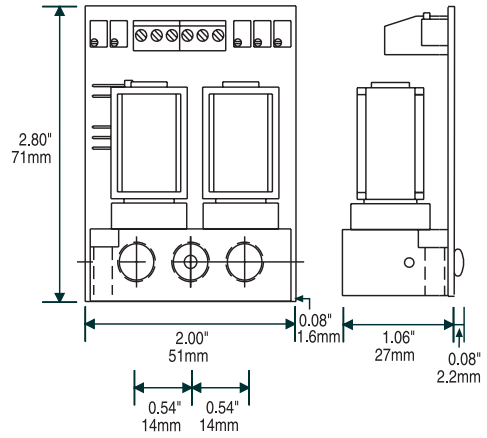
TYPE 3100 DIN-MOUNT CIRCUIT CARDS

DIN TRAY MOUNT
(3100, 3111)

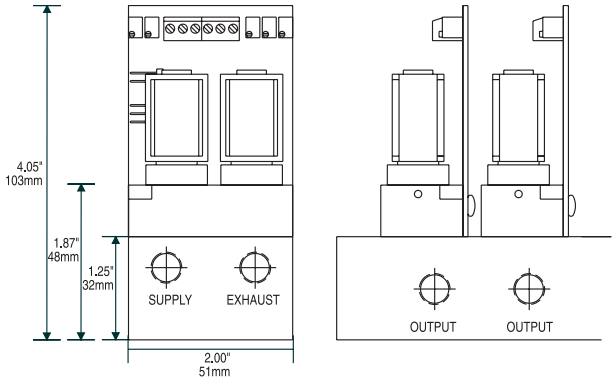
DUST COVER = 157-201-01



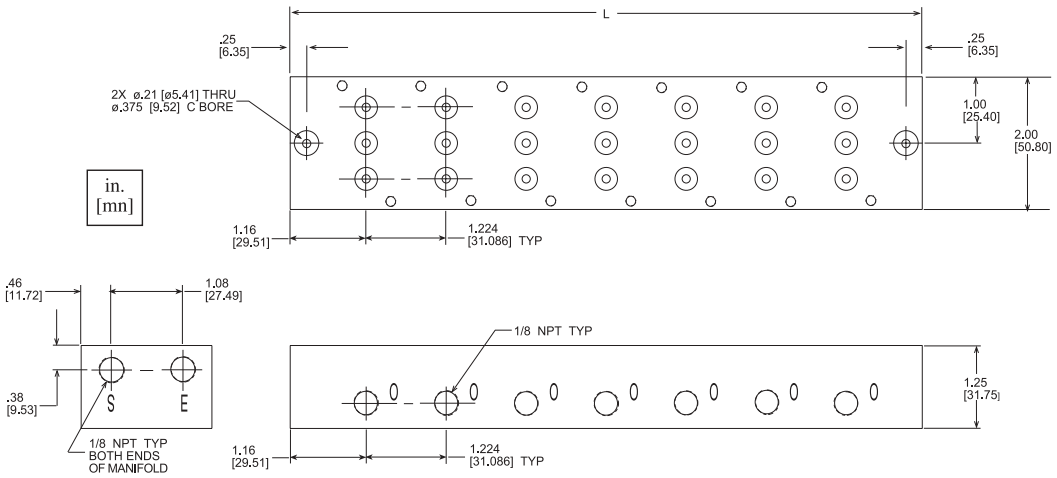
PANEL MOUNT
(3100, 3111)



MANIFOLD MOUNT
(3100, 3111)



Type 3100 & Type 3111 Manifold Block (7 station manifold shown)



MANIFOLD BLANK KIT = 500-310-00

MANIFOLD = 350-110-XX
XX = NUMBER OF STATIONS

Manifolds are available in 2 to 10 stations.

To calculate the overall length "L" of the manifold use the following formula:

L= 2 X 1.16 + (S-1) X 1.224

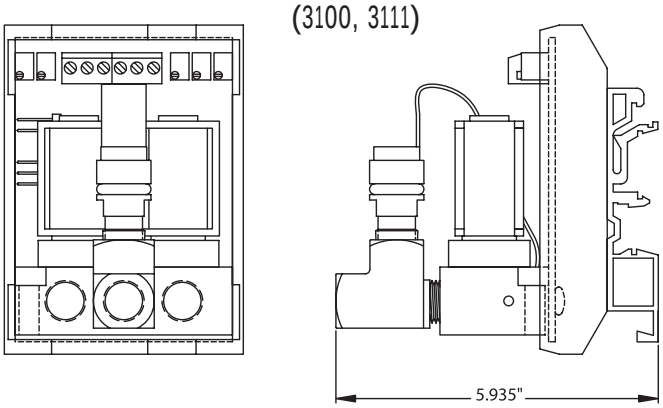
Where S = the number of manifold stations

EXAMPLE: 7 Station Manifold:

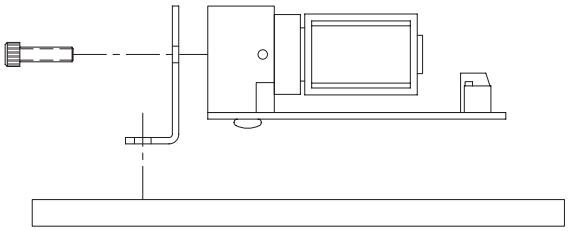
L = 2 X 1.16 + (7-1) X 1.224

L = 9.664 in. [245.47 mm]

High-Pressure (>300 psig) units
(3100, 3111)



Flush Panel Mount
(3100, 3111)

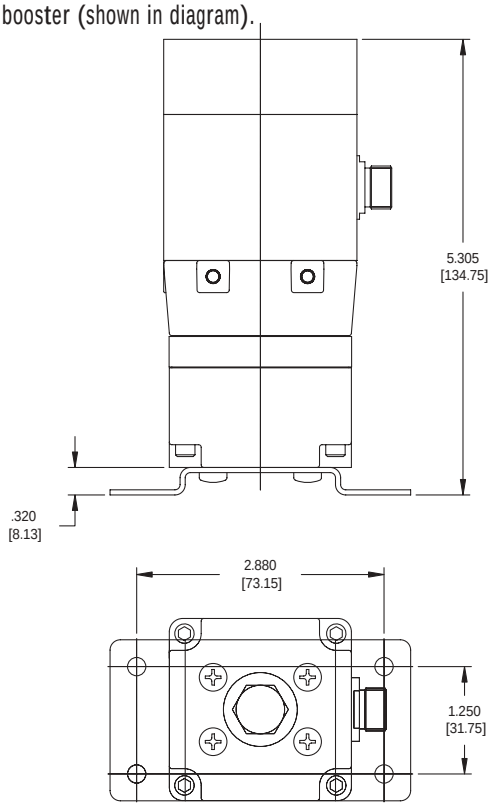


CIRCUIT-BOARD REGULATORS — MOUNTING & PACKAGING

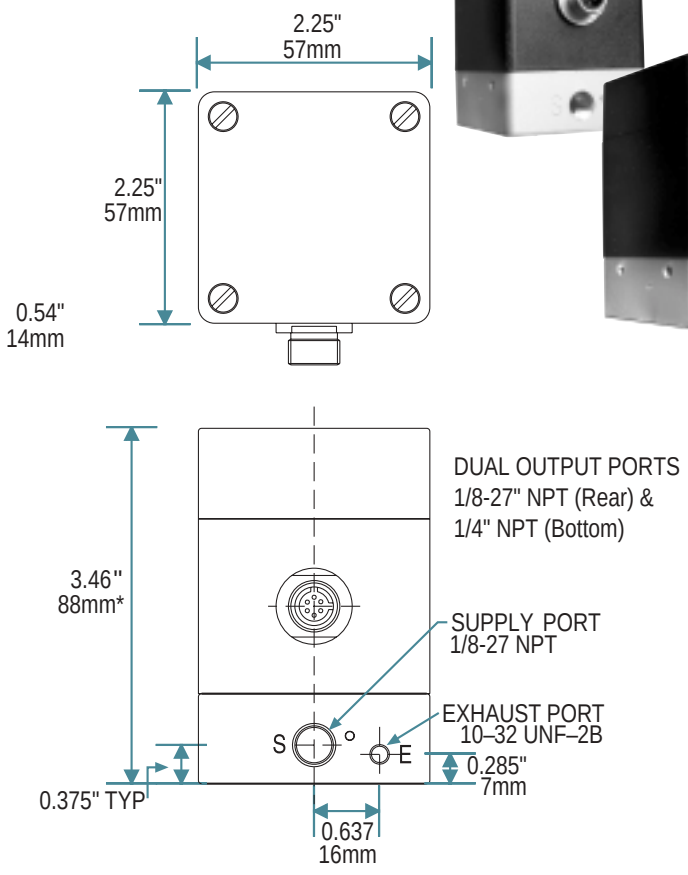
Product	Mounting	Product Configuration	Accessories
3100 & 3111	DIN Tray	Product mounted in DIN Tray	None
3100 & 3111	Panel	Product configured for panel mounting	For 'flush' mounting, order Flush Mount Bracket (161-520-00) separately
3100 & 3111	Multi-Unit Manifold	Product configured for multi-unit manifold mounting	Order Multi-Unit Manifold (350-110-XX) separately. XX = # stations.

WEATHERPROOF REGULATOR MOUNTING OPTIONS

The Type 3200 and 3500 regulators can be mounted in-line or by brackets which are available separately (DIN-rail bracket — 010-115-00; Panel bracket — 010-135-00). Bracket mounting holes (2 X 8-32 UNC 2B X 0.375" deep minimum) are available on the rear and right faces (when looking at product with IN/OUT flow from left to right) and also on the bottom of the medium-flow booster (shown in diagram).

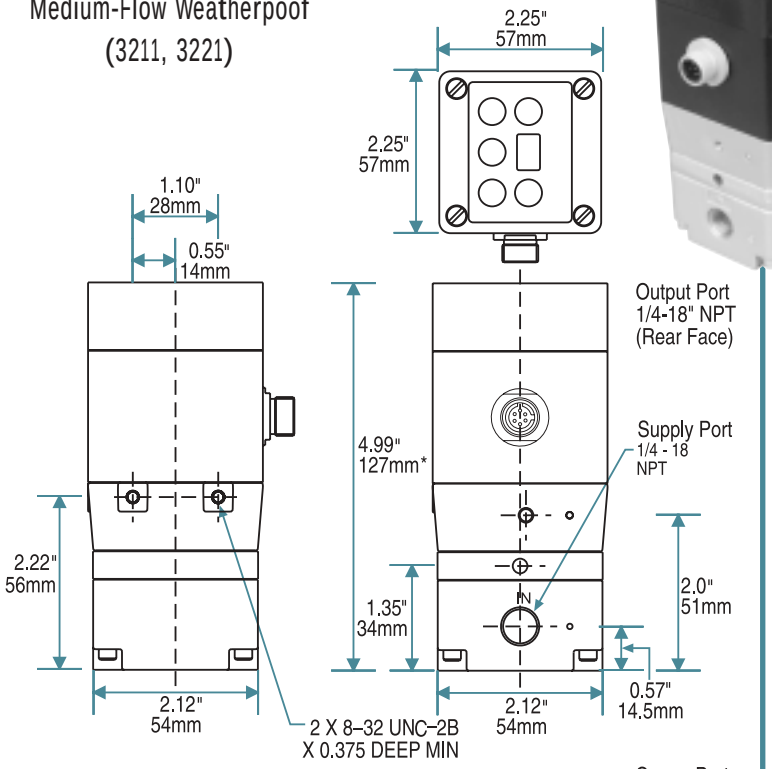


Low-Flow Weatherproof
(3210 & 3220)



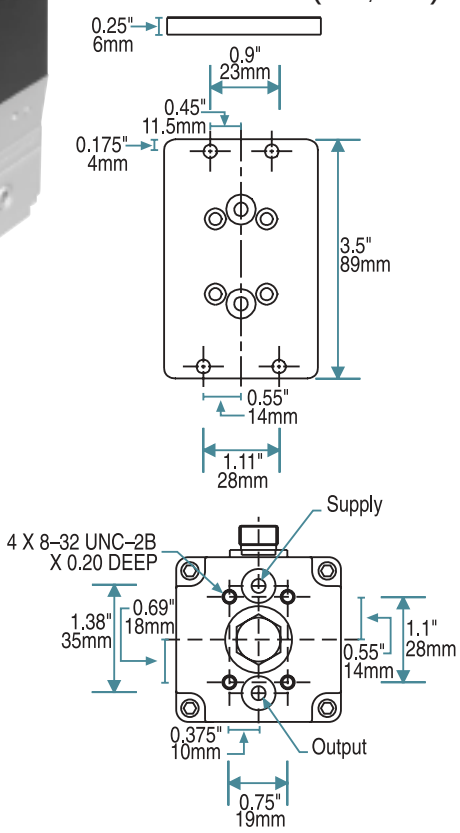
* High Pressure (>300 PSIG) & DeviceNet units are 5.00" tall.

Medium-Flow Weatherpoof (3211, 3221)

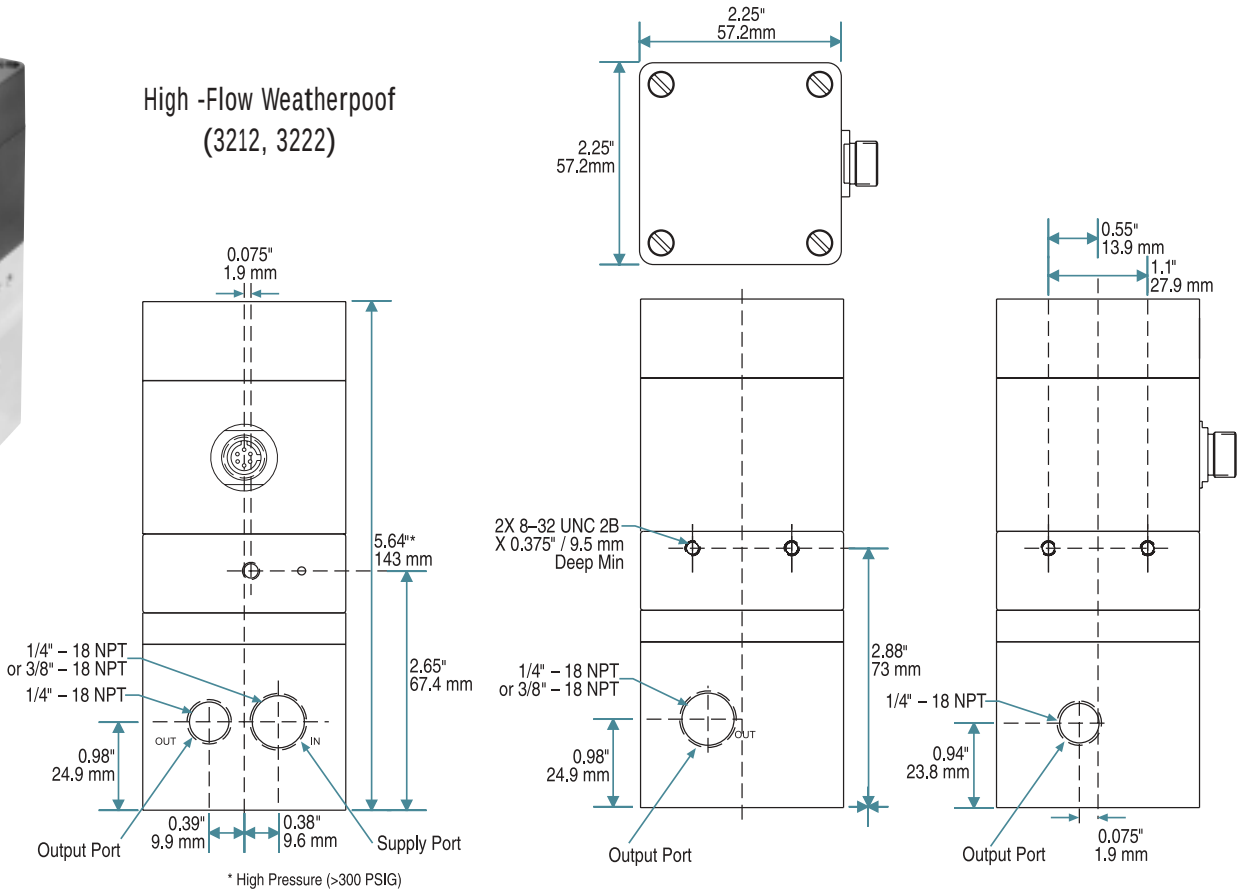


* High Pressure (>300 PSIG)
& DeviceNet Units are 6.35" tall.

Manifold Mount (3211, 3221)



High -Flow Weatherpoof (3212, 3222)



* High Pressure (>300 PSIG)
& DeviceNet units are 7.187" tall.

TYPE 3400 & TYPE 3500 DIGITAL ELECTRO-PNEUMATIC TRANSDUCERS

The T3400 and T3500 digital electro-pneumatic transducers utilize a full-function Serial RS-485 interface. Optional user interfaces such as keypad/display programmer and DeviceNet are layers on top of the serial interface. Advanced keypad/display and DeviceNet users can access the serial interface for full-function access to product settings. The following chart summarizes the functions and settings which are available via each interface.

DIGITAL USER INTERFACES

T3400S and T3500S Serial RS-485 Interface

- Direct Access to Product Settings and Functions
- Free Windows-based software available
- RS-232 and USB Converters available

T3500P Keypad/Display Programmer

- Communicates with product through RS-485
- Mid-Level Access to Product Settings & Functions

T3400D and T3500D DeviceNet Communications

- Communicates with product through RS-485
- Conformance Tested & Certified!
- Send Setpoint and Get Pressure

See User Interfaces Section for more details.

PRODUCT SETTINGS AND FUNCTIONS*

- Accept analog (e.g., 0-10V) or digital (e.g., RS-485, DeviceNet) Setpoint (SP)
- Control Output Pressure (OP) or Process Variable (PV)
- Configure analog inputs: SP, OP, and PV
- Configure analog output (AO): Follow SP, OP, PV
- Optimize PID tuning and deadband
- Read or set device address
- Read product firmware revision

(*Direct RS-485 connection required for complete access to settings.)

			User Configurable Digital Functions						
Product	**User Interface**	**Setpoint Selection**	**Analog Setpoint (SP)**	**Loop 1 Onboard Pressure Sensor (OP)**	**Loop 2 Remote Sensor (PV)**	**Analog Monitor Output (AO)**	**Tuning**	**Serial Address**	**Serial Firmware Revision**
T3400S	Serial RS-485	Analog [2] or Digital	RANGE CAL	CAL	RANGE CAL	MODE RANGE CAL	TUNE PID + DB	Read or Set	Read
T3400D	DeviceNet [1]	Digital [2] Only	N/A	N/A	N/A	N/A	N/A	N/A	N/A
T3500S	Serial RS-485	Analog [2] or Digital	RANGE CAL	CAL	RANGE CAL	MODE RANGE CAL	TUNE PID + DB	Read or Set	Read
T3500P	Keypad/Display Programmer [1]	Analog [2] only	RANGE CAL	CAL	RANGE CAL	MODE RANGE CAL	TUNE P + DB	N/A	N/A
T3500D	DeviceNet [1]	Digital [2] Only	N/A	N/A	N/A	N/A	N/A	N/A	N/A

[1]Remove product cap to access full-function serial interface.
[2]Default Setting

SP	Setpoint Ranges	Analog (0-5V, 0-10V, 0-20mA Forward/Reverse-Acting) or Digital (Serial or DeviceNet)
OP	Loop 1 Onboard Pressure Sensor (Ranges NOT field-selectable)	
	Atmospheric Output Pressure Ranges*	1, 5, 15, 30, 100, 150, 300, 500, 1000 psig
	Vacuum Output Pressure Ranges*	30, 150 psia
PV	Loop 2 Remote Sensor (User must provide Remote Sensor and configure T3000)	
	Process Variable Ranges	0-5V, 0-10V, 0-20mA Forward/Reverse-Acting Disabled
AO	Analog Output Mode of Operation	Follow SP, OP, or PV
	Analog Output Ranges	0-5V, 0-10V

MODE	Select Mode of Operation
RANGE	Select Full-Scale (0-100%) Range
CAL	Configure Min/Max % Full-scale

* Boosted units (eg., T3511 or T3512) are limited to 0-150 psig outputs

TYPE 3400 DIGITAL CIRCUIT-CARD REGULATORS
(3410S 3420S 3410D 3420D)

The compact Type 3410 (one-loop) and 3420 (two-loop) Circuit-Card Pressure Regulators are perfect for size-conscious OEM's, without sacrificing any of the high-end performance normally associated with full-size I/P's.

The T3400 is available with either of two user interfaces: the T3400S with serial interface or the T3400D with DeviceNet interface. The T3400D consists of the T3400S plus a sister board for DeviceNet functions.

The T3400 can be controlled digitally (via the serial or DeviceNet interfaces) or with industry-standard analog control signals (0-10V or 4-20mA). Industry-standard analog monitor output signals (0-10V or 4-20mA optional) are available for user-monitoring of actual output pressure.

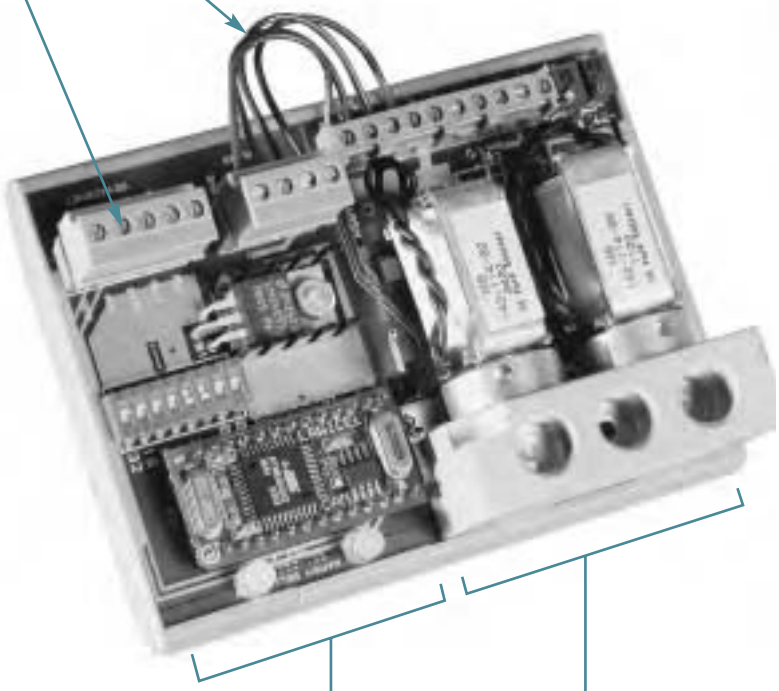
ELECTRICAL CONNECTIONS

- Serial RS-485 Connections
- DC Power
- Optional Monitor Output, Analog Setpoint and Remote Sensor Feedback

TYPE 3410S
(PANEL MOUNT SHOWN)

SERIAL TO
DEVICENET BRIDGE

DEVICENET
CONNECTIONS



TYPE 3410S

TYPE 3410D
(DIN TRAY MOUNT SHOWN)

DEVICENET BOARD

DIGITAL WEATHERPROOF REGULATORS

(3510, 3520, 3511, 3521 3512 & 3522)

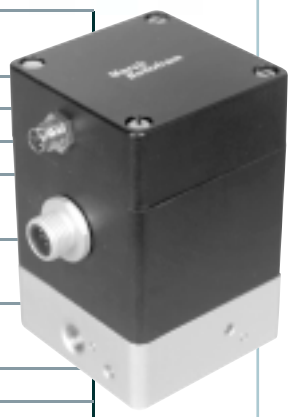
The T3500 is a digital Weatherproof Pressure Controller that is available in three different flow versions: precise low-flow manifold (T3510 or T3520), 15 scfm medium flow (T3511 or T3521), or 60 scfm high-flow (T3512 or T3522).

The 15 scfm booster has dual output ports (side and bottom). The bottom output port can be factory-mounted to externalvolume boosters up to 2000 scfm (944 l/sec).

Consult the User Interface Section (pgs. 102-103) for detailed information on user interfaces (analog, serial, keypad/display, and DeviceNet).

CE

TYPE 3400 & TYPE 3500 SPECIFICATIONS



Full-Scale Accuracy	0.50%
Supply Voltage	24VDC (optional 15VDC)
Supply Current	80 mA standby. T3400: 250 mA maximum. T3500: 325 mA maximum
Setpoint Control	Analog or Digital
Analog Setpoint Control	0-5V, 0-10V, 4-20 mA, (Forward- and Reverse-Acting)*
Digital Setpoint Control	0-100% full-scale (installed sensor =100%)
Digital Communications	Serial RS-485 interface
Serial Address	Addresses a-z available (except p & q reserved). 'r' default.*
Loop Options	Regulate 1st loop (onboard sensor) or 2nd loop (remote sensor)*
Remote Sensor Feedback	0-10V, 0-5V, 4-20 mA, (Forward- and Reverse-Acting)*
Analog Output Source	Follow Setpoint, Output Pressure, or Remote Sensor*
Analog Output Range	0-10V, 0-5V*
Operating Temperature	32-141°F (0-60°C)
Media-Wetted Materials	Aluminum, copper alloys, nickel, buna-n, silicon, 316SS

	T3400**	**T35X0****	**T35X1**	**T35X2**
Supply Pressure	See Page 87	See Page 87	See Page 87	See Page 87
Atmospheric Pressure Ranges (psig)	1, 5, 15, 30, 100, 150, 300, 500, 1000	1, 5, 15, 30, 100, 150, 300, 500, 1000	5, 15, 30, 100, 150	5, 15, 30, 100, 150
Vacuum Pressure Ranges (psia)	30, 150	30, 150	N/A	N/A
Forward Flow Capacity	1.25 scfm (at 100 psig supply and 20 psig setpoint)	1.25 scfm (at 100 psig supply and 20 psig setpoint)	15 scfm (at 100 psig supply)	60 scfm (at 100 psig supply)
Exhaust Flow Capacity	1.25 scfm (at 5 psig over a 20 psig setpoint)	1.25 scfm (at 5 psig over a 20 psig setpoint)	7 scfm (at 5 psig over a 20 psig setpoint)	15 scfm (at 5 psig over a 20 psig setpoint)

*Selectable and Configurable via Serial or Keypad/Display Interface

**Actual Flow Capacity depends on installed solenoid valves.

DIGITAL TYPE 3000 -- ORDERING INFORMATION

Type 3410 & Type 3420	# Loops		Digital Interface	Analog Control Signal	Lower Limit of Output Pressure	Pressure Units	Upper Limit of Output Pressure	Mounting	Supply & Output Ports		Options
4	1	0	S	E	0	G	999	D	0	0	00
	2		D	I		A		P	1		15
						V		M	2		
						W					

Type 3510 & Type 3520	# Loops		Digital Interface	Analog Control Signal	Lower Limit of Output Pressure	Pressure Units	Upper Limit of Output Pressure	Mounting	Supply & Output Ports		Options
5	1	0	S	E	0	G	999	P	0	1	00
	2		P	I		A			1		15
	3		D			V			2		Z2, etc.
						W					

Type 3511 & Type 3521	# Loops		Digital Interface	Analog Control Signal	Lower Limit of Output Pressure	Pressure Units	Upper Limit of Output Pressure	Mounting	Supply & Output Ports		Options
5	1	1	S	E	0	G	150	P	0	1	00
	2		P	I		W		M	1		15
			D						2		

Type 3512 & Type 3522	# Loops		Digital Interface	Analog Control Signal	Lower Limit of Output Pressure	Pressure Units	Upper Limit of Output Pressure	Mounting	Supply & Output Ports		Options
5	1	2	S	E	0	G	150	P	0	1	00
	2		P	I					1		15
			D						2		
									3		
									4		
									5		

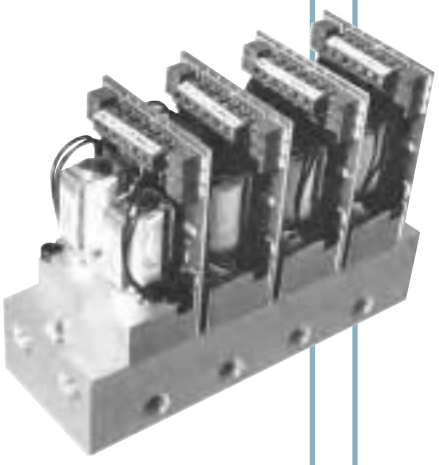
# LOOPS	1=1 2=2 3=enhanced accuracy (T3510 T3520 only)
ANALOG CONTROL SIGNAL	E=0-10V I=4-20mA
LOWER LIMIT OF OUTPUT PRESSURE	For pressures taking more than 1 digit, contact factory
PRESSURE UNITS	G=psig A=psia absolute V=vacuum W=inches of water column
UPPER LIMIT OF OUTPUT PRESSURE	Use all 3 digits (eg., 030 for 30 psig)
MOUNTING For Manifold Mount (no threads), specify 0 for supply & Output Ports	Type 3400 Serial D=DIN tray P=Panel-Mount M=Manifold-Mount (150 psig maximum output)
	Type 3400 DeviceNet **"D" mounting, Type 3400S and Device Net board installed in a single extended DIN tray.** **"P" or "M" mounting, DeviceNet board is supplied with 4 screws and stand-offs for panel-mounting.**
	Type 3500 P=Pipe M=Manifold-Mount (Order panel bracket & DIN rail clip separately)

SUPPLY & OUTPUT PORTS	T3400 0=1/8" NPT 1=1/8" BSPT 2=1/8" BSPP
	T3500 0=1/4" NPT 1=1/4" BSPT 2=1/4" BSPP 3=3/8" NPT 4=3/8" BSPT 5=3/8" BSPP
OPTIONS	00=none 15=15VDC supply X2, X3, Z2, Z3, Z4, N3, N4, N6, N8, Q6, Q8, QA, QB, QC, V2, V3 (External Volume Booster contact factory for other options.)
DIGITAL INTERFACE	S=Serial RS-485 (RS-232 &USB via converters) For free Windows-based software, order 104-600-00 P=keypad/display programmer D=DeviceNet

TYPE 3400 CIRCUIT CARD REGULATORS

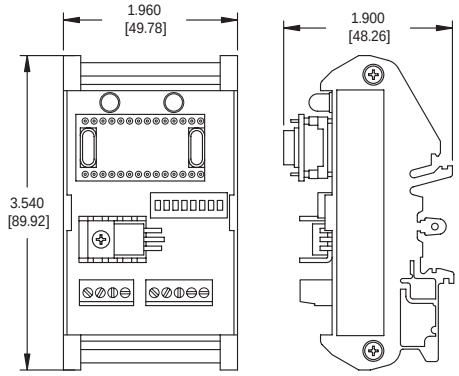
PACKAGING, FLOW CAPACITY, AND MOUNTING

The Type 3100 and 3400 circuit card regulators (as well as the special Type 3111) share a common mounting system. They can be mounted in a plastic DIN tray, on a multi-unit manifold, or panel-mounted. The standard method for panel-mounting is with the regulator perpendicular, but a bracket is available for parallel panel mounting. High pressure (> 150 psi) versions utilize an external sensor assembly.



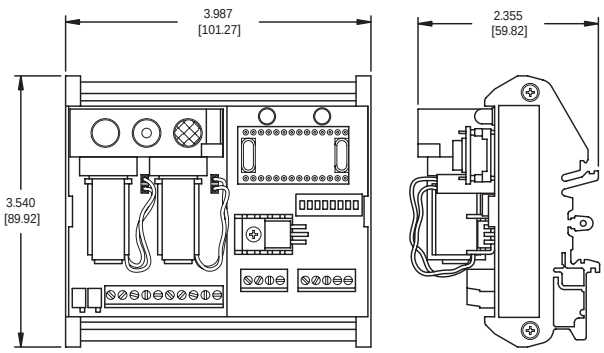
Type 3400D Panel or Manifold Mount
(Type 3400D = Type 3400S + DeviceNet board)

DeviceNet Board (Din Tray Mount)

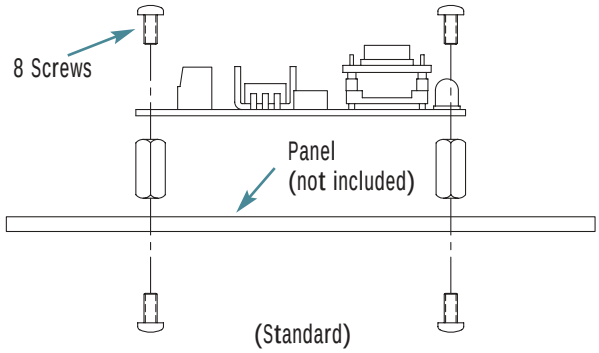


(Order Din Tray Separately)

Type 3400D
Din Tray Mount



Devicenet Board
(Panel Mount)



(Standard)

CIRCUIT-BOARD REGULATORS — MOUNTING & PACKAGING

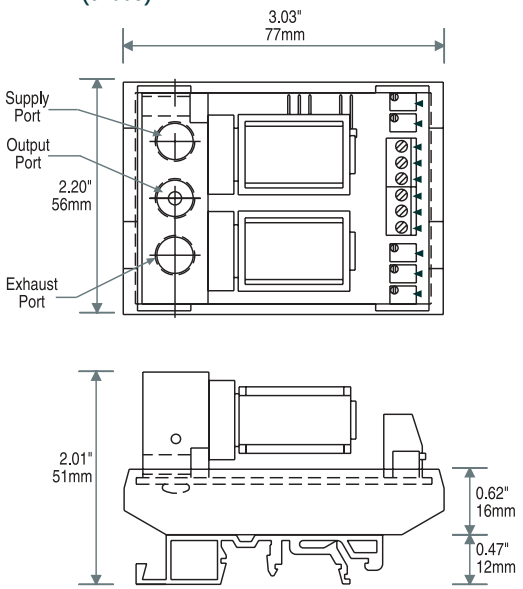
Product	Mounting	Product Configuration	Accessories
3400S	DIN Tray	Product mounted in DIN Tray	None
3400S	Panel	Product configured for panel mounting	For 'flush' mounting, order Flush Mount Bracket (161-520-00) separately
3400S	Multi-Unit Manifold	Product configured for multi-unit manifold mounting	Order Multi-Unit Manifold (350-110-XX) separately. XX = # stations.
3400D*	DIN Tray	3400S and DCB mounted in single extended DIN tray	None
3400D*	Panel	3400S configured for panel mounting. DCB with 4 screws and stand-offs for flush panel mounting.	For 'flush' mounting of 3400S, order Flush Mount Bracket (161-520-00) separately. For DIN-tray mounting of DCB, order 500-410-00 separately.
3400D*	Multi-Unit Manifold	3400S configured for multi-unit manifold mounting. DCB with 4 screws and stand-offs for flush panel mounting.	Order Multi-Unit Manifold (350-110-XX) separately. XX = # stations. For DIN-tray mounting of DCB, order 500-410-00 separately.

*3400D = 3400S + DCB (DeviceNet Circuit Board)

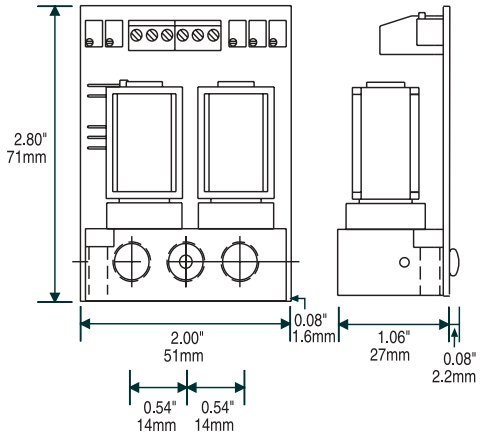
TYPE 3400 DIN-MOUNT CIRCUIT CARDS

DIN TRAY MOUNT (3400S)

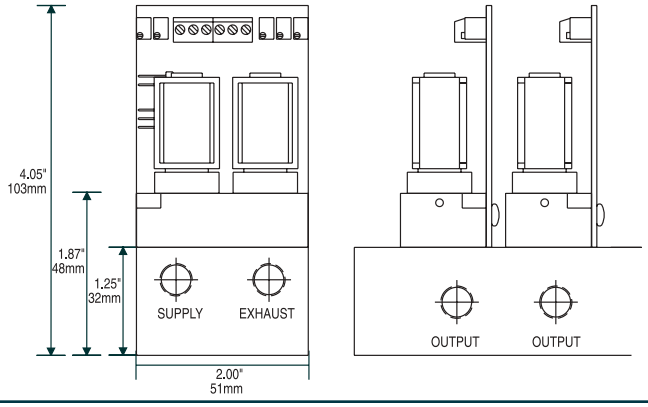
DUST COVER = 157-201-01



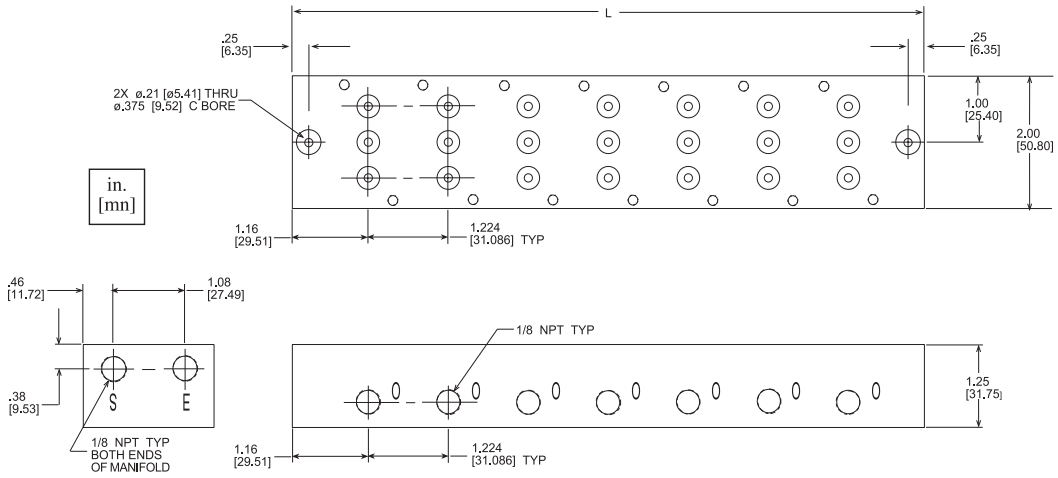
PANEL MOUNT (3400S)



MANIFOLD MOUNT (T3400S)



Type 3400S Manifold Block (7 station manifold shown)



MANIFOLD BLANK KIT = 500-310-00

MANIFOLD = 350-110-XX
XX = NUMBER OF STATIONS

Manifolds are available in 2 to 10 stations.

To calculate the overall length "L" of the manifold use the following formula:

L= 2 X 1.16 + (S-1) X 1.224

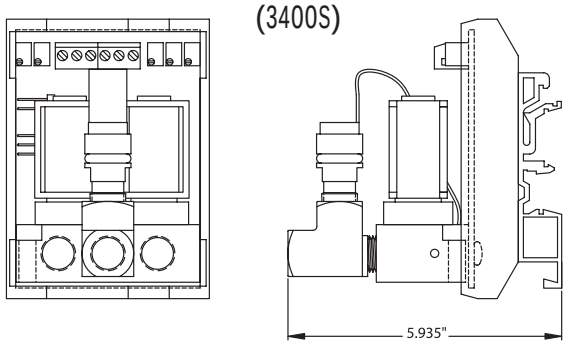
Where S = the number of manifold stations

EXAMPLE: 7 Station Manifold:

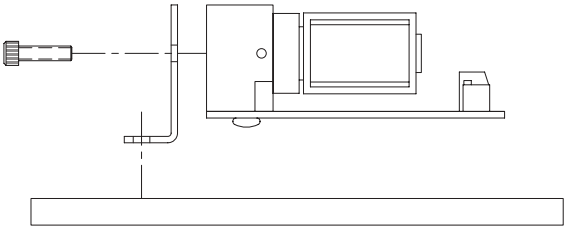
L = 2 X 1.16 + (7-1) X 1.224

L = 9.664 in. [245.47 mm]

High-Pressure (>300 psig) units
(3400S)

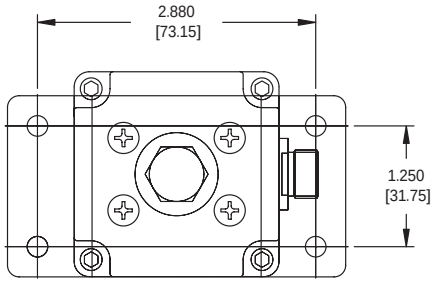


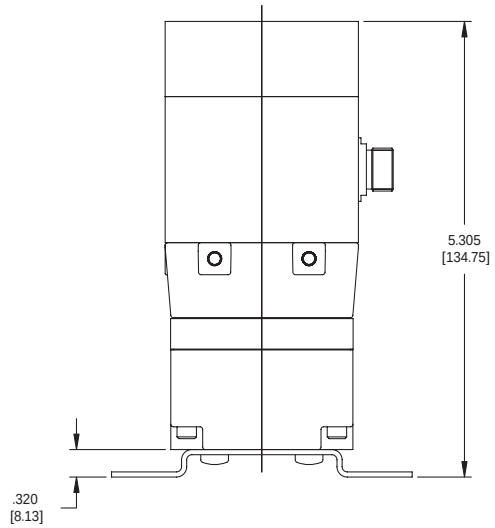
Flush Panel Mount
(3400S)



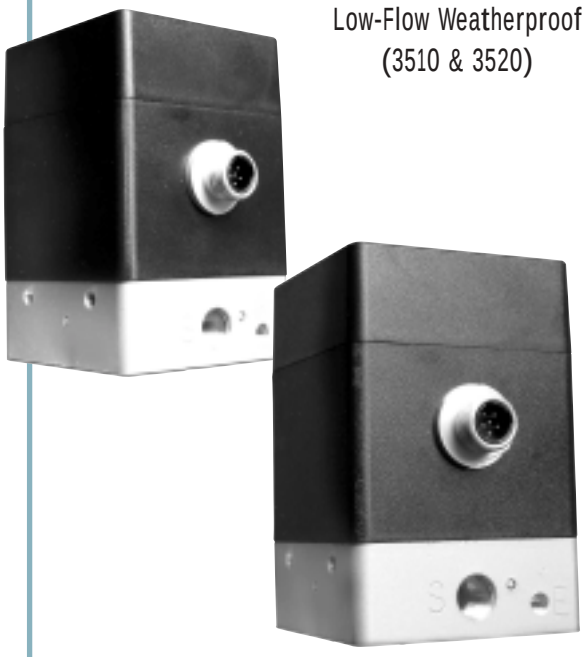
WEATHERPROOF REGULATOR MOUNTING OPTIONS

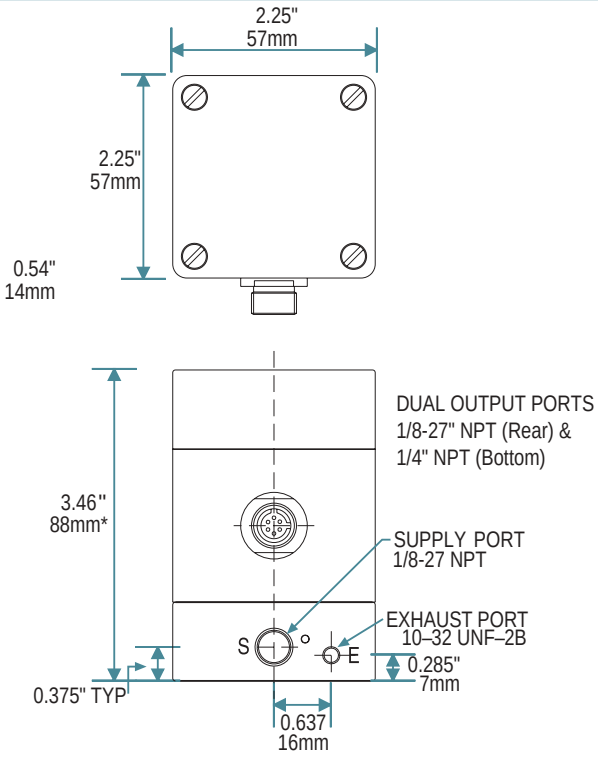
The Type 3500 regulators can be mounted in-line or by brackets which are available separately (DIN-rail bracket — 010-115-00; Panel bracket — 010-135-00). Bracket mounting holes (2 X 8-32 UNC 2B X 0.375" deep minimum) are available on the rear and right faces (when looking at product with IN/OUT flow from left to right) and also on the bottom of the medium-flow booster (shown in diagram).





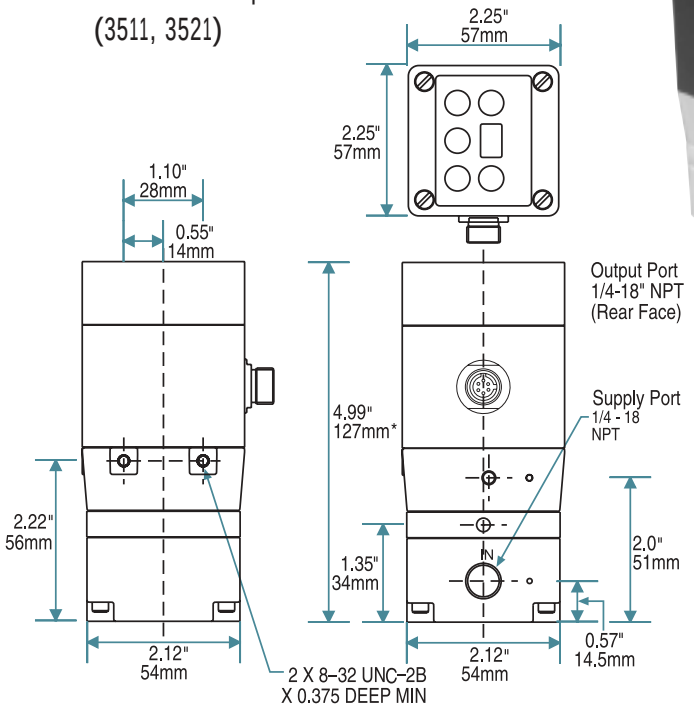
Low-Flow Weatherproof
(3510 & 3520)





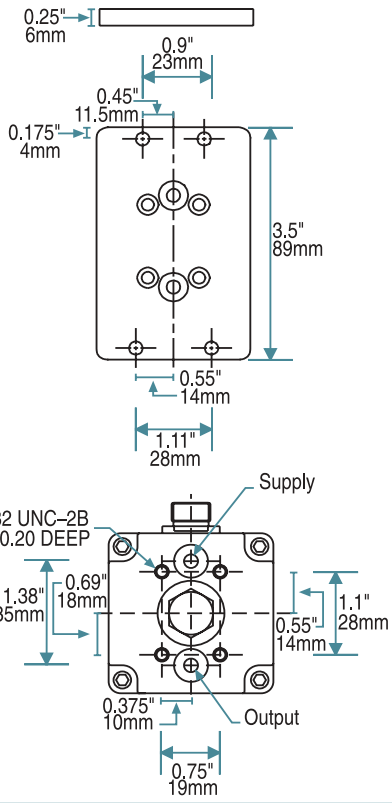
* High Pressure (>300 PSIG) & DeviceNet units are 5.00" tall.

Medium-Flow Weatherpoof (3511, 3521)



* High Pressure (>300 PSIG)
& DeviceNet Units are 6.35" tall.

Manifold Mount (3511, 3521)



High -Flow Weatherpoof (3512, 3522)

* High Pressure (>300 PSIG)
& DeviceNet units are 7.187" tall.

TYPE 3200 & 3500 WEATHERPROOF REGULATORS

The unparalleled modularity of the T3000 product line enables the user to specify any of four Electronic Sections in combination with any of three Pneumatic sections.

ELECTRONICS

T3200
Analog
Input/Output

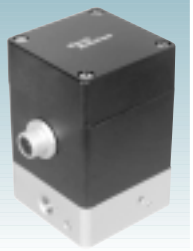
T3500S
Full-Function Serial
Communications
& Analog Input/Output

T3500P
Keypad/Display
Programmer
& Analog Input/Output

T3500D
DeviceNet
Communications
& Analog Input/Output

PNEUMATICS

LOW-FLOW MANIFOLD
1.2 scfm
Vacuum to 1000 psig



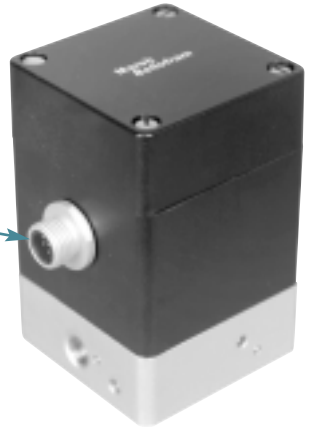
MEDIUM-FLOW BOOSTER
15 scfm
0 to 150 psig

HIGH-FLOW BOOSTER
60 scfm
0-150 psig

ANALOG (V OR mA) USER INTERFACE

All T3000 transducers, whether analog or digital, provide user access to some combination of analog functions such as control signal, 2nd loop remote sensor feedback, monitor output, and logic output. Refer to product specifications for details.

On Circuit-Card units (T3100 and T3400) DC power and analog input/output connections are made to the board's terminal block. On weatherproof units (T3200 and T3500) DC power and analog input/output connections are made to the 6-pin connector in the product's midsection. The 6P cordset is a required accessory.



TYPE 3210 SHOWN

SERIAL RS-485, RS-232, USB

SERIAL RS-485 USER INTERFACE (RS-232 AND USB VIA CONVERTERS)

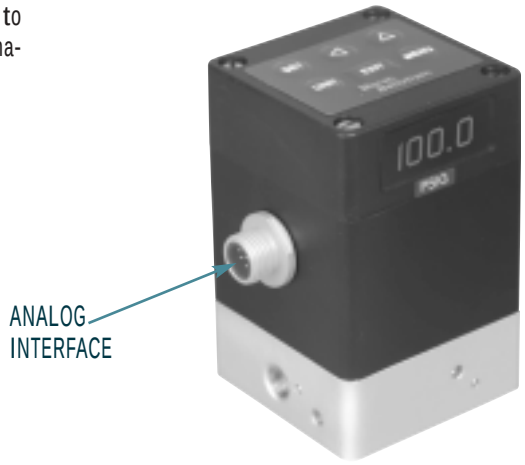
User connection to the T3500 serial interface is made via the 4-pin connector near the top of the product. The 4N cordset is a required accessory.

User connection to the T3400 serial interface is made via the product's terminal block.

TYPE 3510S SHOWN

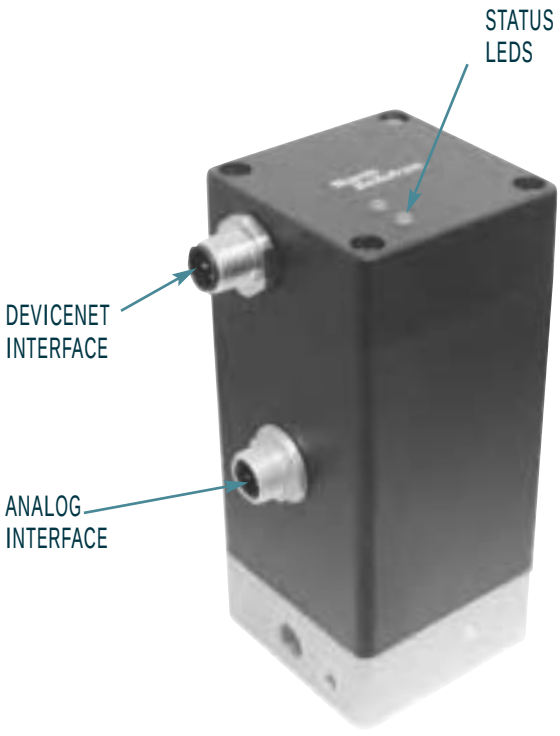
KEYPAD/DISPLAY PROGRAMMER USER INTERFACE

The T3500 keypad/display provides a mid-level interface to product functions and settings. See the chart which summarizes functions for Digital Electro-Pneumatic Transducers.



DEVICENET

The T3500D DeviceNet cap communicates with its Base through a Serial Communications link. The 5P cordest is a required accessory. DeviceNet communication with the T3500D includes Send Setpoint and Get Actual Pressure. The EDS file and Device Profile are available upon request.



DEVICENET CONNECTION (5-PIN MICRO-STYLE CONNECTOR)

Power Supplied by DeviceNet bus
Voltage: 11 to 25 VDC
Current: 70 mA at 12 VDC (nominal)

BASE POWER (6-PIN MICRO-STYLE CONNECTOR)

Must be supplied by user
Voltage: 24VDC (+/-1VDC) ——- (15VDC optional)
Current: 375 mA maximum

NETWORK SPECIFICS

Compatibility: Group 2 Server Only, not UCMM capable.
Baud Rates: 125 Kbaud, 250 Kbaud, and 500 Kbaud.
Bus Interface: Phillips 82C250; mis-wiring protection per DeviceNet Vol. I Sec 10.2.2.
Node Isolation: Bus powered, optically isolated node.
Bus Connection: Micro connector per DeviceNet Volume I Appendix C-5.

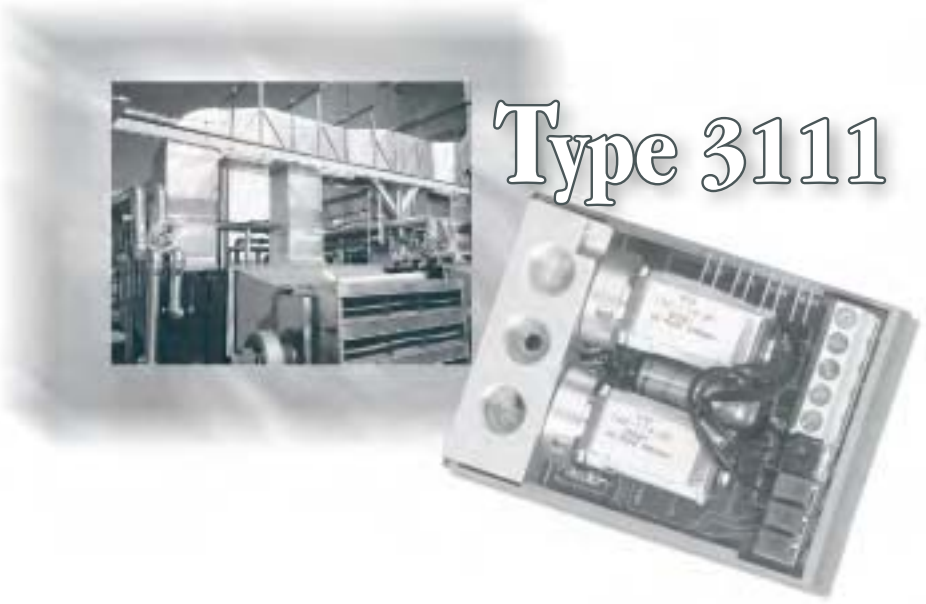
Factory Defaults: Baud rate = 125 K baud. MAC ID = 63.

Device Type: 0 (Generic)
Device Profile: DeviceNet Specification (Volumes I and II of version 2.0).
Device Configuration: No DeviceNet configuration is supported.
Status LED's: Network Status (NS) and Module Status (MS) LED's are provided.

TYPE 3111 ECONOMICAL CIRCUIT CARD REGULATOR

The T3111 Compact Analog Pressure Controller is an economical version of the T3100 with no remote feedback or logic output capabilities. Output pressure is limited to 150 psig maximum. Jumper selections include AC/DC power and several control signal ranges. Manual output pressure adjustment and differential control signals are available.

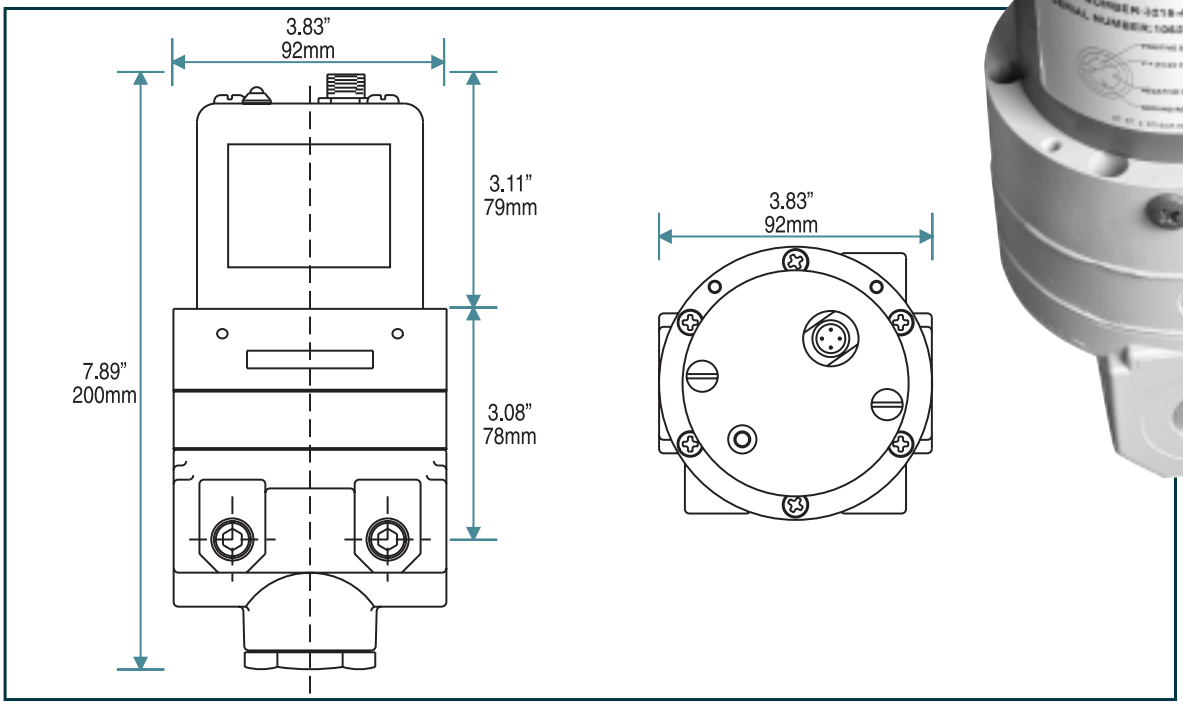
Overall product dimensions are identical to Type 3110.



TYPE 3215 WEATHERPROOF REGULATOR WITH SUPER HIGH FLOW

The T3215 High-Flow Pressure Controller utilizes reliable, quick-firing solenoids, an onboard pressure sensor, and a precision 180 scfm booster to achieve excellent accuracy and stability. There are many custom output ranges between 0 and 150 psig (1.0 MPa). The T3215 is CE-rated, weatherproof, and vibration-resistant. Analog electrical connections include control and monitor output. Mounting options include in-line and panel.

The T3215 is available with or without pressure monitor and logic outputs (6-pin or 4-pin micro connector, respectively). The T3215 is also available with a 6-pin DIN 43650 connector. Differential inputs mean problem-free integration with PLC grounding systems.

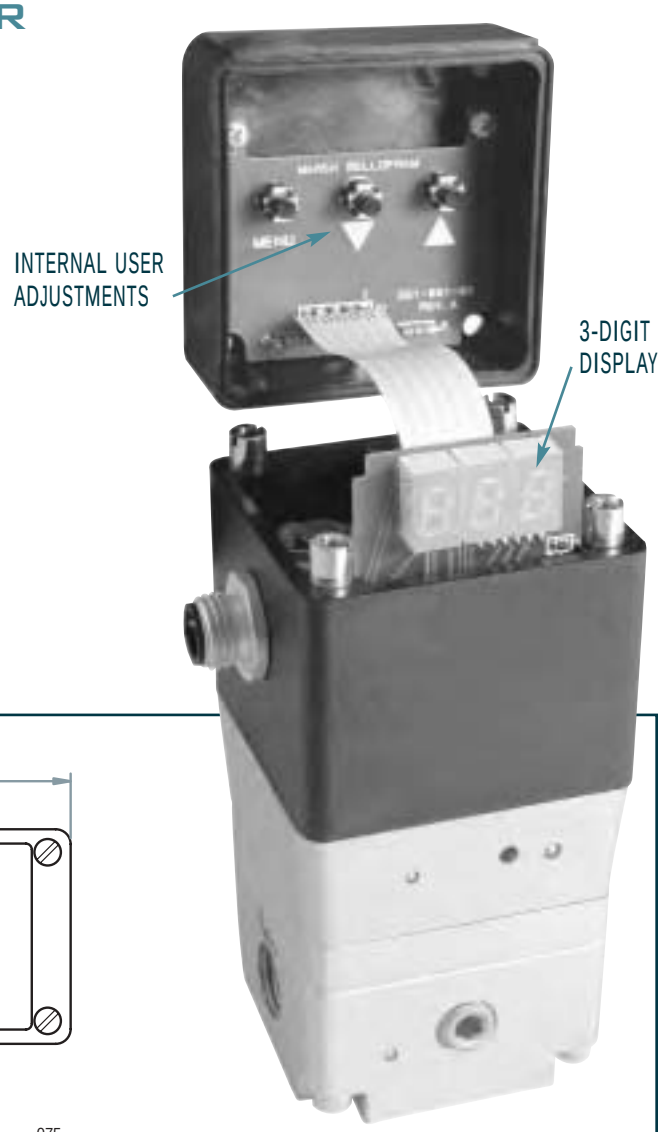


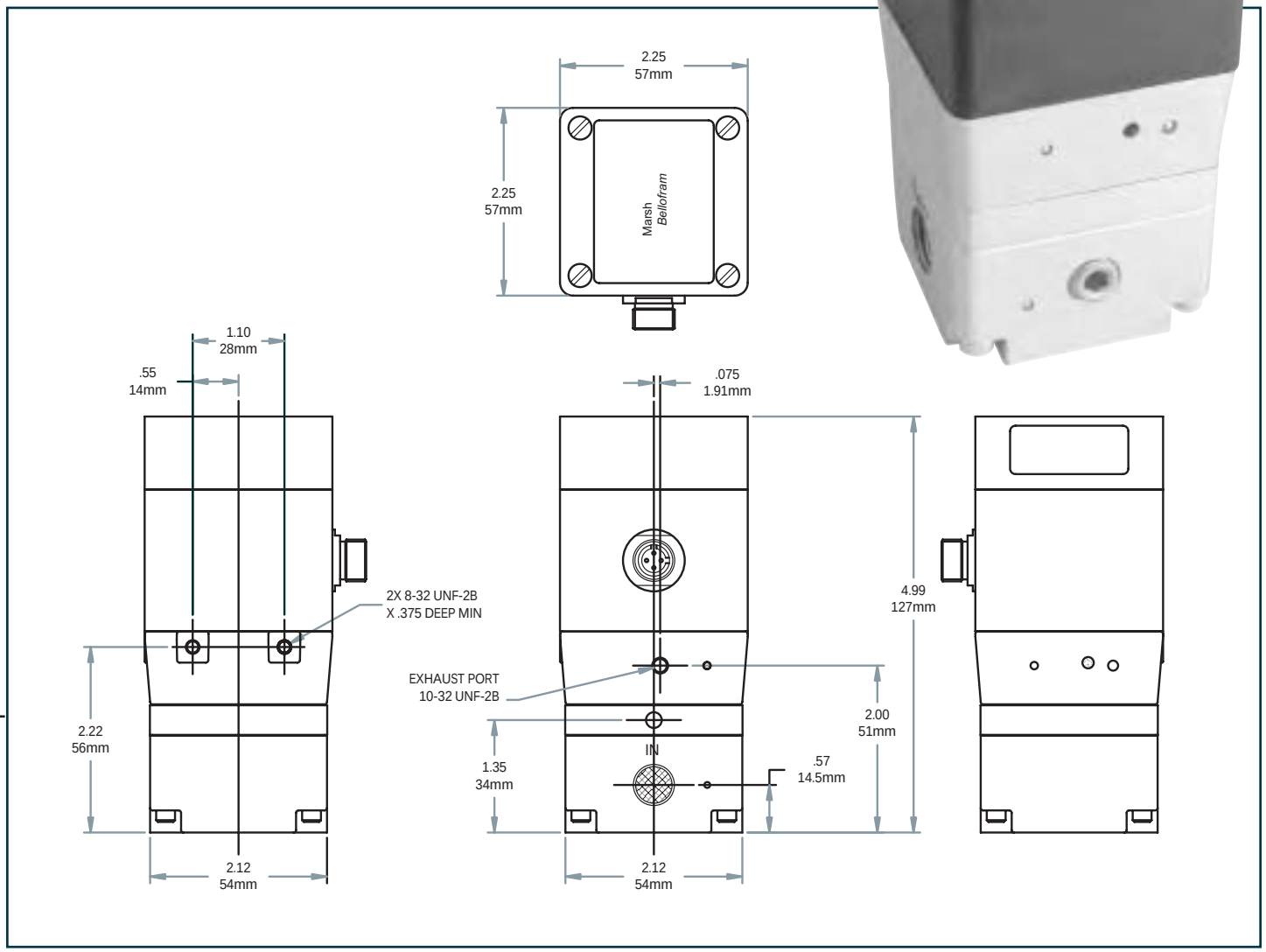
TYPE 3311 ECONOMICAL WEATHERPROOF REGULATOR

The T3311 regulates pressure in proportion to a 0-10V or 4-20mA control signal. Output pressure ranges include 0-30, 0-60, 0-100, and 0-150 psi (0-2, 0-4, 0-7, and 0-10 bar). The Type 3311 is CE-rated and vibration resistant. Mounting options include panel, DIN rail, in-line and manifold.

The keypad / display interface allows the user to: 1) Select displayed pressure units (psig or bar); and 2) Select minimum (zero) and maximum (span) output pressure. The keypad is internally mounted for tamper-resistance.

The T3311 includes a 4-pin 12mm micro-style cordset with a 3' (1m) cord. Other lengths are available. Electrical connections include DC power, ground, control signal, and monitor output.





TYPE 3411 CIRCUIT CARD PRESSURE REGULATOR

QUIET VALVE OPERATION AND AUTO / MANUAL / LEARN MODES

The Type 3411 Circuit Card Pressure Regulator regulates air pressure in proportion to an analog electrical signal (AUTO) or via an over-ride thumbwheel (MANUAL). The 3411 utilizes a unique patent-pending LEARN mode to characterize the users specific downstream load. Quiet Valve Operation produces crisp accurate regulation without the chattering noise typical of other solenoid-valve-based products.

The Type 3411 is specifically designed for use with spring-return air-duct cylinders in the Heating, Ventilating, and Air Conditioning (HVAC) industries. Any application involving single-acting cylinders, valves, or bladders may benefit from the unique advanced features of this product. These include Vent Hood Control, Damper Control, Instrumentation, and Medical Applications. At just 2.1" by 2.8" with a height of 1.3", the 3411 is ideal for OEM's and other space-conscious customers.

FEATURES

- Mounting* DIN Tray, Panel, or Multi-Unit Manifold
- Air Consumption Zero at steady state
- Failure Mode upon loss of power* Lock-in-Place or To-Atmosphere
- Available with snap tracks, barbed air fittings, and pressure gauges

PERFORMANCE	T3111	T3215	T3311	T3411
Full-Scale Accuracy	0.5%	1.0%	1.0%	1.0%
ELECTRICAL INPUTS				
Supply Voltage	24VDC (12VDC option) 24VAC	15-24VDC	24VDC	24VDC, 24VAC
Standby Supply Current	80 mA	80 mA	80 mA	80 mA
Maximum Supply Current	250 mA	325 mA	325 mA	120 mA
E/P Control	0-5V, 0-10V, 0-15V 2K-100K ohms	0-10V 10K ohms	0-10V 10K ohms	0-10V, 15K ohms
I/P Control	0-20 mA 250 ohms	4-20 mA 250 ohms	4-20 mA 250 ohms	4-20 mA 250 ohms
ELECTRICAL OUTPUTS				
Monitor Output*	0-5V	0-10V (4-20mA option)	0-10V, 0-5V	0-10V, 0-5V
Logic Output*	N/A	CMOS, TTL, Open-Collector	N/A	N/A
PNEUMATIC INPUTS				
Supply Pressure	See Chart on Page 87	See Chart on Page 87	See Chart on Page 87	See Chart on Page 87
PNEUMATIC OUTPUTS				
Full-scale Atmospheric Pressure Ranges	1, 5, 15, 30, 100, 150 psig	30, 100, 150 psig	30, 60, 100, 150 psig	15, 30 psig
Vacuum Pressure Ranges	N/A	N/A	N/A	N/A
Forward Flow Capacity	1.25 scfm	180 scfm	15 scfm	1.25 scfm
Exhaust Flow Capacity	1.25 scfm	30 scfm	7 scfm	1.25 scfm
ENVIRONMENTAL				
Operating Temperature	32-141 ˚F (0-60 ˚C)	32-141 ˚F (0-60 ˚C)	32-141 ˚F (0-60 ˚C)	32-141 ˚F (0-60 ˚C)
Media-Wetted Materials	Aluminum, copper alloys, nickel, buna-n, 316SS, silicon	Aluminum, copper alloys, nickel, buna-n, 316SS, silicon	Aluminum, copper alloys, nickel, buna-n, 316SS, silicon	Aluminum, copper alloys, nickel, buna-n, 316SS, silicon
Required Accessories		4 or 6-pin micro cordset		
Recommended Accessories	Manifold, Power Supply, Control Knob, External Volume Volume	Panel Bracket, Power Supply, Control Knob, External Volume Booster	Panel Bracket, DIN Bracket, Power Supply, Control Knob, External Volume Booster	Manifold, Power Supply, Control Knob, External Volume Volume, Snap Track, Barbed Air Fittings, Gauge

* The Type 3215 with "Z" option does not have electrical outputs (consult factory for 4-pin cordset).

SPECIAL TYPE 3000 -- ORDERING INFORMATION

T3111

				Analog Control Signal	Lower Limit of Output Pressure	Pressure Units	Upper Limit of Output Pressure	Mounting	Supply & Output Ports	Connector	Options
1	1	1	Z	E	0	G	150	D	0	0	00
				I		A		P	1		14
				0		V		M	2		
				1		W					

T3215

			Logic Output	Analog Control Signal	Lower Limit of Output Pressure	Pressure Units	Upper Limit of Output Pressure	Mounting	Supply & Output Ports	Connector	Options
2	1	5	M	E	0	G	30	P	3	1	00
			T	I			100		4	D	
			O				150		6		
			Z						8		

T3311

			Logic Output	Analog Control Signal	Lower Limit of Output Pressure	Pressure Units	Upper Limit of Output Pressure	Mounting	Supply & Output Ports	Connector	Options
3	1	1	Z	E	0	G	30	P	0	1	00
				I			60	M	1		15
							100		2		
							150				

T3411

			Gauge	Analog Control Signal	Lower Limit of Output Pressure	Pressure Units	Upper Limit of Output Pressure	Mounting	Supply & Output Ports	Connector	Options
4	1	1	Z	E	0	G	15	D	0	0	00
			G	I			30	P	1	2	01
								M	2		03
									3		
									4		
									5		

# LOOPS	1=1
ANALOG CONTROL SIGNAL	E=0-10V I=4-20mA (0-20 mA on T3111) 0=0-5V 1=0-15V
LOWER LIMIT OF OUTPUT PRESSURE	For pressures taking more than 1 digit, contact factory
PRESSURE UNITS	G=psig A=psia absolute V=vacuum W=inches of water column
UPPER LIMIT OF OUTPUT PRESSURE	Use all 3 digits (eg., 030 for 30 psig)
MOUNTING	Type 3111 & 3411 D=DIN tray P=Panel-Mount M=Manifold-Mount (150 psig maximum output) (For flush panel mounting, specify P option and order 161-520-000 bracket)
	Type 3311 P=Pipe (in-line) M=Manifold-Mount (Panel bracket & DIN rail clip available)
	Type 3215 P=Pipe (in-line) For Manifold-Mount (no threads), specify 0 for Supply & Output Ports

SUPPLY & OUTPUT PORTS	Type 3111 0=1/8" NPT 1=1/8" BSPT 2=1/8" BSPP
	Type 3311 0=1/4" NPT 1=1/4" BSPT 2=1/4" BSPP
	Type 3215 3=3/8" NPT 4=1/2" NPT 6=3/4" NPT 8=1" NPT
	Type 3411 0=1/4" OD BARB (1/8" NPT Plugged) 1=1/4" OD BARB (1/8" BSPT Plugged) 2=1/4" OD BARB (1/8" BSPP Plugged) 3=1/8" NPT 4=1/8" BSPT 5=1/8" BSPP
CONNECTOR	0=Terminal Block 1=Micro Connector 2=Removable Terminal Block D=DIN 43650 connector
OPTIONS	00=none 01=High Flow 03=Fail safe (to atmosphere) 14=12VDC supply 15=15VDC supply Contact factory for other options.
LOGIC OUTPUT	M=CMOS T=TTL O=Open-Collector Z=No Logic Output
GAUGE	Z=No Gauge G=Gauge Installed

CORDSETS

DC POWER AND ANALOG I/O

Required on all T3200 and T3500 transducers.
Single-ended cordset with 6-pin female M12 micro-style connector.

LENGTH OF WIRING	PART #
3' (0.9m)	122-004-08
6' (1.83m)	122-004-09
12' (3.66m)	122-004-10
20' (6.10m)	122-004-11

DC POWER AND ANALOG I/O

Required on Z-option Type 3215.
Single-ended cordset with 4-pin female M12 micro-style connector.

LENGTH OF WIRING	PART #
3' (0.9m)	122-004-04
6' (1.83m)	122-004-05
12' (3.66m)	122-004-06
20' (6.10m)	122-004-07

SERIAL RS-485

Required on all T3500 Serial RS-485 transducers.
Single-ended cordset with 4-pin female nano-style connector.

Length of Wiring	Part #
6.5' (2m)	122-000-00
16.5' (5m)	122-000-01

DEVICENET

Required on all T3500 DeviceNet transducers. Single-ended cordset with 5-pin female M12 micro-style connector

Length of Wiring	Part #
3' (0.9m)	160-560-01

CONVERTERS

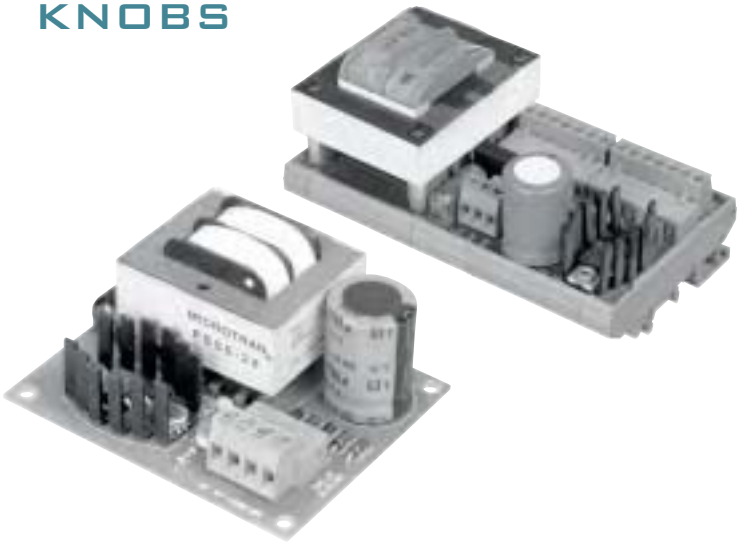
RS-232 CONVERTER

Converts T3400/T3500 Serial RS-485 interface to RS-232.
Part # 160-700-00.

USB CONVERTER

Used in combination with RS-232 Converter, allows connection of T3400 or T3500 Serial to USB port. Part # 160-710-00

POWER SUPPLIES AND CONTROL KNOBS



A pair of 15VDC circuit-card power supplies is available for integration of Type 3000 transducers into 120VAC systems. The ZMS-JR powers a single Type 3000; the ZMS15-2 powers up to 2. In addition, the ZMS15-2 can control a pair of Type 3000 transducers with 0-10V when combined with the P1 Control Knob.

The ZMSJR is rated at 375 mA maximum output; the ZMS15-2 at 750mA. Connections are made via removable terminal blocks. Both power supplies are short circuit protected, and mounted in trays for easy DIN rail mounting. The ZMSJR (without DIN tray) can also be standoff mounted. AC power cords are included. The ZMSJR has a 3.6" X 3.1" footprint and is 2.6" high when mounted in its DIN tray; the ZMS15-2 is 5.4" X 3.1" and 2.7".

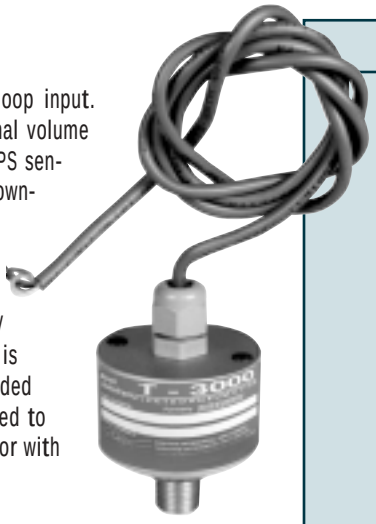
ZMSJR	Powers one Type 3000	Part # 501-200-04
ZMS15-2	Powers & Controls two T3000's	Part # 501-200-00
P1-3	Control Knob with 3' (0.91m) wiring	Part # 504-100-00
P1-6	Control Knob with 6' (1.83m) wiring	Part # 504-100-01
P1-12	Control Knob with 12' (3.66m) wiring	Part # 504-100-02

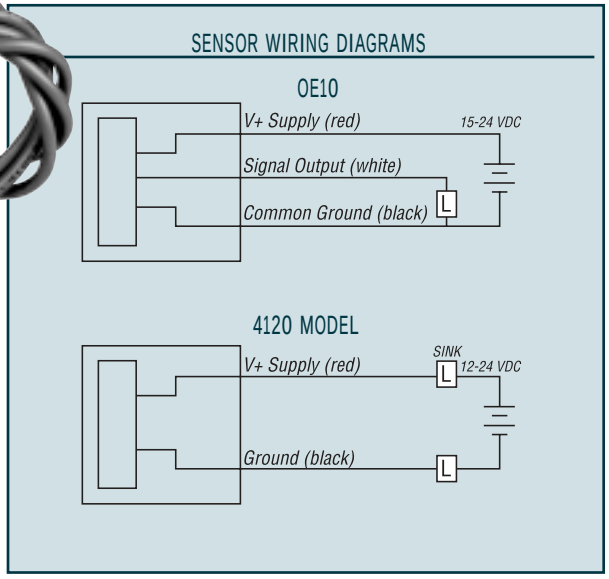
REMOTE PRESSURE SENSORS (RPS)

The RPS is designed for connection to the T3000's 2nd loop input. When used to monitor pressure at the output of an external volume booster, or directly at the user's remote application, the RPS sensor increases overall accuracy and speed of response to downstream changes.

Pressure ranges from vacuum to 1000 psig are available. RPS outputs (0-10V or 4-20mA) are field-adjustable. 4-20 mA versions require 12-24VDC external power, while 0-10V versions require 15-24VDC. The RPS weatherproof housing is 1.8" wide X 2.6" tall (for pressures above 300 psig, extended height housing is required). The RPS can be directly mounted to the application with its male ¼" NPT pneumatic connection, or with the SPC-MB1 bracket (available separately).

Temperature range is 0-50˚C.





Part #: RPS 0GXXX YYYY ZZ

XXX = upper end of pressure range (e.g., '030' for 30 psig)*

YYYY = electrical output ('0E10' for 0-10V or '4I20' for 4-20 mA)

ZZ = length of wiring ('W' for 3' or 'W6' for 6')

* Full scale ranges:
1, 5, 15, 30, 100, 150, 300, 500, 1000 PSIG
Vacuum (29" Hg)

EXTERNAL VOLUME BOOSTERS

Volume Boosters increase the flow capacity of electro-pneumatic transducers, leading to faster response time and increased ability to remain at setpoint.

Low-flow transducers (T3210, T3220, T3510, and T3520) can be mounted on the volume booster of your choice. Simply add the booster's 2-letter code (from below) to the Options field of the T3000 part #.

The RPS sensor can be used with two-loop transducers (T3120, T322X, T3420, and T352X), closing the loop to the booster's output and increasing overall accuracy.

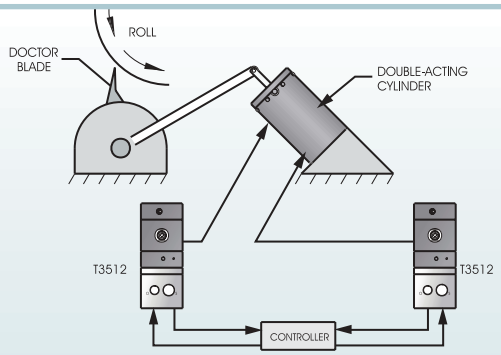
When the distance between transducer and volume booster is large (e.g., when the transducer is mounted in a cabinet and the booster is installed directly at the application), one of the high-flow transducers (e.g., T3211 or T3512) can drive the booster over distance.

The X booster is the Marsh Bellofram Type 20EXHR. It utilizes two-stage technology to maintain setpoint over a wide range of flows (Note: minimum output is 2 psig). The Z booster is the Marsh Bellofram Type 75HR. The N booster is the Marsh Bellofram Type 79. Consult the documentation for these products for more information.

The Q boosters are ultra-high flow boosters. The V booster can be used with vacuum versions of the T3210, T3220, T3510, and T3520.

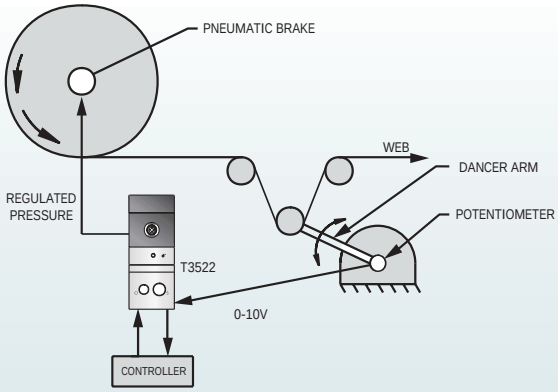
Flow capacities are for comparison purposes only. Forward flow is typically measured at 100 psig supply and 80 psig output. Exhaust flow is typically measured at 5-10 psig above 20 psig setpoint.

Part #	Supply & Output Port Size (NPT)	Maximum Supply (psig)	Maximum Signal & Output (psig)	Typical Forward Flow (scfm)	Typical Exhaust Flow (scfm)
X2	1/4"	150	120	14	10
X3	3/8"	150	120	14	10
Z2	1/4"	250	150	40	15
Z3	3/8"	250	150	50	15
Z4	1/2"	250	150	50	15
N3	3/8"	400	200	170	31
N4	1/2"	400	200	200	31
N6	3/4"	400	200	220	31
N8	1"	400	200	220	31
Q6	3/4"	300	160	550	220
Q8	1"	300	160	550	220
QA	1-1/4"	300	160	2200	200
QB	1-1/2"	300	160	2200	200
QC	2"	300	160	2200	200
V2	1/4"	140	100	50	6
V3	3/8"	140	100	50	6



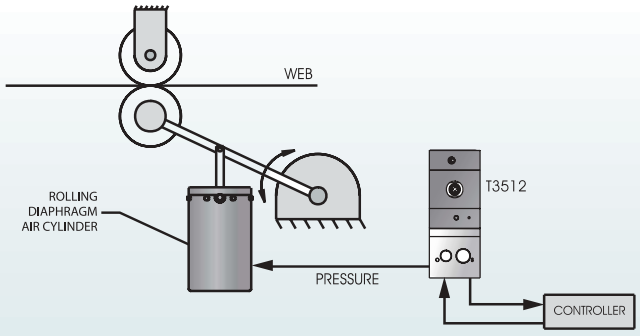
DOCTOR BLADE CONTROL

Doctor blades are used through-out the paper process to remove water and contaminants from the roll. The use of a double-acting cylinder (or bladders or bellows) on each end of the roll, with two T3512's controlling the position of each cylinder, increases the positioning accuracy of the doctor blade.



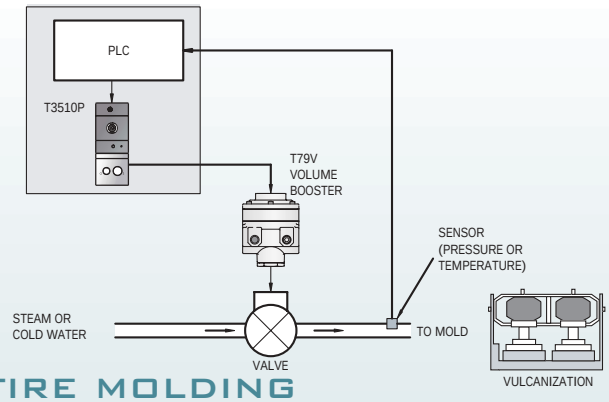
WEB TENSION

A web-tensioning system serves as a kind of shock absorber, keeping the web at the same tension no matter what the roll size. The T3522 utilizes closed-loop feedback from the dancer arm, to adjust pressure delivered to the pneumatic brake, keep the dancer arm at the desired position, and maintain the desired web tension. The two-loop capability of the T3522 frees up the Controller for other tasks.



WEB CALIPER (THICKNESS)

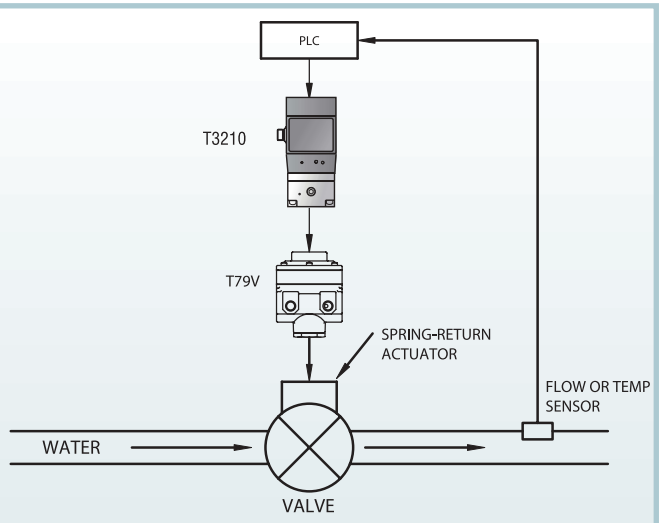
In the calendar section of the paper machine, the T3512 regulates pressure delivered to an air cylinder (or bladder or bellows) to regulate the thickness of the paper. The calendar section consists of calendar stacks with a reel device for winding the paper onto a reel as it leaves the machine. The calendar finishes the paper by smoothing it to the desired finish, thickness, or gloss.



TIRE MOLDING

During the vulcanization stage of tire making, a green tire is molded into a finished tire — ready for testing, inspection, and shipment. Tight control of pressure and temperature is absolutely critical to the making of high-quality tires. This requires valves for steam, cold water, and air pressure, as well as devices to monitor pressure and temperature. In the illustration, the T3510P I/P is mounted in the cabinet with the PLC, to locate all the electronics in a single location. The T79V volume booster provides the flow capacity to open and close the valve rapidly, as well as a 'tunable' integral needle valve to provide stable operation.

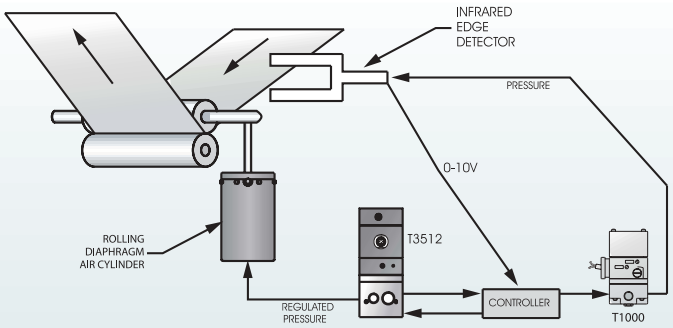
Other products used in tire molding include filter-regulators & T51), regulators (T70, T78), and Positive-Bias Relays (T72).



VALVE CONTROL

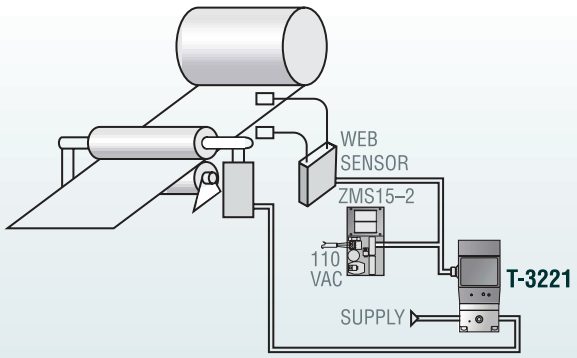
Valves are used throughout the paper-making process to control the flow of water, steam, pulp, and chemicals. Valves are found in Water Treatment facilities (both incoming and outgoing), as well as Power Generation facilities. Some paper mills install steam-shower valves after the dryer section to control paper curl.

Valves can be actuated by Valve Positioners, I/P Electro-Pneumatic Transducers, or both. In the example above, the Type 3210 is used to regulate the amount of water (or other fluid) passing through a valve. The T3210 receives a control signal from a Programmable Logic Controller and regulates the speed and position of the valve actuator. The T79V Volume Booster increases valve opening/closing speed by increasing dramatically the amount of compressed air being fed to the actuator. Other products used in valve control include Filter-Regulators (T50 and T51), Regulators (T70), Positive-Bias Relays (T72), P/I Transducers (T5000), and pressure gauges.



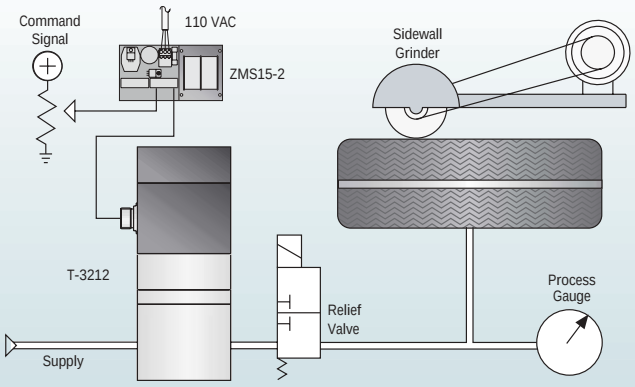
EDGE-GUIDING & WEB-BREAK DETECTION

The Controller uses feedback from an infrared edge detector to control horizontal web position. The T3512 controls the extension of a cylinder (or bladder or bellows) which moves the web from side to side. In the event of a web break, the output of the edge detector signals the Controller to begin remedial action. The T1000 (or T1500) supplies a steady stream of air to keep the edge detector's sensing elements free of contamination.



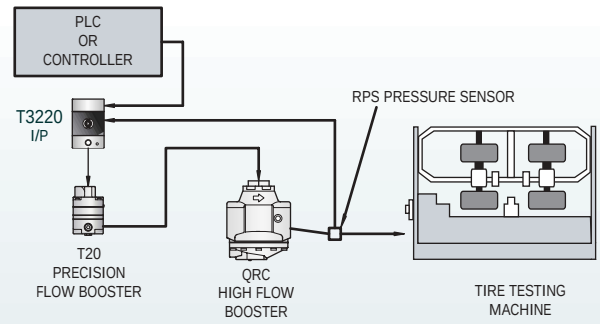
EDGE GUIDING USING A WEB SENSOR AND TYPE 3221

As the web position varies, the web sensor detects the change and feeds a signal back to the Type 3221 Pressure Controller. The Type 3221 then applies pressure to the cylinder to compensate for the shift in web position. The ZMS15-2 Power Supply provides both the command signal and the supply voltage that sets the initial web position while allowing for adjustments.



SIDEWALL GRINDING WITH THE TYPE 3212

A Type 3212 provides pressure control in a tire sidewall grinding application. A command signal is channeled through a ZMS15-2 Power Supply which feeds the command signal as well as the 15 volts DC supply voltage to the Type 3212. A gauge monitors the downstream pressure of the Type 3212, with a relief valve to protect against over pressurization.



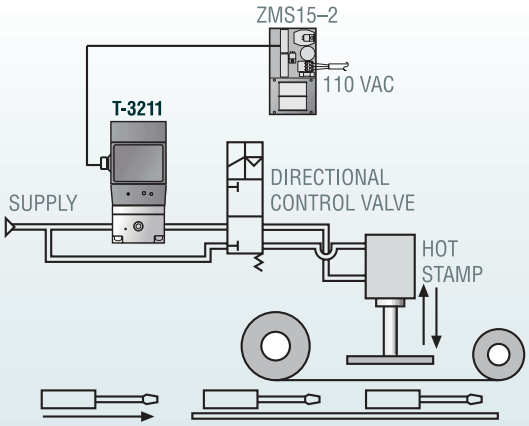
TIRE TESTING

Most manufacturers run finished tires through a battery of tests & inspections. To minimize total testing time, multiple tires must be inflated and deflated very rapidly, with pressure held constant during the testing.

In the illustrated example, the PLC begins the test by sending a setpoint to the T3220 electronic pressure controller. The T20 pre-amplifies the flow of the T3220, to provide tight responsive control of pressure delivered to the High Flow Booster. The T3220 and T20 can be ordered as a single integrated unit.

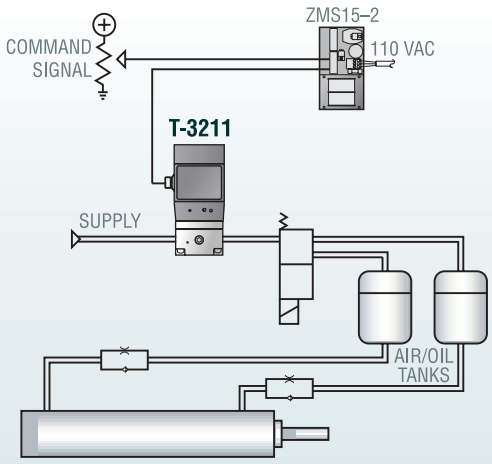
The High Flow Booster is selected based on the size and number of tires to be tested. Marsh Bellofram has a full range of flow boosters up to 2" port size and 2000 scfm.

In order to maintain the highest accuracy, the RPS pressure sensor is mounted close to the tire. The T3220's two-loop capability allows it to close the loop with the downstream sensor, freeing up the PLC for other things.



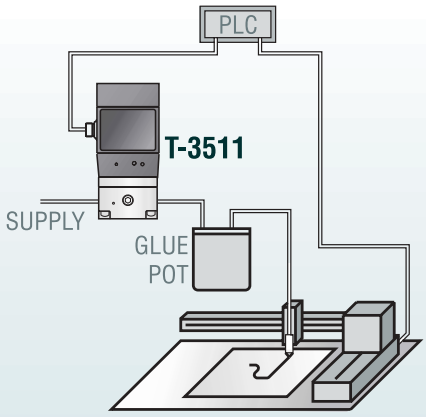
HOT STAMPING FORCE CONTROL WITH THE TYPE 3211

The Type 3211 pressure controller applies pressure to the cylinder to develop a force for the hot stamping operation. In this configuration, the ZMS15-2 Power Supply provides both the command signal and supply voltage necessary to control the Type 3211. A programmable controller may also supply this command signal.



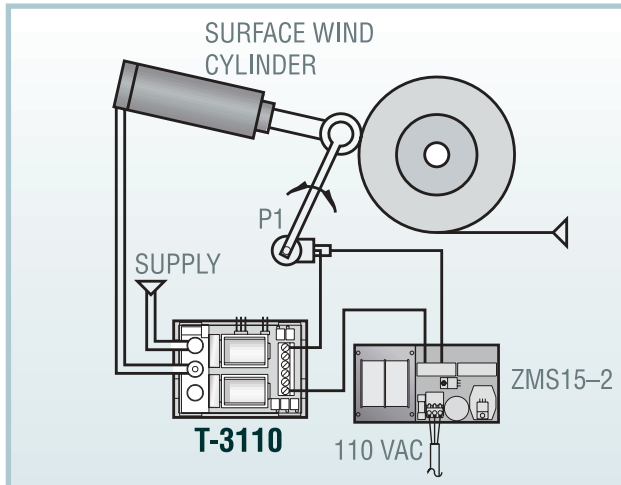
AIR OVER OIL SPEED CONTROLM WITH THE TYPE 3211

The Type 3211 varies the cylinder speed by varying the pressure in the air over oil tanks. The ZMS15-2 Power Supply provides both the command signal and the supply voltage to the Type 3211. The output pressure, through a directional control valve, controls the speed at which the cylinder extends and retracts.



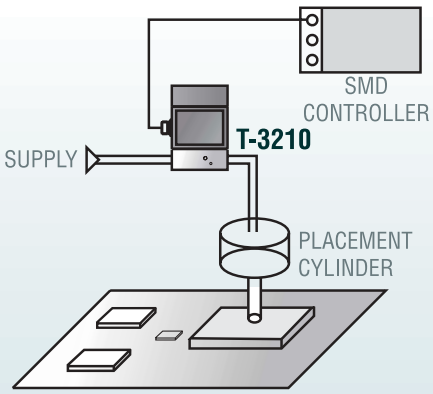
ADHESIVE DISPENSING WITH THE TYPE 3511

The Type 3511 pressure controller, after receiving its signal from the PLC, applies air pressure to the glue pot. This in turn controls the glue pressure and flow to the automatic glue dispensing machine. A sensor in the automatic glue dispensing machine provides feedback to the PLC for fine tuning of the application.



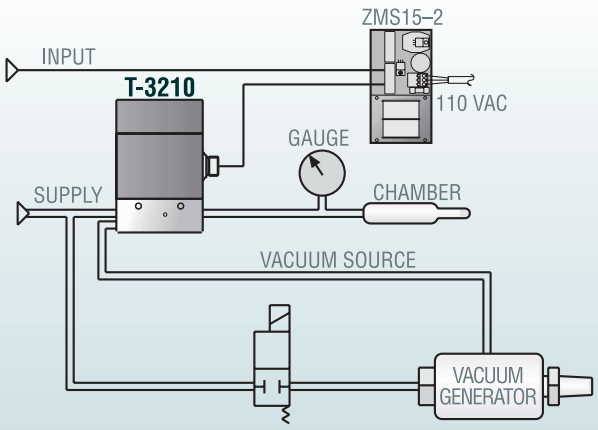
SURFACE WINDING CONTROL WITH THE TYPE 3110

As the roll diameter and the cylinder position change, the feedback arm moves the rotary potentiometer. This rotary potentiometer output changes the regulated output pressure of the Type 3110 to control the pressure to the surface wind cylinder.



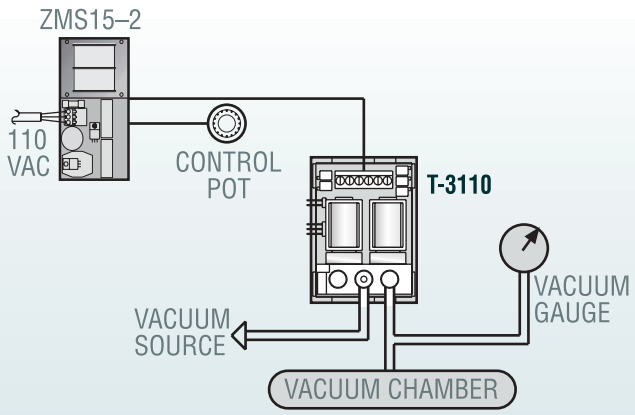
SURFACE MOUNT FORCE CONTROL WITH THE TYPE 3210

The Type 3210 Pressure Controller can provide precise control of force for automated placement of surface mount IC's. In this application, an SMD Machine Controller sets the pressure for each chip placement.



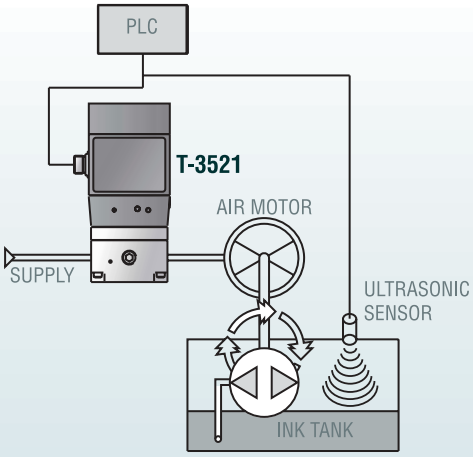
ELECTRONIC CONTROL OF VACUUM THROUGH PRESSURE WITH THE TYPE 3210

The Type 3210 can be calibrated to operate in both the vacuum and pressure ranges. The ZMS15-2 Power Supply provides the Type 3210 with the command signal and supply voltage. Supply pressure is routed to both the vacuum generator and the Type 3210 with an on-off switch in front of the vacuum generator. The Type 3210 then can regulate both vacuum and pressure to the chamber. A compound gauge monitors the pressure in the chamber.



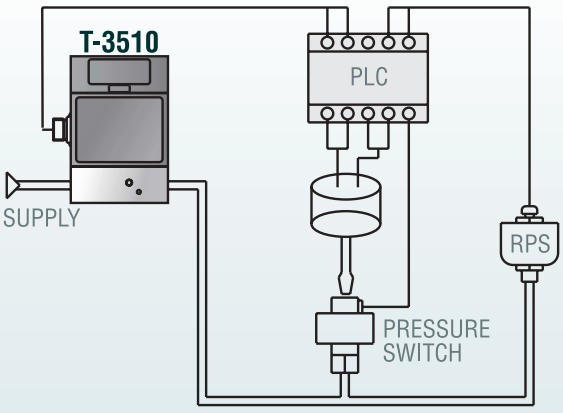
ELECTRONIC CONTROL OF VACUUM USING A TYPE 3110

The Type 3110 is used to control pressure to a vacuum process chamber. A control potentiometer channels the command signal through a ZMS15-2 Power Supply to operate the Type 3110. A vacuum gauge is used to monitor the regulated vacuum from the Type 3110.



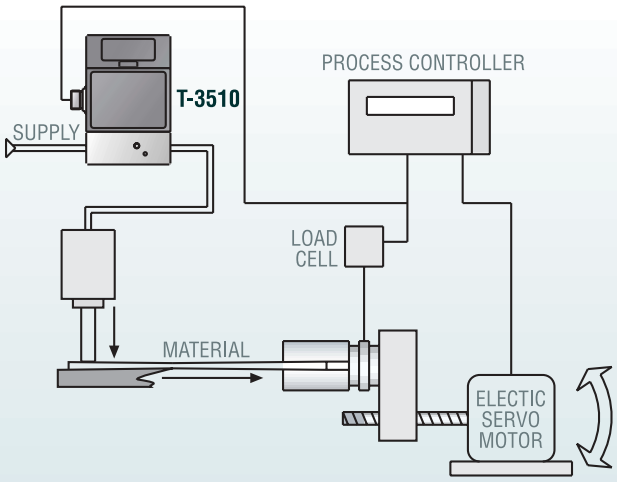
LIQUID LEVEL CONTROL WITH THE TYPE 3521

The ultrasonic sensor provides feedback to the Type 3521 for controlling the liquid level of an ink tank. The liquid level setpoint is controlled by the PLC by varying the command signal to the Type 3521.



AUTOMATED PRESSURE SWITCH CALIBRATOR USING A TYPE 3510

A PLC is configured to automatically calibrate and test electric pressure switches. The PLC first sets the pressure switch set point using an electric screwdriver. It then commands the Type 3510 pressure controller to apply pressure to the switch in order to test it. The PLC monitors the switch output to determine if it is properly set. An RPS pressure sensor is positioned to monitor the actual pressure to the switch.

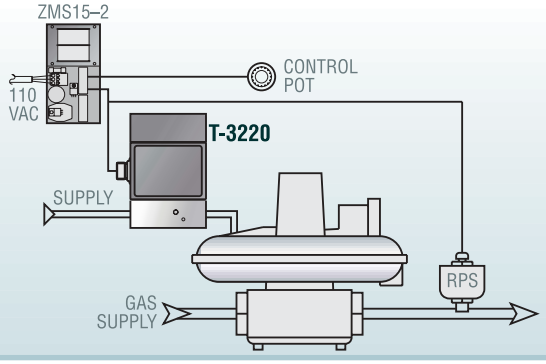


CLAMPING FORCE CONTROL WITH THE TYPE 3510

This circuit provides an adjustable control of clamping force that is directly proportional to the tension of the material being stretched by the servo motor. The initial clamping pressure is set by the process controller and as the servo motor applies tension to the material being tested, the load cell's output signal commands the Type 3510 pressure controller to increase the clamping force.

CONTROL OF HIGH FLOW, LOW PRESSURE WITH THE TYPE 3220

The Type 3220 provides closed loop control of a gas control valve. The ZMS15-2 provides both the command signal and supply voltage to the Type 3220. The output pressure of the Type 3220 is used as the pilot pressure to the gas control valve. An RPS remote pressure sensor monitors the output pressure of the gas valve and provides feedback to the Type 3220.



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