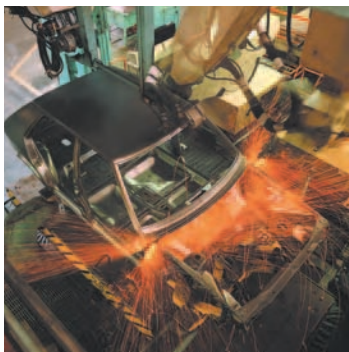


aerospace
 climate control
 electromechanical
 filtration
 fluid & gas handling
 hydraulics
pneumatics
 process control
 sealing & shielding



Air Preparation Products

Filters, Regulators, Lubricators,
 & Airline Accessories

Catalog 0700P-E



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Proportional Regulators

P31P / P32P Series – Electronic
PAR™-15 Series – Programmable

Section F



- P31P / P32P Series
0 to 10 volt, 4 to 20mA.....F3-F18
- PAR™-15 Series
Digital Binary RegulatorF19-F28

Bold text part numbers are standard.
Standard text part numbers may have longer lead times.



Notes


P31P / P23P
PARTS



P31P / P32P Series

Electronic Proportional Regulator

0 to 10 volt, 4 to 20 mA



Proportional Regulator Applications..... F4-F5
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F
P31P / P23P
PAR15

Man-Machine Interface

High Visibility LED Display
Easy to Read Characters
All Controls on the Same Face

Energy Saving

Low Watt Power Consumption
No Unnecessary Loss of Air in Steady State

Total Flexibility

User Friendly and Easily Accessible Software Controls
One Basic Unit Suits All Customer Requirements -
0-10V Control Signal Standard
4-20mA Control Signal Software Selectable
Modular Mounting
10 bar & 2 bar Version

Special Applications

Clean Line Design
Suitable for Washdown: IP65
Forced Exhaust Option Available
4 Output Signal Versions Available

Compact and Light Weight

40 & 60 mm Body Sizes
Light Weight Aluminum Bodies

Flexible Mounting Options

Stand-alone or Modular Mounting
Foot Bracket Mounting
DIN-Rail Mounting

Outstanding Performance

Very Fast Response Times
Full Flow Exhaust
Excellent Linearity
High Flow



P

P31P / P32P

PARTS

Generic Industries



The new Proportional Regulator is designed to quickly and accurately adjust and maintain a set output pressure.

The unit will operate regardless of flow, in response to an electronic control signal. The media can be compressed air or an inert gas.

Applications for this technology are virtually unlimited; from paint spray control, paper manufacturing and printing to weaving and laser cutting control; in fact anywhere that requires accurate remote pressure control.

Automation

In the field of general automation, the need to control processes or movement via electronic signals is of paramount importance. The Proportional Regulator unit provides the facility to incorporate pressure control into a fully integrated control system.



Packaging and Food

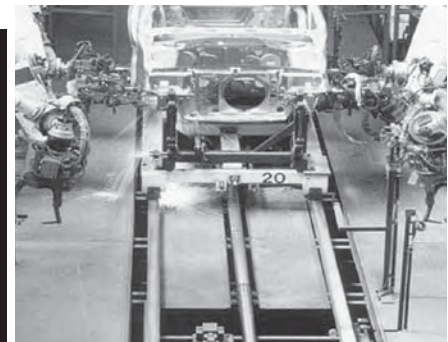


The Packaging and Food industry provides another ideal area for application of the Electronic Proportional Regulator, where fine control of tension on wrapping foils and paper is required. The degree of control and the ability to manually change parameters makes this unit ideally suited to the varying requirements of this industry.

Automotive

Applications for this innovative product in the Automotive industry can be seen in major manufacturers' "body-in-white" lines.

The control of clamping and welding forces during panel assembly is an ideal application, also accurate control in paint dipping and spraying can be achieved.



F

P31P / P32P

PAR15

Why Proportional Technology?

The Difference Between Open or Closed Circuit Control

Standard pressure regulators go a long way towards meeting customers needs. In most cases these regulators work well in general pneumatic and automation applications. However, sometimes the application calls for more precise pressure control. The effects of time, cycling, input, back pressure or pressure and flow variation can all cause inconsistencies in pneumatic systems. Proportional Regulators are designed to eliminate those inconsistencies.

Open Control Circuit

In a normal pressure regulated control system, the inlet pressure (p_1) is converted into the output pressure (p_2) by the regulator. The set pressure (set value) is usually manually set by adjusting the control knob and in normal circumstances the regulator maintains the output pressure (actual value).

No facility for monitoring the output pressure is provided and there is consequently no way of checking that the set value and the actual value are the same. Also, no account is taken of external influences such as air consumption by the system, which can drastically alter the actual value.

Closed Loop Control Circuit

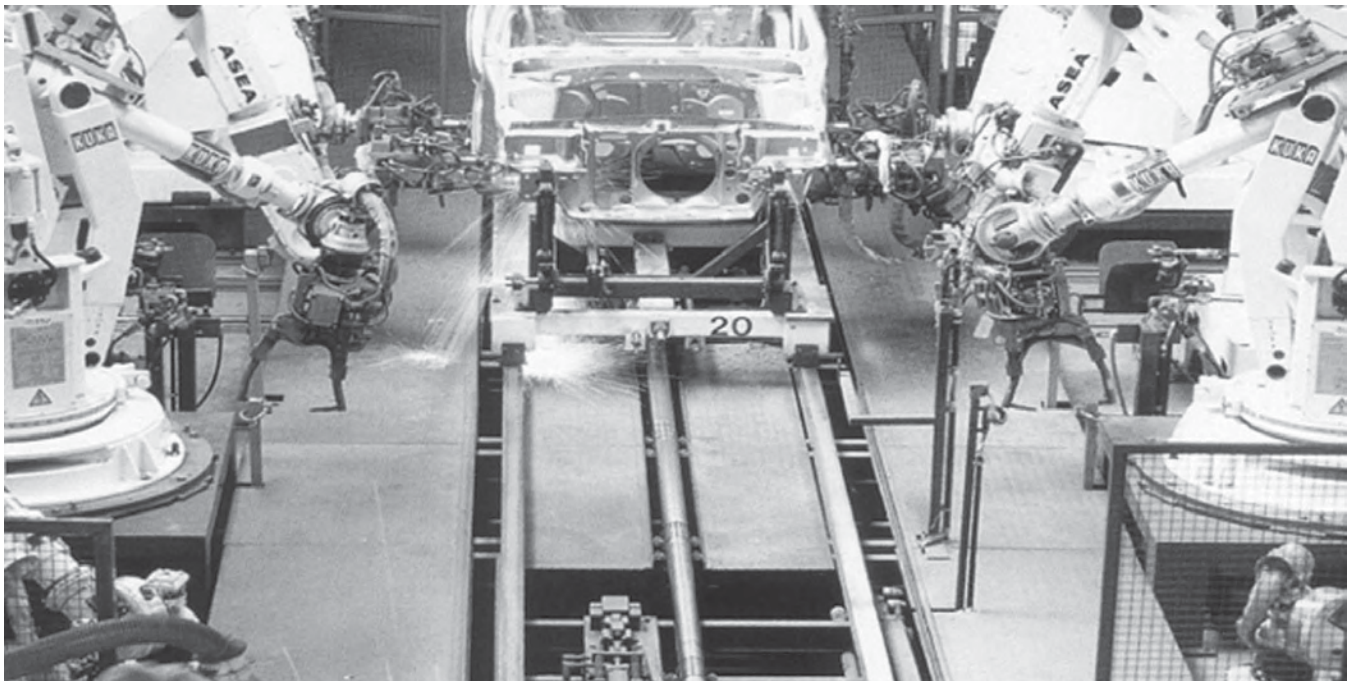
The input signal (Electronic Control Signal) is converted into the output value (P2 Output Pressure). This output value is continuously measured and compared with the input signal. If they are different, the unit adjusts the output value to correspond to the set value, to close the loop.

Proportional Pressure Regulators

The Proportional Regulators provide all the advantages of a closed circuit regulated system. When a set value is defined via the input signal (e.g. 0-10 V), the pressure regulator sets the corresponding output pressure (e.g. 0-150 PSI/0-10 bar). At the same time the integrated pressure sensor measures the actual pressure at the unit's outlet (actual value).

If the electronic regulation system finds that the actual value has deviated from the set value, it immediately corrects the actual value. This is a continuous process ensuring fast, accurate pressure regulation.

Typical Application in Automotive Body in White Welding Pressure Control



F

P31P / P32P

PARTS



P31P Series
 Bottom exhaust



P32P Series
 Bottom exhaust

Features

- Very fast response times
- Accurate output pressure
- Micro parameter settings
- Selectable I/O parameters
- Quick, full flow exhaust
- LED display indicates output pressure
- No air consumption in steady state
- Multiple mounting options
- Protection to IP65
- P31P flows to 19 dm³/s (40 scfm)
- P32P flows to 57 dm³/s (120 scfm)

Ordering Information

P31P A 9 2 A D 2 V D 1 A

Body size	Global modular mini (1/4") P31P	Global modular compact (1/2") P32P
Engr level	Current A	
Thread type	BSPP 1	BSPT 2
		NPT 9
Port size	Global modular mini (1/4") 2	Global modular compact (1/2") 4
Version	Bottom ported exhaust (NC) A	Bottom ported forced exhaust (NO) [†] E

[†] When the supply voltage is lost the unit will automatically exhaust the regulated pressure to 0 bar (atmospheric pressure)

Power supply	2 24 volts
Control signal	V 0-10V [‡]
Pressure range	Z 0 - 2 bar (0-29 PSIG)
	D 0 - 10 bar (0-145 PSIG)
Input Connector	1 M12 (4-pin)
Output signal	D Digital, PNP
	P PNP or 0-10V
	N NPN or 0-10V
	M 4-20mA fixed

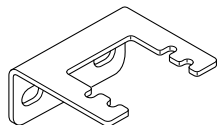
[‡] Factory setting is 0-10 V control signal. 4-20 mA control signal available via parameter 4 on keypad.

D) Digital PNP output only, no analog output selectable
 P) Digital PNP and analogue 0-10V outputs selectable, by means of parameter 6. (Factory default 0-10V)
 N) Digital NPN and analog 0-10 V outputs selectable by means of parameter 6. Factory default 0-10V)
 M) Analog 4-20mA output only.
 Note: On all analog outputs the F.S. value can be adjusted by means of parameter 8.

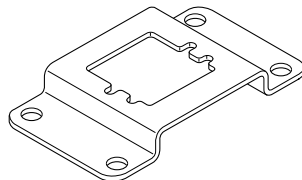
Bold items are most common.

P31P Mounting Brackets

Order Code	Description
P3HKA00ML	L-Bracket mounting kit
P3HKA00MC	Foot bracket mounting kit



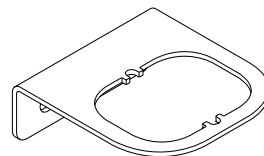
L-Bracket



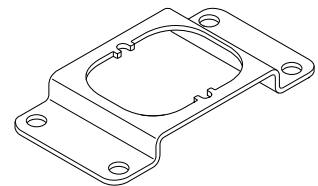
Foot Bracket

P32P Mounting Brackets

Order Code	Description
P3KKA00ML	L-Bracket mounting kit
P3KKA00MC	Foot bracket mounting kit



L-Bracket



Foot Bracket

Cables

Order Code	Description
CB-M12-4P-2M	2 mtr. cable with moulded straight M12x1 connector

Note:

These brackets fit both Proportional Regulators and Combined Soft Start & Dump Valves.

Technical Information

Working media

Compressed air or inert gasses, filtered to Min. 40µ, lubricated or non-lubricated, dried or un-dried, pressure dewpoint 3-5°C.

Operating pressure

Max. Operating Pressure

2 bar unit.....3 bar (43.5 PSI)
 10 bar unit10.5 bar (152 PSI)
 Min. Operating Pressure P2 Pressure + 0.5 bar

Pressure control range

Available in three pressure ranges, 0-2 bar (0-29 psig), 0-7 bar (0-101.5 psig) or 0-10 bar (0-145 psig). Pressure range can be changed through the software at all times. (parameter 19)

Temperature range

32°F to 122°F (0°C to 50°C)

Weight

P31P = 0.291 kg (0.64 lbs)
 P32P = 0.645 kg (1.42 lbs)

Air consumption

No consumption in stable regulated situation.

Display

The regulator is provided with a digital display, indicating the output pressure, either in PSI or bar. The factory setting is as indicated on the label, can be changed through the software at all times (parameter 14).

Supply voltage

24 VDC +/- 10%

Power consumption

Max. 1.1W with unloaded signal outputs

Control signals

The electronic pressure regulator can be externally controlled through an analogue control signal of either 0-10V or 4-20mA. (parameter 4).

Output signals

As soon as the output pressure is within the signal band a signal is given of 24V DC, PNP Ri = 1 kOhm Outside the signal band this connection is 0V.

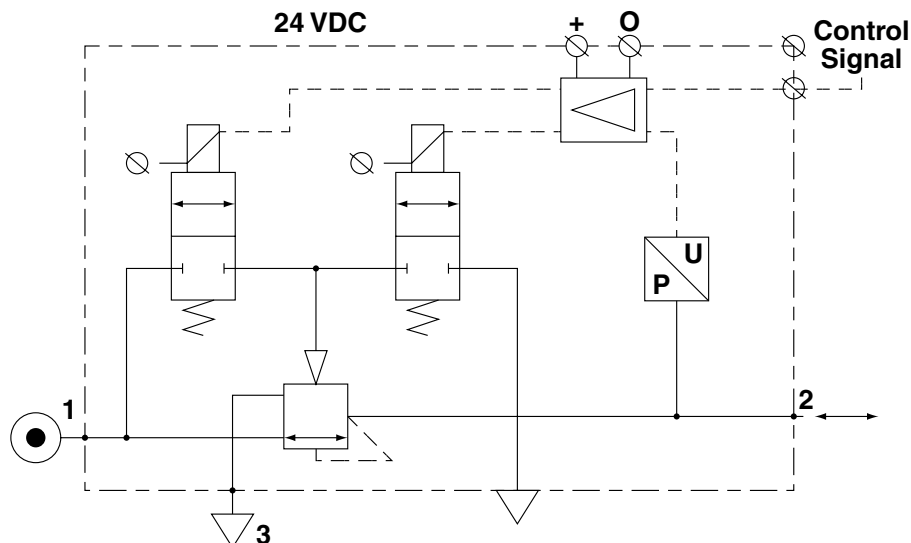
Connections

(In case of output signal (Option D)
 Central M12 connector 4-pole

The electrical connections are as follows:

Pin No.	Function	Color	
1	24 V	Supply	Brown
2	0 to 10 V	Control Signal Ri = 100k Ω	White
	4 to 20mA	Control Signal Ri = 500 Ω	
3	0 V (GND)	Supply	Blue
4	24 V	Alarm Output Signal	Black

Schematic



P
 P31P / P32P
 PART 15

Technical Information

Dead Band

The dead band is preset at 1.3% of Full Scale*, adjustable via parameter 13.

Accuracy

Linearity: = < 0.3% of Full Scale.*

Proportional Band

The proportional band is preset at 10% of Full Scale.*

Fail Safe Operation

- If the P31P / P32P unit has an "0" or "A" in the 12th digit of the model number
 - When the supply voltage drops, the electronic control reverts to the fail safe mode. The last known output pressure air consumption. The digital display indicates the last known pressure setting.
 - When the supply voltage is reinstated to the correct level, the valve moves from the fail safe mode and the output pressure immediately follows the control signal requirement. The display indicates the actual output pressure.
 - Note: In the event of loss of both power and inlet pressure the unit will exhaust downstream pressure.
- If the P31P / P32P unit has an "E" in the 12th digit of the model number
 - When the supply voltage drops, the electronic control reverts to "Forced Exhaust Mode" and will automatically exhaust the downstream (regulated) pressure.
 - When the supply voltage is reinstated to the correct level the unit will return to normal operation and follows the control signal requirement. The display indicates the actual pressure.
- If the unit has been programmed in manual mode (not with a control signal) the unit will EXHAUST and the regulator will need to be reset when power is applied.

Full Exhaust

Complete exhaust of the regulator is defined as $P_2 \leq 1\%$ Full Scale

* Full Scale (F.S.)

For 2 bar (29 psig) versions this will be 2 bar (29 psig), for the 10 bar (145 psig) version full scale will be 10 bar (145 psig).

Degree of Protection

IP65

EU Conformity

CE: standard

EMC: according to directive 89/336/EEC

The new pressure regulator is in accordance with:

EN 61000-6-1:2001

EN 61000-6-2:2001

EN 61000-6-3:2001

EN 61000-6-4:2001

These standards ensure that this unit meets the highest level of EMC protection.

Mounting Position

Preferably vertical, with the cable gland on top.

Materials: P31P & P32P

- Magnet CoreSteel
- Solenoid Valve Poppet FPM
- Solenoid Valve Housing Techno Polymer
- Regulator Body (P31P & P32P versions) Aluminium
- Regulator Top HousingNylon
- Valve HeadBrass & NBR
- Remaining Seals NBR

Advanced Functionality

Pilot valve protection

When the required output pressure can not be achieved because of a lack of input pressure the unit will open fully and will display NoP. Approximately every 10 seconds the unit will retry. The output pressure will then be approximately equal to the inlet pressure. As soon as the input pressure is back on the required level, the normal control function follows.

Safety exhaust

Should the **control signal** fall below 0.1 volts the valve will automatically dump downstream system pressure .

Input protection

The unit has built-in protection against failure and burnout resulting from incorrect input value, typically:

The 24VDC supply is incorrectly connected to the setpoint input, the display will show 'OL', as an overload indication. The unit will need to be rewired and when correctly connected will operate normally.

The overload indicator 'OL' will also appear should the wrong input value be applied or the wrong input value be programmed: 4 - 20m instead of 0 - 10V. To correct this a different set point value should be input or the unit reprogrammed to correct the set point value acceptance. (via parameter 4).

Response time	P31P	P32P
2 to 4 bar	25 msecs	35 msecs
1 to 6 bar	55 msecs	135 msecs
4 to 2 bar	70 msecs	85 msecs
6 to 1 bar	80 msecs	225 msecs

To fill volume of:

100cm³ - P31P

330cm³ - P32P

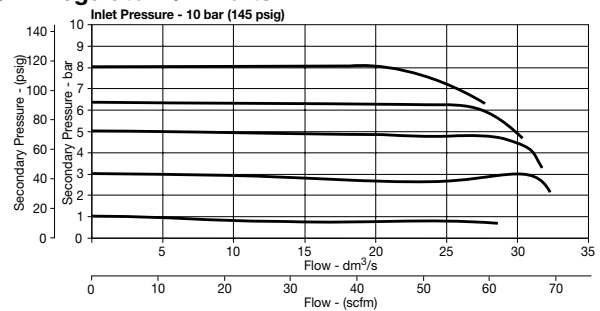
connected to the outlet of the regulator.

Settings

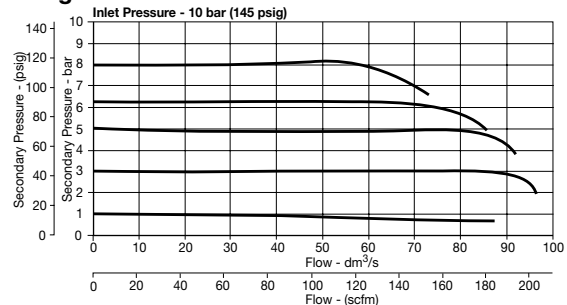
The regulator is pre-set at the factory. If required, adjustments can be made.

Flow Charts

P31P Regulator 1/4" Ports



P32P Regulator 1/2" Ports



How to Change Parameters

Pressing the Accept key “acc” for more than 3 seconds, will activate parameter change mode. The user can then select the parameters by pressing up or down key. (display will show Pxx). When parameter number is correct, pressing accept again will enter parameter number.(display will show parameter value).

Pressing the up or down key will change the parameter itself. (display will flash indicating parameter editing mode). Pressing the accept key will accept the new parameter value. (all digits will flash whilst being accepted).

After releasing all keys , the next parameter number will be presented on the display. (you may step to the next parameter). When no key is pressed, after 3 seconds the display will show the actual output pressure.

When the unit is initially powered up allow approximately 10 seconds for the unit to “boot-up” before changing parameter settings.

Only parameter numbers 0, 4, 6, 8, 9, 14, 18, 19, 20, 12, 13 and 21 are accessible to edit. All other parameters are fixed.

Manual mode:

When keys DOWN and UP are pressed during startup, (connecting to the 24V power supply) manual mode is activated. This means that the user is able to in/decrease the output pressure of the regulator, by pressing the UP or DOWN key. During this action the display will blink, indicating that the manual mode is activated. After powering up again, the unit will revert back to normal mode.















Back to Factory Setting

After start up. (Power is on)

Entering this value in parameter 0 will store the calibrated factory data into the working parameters.

(Default calibration data is used)















Parameter Number 0 – Reset Back to Factory Settings

Step	1	2	3	4	5	
Press 	 3-6 seconds	 or 		 or 		
Until Display Reads			 Flashing Decimal	 Flashing Decimal	 Flashing	
Description	Accesses changeable parameters.	Accesses parameter no. 0.	Displays current parameter value.	Edits parameter. 3 = standard factory settings. If other than 3, use Up or Down Arrow and accept 3	Accepts and saves new parameter setting.	Sequences to next parameter.

Set Control Signal

The unit is factory set for 0-10 V control signal. If 4-20 mA control signal is required, change parameter 4.

Parameter Number 4 – Set Control Signal in Volts or Milliamps

Step	1	2	3	4	5	
Press 	 3-6 seconds	 or 		 or 		
Until Display Reads			 Flashing Decimal	 Flashing Decimal	 Flashing	
Description	Accesses changeable parameters.	Accesses parameter no. 4.	Displays current parameter value. 1 = V 0 = mA	Edits parameter.	Accepts and saves new parameter setting.	Sequences to next parameter.

Set Output Signal

Parameter 6 is used to set the type of output signal to your PLC.
 This parameter is used as follows:



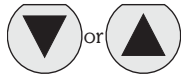

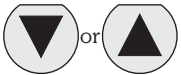







- Output Signal option “0” = Digital Output – PNP
- Factory set at “0” Non Adjustable

- Output Signal option “P” = Digital PNP or Analog 1-10V
- Factory set at “1” for Analog Signal
 - Convert to Digital PNP by changing parameter to “0” setting

- Output Signal option “N” = Digital NPN or Analog 1-10V
- Factory set at “1” Analog Signal
 - Convert to Digital NPN by changing parameter to “0”

- Output Signal option “M” = Analog 4-20 mA
- Factory set at “2” Non Adjustable

Parameter Number 6 – Set Output Signal

Step	1	2	3	4	5	
 Press	 3-6 seconds					
Until Display Reads			 Flashing Decimal	 Flashing Decimal (Value 0, 1 or 2)	 Flashing	
Description	Accesses changeable parameters.	Accesses parameter no. 6.	Displays current parameter value. 1 = m factory default for P3H with analog options	Edits parameter. 0 = digital (NPN or PNP) 1 = analog 0..10V 2 = analog 4..20 mA	Accepts and saves new parameter setting.	Sequences to next parameter.

F
 P31P / P23P
 PAR15





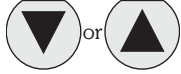







Adjust Span Analog Output Signal

Set value is a % of Full Analog range. As an example for a 0-10V output signal, the original factory setting of 100% will give you an adjustment of 0-10V. If you reset Parameter 8 to 50%, the new output range would be 0-5V or 50% of the full range.

In the event that the output signal is to low, in a certain application, you can adjust it by increasing Parameter 8 to a maximum value of 130% of scale.

Note that all values are nominal and that an actual measurement may be required to ensure signal strength.



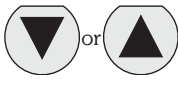

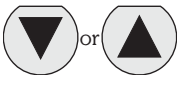







Parameter Number 8 – Adjust Span Analog Output Signal

Step	1	2	3	4	5	
 Press	 3-6 seconds					
Until Display Reads			 Flashing Decimal (For 2 bar versions value = 92)	 Flashing Decimal (Value between 0 and 130)	 Flashing	
Description	Accesses changeable parameters.	Accesses parameter no. 8.	Displays current parameter value.	Edits parameter.	Accepts and saves new parameter setting and implements the new analog signal span.	Sequences to next parameter.

Adjust Digital Display

If necessary, adjustments can be made to the digital display when using an external pressure sensor.

Parameter Number 9 – Adjust Digital Display Value (Pressure Calibration)

Step	1	2	3	4	5	
Press 	 3-6 seconds					
Until Display Reads			 Flashing Decimal	 Flashing Decimal	 Flashing	
Description	Accesses changeable parameters.	Accesses parameter no. 9.	Displays current digital display	Use up or down arrows and accept to adjust the display value if using an external pressure sensor.	Accepts and saves new parameter setting.	Sequences to next parameter.

F



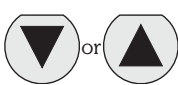

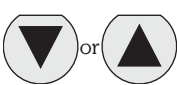







P31P / P32P

PART 15

Set Pressure Scale

Units with NPT port threads are supplied with a factory set psig pressure scale. Use parameter 14 to change scale to bar.



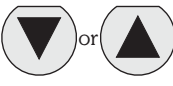

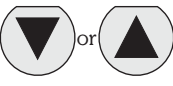







Parameter Number 14 – Set Pressure Scale in psig or bar

Step	1	2	3	4	5	
Press 	 3-6 seconds					
Until Display Reads			 Flashing Decimal	 Flashing Decimal	 Flashing	
Description	Accesses changeable parameters.	Accesses parameter no. 14.	Displays current parameter value. 1 = psig 0 = bar 2 = MPA	Edits parameter.	Accepts and saves new parameter setting.	Sequences to next parameter.

Preset Minimum Pressure

If there is a need for a pre-set Minimum pressure, use parameter 18. (Note: preset pressure is affected by % P19.)

Parameter Number 18 – Set Minimum Preset Pressure

Step	1	2	3	4	5	
Press 	 3-6 seconds					
Until Display Reads			 Flashing Decimal	 Flashing Decimal (value between 0 and 200)	 Flashing	
Description	Accesses changeable parameters.	Accesses parameter no. 18.	Displays current parameter value. Incremental value is: 2 bar unit: x 2 mbar x % P19 10 bar unit: x 10 mbar x % P19	Edits parameter.	Accepts and saves new parameter setting.	Sequences to next parameter.

Set Pressure Correction



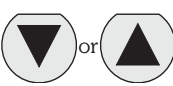

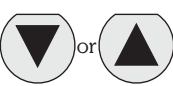







Pressure correction allows the user to set a Maximum pressure as a percentage of secondary pressure F.S.

Example: If F.S. is 10 bar, set parameter 19 to 50 for Maximum preset pressure of 5 bar.

Pressure correction also affects the Minimum preset pressure in parameter 18.

Example: If F.S. is 10 bar and parameter 18 is set to a value of 100 (1 bar), and parameter 19 is set to 50%, then the actual Minimum preset pressure seen is 0.5 bar.

Parameter Number 19 – Set Maximum Preset Pressure



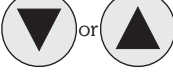

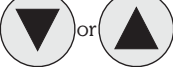







Step	1	2	3	4	5	
Press 	 3-6 seconds					
Until Display Reads			 Flashing Decimal	 Flashing Decimal (value between 0 and 100)	 Flashing	
Description	Accesses changeable parameters.	Accesses parameter no. 19.	Displays current parameter value. Incremental value is: % of F.S.	Edits parameter.	Accepts and saves new parameter setting.	Sequences to next parameter.

Behavior Control

The regulation speed of the pressure regulator can be modified by means of one parameter. (P 20)

The value in this parameter has a range from 0-5. A higher value indicates slower regulation speed, but will be more stable.

Parameter Number 20 – Set Behavior Control

Step	1	2	3	4	5	
Press 	 3-6 seconds					
Until Display Reads			 Flashing Decimal	 Flashing Decimal (value between 0 and 5)	 Flashing	
Description	Accesses changeable parameters.	Accesses parameter no. 20.	Displays current parameter value.	Edits parameter 0 = custom set* 1 = fastest (narrow proportional band) 2 = fast 3 = normal 4 = slow 5 = slowest (proportional band is broad)	Accepts and saves new parameter setting.	Sequences to next parameter.

* When the value 0 is entered, you are able to create your own custom settings true parameters 12, 13 and 21.

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P31P / P32P



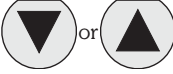

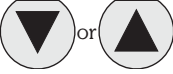







PART 15

Fine Settings

Set Proportional Band

Proportional band is used for setting the reaction sensitivity of the regulator. The displayed value is X 10 mbar and has a range between 50 (0.5 bar) and 250 (2.5 bar).



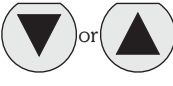

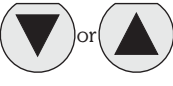



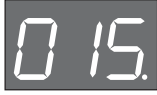


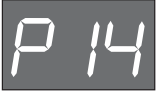
Parameter Number 12 – Set Proportional Band (P20 Must be Set to 0)

Step	1	2	3	4	5	
Press 	 3-6 seconds					
Until Display Reads			 Flashing Decimal	 Flashing Decimal (value between 50 and 250)	 Flashing	
Description	Accesses changeable parameters.	Accesses parameter no. 12.	Displays current parameter value. Incremental value is: x 10 mbar	Edits parameter.	Accepts and saves new parameter setting.	Sequences to next parameter.

Set Deadband



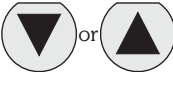

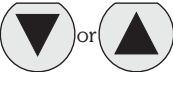


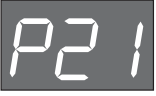




Deadband is the Minimum limit of accuracy at which the regulator is set for normal operation. The displayed value is X 10 mbar and has a range between 4 (40 mbar) and 40 (400 mbar).

Parameter Number 13 – Set Deadband (P20 Must be Set to 0)



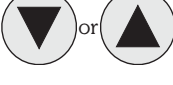




Step	1	2	3	4	5	
Press 	 3-6 seconds					
Until Display Reads			 Flashing Decimal	 Flashing Decimal (value between 4 and 40)	 Flashing	
Description	Accesses changeable parameters.	Accesses parameter no. 13.	Displays current parameter value. Incremental value is x 10 mbar	Edits parameter.	Accepts and saves new parameter setting.	Sequences to next parameter.

Proportional Effect

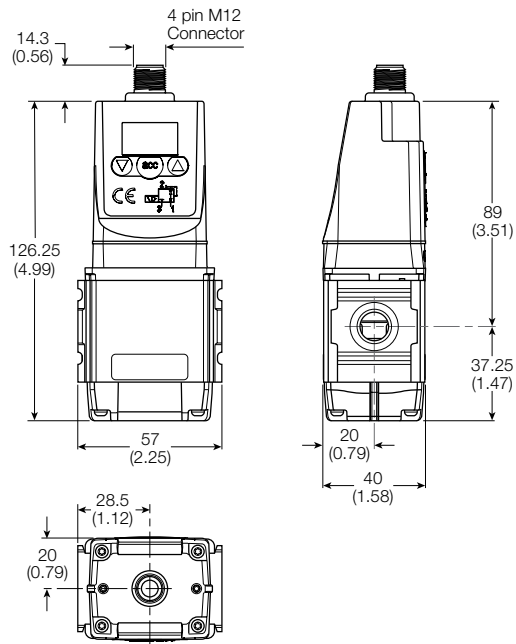
Parameter Number 21 – Set Proportional Effect (P20 Must be Set to 0)

Step	1	2	3	4	5	
Press 	 3-6 seconds					
Until Display Reads			 Flashing Decimal	 Flashing Decimal (value between 5 and 100)	 Flashing	
Description	Accesses changeable parameters.	Accesses parameter no. 21.	Displays current parameter value.	Edits parameter. 5 = fastest regulation 100 = slowest regulation.	Accepts and saves new parameter setting.	Sequences to next parameter.

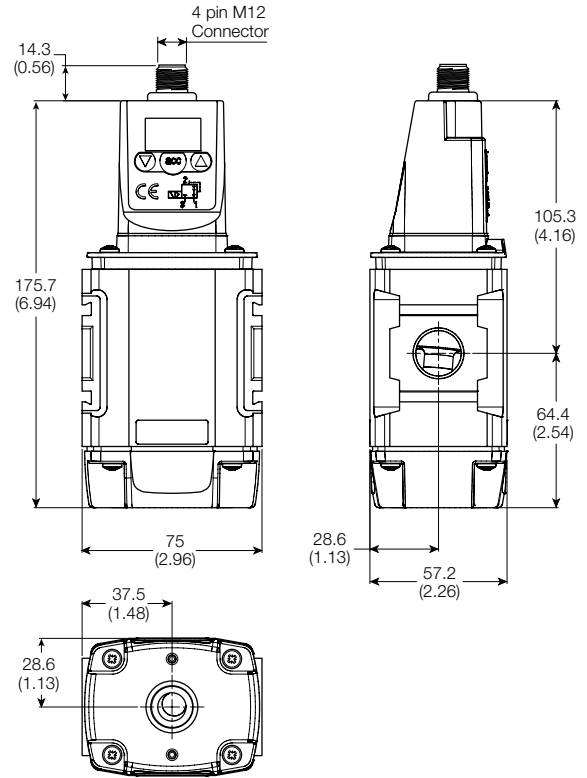
Parameter Number 39 – Displays Current Software Version

Step	1	2	3	
Press 	 3-6 seconds			
Until Display Reads			 Flashing Decimal	
Description	Accesses changeable parameters.	Accesses parameter no. 39.	Displays current parameter value. XXX = current software version	

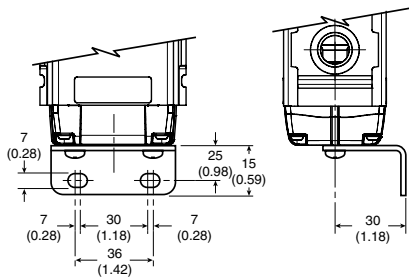
P31P



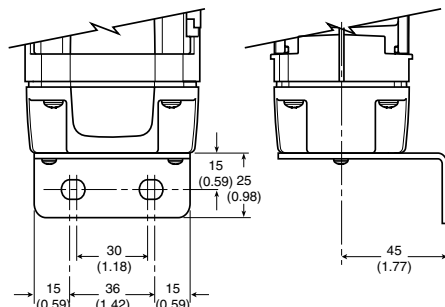
P32P



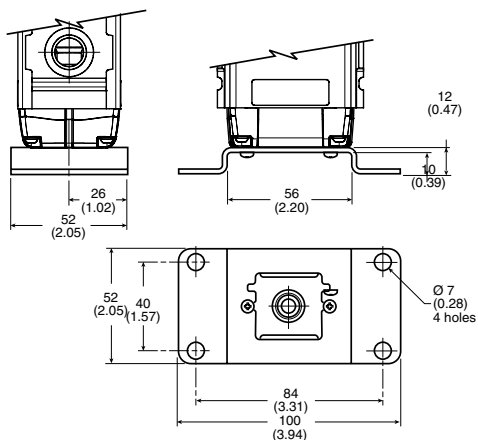
L-Bracket



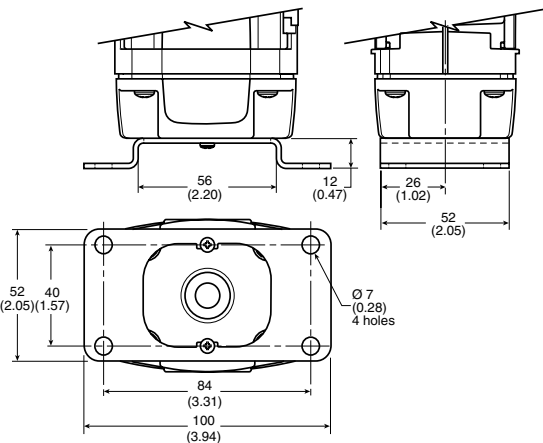
L-Bracket



Foot Bracket



Foot Bracket



Dimensions are in mm (Inches)



Problem	Possible Reason	Solution
Display will not light up	No 24 volts power supply	Check if the wiring is connected according to the schematic wiring diagram
Unit will not, or not correctly respond to given setpoint	Wrong current applied (I.e. Volt instead of mA or mA instead of Volt) Setpoint signal is not stable enough	Change setpoint current or re configure the setpoint current through the software by changing parameter 4 Check wiring if the setpoint signal lead is connected to the right pin within the male M12 connector (should be pin 2) Stabilize setpoint signal input
Display shows NoP.	Unit detects that required output pressure is higher than the supplied pressure No inlet pressure at all	Adjust the inlet pressure to a higher value, preferably 0,5 bar higher than requested output pressure Give lower setpoint value which corresponds to a output pressure lower than the inlet pressure Connect port 1 to the supply pressure
Unit behavior is not considered normal	Faulty settings made in the parameters	Reset the unit to factory settings by using the green key function under parameter 0
Desired pressure can not be reached	Setpoint value to low Pre-set pressure limit has been changed to a lower max. outlet pressure Supply pressure is to low	Increase setpoint value Change max. outlet pressure back to required pressure by changing parameter 19 Increase supply pressure
Secondary side stays pressurized	Setpoint value is higher than 0,1 Volt Pre-set pressure has been enabled to a certain pressure	Lower your setpoint value, preferably to 0 Volts Reset parameter 18 to 0
Display shows unrealistic value	Display maybe configured in the wrong value (bar instead of psi)	Check through parameter 14, if the display value is set on either psi or bar, if necessary change it to the required setting
Unit response time too slow or too quick	Volume behind the unit is either too big or too small	Adjust the regulating speed of the unit through parameter 20
Unit gives too much overshoot	Relation between volume and response me is out of balance	Adjust response time to a higher value through parameter 20, to achieve more accurate behavior
Unit is adjusting/regulating constantly	Air leakage in the system behind the unit Constant changing volume behind the unit "Deadband "area is set too small	Resolve leakage Unit needs to regulate to keep required pressure at the same level Try to minimize the volume changes Enlarge deadband setting through parameter 13 in the software (parameter 20 has to be set to 0 before changing parameter 13)
Can not enter software through touchpad	Unit is currently working/processing Activating time is too short	Make sure that the unit is in steady state while activating the software Hold the accept button for at least 3 seconds
Display indicates 'OL'	Wiring not according to diagram (24 volt connected on the setpoint connection pin) Wrong setpoint value given in relation to programmed setpoint value acceptance	Rewire so that on the setpoint connection pin will be either 0-10v or 4-20mA Change over setpoint value to either V or mA or Reprogram the unit to the correct setpoint value via parameter 4
Any other problem	Please consult factory	

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 PAR15

Glossary

Hysteresis – The mechanical limits of accuracy of the unit. The regulator cannot be adjusted within the inherent mechanical limits of the design.

Dead Band – The minimum limit of accuracy at which the regulator is set for normal operation. This band must be equal to, or exceed, the inherent design limits of the regulator or the hysteresis band.

Proportional Band – The band used for setting reaction sensitivity of the regulator. The regulator senses the excursion from the set pressure and adjusts response in relation to the degree of excursion beyond the dead band. This band must exceed the dead band of the unit.

Proportional Effect – The speed at which the unit approaches P2 (secondary pressure).

Sensitivity – The smallest change in the control signal, or feedback signal, to cause a change in regulated output pressure.

Repeatability – a measurement of how consistently the unit can reproduce an output pressure in relation to a specific set pressure.

Linearity – A measure of how closely the relationship of output pressure vs. the control signal deviates from a straight line function.

PNP Output – Referred to as a “Sourcing” open collector transistor output where the voltage sources towards 24VDC when activated.

NPN Output – Referred to as a “Sinking” open collector transistor output. The output sinks towards 0VDC when activated.

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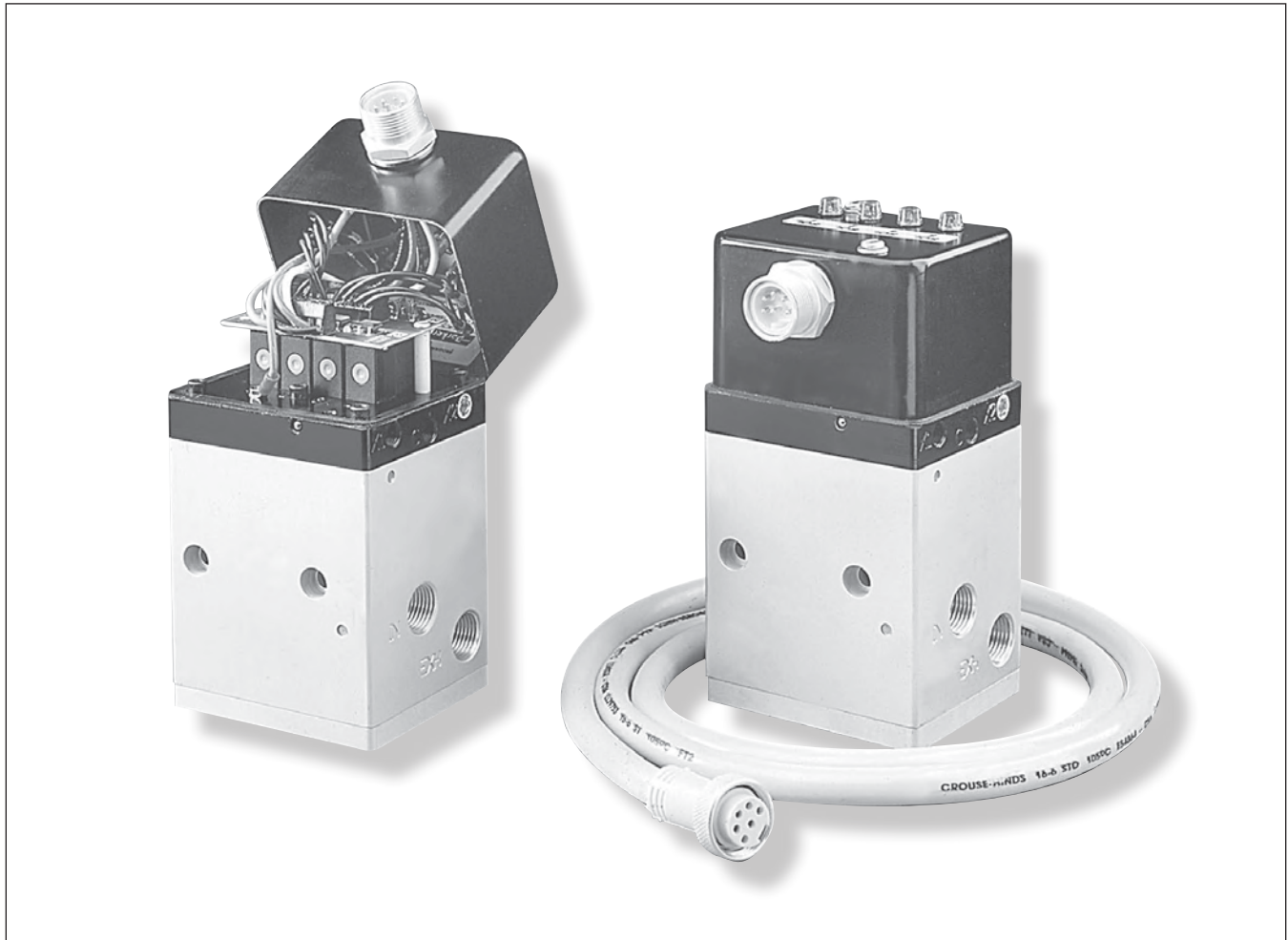
P31P / P32P

PARTS



PAR-15 Series

Programmable Air Regulating Valve
Digital Binary Regulator



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Model Number Index	F21	Cascading Truth Table	F25
Solenoid Operated Valves	F22	Technical Information.....	F26-F27
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PAR15

Features

PAR™-15 is a unique 3-Way, programmable, air regulating valve that functions as a precise, high-flow, multi-purpose regulator.

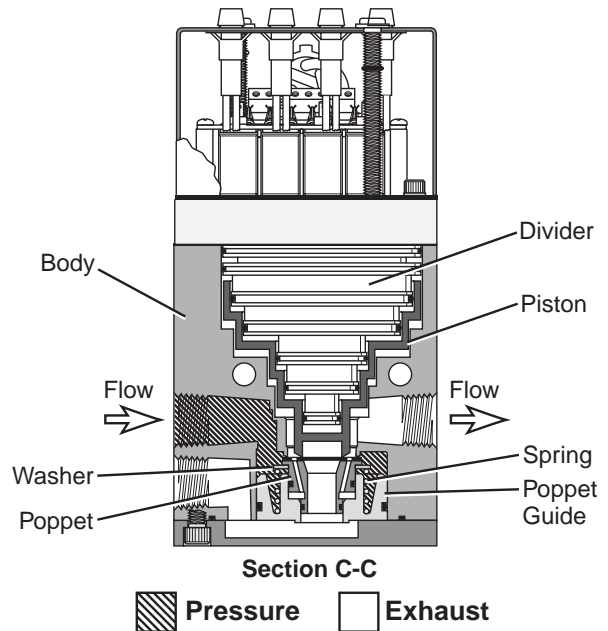
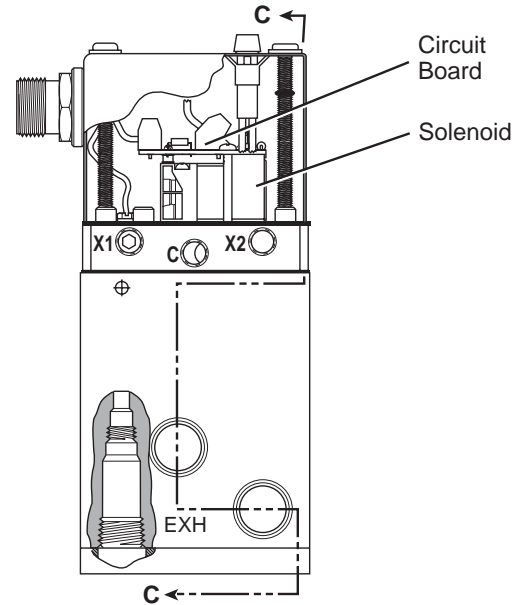
Signals from a computer, programmable controllers or from simple electrical switches, fed to the valve's four solenoids, control the division of a single inlet pressure into any one of fifteen equally spaced output pressures.

The valve's response is instant and repeatable, reducing the need for expensive feedback controls.

It goes far beyond the capabilities of conventional controls by providing a limitless range of application possibilities including cylinder pressure/stroke control, clamping, retracting, approach, flow, and impact.

PAR™-15 eliminates shock absorbers, increases tool life, saves air, and reduces workpiece damage.

- Full flow capacity for direct air device operation.
- Quick, full flow exhaust.
- Instantly repeatable response.
- Air saving design, close crossover, non-constant bleed.
- Wide range of discrete output pressures.
- Normally closed or normally open operators.
- Compatible with computers and programmable controllers with digital solid state relay outputs.
- Meets NEMA 4 standard (6-Pin option only).

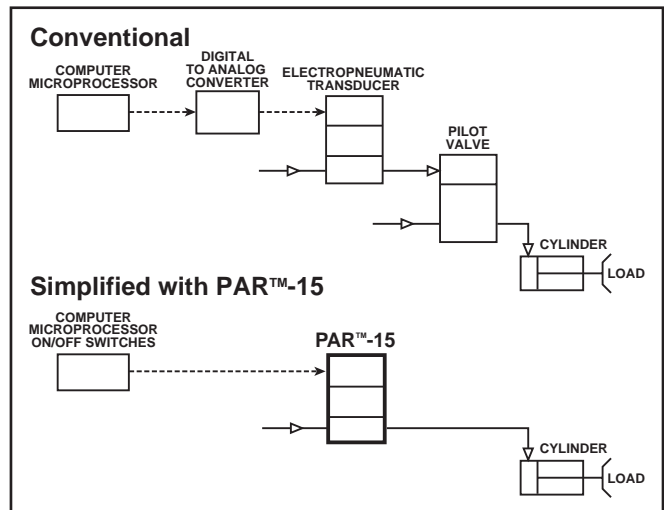


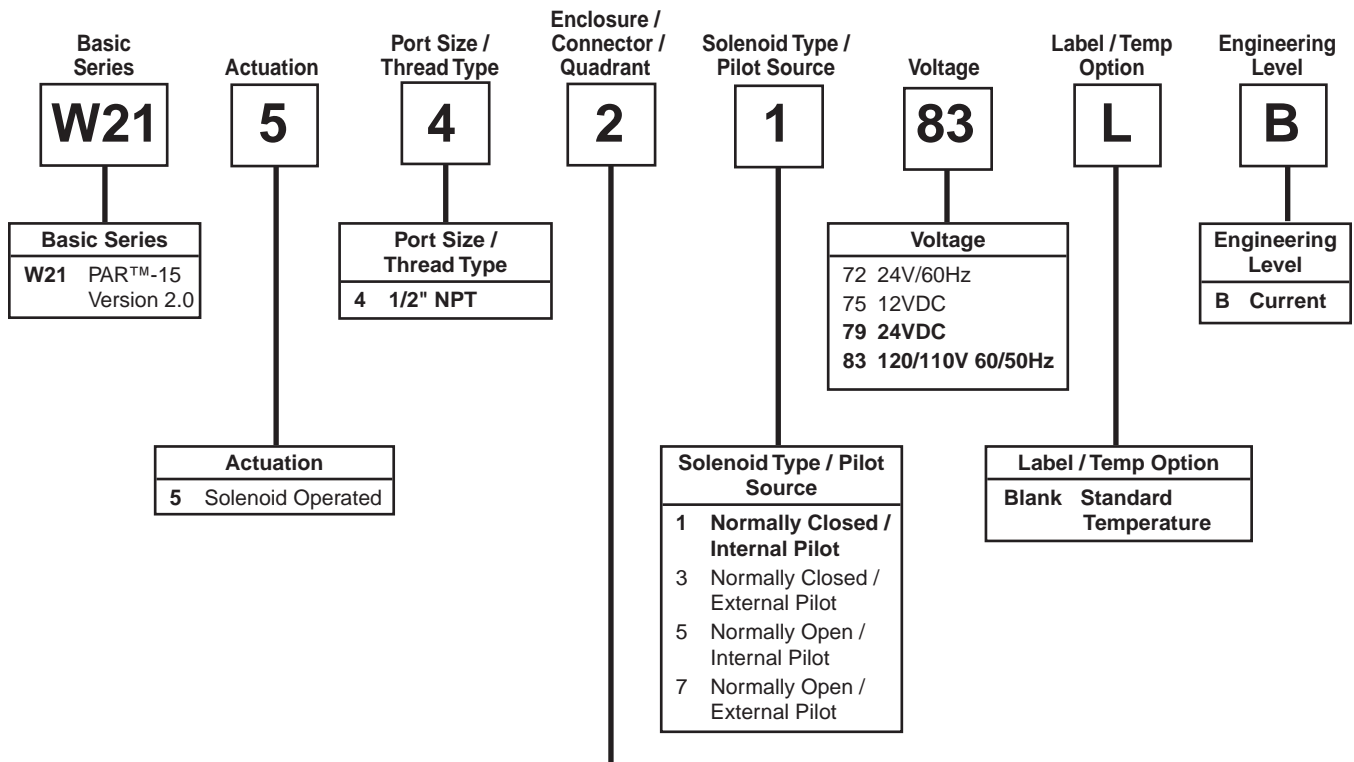
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 P31P / P32P
 PAR15

Electropneumatic System

A conventional system is usually composed by several electronic and pneumatic components as shown on the schematic. The cylinder which is moving a load is operated with a pilot valve which receives the instructions from an electropneumatic transducer. The transducer converts electronic signals to pneumatic signals. These electronic signals are usually of an analog type, but controllers/computer microprocessors send digital signals as outputs, therefore, a digital to analog signal converter is required.

The simplified schematic with the PAR™-15 is reduced to fewer components since the PAR™-15 takes the place of the digital to analog converter, the electropneumatic transducer, and the pilot valve. The benefits being fewer components, and less maintenance and downtime.



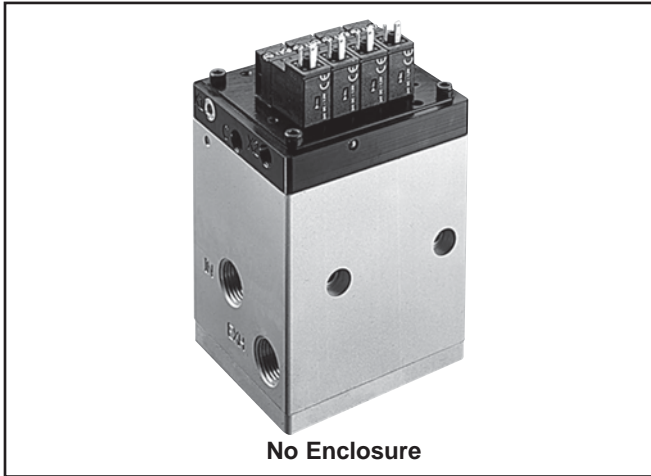


Enclosure / Connector Quadrant	
0 No Enclosure	F NEMA 4 Enclosure with 6-Pin Micro Connector at Quadrant 4, Cord Included
1 Metal Enclosure with 7/8" Conduit Opening at Quadrant 2	G NEMA 4 Enclosure with 6-Pin Micro Connector at Quadrant 2, No Cord
2 NEMA 4 Enclosure with 6-Pin Mini Connector Quadrant 2, Cord Included	H NEMA 4 Enclosure with 6-Pin Micro Connector at Quadrant 4, No Cord
3 Metal Enclosure with 7/8" Conduit Opening at Quadrant 4	K* Lighted Enclosure with 6-Pin Micro Connector at Quadrant 2, Cord Included
4 NEMA 4 Enclosure with 6-Pin Mini Connector Quadrant 4, Cord Included	L* Lighted Enclosure with 6-Pin Micro Connector at Quadrant 2, No Cord
5 NEMA 4 Enclosure with 6-Pin Mini Connector Quadrant 2, No Cord	M* Lighted Enclosure with 6-Pin Mini Connector at Quadrant 4, Cord Included
6 NEMA 4 Enclosure with 6-Pin Mini Connector Quadrant 4, No Cord	N* Lighted Enclosure with 6-Pin Mini Connector at Quadrant 4, No Cord
B* Lighted Enclosure with 6-Pin Mini Connector at Quadrant 2, Cord Included	P* Lighted Enclosure with 6-Pin Micro Connector at Quadrant 4, Cord Included
C* Lighted Enclosure with 6-Pin Mini Connector at Quadrant 2, No Cord	Q* Lighted Enclosure with 6-Pin Micro Connector at Quadrant 4, No Cord
E NEMA 4 Enclosure with 6-Pin Micro Connector at Quadrant 2, Cord Included	

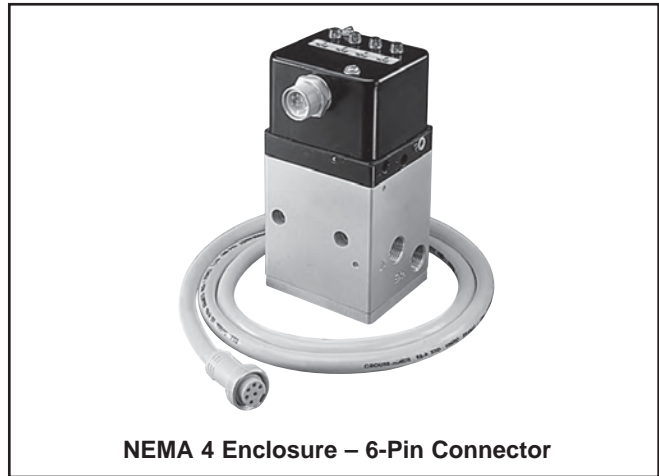
Theoretically, Quadrant 1 is defined as the 6-Pin Connector on the same face with the inlet port. Looking from the top down and rotating the enclosure clockwise 90° you get Quadrant 2 or 270° for Quadrant 4.

* Available in 24VDC and 120VAC Only.
 Not NEMA 4 rated.

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 PAR15



No Enclosure



NEMA 4 Enclosure – 6-Pin Connector

Application

Pneumatic systems operating under multiple pressures, and requiring almost instantaneous pressure changes are good application cases for the PAR™-15. Usually the more pressures needed for a particular operation, the easier it is to justify the valve, since it will take the place of several pneumatic regulators and selector valves.

Among the most common applications are brakes and clutches, painting, printing feeds and tension, robotics, and spot welding.

Other Applications:

- Air Chucks
- Air Cylinder Control
- Air Winches
- Blow Molding Control
- Contact Force Control
- Conveyor Control
- Die Cushioning
- Dynamic Braking
- Fuel Control
- Hopper Control
- Robot Gripper Control
- Valve Positioning
- Variable Clamping
- Variable Pressure Processing
- Torque Control
- Wire Tensioning

Operation

Four solenoids are controlled by on/off signals that selectively divide any input pressure into any one of 15 equally spaced pressures plus zero. See the truth table.

Full flow exhaust permits instant reduction to any lower selected pressure or zero. High relief capacity quickly vents downstream overpressure. The output pressure will begin to change within 20 milliseconds after a change in the electrical input to one or more of the solenoids. However, the time which elapses until the output pressure reaches the new level will depend upon the volume of air, the size of the connection from the PAR™-15 valve and the magnitude of the pressure change.

A small regulator may be used to feed the external pilot port X1 on units with normally closed solenoid operators or X2 on units with normally open solenoid operators. The PAR™-15 valve will then divide this pressure independent of mainline supply pressure so long as the pilot regulator is set to a pressure below the mainline supply pressure. A regulated external supply will eliminate the effects of fluctuating mainline pressures. (NOTE: A regulator placed upstream of the inlet also eliminates the effects of fluctuating pressures).

The PAR™-15 is available with two types of output pressure regulation: increasing output and decreasing output. In the increasing output pressure regulation type, normally closed solenoid operators are used to divide the input pressure into 15 equal steps, ranging from 0 PSIG (all solenoid operators de-energized) to full line pressure (all solenoid operators energized). With the decreasing output pressure regulation type, normally open solenoid operators are used to divide the input pressure into 15 equal steps, but starting with full line pressure (all solenoid operators de-energized) and ending with 0 PSIG (all solenoid operators energized).

Model Selection Information

Solenoid Operated – Normally Closed – Internal Pilot*			Voltage/Cycle	Port Size	
No Enclosure	NEMA 4 Enclosure - 6-Pin Connector			Body	Pilot
	Quadrant 2 †	Quadrant 4 †			
W21540172	W21542172	W21544172	24V/60Hz	1/2"	1/8"
W21540175	W21542175	W21544175	12VDC	1/2"	1/8"
W21540179	W21542179	W21544179	24VDC	1/2"	1/8"
W21540183	W21542183	W21544183	110/120V / 50/60Hz	1/2"	1/8"

* Normally open and external pilot options also available.

† Theoretically Quadrant 1 is defined as the 6-Pin connector on the same face with the inlet port. Looking from the top down and rotating the enclosure clockwise 90° you get Quadrant 2 or 270° for Quadrant 4.

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PAR15

Truth Table

Normally Closed Valves / Solenoids	Normally Open Valves / Solenoids	Proportion of Inlet Pressure	PSIG Output@ 75 PSIG Inlet ^{††}	PSIG Output@ 90 PSIG Inlet
Binary Input* 8 4 2 1	Binary Input* 8 4 2 1			
Pin Number † 5 3 2 1	Pin Number † 5 3 2 1			
0 0 0 0	1 1 1 1	0	0	0
0 0 0 1	1 1 1 0	1/15	5	6
0 0 1 0	1 1 0 1	2/15	10	12
0 0 1 1	1 1 0 0	3/15	15	18
0 1 0 0	1 0 1 1	4/15	20	24
0 1 0 1	1 0 1 0	5/15	25	30
0 1 1 0	1 0 0 1	6/15	30	36
0 1 1 1	1 0 0 0	7/15	35	42
1 0 0 0	0 1 1 1	8/15	40	48
1 0 0 1	0 1 1 0	9/15	45	54
1 0 1 0	0 1 0 1	10/15	50	60
1 0 1 1	0 1 0 0	11/15	55	66
1 1 0 0	0 0 1 1	12/15	60	72
1 1 0 1	0 0 1 0	13/15	65	78
1 1 1 0	0 0 0 1	14/15	70	84
1 1 1 1	0 0 0 0	15/15	75	90

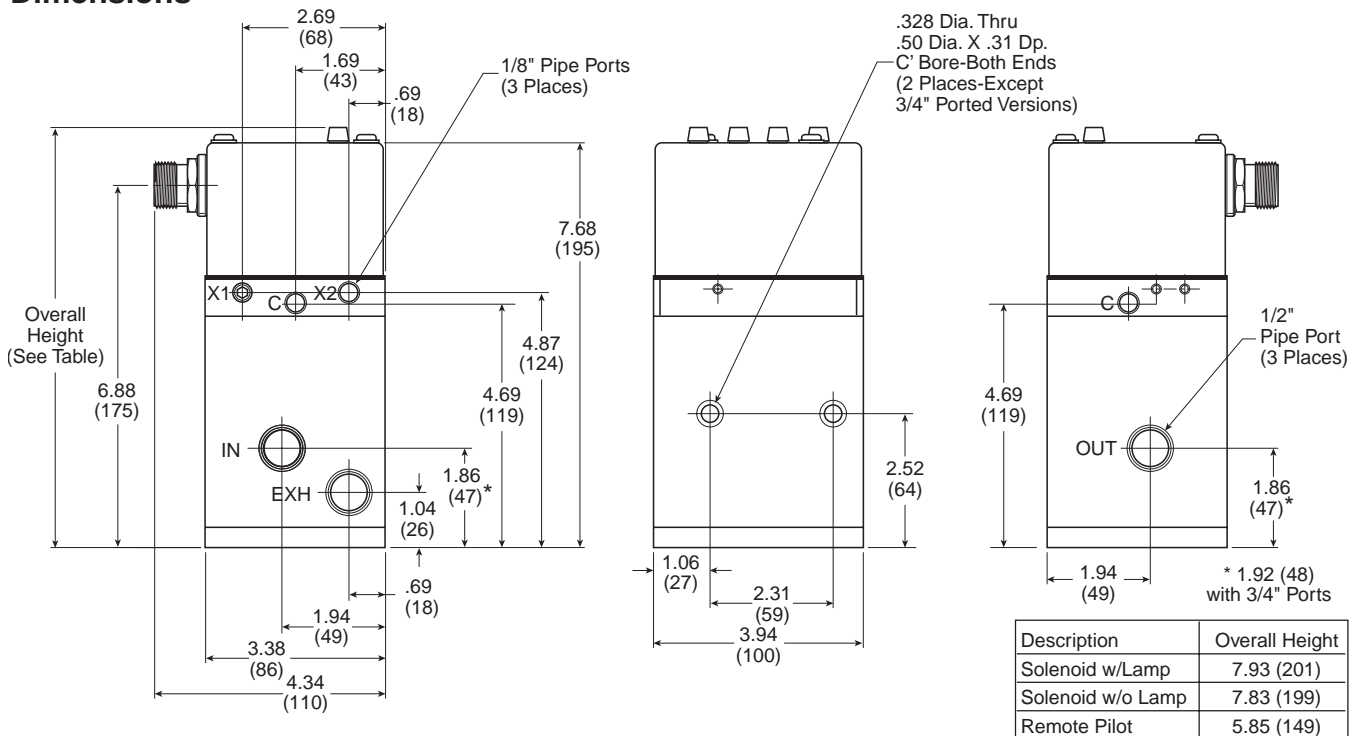
Table above illustrates available output pressures for inlet pressures of 75 PSIG and 90 PSIG. Inlet pressure may be any value between 15 and 150 PSIG. Output pressure increment will be 1/15 of inlet pressure.

* 0 = Voltage "OFF"
 1 = Voltage "ON"

† Available only on units with 6-Pin connector.

†† Shaded output pressures shown are theoretical and are below the minimum operating range of the valve and should not be used. Please refer to the Engineering Specifications for minimum output.

Dimensions



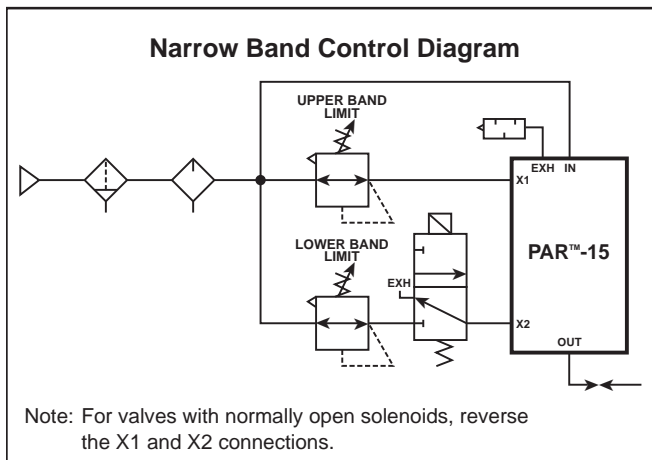
Narrow Band Control

The PAR™-15 can also be used to provide a narrower band of output pressures with the lowest selected pressure greater than zero.

EXAMPLE:

Assume valve with normally closed solenoids. Customer desires to divide a range from 25 PSIG to 100 PSIG into 15 increments of 5 PSIG each. This is done by applying 100 PSIG to the external pilot supply port X1 and 25 PSIG to the pilot exhaust port X2.

Two 1/8 inch relieving regulators are required. The addition of one 3-Way normally closed solenoid operated valve allows the additional selection of 0 PSIG. These are connected as shown in the diagram. The relieving regulators set the upper and lower band limits. With a normally closed PAR™-15 valve, zero output pressure may be selected by simultaneously de-energizing the 3-Way valve and the PAR™-15 valve solenoids. With a normally open PAR™-15 valve, zero output pressure may be selected by simultaneously de-energizing the 3-Way valve and energizing the PAR™-15 valve solenoids.



Operation of the valves is the same as mentioned previously under the Operation section. See Cascading Truth Table for the proper input signal to each solenoid, and the resulting proportion of inlet pressure for an output pressure.

A formula can be used to calculate the output pressure of the valve downstream.

$$\text{OUTPUT PRESSURE (PSIG)} = \frac{\text{LINE PRESSURE (PSIG)}}{15} \times \left(\frac{\text{BINARY INPUT UPSTREAM VALVE}}{16} + \frac{\text{BINARY INPUT DOWNSTREAM VALVE}}{16} \right)$$

Where:

LINE PRESSURE is the supply pressure to both valves and it must be equal.

BINARY INPUT UPSTREAM VALVE is the binary number, a number from 0 to 15 depending on which solenoids are energized (normally closed solenoids) or de-energized (normally open solenoids) on the valve upstream.

BINARY INPUT DOWNSTREAM VALVE is the binary number, a number from 0 to 15 depending on which solenoids are energized (normally closed solenoids) or de-energized (normally open solenoids) on the valve downstream.

EXAMPLE:

Assume the line pressure is 120 PSIG, the valve upstream has inputs 1 & 2 energized, and the valve downstream has inputs 1 & 8 energized. Also, assume normally closed solenoids. What is the output pressure of the valve downstream?

SOLUTION:

BINARY INPUT VALVE UPSTREAM = 1 + 2 = 3
BINARY INPUT VALVE DOWNSTREAM = 1 + 8 = 9

$$\text{OUTPUT PRESSURE} = \frac{120}{15} \times \left(\frac{3}{16} + 9 \right) = 8 \times 9.1875 = 73.5 \text{ PSIG}$$

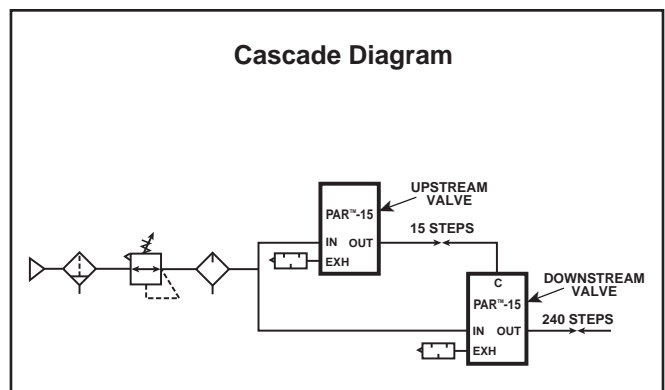
Cascading

Two PAR™-15's can also be used in conjunction to provide 240 steps (versus 15 steps from one valve), therefore more output pressures. See diagram.

Connect the outlet port marked OUT of the valve upstream to the 1/8" port marked C of the valve downstream. A port/pipe reducer(s) must be used to accomplish this task. If desired, a pressure gauge can be installed between these two points. A gauge isolator should be used to protect the gauge from pulsating pressures.

Connect the outlet port marked OUT of the valve downstream to the supply side of the system requiring multiple pressures. If desired, a pressure gauge can be installed downstream of the outlet port. A gauge isolator should be used to protect the gauge from pulsating pressures.

DO NOT PLUG THE 1/8" PORTS MARKED C AND X2 ON THE VALVE UPSTREAM AND X2 ON THE VALVE DOWNSTREAM.



Technical Information

	Normally Closed Solenoids		Normally Open Solenoids		Down-stream Valve	Up-stream Valve	PSIG Output @ 60 PSIG Inlet ††	PSIG Output @ 120 PSIG Inlet ††		
	Down-Step Valve	Up-stream Valve	Down-stream Valve	Up-stream Valve						
	Binary Input* 8 4 2 1 8 4 2 1		Binary Input* 8 4 2 1 8 4 2 1						Proportion	Proportion
	Pin Number † 5 3 2 1 5 3 2 1		Pin Number † 5 3 2 1 5 3 2 1						of Inlet Pressure +	of Inlet Pressure
0	0000	0000	1111	1111	0	0	0.00	0.00		
1	0000	0001	1111	1110	0	1/240	0.25	0.50		
2	0000	0010	1111	1101	0	2/240	0.50	1.00		
3	0000	0011	1111	1100	0	3/240	0.75	1.50		
4	0000	0100	1111	1011	0	4/240	1.00	2.00		
5	0000	0101	1111	1010	0	5/240	1.25	2.50		
6	0000	0110	1111	1001	0	6/240	1.50	3.00		
7	0000	0111	1111	1000	0	7/240	1.75	3.50		
8	0000	1000	1111	0111	0	8/240	2.00	4.00		
9	0000	1001	1111	0110	0	9/240	2.25	4.50		
10	0000	1010	1111	0101	0	10/240	2.50	5.00		
11	0000	1011	1111	0100	0	11/240	2.75	5.50		
12	0000	1100	1111	0011	0	12/240	3.00	6.00		
13	0000	1101	1111	0010	0	13/240	3.25	6.50		
14	0000	1110	1111	0001	0	14/240	3.50	7.00		
15	0000	1111	1111	0000	0	15/240	3.75	7.50		
16	0001	0000	1110	1111	1/15	0	4.00	8.00		
17	0001	0001	1110	1110	1/15	1/240	4.25	8.50		
18	0001	0010	1110	1101	1/15	2/240	4.50	9.00		
19	0001	0011	1110	1100	1/15	3/240	4.75	9.50		
20	0001	0100	1110	1011	1/15	4/240	5.00	10.00		
21	0001	0101	1110	1010	1/15	5/240	5.25	10.50		
22	0001	0110	1110	1001	1/15	6/240	5.50	11.00		
23	0001	0111	1110	1000	1/15	7/240	5.75	11.50		
24	0001	1000	0010	0111	13/15	0	53.00	105.50		
211	0001	1000	0010	0111	13/15	1/240	53.25	106.00		
212	0000	1111	0010	1011	13/15	2/240	53.50	106.50		
213	0000	0000	0010	1010	13/15	3/240	53.75	107.00		
214	0000	0000	0010	1001	13/15	4/240	54.00	107.50		
215	0000	0000	0010	1000	13/15	5/240	54.25	108.00		
216	0000	0000	0010	0111	13/15	6/240	54.50	108.50		
217	0000	0000	0010	0110	13/15	7/240	54.75	109.00		
218	0000	0000	0010	0101	13/15	8/240	55.00	109.50		
219	0000	0000	0010	0100	13/15	9/240	55.25	110.00		
220	0000	0000	0010	0011	13/15	10/240	55.50	110.50		
221	0000	0000	0010	0010	13/15	11/240	55.75	111.00		
222	0000	0000	0010	0001	13/15	12/240	56.00	111.50		
223	0000	0000	0010	0000	13/15	13/240	56.25	112.00		
224	0000	0000	0010	0000	13/15	14/240	56.50	112.50		
225	0000	0000	0010	0000	13/15	15/240	56.75	113.00		
226	0000	0000	0010	0000	13/15	16/240	57.00	113.50		
227	0000	0000	0010	0000	13/15	17/240	57.25	114.00		
228	0000	0000	0010	0000	13/15	18/240	57.50	114.50		
229	0000	0000	0010	0000	13/15	19/240	57.75	115.00		
230	1110	0101	0001	1011	14/15	0	58.00	115.50		
231	1110	0110	0001	1010	14/15	1/240	58.25	116.00		
232	1110	0111	0001	1001	14/15	2/240	58.50	116.50		
233	1110	1000	0001	1000	14/15	3/240	58.75	117.00		
234	1110	1001	0001	0111	14/15	4/240	59.00	117.50		
235	1110	1010	0001	0110	14/15	5/240	59.25	118.00		
236	1110	1011	0001	0101	14/15	6/240	59.50	118.50		
237	1110	1100	0001	0100	14/15	7/240	59.75	119.00		
238	1110	1101	0001	0011	14/15	8/240	59.90	119.25		
239	1110	1110	0001	0010	14/15	9/240	60.00	119.50		
240	1110	1111	0001	0001	14/15	10/240	60.00	120.00		
241	1110	1111	0001	0000	14/15	11/240	60.00	120.00		
242	1110	1111	0001	0000	14/15	12/240	60.00	120.00		
243	1110	1111	0001	0000	14/15	13/240	60.00	120.00		
244	1110	1111	0001	0000	14/15	14/240	60.00	120.00		
245	1110	1111	0001	0000	14/15	15/240	60.00	120.00		
246	1110	1111	0001	0000	14/15	16/240	60.00	120.00		
247	1110	1111	0001	0000	14/15	17/240	60.00	120.00		
248	1110	1111	0001	0000	14/15	18/240	60.00	120.00		
249	1110	1111	0001	0000	14/15	19/240	60.00	120.00		
250	1110	1111	0001	0000	14/15	20/240	60.00	120.00		
251	1110	1111	0001	0000	14/15	21/240	60.00	120.00		
252	1110	1111	0001	0000	14/15	22/240	60.00	120.00		
253	1110	1111	0001	0000	14/15	23/240	60.00	120.00		
254	1110	1111	0001	0000	14/15	24/240	60.00	120.00		
255	1110	1111	0001	0000	14/15	25/240	60.00	120.00		
256	1110	1111	0001	0000	14/15	26/240	60.00	120.00		
257	1110	1111	0001	0000	14/15	27/240	60.00	120.00		
258	1110	1111	0001	0000	14/15	28/240	60.00	120.00		
259	1110	1111	0001	0000	14/15	29/240	60.00	120.00		
260	1110	1111	0001	0000	14/15	30/240	60.00	120.00		
261	1110	1111	0001	0000	14/15	31/240	60.00	120.00		
262	1110	1111	0001	0000	14/15	32/240	60.00	120.00		
263	1110	1111	0001	0000	14/15	33/240	60.00	120.00		
264	1110	1111	0001	0000	14/15	34/240	60.00	120.00		
265	1110	1111	0001	0000	14/15	35/240	60.00	120.00		
266	1110	1111	0001	0000	14/15	36/240	60.00	120.00		
267	1110	1111	0001	0000	14/15	37/240	60.00	120.00		
268	1110	1111	0001	0000	14/15	38/240	60.00	120.00		
269	1110	1111	0001	0000	14/15	39/240	60.00	120.00		
270	1110	1111	0001	0000	14/15	40/240	60.00	120.00		
271	1110	1111	0001	0000	14/15	41/240	60.00	120.00		
272	1110	1111	0001	0000	14/15	42/240	60.00	120.00		
273	1110	1111	0001	0000	14/15	43/240	60.00	120.00		
274	1110	1111	0001	0000	14/15	44/240	60.00	120.00		
275	1110	1111	0001	0000	14/15	45/240	60.00	120.00		
276	1110	1111	0001	0000	14/15	46/240	60.00	120.00		
277	1110	1111	0001	0000	14/15	47/240	60.00	120.00		
278	1110	1111	0001	0000	14/15	48/240	60.00	120.00		
279	1110	1111	0001	0000	14/15	49/240	60.00	120.00		
280	1110	1111	0001	0000	14/15	50/240	60.00	120.00		
281	1110	1111	0001	0000	14/15	51/240	60.00	120.00		
282	1110	1111	0001	0000	14/15	52/240	60.00	120.00		
283	1110	1111	0001	0000	14/15	53/240	60.00	120.00		
284	1110	1111	0001	0000	14/15	54/240	60.00	120.00		
285	1110	1111	0001	0000	14/15	55/240	60.00	120.00		
286	1110	1111	0001	0000	14/15	56/240	60.00	120.00		
287	1110	1111	0001	0000	14/15	57/240	60.00	120.00		
288	1110	1111	0001	0000	14/15	58/240	60.00	120.00		
289	1110	1111	0001	0000	14/15	59/240	60.00	120.00		
290	1110	1111	0001	0000	14/15	60/240	60.00	120.00		

Table above illustrates available output pressures for inlet pressures of 75 PSIG and 90 PSIG. Inlet pressure may be any value between 15 and 150 PSIG. Output Pressure increment will be 1/15 of inlet pressure.

* 0 = Voltage "OFF"

1 = Voltage "ON"

† Available only on units with 6-Pin connector.

†† Shaded output pressures shown are theoretical and are below the minimum operating range of the valve and should not be used. Please refer to the Engineering Specifications for minimum output.

Note: Full table appears in instruction sheet enclosed with the product.



Flow Capacity

275 SCFM Inlet to Outlet
225 SCFM Outlet to Exhaust

Life Expectancy

Normal multi-million cycle life expectancy of these valves is based on the use of properly filtered air at room temperature.

Lubrication

Although the valve does not require lubrication for a normal service life, use of SAE 10 mineral base oil is recommended to extend component life. This should be supplied using a 1/2 inch full flow lubricator located upstream of the valve inlet port.

CAUTION:

DO NOT USE SYNTHETIC, RECONSTITUTED, OR OILS WITH AN ALCOHOL CONTENT.

Materials

- Body, Bottom and Top Plates Aluminum
- Divider Aluminum
- Piston Acetal
- Poppet Aluminum
- Poppet Guide Aluminum
- Poppet Seal Fluorocarbon
- Seals Nitrile
- Spring Stainless Steel

Output Response

20 milliseconds

Operating Pressure

Pressure Range	PSIG	kPa
Maximum Inlet	150	1035
Minimum Output	6	41

Shipping Weight

Without Enclosure 6.3 lbs. (2.9 kg.)
With 6-Pin Plug & Cord 8.0 lbs. (3.6 kg.)

Solenoid Enclosure

Meets NEMA-4 Standard (6-Pin Plug Optional Only)

Solenoid Kits & Electrical Data

Class F Solenoids				
Part Number	Voltage / Cycles	Solenoid Type*	Power Consumption (Watts)	Holding Current (AMPS)
PS2982B45P	12VDC	NC	1.2W	0.1
PS2982B49P	24VDC	NC	1.2W	0.05
PS2982B53P	120V/60Hz	NC	1.6VA	0.013
PS2982B42P	24V/60Hz	NC	1.6VA	0.066
PS3202B42P	24V/60Hz	NO	2.4VA	0.1
PS3202B45P	12VDC	NO	1.8W	0.15
PS3202B49P	24VDC	NO	1.8W	0.075
PS3202B53P	120V/60Hz	NO	2.4VA	0.02

* NC = Normally Closed
NO = Normally Open

Temperature Range (Ambient)

32°F (0°C) to 140°F (60°C)

⚠ Caution: If it is possible that the ambient temperature may fall below freezing, the media must be moisture free to prevent internal damage or unpredictable behavior.

Voltage Range

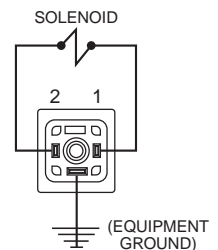
+10% to -10% of rating

Wiring

Follow all national and local electrical codes.

Units with No Enclosure

Connect input and common signals to each one of the solenoids marked with the binary inputs 1, 2, 4 and 8, using the 3-Pin female connector kits shown in the catalog. Follow the installation instructions included with the 3-Pin female connector kits for the proper installation.



If you elect not to use the 3-Pin female connector kits, you may use three female spade connectors per solenoid and connect the wires as shown on the figure.

Units with Enclosure and Without 6-Pin Receptacle

Connect input and common signals to the terminal block on the circuit board labelled TB1. Connect each solenoid input (1, 2, 4, & 8) to the respective label on the circuit board. Connect each common to the input labelled C on the circuit board.

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Units with Enclosure and 6-Pin Micro Receptacle

These units use the following brand names for 6-Pin micro connectors:

Brand Name	Receptacle	Connector w/ 6 Foot Cord
Brad Harrison	7R6006A19A120	706000D02F060
Joy	5000127-41	5000127-2

Connection is made as shown in the chart below.

 Micro	Pin	Wire Color	Function
	1	Red-White	Input 1
	2	Red	Input 2
	3	Green	Equipment Ground
	4	Red-Yellow	Common
	5	Red-Black	Input 8
	6	Red-Blue	Input 4

Units with Enclosure and 6-Pin Mini Connector

These units use either one of the following brand names for 6-Pin mini connectors:

Brand Name	Receptacle	Connector w/ 6 Foot Cord
Brad Harrison	42605	42602
Joy	X8987-2	X8987-4

Connection is made as shown in the chart below.

 Mini	Pin	Wire Color	Function
	1	Orange	Input 1
	2	Blue	Input 2
	3	Black	Input 4
	4	White	Common
	5	Red	Input 8
	6	Green	Equipment Ground

Units with Enclosure, 6-Pin Connector and Indicator Lamps

Each indicator lamp signals when the corresponding solenoid operator is actuated. Lamps that fail to light may need to be replaced or a check made to see if a connection has become loose.

Follow the service kit instructions included with the repair kits for proper installation of replacement lamps.

For units with DC solenoids and indicator lamps red wire is (+) positive white wire is (-) negative.

⚠ Caution: DC solenoids with indicator lamps are polarity sensitive. Observe polarities indicated above.

Available Lamps

Description	Part Number
Lamp (120/60AC) with spring clip	K352428B
Lamp (24VDC) with spring clip	K352429B

15mm 3-Pin DIN 43650C

Description	Connector with 6' (2m) Cord	Connector
PS2932BP	PS2932JBP	Unlighted
PS294675BP	PS2946J75BP*	Light – 12VAC or DC
PS294679BP	PS2946J79BP*	Light – 24VAC or DC
PS294683BP	PS2946J83BP*	Light – 110/120VAC

* LED with surge suppression.

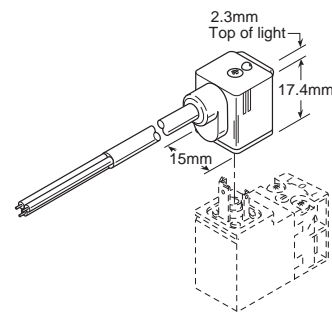
Note: Max ø6.5mm cable size required for connector w/o 6' (2m) cord.

Engineering Data:

Conductors: 2 Poles Plus Ground

Cable Range (Connector Only): 4 to 6mm (0.16 to 0.24 Inch)

Contact Spacing: 8mm



Service Kit

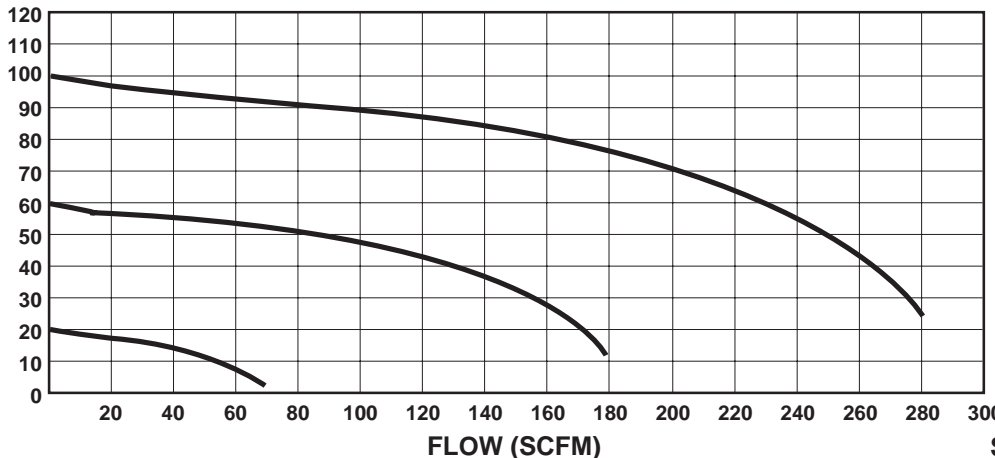
Part Number	Kit Contents
K352413B	Piston, Poppet Assembly, all Rubber Seals and Gaskets

Flow Characteristics

INCREASING
OUTPUT
BINARY
INPUT

8	4	2	1
1	0	1	0
0	1	1	0
0	0	1	0

OUTLET PRESSURE (PSIG)



DECREASING
OUTPUT
BINARY
INPUT

8	4	2	1
0	1	0	1
1	0	0	1
1	1	0	1

OUTLET PRESSURE (PSIG)

N.C.
SOLENOIDS

N.O.
SOLENOIDS

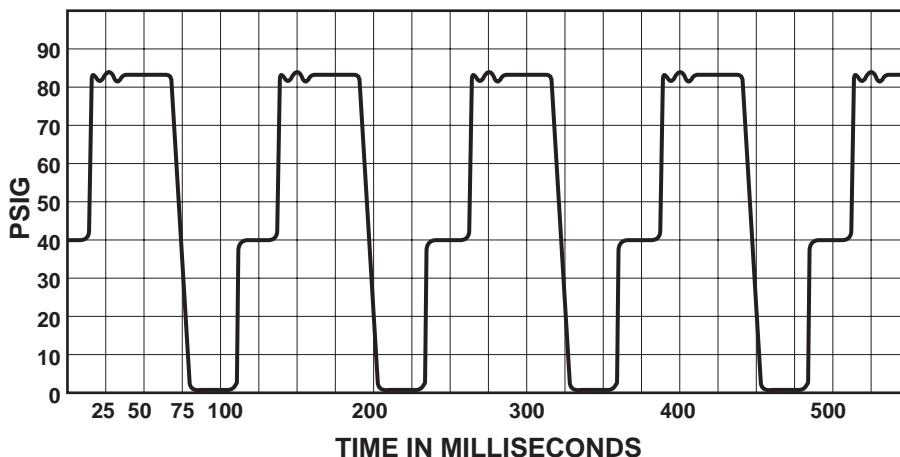


P31P / P32P

PAR15

Typical Time Response

PERFORMANCE CHARACTERISTICS



Actual test results show rapid response on a robot welding operation at a major U.S. automotive manufacturer.

NOTE: Although graph illustrates pressure dropping to 0 PSIG at the end of each cycle, the PAR™-15 valve can shift down to intermediate pressure steps, i.e. from 75 PSIG to 45 PSIG, without returning to 0 PSIG first.

Safety Guide For Selecting And Using Pneumatic Division Products And Related Accessories

WARNING:

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF PNEUMATIC DIVISION PRODUCTS, ASSEMBLIES OR RELATED ITEMS (“PRODUCTS”) CAN CAUSE DEATH, PERSONAL INJURY, AND PROPERTY DAMAGE. POSSIBLE CONSEQUENCES OF FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THESE PRODUCTS INCLUDE BUT ARE NOT LIMITED TO:

- Unintended or mistimed cycling or motion of machine members or failure to cycle
- Work pieces or component parts being thrown off at high speeds.
- Failure of a device to function properly for example, failure to clamp or unclamp an associated item or device.
- Explosion
- Suddenly moving or falling objects.
- Release of toxic or otherwise injurious liquids or gasses.

Before selecting or using any of these Products, it is important that you read and follow the instructions below.

1. GENERAL INSTRUCTIONS

- 1.1. Scope:** This safety guide is designed to cover general guidelines on the installation, use, and maintenance of Pneumatic Division Valves, FRLs (Filters, Pressure Regulators, and Lubricators), Vacuum products and related accessory components.
- 1.2. Fail-Safe:** Valves, FRLs, Vacuum products and their related components can and do fail without warning for many reasons. Design all systems and equipment in a fail-safe mode, so that failure of associated valves, FRLs or Vacuum products will not endanger persons or property.
- 1.3. Relevant International Standards:** For a good guide to the application of a broad spectrum of pneumatic fluid power devices see: ISO 4414:1998, Pneumatic Fluid Power – General Rules Relating to Systems. See www.iso.org for ordering information.
- 1.4. Distribution:** Provide a copy of this safety guide to each person that is responsible for selection, installation, or use of Valves, FRLs or Vacuum products. Do not select, or use Parker valves, FRLs or vacuum products without thoroughly reading and understanding this safety guide as well as the specific Parker publications for the products considered or selected.
- 1.5. User Responsibility:** Due to the wide variety of operating conditions and applications for valves, FRLs, and vacuum products Parker and its distributors do not represent or warrant that any particular valve, FRL or vacuum product is suitable for any specific end use system. This safety guide does not analyze all technical parameters that must be considered in selecting a product. The user, through its own analysis and testing, is solely responsible for:
 - Making the final selection of the appropriate valve, FRL, Vacuum component, or accessory.
 - Assuring that all user's performance, endurance, maintenance, safety, and warning requirements are met and that the application presents no health or safety hazards.
 - Complying with all existing warning labels and / or providing all appropriate health and safety warnings on the equipment on which the valves, FRLs or Vacuum products are used; and,
 - Assuring compliance with all applicable government and industry standards.
- 1.6. Safety Devices:** Safety devices should not be removed, or defeated.
- 1.7. Warning Labels:** Warning labels should not be removed, painted over or otherwise obscured.
- 1.8. Additional Questions:** Call the appropriate Parker technical service department if you have any questions or require any additional information. See the Parker publication for the product being considered or used, or call 1-800-CPARKER, or go to www.parker.com, for telephone numbers of the appropriate technical service department.

2. PRODUCT SELECTION INSTRUCTIONS

- 2.1. Flow Rate:** The flow rate requirements of a system are frequently the primary consideration when designing any pneumatic system. System components need to be able to provide adequate flow and pressure for the desired application.
- 2.2. Pressure Rating:** Never exceed the rated pressure of a product. Consult product labeling, Pneumatic Division catalogs or the instruction sheets supplied for maximum pressure ratings.
- 2.3. Temperature Rating:** Never exceed the temperature rating of a product. Excessive heat can shorten the life expectancy of a product and result in complete product failure.
- 2.4. Environment:** Many environmental conditions can affect the integrity and suitability of a product for a given application. Pneumatic Division products are designed for use in general purpose industrial applications. If these products are to be used in unusual circumstances such as direct sunlight and/or corrosive or caustic environments, such use can shorten the useful life and lead to premature failure of a product.
- 2.5. Lubrication and Compressor Carryover:** Some modern synthetic oils can and will attack nitrile seals. If there is any possibility of synthetic oils or greases migrating into the pneumatic components check for compatibility with the seal materials used. Consult the factory or product literature for materials of construction.
- 2.6. Polycarbonate Bowls and Sight Glasses:** To avoid potential polycarbonate bowl failures:
 - Do not locate polycarbonate bowls or sight glasses in areas where they could be subject to direct sunlight, impact blow, or temperatures outside of the rated range.
 - Do not expose or clean polycarbonate bowls with detergents, chlorinated hydro-carbons, ketones, esters or certain alcohols.
 - Do not use polycarbonate bowls or sight glasses in air systems where compressors are lubricated with fire resistant fluids such as phosphate ester and di-ester lubricants.

Safety Guide

2.7. Chemical Compatibility: For more information on plastic component chemical compatibility see Pneumatic Division technical bulletins Tec-3, Tec-4, and Tec-5

- 2.8. Product Rupture:** Product rupture can cause death, serious personal injury, and property damage.
- Do not connect pressure regulators or other Pneumatic Division products to bottled gas cylinders.
 - Do not exceed the maximum primary pressure rating of any pressure regulator or any system component.
 - Consult product labeling or product literature for pressure rating limitations.

3. PRODUCT ASSEMBLY AND INSTALLATION INSTRUCTIONS

3.1. Component Inspection: Prior to assembly or installation a careful examination of the valves, FRLs or vacuum products must be performed. All components must be checked for correct style, size, and catalog number. DO NOT use any component that displays any signs of nonconformance.

3.2. Installation Instructions: Parker published Installation Instructions must be followed for installation of Parker valves, FRLs and vacuum components. These instructions are provided with every Parker valve or FRL sold, or by calling 1-800-CPARKER, or at www.parker.com.

3.3. Air Supply: The air supply or control medium supplied to Valves, FRLs and Vacuum components must be moisture-free if ambient temperature can drop below freezing

4. VALVE AND FRL MAINTENANCE AND REPLACEMENT INSTRUCTIONS

4.1. Maintenance: Even with proper selection and installation, valve, FRL and vacuum products service life may be significantly reduced without a continuing maintenance program. The severity of the application, risk potential from a component failure, and experience with any known failures in the application or in similar applications should determine the frequency of inspections and the servicing or replacement of Pneumatic Division products so that products are replaced before any failure occurs. A maintenance program must be established and followed by the user and, at minimum, must include instructions 4.2 through 4.10.

4.2. Installation and Service Instructions: Before attempting to service or replace any worn or damaged parts consult the appropriate Service Bulletin for the valve or FRL in question for the appropriate practices to service the unit in question. These Service and Installation Instructions are provided with every Parker valve and FRL sold, or are available by calling 1-800-CPARKER, or by accessing the Parker web site at www.parker.com.

4.3. Lockout / Tagout Procedures: Be sure to follow all required lockout and tagout procedures when servicing equipment. For more information see: OSHA Standard – 29 CFR, Part 1910.147, Appendix A, The Control of Hazardous Energy – (Lockout / Tagout)

4.4. Visual Inspection: Any of the following conditions requires immediate system shut down and replacement of worn or damaged components:

- Air leakage: Look and listen to see if there are any signs of visual damage to any of the components in the system. Leakage is an indication of worn or damaged components.
- Damaged or degraded components: Look to see if there are any visible signs of wear or component degradation.
- Kinked, crushed, or damaged hoses. Kinked hoses can result in restricted air flow and lead to unpredictable system behavior.
- Any observed improper system or component function: Immediately shut down the system and correct malfunction.
- Excessive dirt build-up: Dirt and clutter can mask potentially hazardous situations.

Caution: Leak detection solutions should be rinsed off after use.

4.5. Routine Maintenance Issues:

- Remove excessive dirt, grime and clutter from work areas.
- Make sure all required guards and shields are in place.

4.6. Functional Test: Before initiating automatic operation, operate the system manually to make sure all required functions operate properly and safely.

4.7. Service or Replacement Intervals: It is the user's responsibility to establish appropriate service intervals. Valves, FRLs and vacuum products contain components that age, harden, wear, and otherwise deteriorate over time. Environmental conditions can significantly accelerate this process. Valves, FRLs and vacuum components need to be serviced or replaced on routine intervals. Service intervals need to be established based on:

- Previous performance experiences.
- Government and / or industrial standards.
- When failures could result in unacceptable down time, equipment damage or personal injury risk.

4.8. Servicing or Replacing of any Worn or Damaged Parts: To avoid unpredictable system behavior that can cause death, personal injury and property damage:

- Follow all government, state and local safety and servicing practices prior to service including but not limited to all OSHA Lockout Tagout procedures (OSHA Standard – 29 CFR, Part 1910.147, Appendix A, The Control of Hazardous Energy – Lockout / Tagout).
- Disconnect electrical supply (when necessary) before installation, servicing, or conversion.
- Disconnect air supply and depressurize all air lines connected to system and Pneumatic Division products before installation, service, or conversion.
- Installation, servicing, and / or conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
- After installation, servicing, or conversions air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or if the product does not operate properly, do not put product or system into use.
- Warnings and specifications on the product should not be covered or painted over. If masking is not possible, contact your local representative for replacement labels.

4.9. Putting Serviced System Back into Operation: Follow the guidelines above and all relevant Installation and Maintenance Instructions supplied with the valve FRL or vacuum component to insure proper function of the system.

The items described in this document and other documents and descriptions provided by Parker Hannifin Corporation, its subsidiaries and its authorized distributors ("Seller") are hereby offered for sale at prices to be established by Seller. This offer and its acceptance by any customer ("Buyer") shall be governed by all of the following Terms and Conditions. Buyer's order for any item described in its document, when communicated to Seller verbally, or in writing, shall constitute acceptance of this offer. All goods or work described will be referred to as "Products".

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- 2. Price Adjustments; Payments.** Prices stated on Seller's quote or other documentation offered by Seller are valid for 30 days, and do not include any sales, use, or other taxes unless specifically stated. Unless otherwise specified by Seller, all prices are F.C.A. Seller's facility (INCOTERMS 2010). Payment is subject to credit approval and is due 30 days from the date of invoice or such other term as required by Seller's Credit Department, after which Buyer shall pay interest on any unpaid invoices at the rate of 1.5% per month or the maximum allowable rate under applicable law.
- 3. Delivery Dates; Title and Risk; Shipment.** All delivery dates are approximate and Seller shall not be responsible for any damages resulting from any delay. Regardless of the manner of shipment, title to any products and risk of loss or damage shall pass to Buyer upon placement of the products with the shipment carrier at Seller's facility. Unless otherwise stated, Seller may exercise its judgment in choosing the carrier and means of delivery. No deferral of shipment at Buyers' request beyond the respective dates indicated will be made except on terms that will indemnify, defend and hold Seller harmless against all loss and additional expense. Buyer shall be responsible for any additional shipping charges incurred by Seller due to Buyer's acts or omissions.
- 4. Warranty.** Seller warrants that the Products sold hereunder shall be free from defects in material or workmanship for a period of twelve months from the date of delivery to Buyer or 2,000 hours of normal use, whichever occurs first. The prices charged for Seller's products are based upon the exclusive limited warranty stated above, and upon the following disclaimer: **DISCLAIMER OF WARRANTY: THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO PRODUCTS PROVIDED HEREUNDER. SELLER DISCLAIMS ALL OTHER WARRANTIES, EXPRESS AND IMPLIED, INCLUDING DESIGN, MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.**
- 5. Claims; Commencement of Actions.** Buyer shall promptly inspect all Products upon delivery. No claims for shortages will be allowed unless reported to the Seller within 10 days of delivery. No other claims against Seller will be allowed unless asserted in writing within 30 days after delivery. Buyer shall notify Seller of any alleged breach of warranty within 30 days after the date the defect is or should have been discovered by Buyer. Any action based upon breach of this agreement or upon any other claim arising out of this sale (other than an action by Seller for an amount due on any invoice) must be commenced within 12 months from the date of the breach without regard to the date breach is discovered.
- 6. LIMITATION OF LIABILITY.** UPON NOTIFICATION, SELLER WILL, AT ITS OPTION, REPAIR OR REPLACE A DEFECTIVE PRODUCT, OR REFUND THE PURCHASE PRICE. **IN NO EVENT SHALL SELLER BE LIABLE TO BUYER FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR AS THE RESULT OF, THE SALE, DELIVERY, NON-DELIVERY, SERVICING, USE OR LOSS OF USE OF THE PRODUCTS OR ANY PART THEREOF, OR FOR ANY CHARGES OR EXPENSES OF ANY NATURE INCURRED WITHOUT SELLER'S WRITTEN CONSENT, EVEN IF SELLER HAS BEEN NEGLIGENT, WHETHER IN CONTRACT, TORT OR OTHER LEGAL THEORY. IN NO EVENT SHALL SELLER'S LIABILITY UNDER ANY CLAIM MADE BY BUYER EXCEED THE PURCHASE PRICE OF THE PRODUCTS.**
- 7. User Responsibility.** The user, through its own analysis and testing, is solely responsible for making the final selection of the system and Product and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application and follow applicable industry standards and Product information. If Seller provides Product or system options, the user is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the Products or systems.
- 8. Loss to Buyer's Property.** Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which become Buyer's property, may be considered obsolete and may be destroyed by Seller after two consecutive years have elapsed without Buyer ordering the items manufactured using such property. Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.
- 9. Special Tooling.** A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture Products. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the manufacture of the Products, even if such apparatus has been specially converted or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.
- 10. Buyer's Obligation; Rights of Seller.** To secure payment of all sums due or otherwise, Seller shall retain a security interest in the goods delivered and this agreement shall be deemed a Security Agreement under the Uniform Commercial Code. Buyer authorizes Seller as its attorney to execute and file on Buyer's behalf all documents Seller deems necessary to perfect its security interest.
- 11. Improper use and Indemnity.** Buyer shall indemnify, defend, and hold Seller harmless from any claim, liability, damages, lawsuits, and costs (including attorney fees), whether for personal injury, property damage, patent, trademark or copyright

infringement or any other claim, brought by or incurred by Buyer, Buyer's employees, or any other person, arising out of: (a) improper selection, improper application or other misuse of Products purchased by Buyer from Seller; (b) any act or omission, negligent or otherwise, of Buyer; (c) Seller's use of patterns, plans, drawings, or specifications furnished by Buyer to manufacture Product; or (d) Buyer's failure to comply with these terms and conditions. Seller shall not indemnify Buyer under any circumstance except as otherwise provided.

- 12. Cancellations and Changes.** Orders shall not be subject to cancellation or change by Buyer for any reason, except with Seller's written consent and upon terms that will indemnify, defend and hold Seller harmless against all direct, incidental and consequential loss or damage. Seller may change product features, specifications, designs and availability with notice to Buyer.
- 13. Limitation on Assignment.** Buyer may not assign its rights or obligations under this agreement without the prior written consent of Seller.
- 14. Force Majeure.** Seller does not assume the risk and shall not be liable for delay or failure to perform any of Seller's obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter "Events of Force Majeure") Events of Force Majeure shall include without limitation: accidents, strikes or labor disputes, acts of any government or government agency, acts of nature, delays or failures in delivery from carriers or suppliers, shortages of materials, or any other cause beyond Seller's reasonable control.
- 15. Waiver and Severability.** Failure to enforce any provision of this agreement will not waive that provision nor will any such failure prejudice Seller's right to enforce that provision in the future. Invalidation of any provision of this agreement by legislation or other rule of law shall not invalidate any other provision herein. The remaining provisions of this agreement will remain in full force and effect.
- 16. Termination.** Seller may terminate this agreement for any reason and at any time by giving Buyer thirty (30) days written notice of termination. Seller may immediately terminate this agreement, in writing, if Buyer: (a) commits a breach of any provision of this agreement (b) appoints a trustee, receiver or custodian for all or any part of Buyer's property (c) files a petition for relief in bankruptcy on its own behalf, or by a third party (d) makes an assignment for the benefit of creditors, or (e) the dissolves or liquidates all or a majority of its assets.
- 17. Governing Law.** This agreement and the sale and delivery of all Products hereunder shall be deemed to have taken place in and shall be governed and construed in accordance with the laws of the State of Ohio, as applicable to contracts executed and wholly performed therein and without regard to conflicts of laws principles. Buyer irrevocably agrees and consents to the exclusive jurisdiction and venue of the courts of Cuyahoga County, Ohio with respect to any dispute, controversy or claim arising out of or relating to this agreement.
- 18. Indemnity for Infringement of Intellectual Property Rights.** Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Section. Seller will defend and indemnify Buyer against allegations of infringement of U.S. patents, U.S. trademarks, copyrights, trade dress and trade secrets ("Intellectual Property Rights"). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that a Product sold pursuant to this Agreement infringes the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If a Product is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using the Product, replace or modify the Product so as to make it noninfringing, or offer to accept return of the Product and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to Products delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any Product sold hereunder. The foregoing provisions of this Section shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.
- 19. Entire Agreement.** This agreement contains the entire agreement between the Buyer and Seller and constitutes the final, complete and exclusive expression of the terms of sale. All prior or contemporaneous written or oral agreements or negotiations with respect to the subject matter are herein merged.
- 20. Compliance with Law, U. K. Bribery Act and U.S. Foreign Corrupt Practices Act.** Buyer agrees to comply with all applicable laws and regulations, including both those of the United Kingdom and the United States of America, and of the country or countries of the Territory in which the Buyer may operate, including without limitation the U. K. Bribery Act, the U.S. Foreign Corrupt Practices Act ("FCPA") and the U.S. Anti-Kickback Act (the "Anti-Kickback Act"), and agrees to indemnify and hold harmless Seller from the consequences of any violation of such provisions by Buyer, its employees or agents. Buyer acknowledges that they are familiar with the provisions of the U. K. Bribery Act, the FCPA and the Anti-Kickback Act, and certifies that Buyer will adhere to the requirements thereof. In particular, Buyer represents and agrees that Buyer shall not make any payment or give anything of value, directly or indirectly to any governmental official, any foreign political party or official thereof, any candidate for foreign political office, or any commercial entity or person, for the purpose of influencing such person to purchase products or otherwise benefit the business of Seller.

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