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Choosing Pneumatic Controls

When to Choose Pneumatic Controls

Automated machines often mix pneumatic actuation (cylinders, air motors, blowers, suction cups, etc.) and electrical actuation (motors, heat resistors, electro-magnets, etc.).

In choosing control hardware, the designer should seek to maximize overall system uniformity.

The flow chart on the facing page enables the choice of control technology for a machine or machine work station where pneumatic actuators are in the majority (60% minimum); the machine must be of unit or semi-unit construction; and finally it should only comprise of separate signals and require only logic processing.

These latter conditions apply to the latest automated systems. If however the machine under consideration comprises sections with analog or digital signals, it can be structured as a series of work stations and those which do not meet all the conditions can be treated separately.

Using the Flow Chart

The three essential selection criteria are applied in turn to the machine under consideration.

1 - Distance and Reaction Time

This criterion eliminates the total pneumatic configuration for machines which are too large.

The signal transfer distance, \( D = D_1 + D_2 \) is easily evaluated.

- If \( D \leq 4 \text{m} \) : all configurations are possible.
- If \( D \geq 16 \text{m} \) : only electro-pneumatic is suitable.
- If \( 4 \text{m} < D < 16 \text{m} \) : the choice is made using Diagram A on the right; an average time is calculated for the stage \( T_E \) and, as a function of \( D \), the diagram enables the choice of direction I - all configurations possible, or direction II - electro-pneumatic configuration.

2 - Matching of Sensors

We have seen the parallel which exists between pneumatic sensors and electric and electrical sensors. At this stage, verify that the majority of the sensors can be pneumatic.

3 - Volume of Processing Required

This is the optimization criterion enabling the best choice for the life of the machine and therefore its best overall cost.

The processing volume is a function of:

- the number of inputs / outputs, \( I + O \)
- the degree of complexity given by the formula:

\[
T_C = \frac{N_\text{steps} + N_\text{sequences}}{I + O}
\]

Values are established for both of these elements for the application concerned, and entered onto one of the diagrams alongside:

- Diagram B enables the choice between pneumatic control (I) and the programmable controller (II).
- Diagram C enables the choice between the electrical control with contacts (I) and the programmable controller (III).

In the case where the diagram indicates “free choice”, both technologies present are valid for the application concerned.

Therefore:

- Pneumatic controls should be used when the majority of actuators are pneumatic.
- Electrical controls should be used when the majority of actuators are electrical.
Selection Criteria

1. Machine or Sub-Machine with Majority of Pneumatic Actuators
   Produced on a unit or semi-unit basis and working in a non-explosive environment, with separate control signals and logic processing only.

2. Distances and Reaction Times
   \[ D = D^1 + D^2 \]
   \[ D^1 = \text{Distance "Sensors \rightarrow Processing"} \]
   \[ D^2 = \text{Distance "Processing" \rightarrow Directional Control Valves} \]
   \[ T_e = \text{Average Step Time} \]

3. Adaptation of Sensors

   Only Electrical or Electronic Sensors Suitable

   Pneumatic Sensors Suitable

Volume of Processing Required

\[ E + S = N^I \text{ Inputs / Outputs} \]
\[ T_c = \text{Degree of Complexity} = N^I \text{ of Steps} + N^O \text{ of Sequences} \]

According to \(I + O\) and \(T_c\)

Free Choice

Pneumatic Control

- Total Pneumatic Structure
- Pneumatic Sensors

“Sequential” Programmable Controller

- Electro-Pneumatic Structure
- Electrical and Electronic Sensors

Electrical Control with Contacts

Component Symbols

<table>
<thead>
<tr>
<th>OR Function</th>
<th>TIME Function</th>
<th>THRESHOLD NOT Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES Function</td>
<td>Air/Electric Interface (Pressure Switch: Non Adjustable)</td>
<td>Back-Pressure Sensor (Booster Relay)</td>
</tr>
<tr>
<td>Not Function (Inhibitor)</td>
<td>AND Function</td>
<td>INVERTED TIME Function</td>
</tr>
<tr>
<td>MEMORY Function</td>
<td>Amplifier Function</td>
<td>Electric/Air Interface (Pressure Switch: Non Adjustable)</td>
</tr>
</tbody>
</table>

Modular Sequencer
Advantages
Total Pneumatic control systems have a number of advantages over electro-pneumatic actuation. Among these are:

- **System Uniformity**
The use of one power and control medium simplifies design, operation, and maintenance of equipment by reducing the number of necessary skills and techniques.

- **Hardware Uniformity**
In practice, pneumatic cylinders integrate better with pneumatic sensors than electrical sensors. For example:

In Wet Environments:
Contrary to electrical sensors, pneumatic sensors operate trouble free in wet surroundings, an application where pneumatic cylinders are generally favored.

In Explosive Environments:
Different explosion-proof electrical components are cumbersome and expensive; pneumatic components, inherently explosion-proof, are ideally suited to increasingly frequent explosive industrial environments.

For Short Stroke Cylinders:
Short strokes, typical of clamping cylinders for example, are easily sensed with pneumatic limit switches.

Where Limit Switches Cannot be Used:
This frequently encountered problem can be solved by using threshold relays.

- Elimination of Solenoid Valves
Pneumatic systems are more compact, more reliable. Costs are reduced.

- Elimination of Electric Power Supplies and Protection Devices
Reduced costs and added safety.

- Increased Safety
No shocks from cut or exposed wires and devices.

- Longer Life and Increased Reliability
Recent generations of pneumatic controls have maximized simplicity of operation. Pneumatic controls are not inherently self-destructive as are their equivalents (through arcing).

- Faster Response Times
In compact control systems, total pneumatic systems have faster response times than electro-pneumatic systems.

- Reduced Overall Costs
For all these reasons, total pneumatic automation is an effective technique to reduce machine design, operation and maintenance costs.

Direct Operation

Relay Operation

- Non-Passing (YES Function)

- Output signal S is ON when pilot signal “a” is present.
- Relay is snap-acting because area of diameter 1 is greater than area of diameter 2.
**Logic Principles of Pneumatic Switching**

**• Passing (NOT Function)**

- Output signal S is ON when pilot signal "a" is present. When "a" appears, S is exhausted to atmosphere.
- Relay is snap-acting because area of diameter 1 is greater than area of diameter 2.

**Pilot Operation**

**• Non-Passing**

- Depressing actuator creates signal from pilot section; signal actuates NON-PASSING relay. Output S is ON.
- Associating pilot and relay in one component allows high flow (full 1/8" internal orifice) with minimal actuating effort (11 oz.). Snap-action at a precise point along actuator travel is an added characteristic.

**• Passing**

- Depressing actuator creates signal from pilot section; signal actuates PASSING relay. Output S is OFF.
- Associating pilot and relay in one component allows high flow (full 1/8" internal orifice) with minimal actuating effort (11 oz.). Snap-action at a precise point along actuator travel is an added characteristic.
The following chart shows how pneumatic components perform all the basic logic functions.

<table>
<thead>
<tr>
<th>Logic Function</th>
<th>Logic Symbol</th>
<th>Pneumatic Component</th>
<th>Function Symbol</th>
<th>Electrical Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PASSIVE FUNCTIONS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OR</td>
<td>≥1</td>
<td>Output S is ON if at least one of the inputs “a” OR “b” is ON</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AND</td>
<td>&amp;</td>
<td>Output S is ON only if inputs “a” AND “b” are ON</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ACTIVE FUNCTIONS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YES (Regenerate)</td>
<td>S = a (Regenerated)</td>
<td>Output S is ON and regenerated if input “a” is ON</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NOT (Inhibit)</td>
<td>&amp;</td>
<td>Output S is ON if input “a” is OFF (and if supply P is present)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MEMORY</td>
<td></td>
<td>Input “a” generates Output S (SET). Output S remains ON until removed by input “b” (RESET)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **S = a OR b (or both)**
- **S = a + b**
- **S = a and b**
- **S = ab**
- **S = NOT a**
- **S = a̅**
- **S = a̅b**
- **S = a OR b (or both)**
- **S = a + b**
- **S = a and b**
- **S = ab**
- **S = NOT a**
- **S = a̅**
- **S = a̅b**
- **S = a OR b (or both)**
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- **S = NOT a**
- **S = a̅**
- **S = a̅b**
- **S = a OR b (or both)**
- **S = a + b**
- **S = a and b**
- **S = ab**
- **S = NOT a**
- **S = a̅**
- **S = a̅b**
Virtually all production machines using pneumatic actuators operate in a dedicated and repeatable sequence or cycle. The purpose of any control method is to ensure that all steps of the machine’s cycle occur as intended.

The sequencer constitutes the backbone of a Telepneumatic control circuit. The sequencer’s poppet design provides long life using only shop air. Since it is modular, the sequencer can easily be configured to any application cycle requirement. Logic elements and supporting relays provide for other application needs such as safety conditions, operating modes and time delays. The Telepneumatic sequencer eliminates the need for solenoid operated valves.

**COMPOSITION**

A sequencer is comprised of a Number of step modules, each corresponding to a defined step in the machine’s cycle according to the application requirements.

The head / tail module performs the function of locking the easily stacked step modules to the 35 mm DIN rail while also supplying connection to the stack as follows: (1) supply pressure, (2) starting condition and (3) general and emergency resets. A deviation module is placed between step modules to provide for variation to the normal sequence of events such as skips, repeats, multi line cycles and resets.

**STEP MODULE**

At the heart of the sequencer, the step module is the decision making element that will read the necessary inputs and provide output commands as needed. The step module consists of the following parts:

- Input / Output via 5/32" Instant Swivels with Test Points
- Visual Indicator, Defining Status
- Both On and Off Manual Overrides
- Step Reference Marking to Assist in Sequence Diagnostics
- Stackable Subbase with Special Internal Piping.
GRAFCET

The use of a function flow diagram allows the designers of machine tool automation to organize application requirements in a simple sequential flow. The GRAFCET flow diagram becomes a snapshot of the machine’s positions and conditions. This simplifies understanding and modification of the specific application.

CONTROL LOOP

To understand the operating cycle, we first define each actuator motion in sequence. We will address each actuator with a letter starting with A. For a cylinder as shown to the right, the motion required is the extension of the cylinder. This action will now be known as A+. The “+” indicates the extension of a cylinder, or the turning of an actuator that is digital (on / off). When the cylinder reaches the end of its stroke, it will trigger a limit switch. This signal is an input (transition) that we call “a1”. The “a” defines the actuator, and “1” defines its active state. This completes a step consisting of a command and a transition.

COMBINATION

We can now combine additional actuators and reciprocal motions to create a total control package. To the right are two actuators A and B. “A” is a transfer cylinder that will move parts into the workspace. “B” is a press that will form the parts.

The GRAFCET flow diagram in the upper left shows the required actions and the corresponding limit switch feedback signals to indicate the actions are complete. When the machine starts, the transfer (A) will extend (+), placing a part in the nest. Feedback (a1) states that the action is complete and initiates retraction (A-). Feedback (a0) confirms the action is complete and initiates the next motion. The press (B) will extend downward (+) until reaching the end of stroke sensor (b1) which confirms the action and initiates the final step that returns the press to its home condition (B-). The sensor (b0) confirms when (B) is home and signals end of cycle.
IN-LINE MOUNTED LOGIC ELEMENTS

These logic elements can be either flush mounted on any flat surface, 35mm DIN rail mounted with the addition of a spring clip or hung from the tubing.

In-line elements are available in two logic statements: AND and OR.

INTEGRATED LOGIC ELEMENTS

These elements can be combined with each other, allowing the creation of string statements in a compact footprint while reducing the piping required.

There are three logic functions available in this configuration: AND, OR and NOT.

Each element is supplied with an integral locking key which allows each logic unit to lock to the next element to the right. In addition, each element includes a mode selector which enables the user to select either cascade (series) or common (parallel) circuitry.

Cascade mode determines that the output of a logic element will feed the next downstream logic element, while the common mode feeds its supply to the next component. These units are designed for 35mm DIN rail mounting and are supplied with the internal piping diagram printed on the face of the device. This internal piping is field convertible.

SUBBASE MOUNTING LOGIC ELEMENTS

All logic devices are designed to mount on 3-port subbases. The 3-Port subbase is available in two styles (common input and cascade input) and are manifoldable with each other as well as the 4-Port subbases for relays.

A stand alone 3-Port (1/8” pipe) metal subbase is also available. There are 5 logic elements for subbase mounting: AND, OR, YES, NOT and THRESHOLD NOT.
**RELAYS**

These components provide additional capability to the pneumatic logic system. Types available are: Time Delay, Memory, Amplifier, Sensor, Solenoid, and Pressure Switch (both pneumatic and electric). Depending on function, a 3 or 4-Port subbase is used.

**3-PORT SUBBases**

These stackable subbases are designed for the mounting of:
- Logic Devices
- Timers
- Bleed Sensor Relays
- Threshold NOT Relays
- E/P and P/E Interfaces.

They are stackable with the 4-Port subbases below and are available in common input or cascade input styles.

**4-PORT SUBBases**

These stackable subbases are designed for the mounting of:
- Memory Relays
- Amplifier Relays for use with Proximity Sensors.

They are stackable with the 3-Port subbases above.

**STACK ASSEMBLY**

The drawing to the right explains the procedure for assembling subbase mounted logic components and relays.

Note: The subbases are supplied with an integral key that must be pulled upward (1) to release the blanking plug (2). Now the downstream subbase can be positioned (3) then locked by returning the integral key back to its original position (4). After this process is complete, the relay or logic element are mounted on top.
Logic
Inline Logic Elements

**Specifications**

**Air Quality** –
Standard Shop Air, Lubricated or Dry, 40 µm Filtration

- Cv ................................................................. 0.14 (1.8)
- Flow rate at 90 PSI (6 bar) in SCFM (l/min ANR) ... 6.4 (180)

**Materials** –
- Body ................................................................. Polyamide
- Poppet ............................................................... Polyurethane
- Seals ................................................................. Nitrile (Buna N)

**Mounting** ....................................................... Inline or 35mm DIN Rail

**Number of Operations with Dry Air at 90 PSI and 70°F,**
**Frequency 1 Hz .................................................... 10 Million**

**Operating Positions** ........................................... All Positions

**Operating Pressure** .......................................... 20 to 115 PSIG (1.4 to 8 bar)

**Ports** –
- Standard: 5/32” Instant for Semi-Rigid Nylon or Polyurethane Tube
- 10-32 UNF Available

**Response Time** .................................................. 2 to 3 msec

**Temperature** –
- Operating ....................................................... 32°F to 122°F (0°C to +50°C)
- Storage ......................................................... -22°F to 140°F (-30°C to +60°C)

---

**Part Numbers & Description**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLLA11</td>
<td>5/32” Instant</td>
</tr>
<tr>
<td>PLKA11</td>
<td>5/32” Instant</td>
</tr>
<tr>
<td>PZML199</td>
<td>1 Set of Clip Assemblies</td>
</tr>
</tbody>
</table>

---

**Dimensions**

---

*Images of the AND Element, OR Element, and Mounting Clip Assembly are included.*
## With 5/32" Instant Swivel Connections and Pressure Indicators

### AND Element

![AND Element](image1)

**Part Number** | **Description**  
--- | ---  
PLLBB12 | With Integral Circuit Selector for Cascade or Common Mode Selection

### NOT Element

![NOT Element](image2)

**Part Number** | **Description**  
--- | ---  
PLNB12 | With Integral Circuit Selector for Cascade or Common Mode Selection

### OR Element

![OR Element](image3)

**Part Number** | **Description**  
--- | ---  
PLKB12 | With Integral Circuit Selector for Cascade or Common Mode Selection

### Head / Tail Plate Set

![Head / Tail Plate Set](image4)

**Part Number** | **Description**  
--- | ---  
PLEB12 | Mounts on DIN Rail, Required with Integrated Logic Elements to Complete Stack Assembly

### Specifications

**Air Quality** –  
Standard Shop Air, Lubricated or Dry, 40 µm Filtration  
\[ \text{Cv} \] \[ \text{Flow rate at 90 PSI (6 bar) in SCFM (l/mn ANR)} \] \[ \text{Materials} \] –  
- Body: Polyamide  
- Poppet: Polyurethane  
- Seals: Nitrile (Buna N)  
**Mounting** – Inline or 35mm DIN Rail  
**Number of Operations with Dry Air at 90 PSI and 70°F, Frequency 1 Hz** \[ \text{10 Million} \]  
**Operating Positions** – All Positions  
**Operating Pressure** – 40 to 115 PSIG (3 to 8 bar)  
**Ports** –  
- Standard: 5/32" Instant for Semi-Rigid Nylon or Polyurethane Tube  
- 10-32 UNF Available  
**Response Time** – 2 to 3 msec  
**Temperature** –  
- Operating: 32°F to 122°F (0°C to +50°C)  
- Storage: -22°F to 140°F (-30°C to +60°C)

### Dimensions

![Dimensions](image5)

**PLN - NOT**

![Pressure Signal](image6)

<table>
<thead>
<tr>
<th>PSI (bar)</th>
<th>Pressure Signal a (Ratio = 7.4:5)</th>
<th>Flat Threshold</th>
<th>Defeat Threshold (Ratio = 7.1:5)</th>
<th>Air Supply Pressure P</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>bar</td>
<td>15</td>
<td>30</td>
<td>45</td>
<td>60</td>
</tr>
</tbody>
</table>

---

**Part Numbers**

- PLLBB12
- PLNB12
- PLKB12
- PLEB12

---

**Catalog PCC-4/USA**

**Part Numbers**

- PLLBB12
- PLNB12
- PLKB12
- PLEB12

---

**Logic Integrated Logic Elements**

---

**Parker Hannifin Corporation**

Pneumatic Division
Richland, Michigan
www.parker.com/pneumatics
### And Element

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLLC10</td>
<td>Less Base</td>
</tr>
</tbody>
</table>

### Or Element

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLKC10</td>
<td>Less Base</td>
</tr>
</tbody>
</table>

### Yes Element

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLJC10</td>
<td>Less Base</td>
</tr>
</tbody>
</table>
**Technical Information**

### Make and Break Pressures

#### PLJ - YES Element

**Input Pressure “a”**

**PSI**

0 20 40 60 80 100 120 PSI

**Pressure to Make**

**Pressure to Break**

**Supply Pressure P**

Because of sizeable differences in seating areas, pressure to make and pressure to break differ significantly. Snap-acting feature of relay is a result of this difference in pressure.

#### PLN - NOT Element

**Input Pressure “a”**

**PSI**

0 20 40 60 80 100 120 PSI

**Pressure to Make**

**Pressure to Break**

**Supply Pressure P**

Because of sizeable differences in seating areas, pressure to make and pressure to break differ significantly. Snap-acting feature of relay is a result of this difference in pressure.

#### PLND - Threshold NOT Element

**Input Pressure “a”**

**PSI**

0 20 40 60 80 100 120 PSI

**Pressure to Make**

**Pressure to Break = 1/12 of Supply**

**Supply Pressure P**

Diameter of supply P orifice is reduced to keep relay from breaking until control signal “a” is almost completely exhausted.

- Nominal supply orifice diameter = 5/64”
- Cv factor: .11

### Specifications

**Air Quality** –
Standard Shop Air, Lubricated or Dry, 40 µm Filtration

**Cv** –
- PLNC, PLJC, PLL & PLK ................. 0.14 (1.8)
- PLND .................................... 0.08 (1.0); 0.14 (1.8)

**Flow rate at 90 PSI (6 bar) in SCFM (l/min ANR)** –
- PLNC, PLJC, PLL & PLK ................. 6.4 (180)
- PLND .................................... 3.2 (90); 6.4 (180)

**Materials** –
- Body .................................. Polyamide
- Poppet .................................. Polyurethane
- Seals ................................... Nitrile (Buna N)

**Mounting** .................................. 3-Port Subbase

**Number of Operations with Dry Air at 90 PSI and 70°F, Frequency 1 Hz** –
- PLND, PLNC / PLJC ..................... 10 Million
- PLL & PLK ............................... 100 Million

**Operating Positions** ......................... All Positions

**Operating Pressure** ......................... 40 to 115 PSIG (3 to 8 bar)

**Ports** –
- Standard: 5/32” Instant for Semi-Rigid Nylon or Polyurethane Tube
- 10-32 UNF Available

**Response Time** .......................... 2 to 3 msec

**Temperature** –
- Operating ............................. 32°F to 122°F (0°C to +50°C)
- Storage .............................. -22°F to 140°F (-30°C to +60°C)

### Dimensions

**PLNC10, PLND10, PLJC10**

**PLKC10, PLLC10**

**Output Indicator**

**Signal Indicator**

- **Diameter**
  - M4: 1.11 (28)
  - 1.25 (32)
  - 1.34 (34)

- **Length**
  - 97 (25)

---

**Logic**

**Subbase Mounted Logic Elements**

---

**Input Pressure “a”**

**Supply Pressure P**

**Pressure to Make**

**Pressure to Break**

**Output Indicator**

**Signal Indicator**

**Dimensions**

**PLNC10, PLND10, PLJC10**

**PLKC10, PLLC10**

**Output Indicator**

**Signal Indicator**

- **Diameter**
  - M4: 1.11 (28)
  - 1.25 (32)
  - 1.34 (34)

- **Length**
  - 97 (25)
Time Delay Relays
For Mounting on any 2* or 3-Port Subbase
Using Atmospheric Air for Control
Single Turn Adjustment

The Time Delay Relay delays a maintained input signal during an adjustable time period after which a regenerated output appears.

**Setting**
- Delay is set by turning knob.
- One 360° turn covers complete timing range.
- When white line on dial is set at top dead center, TDR goes to infinity. This feature facilitates machine set up.

**Connections: 3-Port Subbase with**
- Instant Straight Connections
- Instant Swivel Connections
- 1/8" NPT Female Connections

**Timing Functions**
- **Positive Output**
  - Pressure
    - Control Signal a
    - Output Signal S
    - Adjustable Time
    - Time Delay Relay: Positive Output

- **Inverted Output**
  - Pressure
    - Control Signal a
    - Output Signal S
    - Adjustable Time
    - Time Delay Relay: Inverted Output, Adjustable Pulse Function

Repeatability +2%

**Specifications**

- **Air Quality**
  - Standard Shop Air, Lubricated or Dry, 40 µm Filtration

- **Cv**
  - 0.14 (1.8)

- **Filter**
  - a-PPRL23, Vent - PPRL20

- **Flow rate at 90 PSI (6 bar) in SCFM (l/mn ANR)**
  - 6.4 (180)

- **Interchangeable 50 µm Filter**
  - (Input) PPRL23
  - (Output) PPRL20

- **Materials**
  - Body: Polyamide
  - Poppet: Polyurethane
  - Seals: Nitrile (Buna N)

- **Mounting**
  - 2 or 3-Port Subbase

- **Number of Operations with Dry Air at 90 PSI and 70°F, Frequency 1 Hz**
  - 10 Million

- **Operating Positions**
  - All

- **Operating Pressure**
  - 40 to 115 PSIG (3 to 8 bar)

- **Repeatability**
  - ±5% / 5 Operations

- **Response Time**
  - 2 to 3 msec

- **Temperature**
  - Operating: 32°F to 122°F (0°C to +50°C)
  - Storage: -22°F to 140°F (-30°C to +60°C)

- **Tamperproof Cap**
  - **Locking**
    - Set desired time delay, then place transparent cap over setting knob and tighten screw.
  - **Sealing**
    - Bend tab over screw head; run wire over head, then seal.

- **Dimensions**
  - **PRT-10**

---

Parker Hannifin Corporation
Pneumatic Division
Richland, Michigan
www.parker.com/pneumatics
Operating Principle

The time delay relay is entirely pneumatic. Air supply to the timing head is taken from the ambient atmosphere. The timing function is therefore independent of line pressure. As a result, repeatability is unaffected by variations in supply pressure, temperature or contamination of supply. In the positive output version, output is provided by a YES relay. In the inverted version, Output is provided by a NOT relay.

Note: Piping inverted TDR for adjustable pulse function: Tee off input “a” to supply port as shown on diagram.

Time Delay Relay Operating Principle: On Delay Positive Output

• SET
Signal “a” appears at input orifice in subbase and is divided into two separate signals after filter (1). The first signal cocks the piston (2) and timing begins.

Simultaneously the second divided signal flows through fixed orifice (3) and supplies bleed at orifice (4).

• TIMING
Poppet (5), attached to bellows (7) and released by piston (2), starts to extend at a rate determined by the amount of delay required. Bellows (7) rate of extension is controlled as follows:

- Spring (6) pushed bellows out. To extend, bellows draws atmosphere air through filter (8) and circular channel (9). Length of channel (9) varies as a function of angle, determined by knob (10).

The greater the angle, the longer the time delay.

• OUTPUT
When bellows (7) reaches the end of its travel, poppet (5) seals off bleed from orifice (4), causing a rise in pressure and as a result output relay switches. Output S appears, supplied by pressure P.

• RESET
Removing the signal “a” automatically resets the time delay relay. Output S disappears.
Adjustable Pulse Output Timer
Maintained input generates adjustable pulse output. When maintained input “a” goes ON, output S goes ON then drops OFF after an adjustable time period T even though “a” is still on.

Single Adjustable Pulse Output Timer
Momentary input generates single adjustable pulse output (one shot). This circuit is useful when a brief signal needs to be prolonged, for example, rapidly actuated limit switches. Momentary input “a” generates longer output S. After adjustable time period T, the inverted TDR cuts off output S.

Adjustable Reciprocate Output Timer
Maintained input generates repeated pulse output (clock signal). Maintained input “a” generates continuously repeated pulse output S.
- The time duration of pulse S is adjustable separately.
- The time between pulses is adjustable separately.
Memory Operation

• OFF
Held in position by magnet 2, Poppet 1 closes off supply pressure P.

• SET
Input signal “a” acting on a diaphragm drives poppet 1 from magnet 2 to magnet 3 allowing pressure to flow. Output signal S appears as indicated by position indicator 4.

• ON
When input “a” is removed, output S is maintained since magnet 3 holds poppet 1 seated.
Note: If pressure is lost, the last MEMORY will maintain its last position.

• RESET
Input “b” acting on the opposite diaphragm returns poppet 1 to magnet 2. Output S is removed and exhausted to atmosphere.
Memory Relay Without Subbase
For Mounting On 4-Port Modular Subbase

The Memory element is a relay designed to maintain output signal S after disappearance of the input signal which generated it.

Special Characteristics

The signal “a” for setting to State 1 causes the output Signal S to be maintained. This will only be erased by the Signal “b” for resetting to State 0.

“b” = Resetting to State 0 of the Memory

“a” = Setting to State 1 of the Memory

Specifications

Air Quality
Standard Shop Air, Lubricated or Dry, 40 µm Filtration

Cv ............................................................0.14 (1.8)

Flow rate at 90 PSI (6 bar) in SCFM (l/mn ANR) ....6.4 (180)

Materials –
- Body ...................................................... Polyamide
- Poppet .................................................... Polyurethane
- Seals ..................................................... Nitrile (Buna N)

Mounting .................................................. 4-Ported Subbase

Number of Operations with Dry Air at 90 PSI and 70°F, Frequency 1 Hz .................10 Million

Operating Positions .............................................. All

Operating Pressure .......................................40 to 115 PSIG (3 to 8 bar)

Response Time ................................................... 2 to 3 msec

Temperature –
Operating .................................................. 32°F to 122°F (0°C to +50°C)
Storage .................................................. -22°F to 140°F (-30°C to +60°C)

Dimensions

PLMA12
### Step Module

- **Part Number:** PSMA10
  - **Description:** With Manual Override, Less Base

- **Part Number:** PSMB10
  - **Description:** Without Manual Override, Less Base

- **Part Number:** PSMA12
  - **Description:** PSMA10 on PSBA12 Base

- **Part Number:** PSMB12
  - **Description:** PSMB10 on PSBA12 Base

### Step Module Subbase

- **Part Number:** PSBA12
  - **Description:** For Mounting with PSM•10 Step Modules

### Step Module Interlock

- **Part Number:** PSVA12
  - **Description:** Mounted between the Subbase and the Step Module to Interrupt the Sequence if a Sensor Signal is Faulty.

### Head / Tail Set

**(For 35mm DIN Rail Mounting)**

- **Part Number:** PSEA127
  - **Description:** Required to assemble Modular Sequencer
    - Provides Inlet & Signal Ports

### Deviation Models

- **Part Number:** PSEA127
  - **Description:**
    - Standard
    - Blocked Port

### Pilot & Depilot Pressures

**Reset Signal always takes priority over Set Signal in a Step Module.**

- **Part Number:** PSDA12
  - **Description:**
    - Standard:
      - Parallel Sequences
      - Selection Sequences
      - Repeat Sequences
      - Skip Steps

- **Part Number:** PSDB12
  - **Description:** Blocked Port:
    - For the Remote Reinitialization of the Blocked Port

---

**Pres. "a" and "b"**

<table>
<thead>
<tr>
<th>PSI bar</th>
<th>75</th>
<th>60</th>
<th>45</th>
<th>30</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 bar</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>15 bar</td>
<td>30</td>
<td>45</td>
<td>60</td>
<td>75</td>
<td>90</td>
</tr>
<tr>
<td>75 bar</td>
<td>105</td>
<td>120</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Depilot Threshold "a"**

**Pilot Threshold "b"**

---

Parker Hannifin Corporation
Pneumatic Division
Richland, Michigan
www.parker.com/pneumatics
Specsifications

Air Quality –
Standard Shop Air, Lubricated or Dry, 40 µm Filtration

Cv.................................................................0.14 (1.8)

Flow rate at 90 PSI (6 bar) in SCFM (/min ANR).....6.4 (180)

Function –
3-Way, Double Air operated Valve with priority reset (Reset
signal takes precedence over set signal).

Materials –
- Body.................................................................Polyamide
- Poppet............................................................Polyurethane
- Seals.................................................................Nitrile (Buna N)

Sequencer Special Applications

Application of Dummy Modules
In most applications the rule of thumb for sequencer circuit
design is “one step module for each step in the cycle”. Some
applications, particularly those involving several
sequencers controlling sub-programs, may require the use
of dummy modules.

Following are the most frequent instances and the method
for handling each one.

Less than 3 Steps in the Cycle
Module 1 cannot start because of module 2 resetting it
while at the same time pressurizing the recycle loop.

Dummy module 0, with its output connected to its feedback
port, pressurizes the recycle loop without resetting module
1. In most cases, sequencers must have at least 3 modules
to operate.

Parallel Lines in the Cycle
– Input k determines which program will be activated.
– One program has less than 3 steps.

The rule of “3 modules minimum” applies in this case also.

Parallel Lines in the Cycle
– Both programs operate simultaneously.
– Interlock P is required to start the second program.

Module 3 is reset by module 4.
If interlock P is delayed, module 3, reset by 14, will be
unable to satisfy AND the function. Therefore module 24 will
not start.

Dimensions
Application Example

The sequencer is inherently adapted to the control of sequential automation cycles as shown in the following example.

Machine

This typical pneumatic part forming machine consists of three pneumatic cylinders with the following functions:
- Cylinder A: Part Transfer
- Cylinder B: Part Forming
- Cylinder C: Part Ejecting

A 4-Way power valve controls each cylinder. Limit switches are mounted at both ends of each cylinder stroke. Push button starts the cycle.

Cycle

Step 1. Part is Transferred A+
Step 2. Part is Formed. A retracts B+ A-
Step 3. Cylinder B Retracts. B-
Step 4. Part is Ejected. C-
Step 5. Cylinder C Extends. C+

Sequencer

A step module is assigned to each step (or line) in the cycle. Since there are 5 steps in the cycle, there are 5 step modules in the sequencer. Control piping of the sequencer is immediately apparent:
- The output from each step module orders its assigned movement(s).
- The feedback from each completed movement(s) is directed back to the step module where the movement originated.

START push button is connected in series in the recycle loop.
Operating Principle

Each step module consists of a MEMORY mounted on a subbase. Integrated in each subbase are an AND function and an OR function. Module interconnections automatically plug in during sequencer assembly.

Two channels run from one end of the completed sequencer to the other:
- Common Supply Channel, inlet in entry module (P)
- General Reset Channel, input in entry module (R)

Schematic

Step Module MEMORY is set (ON) by output from preceding AND element.

Output from MEMORY has three functions:
1. Provides working output for that step.
2. Resets preceding step module through OR element.
3. Pressurizes one input of its own AND element.

Upon completion of movement in the step, feedback signal “r” pressurizes second input of AND element. AND element goes PASSING (ON) and sets following step module MEMORY (ON).

Advantages of Modular Schematic
- Circuit design is immediately evident. Because circuit logic is integrated the designer has only to stack up modules. No need for elaborate diagrams.
- Cycle progression is clearly displayed. Position indicator identifies active step at all times.
- Cycle progression is fully interlocked. False feedback signals are rejected because the AND element in the active step module is the only one in PASSING state.
- Varying types of operating modes, emergency stops, “safeties” and interlock information can be plugged in as modular circuit elements.
**Bleed Sensor Relay**

For Mounting On Any 3-Port Base

**Specifications**

- **Air Quality** – Standard Shop Air, Lubricated or Dry, 40 µm Filtration
  - Cv: 0.14 (1.8)
  - Flow rate at 90 PSI (6 bar) in SCFM (l/min ANR): 6.4 (180)

- **Function** – 3-Way Normally Closed NNP

- **Materials** –
  - Body: Polyamide
  - Poppet: Polyurethane
  - Seals: Nitrile (Buna N)

- **Mounting** – Sensor: 3-Ported Subbase

- **Nozzle Consumption** – 0.00487 ft³ / PSI Min (2 l / bar - Min ANR)

- **Nozzle Ø (Of Sensor)**: 1/32” (3mm)

- **Number of Operations with Dry Air at 90 PSI and 70°F, Frequency 1 Hz**: 10 Million

- **Operating Positions**: All

- **Operating Pressure**: 40 to 115 PSIG (3 to 8 bar)

- **Response Time**: 2 to 3 msec

- **Temperature** –
  - Operating: 32°F to 122°F (0°C to +50°C)
  - Storage: -22°F to 140°F (-30°C to +60°C)

---

**Part Numbers**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRFA10</td>
<td>Provides a supply to a bleed sensor and generates an output signal when operated.</td>
</tr>
<tr>
<td>PRFA12</td>
<td>PRFA10 on PZUA12 Subbase</td>
</tr>
</tbody>
</table>

**Dimensions**

PRFA10

- M4: 0.97 (25)
- M4: 1.25 (32)
- M4: 1.34 (34)
- 1.11 (28)
Bleed Sensors

Bleed sensors are used for the sensing of low forces and short travel. They are simple to install and connect. The detected object blocks the bleed air at low flow. An increase of pressure in tube (T) creates a pneumatic signal (S) on the relay equal to the supply pressure (P).

For Use With PRFA12 Relay

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Port</th>
<th>Actuator</th>
</tr>
</thead>
<tbody>
<tr>
<td>PXFA111</td>
<td>5/32&quot;</td>
<td>Instant Touch</td>
</tr>
<tr>
<td>PXFA121</td>
<td>5/32&quot;</td>
<td>Instant Ball Roller</td>
</tr>
<tr>
<td>PXFA131</td>
<td>5/32&quot;</td>
<td>Instant Cat’s Whisker</td>
</tr>
</tbody>
</table>

Application

Bleed sensors make it possible to sense very low actuating forces or small motions in a small space. They are easy to install and connect, as they only require a single tube.

Note: The length of the interconnecting tube must remain short if quick response times are required.

Specifications

Minimum Pre-Travel at 6 bar –
PXFA12................................. 040 (1 mm)

Maximum Travel –
PXFA12................................. 110 (2.8 mm)

Minimum Operating Force at 90 PSI (6 bar) –
PXFA12................................. 11 oz. (3 N)

Minimum Operating Torque at 90 PSI (6 bar) –
PXFA13................................. 1.3 in-oz (12.5 mmN) (Center of Operator)

Sensing Distance –
PXFA11................................. Direct
PXFA12................................. Direct
PXFA13................................. Direct

Sensing Angle –
PXFA13................................. 10°

For PRFA12 Specifications, see Relays in Section A of this Catalog.

Dimensions

<table>
<thead>
<tr>
<th>PXFA111</th>
<th>PXFA121</th>
<th>PXFA131</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Dimensions Diagram]</td>
<td>![Dimensions Diagram]</td>
<td>![Dimensions Diagram]</td>
</tr>
</tbody>
</table>

Catalog PCC-4/USA  (Revised 06-12-07)

Pneumatic Division
Richland, Michigan
www.parker.com/pneumatics
Amplifier Relay
For Mounting On 4-Port Base

PRDA10

Part Number | Description |
---|---|
PRDA10 | Amplifies the low pressure With signal coming from a fluidic Manual proximity sensor to a Override usable level. |
PRDA12 | PRDA10 on PZUB12 Subbase |

Specifications

Air Quality – Standard Shop Air, Lubricated or Dry, 40 µm Filtration
Cv........................................... 0.14 (1.8)
Flow rate at 90 PSI (6 bar) in SCFM (l/mn ANR).... 6.4 (180)
Function –
3-Way Normally Closed NNP.............................. Yes
Materials –
- Body.................................................. Polyamide
- Poppet............................................. Polyurethane
- Seals............................................ Nitrile (Buna N)
Mounting –
Amplifier ........................................... 4-Ported Subbase
Number of Operations with Dry Air at 90 PSI and 70°F, Frequency 1 Hz................................. 10 Million
Operating Positions........................................... All
Operating Pressure ................................. 40 to 115 PSIG (3 to 8 bar)
Response Time........................................... 2 to 3 msec
Temperature –
Operating ........................................... 32°F to 122°F (0°C to +50°C)
Storage ................................................... -22°F to 140°F (-30°C to +60°C)
PRD - Amplifier Relay Only:
Air Signal Pressure (a)........... .007 to .03 PSI (0.5 to 2 mbar)
Auxiliary Supply Pressure (Px) – 1.5 to 3 PSI (100 to 200 mbar)
Consumption –
At 1.5 PSI (100mbar) with a = 0: 0.1 SCFM (3Nl/mn)
Maximum Operating Frequency.............................. 10 Hz
Manual Control ............................................... PRDA
Replacement Diaphragm for PRDA.... PPRL08 (Pack of 10)
Fluidic Proximity Sensor
Amplified, 1/8" I.D. Internal Orifice

For Use With PRDA12 Amplifier Relay

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Sensing Distance</th>
<th>Ø Mounting</th>
<th>Connections</th>
</tr>
</thead>
<tbody>
<tr>
<td>PXDA111</td>
<td>5/64&quot; to 3/16&quot;</td>
<td>M12 x 2</td>
<td>5/32&quot; (4mm) Instant</td>
</tr>
</tbody>
</table>

Mounting Styles
Two mounting styles are provided on each Sensor.
Nose Mount: Nuts are supplied
Flush Mount: Two clearance holes are provided in Sensor body.

Dimensions
PXDA111

<table>
<thead>
<tr>
<th>inch</th>
<th>mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>.49</td>
</tr>
<tr>
<td>B</td>
<td>.67</td>
</tr>
<tr>
<td>C</td>
<td>.71</td>
</tr>
<tr>
<td>D</td>
<td>.98</td>
</tr>
<tr>
<td>E</td>
<td>.59</td>
</tr>
</tbody>
</table>

Operating Principle, Characteristics
Fluidic proximity sensors are used when the application requires non-contact sensing of the moving part. A fluidic sensor emits a continuous air jet (A) at low pressure. When the object to be detected interferes with this air jet, a back pressure (a) is created. When this back pressure reaches the amplifier relay, an output signal (S) is generated equal to supply pressure (P).

Specifications
Sensing Distance –
PXDA111 ........................................... .04 to .20 (1 to 5 mm)

Low Pressure Supply Px
Inches of WC

D = 3/16"  D = 5/32"  D = 1/8"

L = Distance between Sensor and Relay
0 2 4 6 8 10 Feet
0 50 100 Px
Solenoid Relay
With PZUA12 Subbase

With manual override and plug-in DIN connector
22 x 30 mm (43650 Form B Industrial)

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRSA121B</td>
<td>24VAC 50/60 Hz 6VA</td>
</tr>
<tr>
<td>PRSA121F</td>
<td>120VAC 60 Hz 6VA</td>
</tr>
<tr>
<td>PRSA122B</td>
<td>24VDC 5W</td>
</tr>
</tbody>
</table>

Solenoid Coil
With Plunger and Plug-in DIN Connector (22 x 30mm)

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVAF102B</td>
<td>24VDC 5W</td>
</tr>
<tr>
<td>PVAF102E</td>
<td>48VDC 5W</td>
</tr>
<tr>
<td>PVAF101B</td>
<td>24VAC 50/60 Hz 6VA</td>
</tr>
<tr>
<td>PVAF101E</td>
<td>48VAC 50/60 Hz 6VA</td>
</tr>
<tr>
<td>PVAF101F</td>
<td>120VAC 60 Hz 6VA</td>
</tr>
<tr>
<td>PVAF101M</td>
<td>240VAC 60 Hz 6VA</td>
</tr>
</tbody>
</table>

Coil Mount
For Mounting on any 2 or 3-Port Subbase

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRSD10</td>
<td>For mounting the Solenoid Coil and Plunger on a 3-Port Subbase With Manual Override</td>
</tr>
</tbody>
</table>

Specifications

Air Quality –
Standard Shop Air, Lubricated or Dry, 40 µm Filtration

Consumption –
Direct Current: Holding = 5 W
Alternating Current: Holding = 6 VA; Inrush = 20 VA

Cv ........................................... 0.05 (0.65)

Degree of Protection ........................................... IP 65

Duty Rating .................................................. 100 %

Electrical Connection –
Plug-in Connector, 22-30 mm,
Ø 9 mm Cable Entry, Terminal Capacity 1.5 mm²

Flow rate at 90 PSI (6 bar) in SCFM (l/min ANR) .... 2.1 (60)

Manual Control .................................................. Yes

Materials –
- Body .......................................................... Polyamide
- Poppet ..................................................... Polyurethane
- Seals .......................................................... Nitrile (Buna N)

Mounting ...................................................... 3-Ported Subbase

Number of Operations with Dry Air at 90 PSI and 70°F,
Frequency 1 Hz .................................................. 10 Million

Operating Positions ........................................... All Positions

Operating Pressure ...................................... 40 to 115 PSIG (3 to 8 bar)

Rated Insulation Voltage .................................. 660V AC or DC

Response Time ................................................ 8 to 12 msec

Standard Voltages –

| 24 VDC | 48 VDC | 24 VAC | 48 VAC | 120 VAC | 240 VAC |

Temperature –
Operating ........................................... 32°F to 122°F (0°C to +50°C)
Storage ........................................... -22°F to 140°F (-30°C to +60°C)

Dimensions

PRSA121B
Electrical Pressure Switch
Without Subbase
For Mounting On Any 2 or 3-Port Base

Part Numbers

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPS10/2</td>
<td>1.5 to 30 PSIG Adjustable Senses Presence of Air Pressure to provide Electrical Switching</td>
</tr>
<tr>
<td>LPS10/3</td>
<td>10 to 100 PSIG Adjustable Senses Presence of Air Pressure to provide Electrical Switching</td>
</tr>
</tbody>
</table>

Units supplied with 3 crimp-on electrical terminals with insulators.

Electrical Characteristics
5A / 250V, 1 N.O. or 1 N.C. (SPDT) Contact

<table>
<thead>
<tr>
<th>Terminal Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Common</td>
</tr>
<tr>
<td>2</td>
<td>Normally Passing</td>
</tr>
<tr>
<td>3</td>
<td>Normally Non-Passing</td>
</tr>
</tbody>
</table>

Specifications

Air Quality
- Standard Shop Air, Lubricated or Dry, 40 µm Filtration

Degree of Protection
- IP40 with Molded Connector

Depilot Pressure
- Differential less than 25% of maximum range

Electrical Connection
- Spade Connectors or Molded Cable

Function
- SPDT Contacts (NO or NC)

Insulation Voltage Rating
- 250V AC or DC

Materials
- Body: Polyamide
- Poppet: Acetal
- Seals: Nitrile (Buna N)

Maximum Operating Frequency
- 2 Hz

Mechanical Life
- 10 Million Operations

Mounting
- 2 or 3-Port Subbase

Number of Operations with Dry Air at 90 PSI and 70°F – Frequency 1 Hz
- 10 Million

Operating Positions
- All Positions

Operating Pressure
- 115 PSIG (8 bar Max.)

Rated Current
- 5A (3A with 7097J03711 Cable)

Temperature
- Operating:
  - 32°F to 122°F (0°C to +50°C)
- Storage:
  - -22°F to 140°F (-30°C to +60°C)

Trip Pressure
- LPS10/2 - 1.5 to 30 PSI (0.1 to 2 bar) Adjustable
- LPS10/3 - 10 to 100 PSI (0.7 to 7 bar) Adjustable

Dimensions

Locating pin
- 0.112 Dia. x .06 Long

Signal (a or 1)
Line Mounted Pressure Switch
(Includes Manual Override and Visual Indicator)

Specifications

Adjustable Trip Pressure
30 to 75 PSI (2 to 5 bar)

Air Quality
Standard Shop Air, Lubricated or Dry, 40 µm Filtration

Degree of Protection
IP 40

Electrical Connections
Screw Terminals

Fixed Trip Pressure
≥20 PSI (1.3 bar)

Function
SPDT Contacts

Insulation Voltage Rating
250V AC or DC

Materials
- Body................................................................. Polyamide
- Poppet............................................................... Polyurethane
- Seals................................................................. Nitrile (Buna N)

Maximum Operating Frequency
10 Hz

Mounting
Inline or 35 mm DIN Rail

Nominal Current Rating
5 A

Number of Operations with Dry Air at 90 PSI and 70°F – Frequency 1 Hz
10 Million

Operating Positions
All Positions

Operating Pressure
115 PSIG Max. (8 bar)

Ports
5/32“ Instant for Semi- Rigid Nylon or Polyurethane Tube

Response Time
2 to 3 msec

Temperature
Operating
32°F to 122°F (0°C to +50°C)

Storage
-22°F to 140°F (-30°C to +60°C)

Electrical Life

<table>
<thead>
<tr>
<th>Type of Circuit</th>
<th>AC (Switching Capacity in VA)</th>
<th>DC (Switching Capacity in W)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12V 24V 48V 120V 220V</td>
<td>12V 24V 48V 110V 220V</td>
</tr>
<tr>
<td>For 1 Million Operations AC</td>
<td>15 25 56 115 140</td>
<td>17 24 37 50 54</td>
</tr>
<tr>
<td>DC</td>
<td>54 86 190 370 440</td>
<td>42 58 88 115 105</td>
</tr>
<tr>
<td>For 2 Million Operations AC</td>
<td>- - - - -</td>
<td>10 14 25 40 23</td>
</tr>
<tr>
<td>DC</td>
<td>- - - - -</td>
<td>30 43 70 100 90</td>
</tr>
<tr>
<td>For 5 Million Operations AC</td>
<td>8 10 14 19 21</td>
<td>- - - - -</td>
</tr>
<tr>
<td>DC</td>
<td>21 35 82 160 200</td>
<td>- - - - -</td>
</tr>
</tbody>
</table>

Dimensions

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS1P1081</td>
<td>1SPDT Contact 5A / 250V Fixed Switching Pressure</td>
</tr>
<tr>
<td>PS1P1091</td>
<td>1SPDT Contact 5A / 250V Adjustable Switching Pressure</td>
</tr>
</tbody>
</table>
Pressure Switch Without Subbase
For Mounting On Any 2 or 3-Port Base

Specifications

Air Quality –
Standard Shop Air, Lubricated or Dry, 40 μm Filtration

Degree of Protection ........................................ IP 65

Depilot Pressure ........................................... 30 to 37 PSI (2 to 2.6 bar)

Electrical Characteristics.... N.O. (NNP) Contact, 5A / 660V

Electrical Connection –
Plug-in Connector, 22-30 mm,
Ø 9 mm Cable Entry,
Terminal Capacity 1.5 mm2

Function .............................................................. NO Contact

Insulation Voltage Rating ............................................ 660V AC or DC

Materials
- Body .................................................................. Polyamide
- Poppet........................................................... Polyurethane
- Seals ......................................................... Nitrile (Buna N)

Maximum Operating Frequency ........................................ 10 Hz

No-Mounting ........................................... 2 or 3-Ported Subbase

Nominal Current Rating ............................................. 10 A

Number of Operations with Dry Air at 90 PSI and 70°F,
Frequency 1 Hz ...................................................... 10 Million

Operating Positions ............................................ All Positions

Operating Pressure ........................................ 115 PSIG Max. (8 bar)

Response Time .................................................. 2 to 3 msec

Temperature –
Operating .................................................. 32°F to 122°F (0°C to +50°C)
Storage .................................................. -22°F to 140°F (-30°C to +60°C)

Trip Pressure .................................................... 32 to 40 PSI (2.2 to 3 bar)

Mechanical Life –

Dimensions

Part Number | Description
--- | ---
PREA10 | With Manual Override and Plug-in DIN Connector 22 x 30 mm
PREA12 | PREA10 on PZUA12 Subbase

Volts

<table>
<thead>
<tr>
<th>Volt Ampere</th>
<th>24</th>
<th>48</th>
<th>110</th>
<th>220</th>
<th>380</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 million operations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 million operations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 million operations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

VA

Volts

2.00 (51)
1.00 (25)
1.25 (32)
1.38 (35)
1.34 (34)
1.57 (40)

Manual Override
Vacuum Switch
For Mounting On Any 2 or 3-Port Base

Signal
(a or 1 - Green)

LPSV10

Part Number | Description
--|--
LPSV10 | Senses Presence of Vacuum

Units supplied with 3 crimp-on electrical terminals with insulators.

Electrical Characteristics
5A / 250V, 1 N.O. or 1 N.C. (SPDT) Contact

<table>
<thead>
<tr>
<th>Terminal Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Common</td>
</tr>
<tr>
<td>2</td>
<td>Normally Passing</td>
</tr>
<tr>
<td>3</td>
<td>Normally Non-Passing</td>
</tr>
</tbody>
</table>

Specifications

Air Quality
Standard Shop Air, Lubricated or Dry, 40 µm Filtration

Degree of Protection
IP40 with Molded Connector

Depilot Pressure
Differential less than 25% of maximum range

Electrical Connection
Spade Connectors or Molded Cable

Function
SPDT Contacts (NO or NC)

Insulation Voltage Rating
250V AC or DC

Materials
- Body: Polyamide
- Poppet: Acetal
- Seals: Nitrile (Buna N)

Maximum Operating Frequency
2 Hz

Mechanical Life
10 Million Operations

Mounting
2 or 3-Port Subbase

Number of Operations with Dry Air at 90 PSI and 70°F – Frequency 1 Hz
10 Million

Operating Positions
All Positions

Operating Pressure
115 PSIG (8 bar Max.)

Rated Current
5A (3A with 7097J03711 Cable)

Temperature
Operating
32°F to 122°F (0°C to +50°C)
Storage
-22°F to 140°F (-30°C to +60°C)

Trip Pressure
LPS10/2 - 1.5 to 30 PSI (0.1 to 2 bar) Adjustable
LPS10/3 - 10 to 100 PSI (0.7 to 7 bar) Adjustable

Dimensions
# Logic 3 & 4-Port Modular Subbases

## 3-Port Subbases
**With 5/32” Instant Swivel Connections, Pressure Indicators and Integral Lock for Stacking**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PZUA12</td>
<td>Common Input</td>
</tr>
<tr>
<td>PZUC12</td>
<td>Cascade</td>
</tr>
</tbody>
</table>

## 4-Port Subbases
**With 5/32” Instant Swivel Connections, Pressure Indicators and Integral Lock for Stacking**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PZUB12</td>
<td>Common Input</td>
</tr>
</tbody>
</table>

## Entry Module
**With Integral Lock for Stacking**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PZUE12</td>
<td>Relay Entry Module (Used with PZUA12, PZUB12 and PZUC12 Bases)</td>
</tr>
</tbody>
</table>

## Specifications

**Materials**
Polyamide and Brass

**Ports**
5/32” Instant for Semi-Rigid Nylon or Polyurethane Tube

**Notes:**
1. Can be used as individual units or in stacking assemblies.
2. May be DIN rail mounted using spring clip or surface mounted using 2 socket head cap screws.
3. PZUA12, PZUB12 and PZUC12 can be mounted together in the same assembly.
4. Units interconnect with 5/32” Tube. For replacement use 1” (25mm), 5/32” semi-rigid nylon or polyurethane.

## Dimensions

**PZUE12, PZUC12, PZUA12**

<table>
<thead>
<tr>
<th>Clip (5/32&quot;) Instant</th>
<th>5/32“ (0.17) Thru (4.27) C Bore (0.185) Deep</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.17 (4.2) Thru (7.0) C Bore (0.185) Deep</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PZUB12</th>
<th>5/32“ (0.17) Thru (4.27) C Bore (0.185) Deep</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.17 (4.2) Thru (7.0) C Bore (0.185) Deep</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>inch</th>
<th>mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.55</td>
</tr>
<tr>
<td>B</td>
<td>0.39</td>
</tr>
<tr>
<td>C</td>
<td>0.59</td>
</tr>
<tr>
<td>D</td>
<td>0.47</td>
</tr>
<tr>
<td>E</td>
<td>0.20</td>
</tr>
<tr>
<td>F</td>
<td>0.59</td>
</tr>
</tbody>
</table>
**Independent Base**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th># of Ports</th>
</tr>
</thead>
<tbody>
<tr>
<td>BNC3P10</td>
<td>1/8&quot; NPT, Individual Mount</td>
<td>3</td>
</tr>
<tr>
<td>BPB3P10</td>
<td>5/32 Instant Fitting, Machine Mount</td>
<td>3</td>
</tr>
</tbody>
</table>

**Specifications**

Materials (BNC) ........................................... Plated Zinc

Materials (BPB) ............................................. Aluminum

**Dimensions**

**BNC3P10**

- 2 Mtg. Holes .17 Dia. Thru Cbore .29 Dia. x .19 Deep
- 3 Holes .118 Dia. 1 Hole .130 Dia. x .138 Deep

**Independent 2-Port Pulse Base**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BNC3P20</td>
<td>1/8&quot; NPT, Port 1 and 2 Common</td>
</tr>
<tr>
<td>BPB3P20</td>
<td>5/32 Instant Fitting, Machine Mount, Port 1 and 2 Common</td>
</tr>
</tbody>
</table>

**Specifications**

Materials (BNC) ........................................... Plated Zinc

Materials (BPB) ............................................. Aluminum

**Dimensions**

**BNC3P20**

- 2 Mtg. Holes .17 Dia. Thru Cbore .29 Dia. x .19 Deep
- 3 Holes .118 Dia. 1 Hole .130 Dia. x .138 Deep

**BPB3P10**

- .24 Dia. thru typ.
- 3 Ports Tapped 1/8
- .17 Dia. thru typ.

**BPB3P20**

- .24 Dia. thru typ.
- 3 Ports Tapped 1/8
- .17 Dia. thru typ.
**Base Usage** - Shows which components can be mounted with which base types.

<table>
<thead>
<tr>
<th>Element</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Base Description / Part Number</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td><strong>2-Port</strong></td>
</tr>
<tr>
<td>Stacking</td>
<td>PZUA12</td>
</tr>
<tr>
<td>Stacking</td>
<td>PZUC12</td>
</tr>
<tr>
<td>Inline</td>
<td>BNC3P20</td>
</tr>
<tr>
<td>Inline</td>
<td>BPB3P20</td>
</tr>
</tbody>
</table>

**Step Module**
- Step Module w/Overrides: PSMA10
- Step Module w/o Overrides: PSMB10

**Logic**
- AND: PLLC10
- OR: PLKC10
- YES: PLJC10
- NO: PLNC10
- Threshold NOT: PLND10

**Relays**
- Sensor: PRFA10
- Solenoid: PRSA10
- Electric Pressure Switch: PREA10
- E/P Pressure Switch: LNOTPS10
- Electric Pressure Switch: LPS10
- Vacuum/Electric: LPSV10

**Timers**
- Timer (NNP) Relay: PRTA10
- Timer (NNP) Relay: PRB10
- Timer (NNP) Relay: PRTE10
- Timer (NP) Relay: PRTC10
- Timer (NP) Relay: PRTD10
- Timer (NP) Relay: PRTF10

**Other Relays**
- Memory Relay: PLMA10
- Amplifier Relay: PRDA10

*Functionality Must be Checked.

<table>
<thead>
<tr>
<th>Port</th>
<th>Label</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply</td>
<td>P</td>
<td>Black / None</td>
</tr>
<tr>
<td>Signal</td>
<td>a</td>
<td>Green</td>
</tr>
<tr>
<td>Output</td>
<td>S</td>
<td>Red</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Entry Module</th>
<th>Head / Tail</th>
</tr>
</thead>
<tbody>
<tr>
<td>PZUE12</td>
<td>PSEA127</td>
</tr>
<tr>
<td>PZUA12</td>
<td>PSBA12</td>
</tr>
<tr>
<td>PZUC12</td>
<td>PZUB12</td>
</tr>
</tbody>
</table>
CAUTION: The logic and relay units shown on the right can be improperly assembled to the bases shown on the left. For proper assembly, the locators shown should be oriented towards port 3 on the subbases.
Catalog PCC-4/USA
Part Numbers

With 5/32" Instant Straight Connections

Totalizing Counters

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCTA11</td>
<td>0 to 999,999 Surface Mount</td>
</tr>
<tr>
<td>PCTB11</td>
<td>0 to 99,999 Panel Mount with 60 x 50 mm Bezel (Lockable cover available, see below)</td>
</tr>
</tbody>
</table>

Predetermined Counters

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCPA11</td>
<td>0 to 99,999 Panel Mount with 60 x 75 mm Bezel (Lockable cover available, see below)</td>
</tr>
</tbody>
</table>

Lockable Cover

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PXCA1</td>
<td>For 60 x 50 mm Bezel</td>
</tr>
<tr>
<td>PXCB1</td>
<td>For 60 x 75 mm Bezel</td>
</tr>
</tbody>
</table>

Timers with Calibrated Dial

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCMC11</td>
<td>3 to 100 Seconds, With Reset</td>
</tr>
<tr>
<td>PCMD11</td>
<td>0.3 to 10 Minutes, With Reset</td>
</tr>
<tr>
<td>PCME11</td>
<td>3 to 100 Minutes, With Reset</td>
</tr>
</tbody>
</table>

Dimensions

Logic
Impulse Counters & Dial Timers
Specifications

<table>
<thead>
<tr>
<th>Connections</th>
<th>PCTA</th>
<th>PCTB</th>
<th>PCPA</th>
<th>PCMC, PCMD &amp; PCME</th>
</tr>
</thead>
</table>

| Degree of Protection | — | — | IP55 with Lockable Cover | — |
| Degree of Protection | — | — | NNP or NP | — |

| Maximum Operating Frequency | 20 Hz with Mark / Space Ratio of 1/1 | — | — | — |
| Mechanical Life (Number of Operations) with Dry Air at 90 PSI and 70°F – Frequency 1 Hz | 10 Million | — | 10 Million | — |

| Mounting | Surface Mount | Panel Mount | Panel Mount | Panel Mount |
| Mounting | All Positions | All Positions | All Positions | All Positions |

| Operating Pressure | 40 to 130 PSI (3 to 9 bar) | — | 40 to 130 PSI (3 to 9 bar) | — |
| Operating Pressure | 32°F to 140°F (0°C to 60°C) | — | 32°F to 122°F (0°C to 50°C) | — |

| Pneumatic Reset Time | 150 ms | 150 ms | 150 ms | 200 ms |
| Setting Accuracy | — | — | — | — |

| Storage Temperature | -40°F to 160°F (-40°C to 70°C) | — | -22°F to 140°F (-30°C to 60°C) | ± 2% |
| Timing Accuracy | — | — | — | — |

| Type of Air | Dry with 40 µm Filtration | Dry with 5 µm Filtration |

Operating Characteristics

**PCTA11 and PCTB11**
- Count and display the Number of impulses received.
- Pulse input at Port Z.
- Pneumatic reset at Port Y.

**PCPA11**
- Supplies a signal at A when the preselected Number of pulses has been reached.
- The required Number of impulses is preselected using the keys associated with the lower display, which remains unchanged during counting.
- The pulses to be counted are applied to Port Z. Signal A is given as soon as the two displays show the same value.
- Port Y is used to reset the counter with a single pulse. (1)

**PCMC11, PCMD11 and PCME11**
- The required time is preselected directly on the dial, by moving the preselection pointer to the required position.
- Timing starts when a signal appears at 12.
- This signal must be maintained continuously until the output signal appears at 2.
- Signal 2 is given at the end of the timing period.
- The output signal is “on delay” if connected to 2 and “off delay” if connected to 4.
- The timer is reset by breaking the command signal at 12.
- Units have constant bleed rate of 0.14 SCFM @ 72 PSIG (4Nl/min @ 5 bar)

---

(1) Note: “Output” may not be used as the reset signal.
**Binary Counter Valve**

**Part Numbers**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2147900</td>
<td>Pneumatic Actuated</td>
</tr>
<tr>
<td>2147950</td>
<td>Electric Actuated</td>
</tr>
</tbody>
</table>

**Features**

This valve is controlled by an internal integrated sequence system and utilizes the ball-point principle. (Two pilot spools and a main spool are fully integrated in an aluminum block.)

**Specifications**

**Air Quality** –
- Standard Shop Air, Lubricated or Dry, 50 µm Filtration
- Flow: 460 Nl/min

**Materials** –
- Body: Anodized Aluminum
- Other: Steel
- Seals: NBR and PTFE
- Spool: Brass

**Mounting** – M4 Bolts Thru Holes in Mounting Plate

**Operating Pressure** – 58 to 145 PSIG (4 to 10 bar)

**Ports** –
- Pneumatic: 1/4" (Ports 1,2,3,4,5)
- Actuation Port: 1/8"
- Electrical: 1/4" (Ports 1,2,3,4,5)
- Electrical Connection: P2E Solenoid, DIN 43650 Form C

**Temperature Range** – 32°F to 158°F (0°C to +70°C)

**2147950** – (Solenoid & Cable Plug Must be Ordered Separately)
- Solenoid (Manual Override, Non-locking): P2E-KV32C1
- Cable Plug: P8C-H

**Dimensions**

**2147900**

- 3.23 (82) Dia.
- 2.44 (62) Dia.
- 1.13 (30) Dia.
- 1.77 (45) Dia.
- 4 Places
- 1/8" Port

**2147950**

- 3.23 (82) Dia.
- 2.44 (62) Dia.
- 1.13 (30) Dia.
- 1.77 (45) Dia.
- 4 Places
- 1/8" Port
DIN Rail

Subbase Plugs for 3 or 4-Port Subbases

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Base Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPRL05</td>
<td>PZUA12</td>
<td>1 Set of 50 Subbase Plugs</td>
</tr>
<tr>
<td></td>
<td>PZUB12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PZUC12</td>
<td></td>
</tr>
</tbody>
</table>

Head and Tail Module
Rail Clamping Components

Mylar Diaphragms for Amplifier Relays

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Base Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPRL09</td>
<td>PSEA12</td>
<td>1 Set Comprising Of:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- 20 Hooks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- 20 Screws</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- 20 Springs</td>
</tr>
</tbody>
</table>

Base Mounted Component Screws M4 x 0.7 With 7mm Head Diameter

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Element</th>
<th>Screw Length</th>
<th>Replacement Screw Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLMA10</td>
<td>Memory Relay</td>
<td>50 mm</td>
<td>K05M11040050</td>
</tr>
<tr>
<td>PREA10</td>
<td>Electric Pressure Switch</td>
<td>12 mm</td>
<td>K05M11040012</td>
</tr>
<tr>
<td>PRTA10</td>
<td>Timer (NNP) Relay</td>
<td>12 mm</td>
<td>K05M11040012</td>
</tr>
<tr>
<td>PRTB10</td>
<td>Timer (NNP) Relay</td>
<td>12 mm</td>
<td>K05M11040012</td>
</tr>
<tr>
<td>PRTC10</td>
<td>Timer (NP) Relay</td>
<td>12 mm</td>
<td>K05M11040012</td>
</tr>
<tr>
<td>PRTD10</td>
<td>Timer (NP) Relay</td>
<td>12 mm</td>
<td>K05M11040012</td>
</tr>
<tr>
<td>PRTE10</td>
<td>Timer (NNP) Relay</td>
<td>12 mm</td>
<td>K05M11040012</td>
</tr>
<tr>
<td>PRTF10</td>
<td>Timer (NP) Relay</td>
<td>12 mm</td>
<td>K05M11040012</td>
</tr>
<tr>
<td>PSMA10</td>
<td>Step Module w/Overrides</td>
<td>50 mm</td>
<td>K05M11040050</td>
</tr>
<tr>
<td>PSMB10</td>
<td>Step Module w/o Overides</td>
<td>50 mm</td>
<td>K05M11040050</td>
</tr>
</tbody>
</table>
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.


1.4. 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, keytones, 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.
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.


4.4. 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.
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