Product Description

The Hans Rudolph line of Inflatable Balloon-Type directional control valves are designed specifically for use in respiratory circuits where a valve is required for directional control in the breathing circuit. These valves contain a proprietary inflatable silicone rubber balloon assembly that when inflated occludes (closes off) a flow bore of the valve. Valve configurations are available with one (one-way) through four balloons (five-way) depending on the directional control requirements of the circuit design. The inflatable balloon component will operate for several thousand inflations and is easily replaceable in the field. Controllers are available for use with these valves for manual and external input control of the balloon valve actuation. Typical applications include pulmonary function testing, exercise testing, and primarily respiratory research.

Product Features

- Valve housings machined and polished of clear Acrylic for balloon actuation visualization
- Balloon inflation and deflation actuation is quick at 120 ms response time
- Minimal valve breathing resistance to flow
- Minimal valve rebreathing dead space volume
- Three standard port sizes available
- Port connections thread into valve housing for ease of changing sizes
- Pneumatic Controllers available for one through four balloon valves
- Pneumatic hand controls available for one and two balloon valves
- Sampling ports standard at the common port on all valves
- Custom configurations of valves available
- Custom connections (medical tapered, o-ring slip-fit, coupler lock-ring assembly) available
- Reusable

Specifications

<table>
<thead>
<tr>
<th>Valve Series</th>
<th>Description</th>
<th>Number of Balloons</th>
<th>Number of Valve Ports</th>
<th>Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>9340</td>
<td>2 Way Shut-Off</td>
<td>1</td>
<td>1</td>
<td>Straight-Through</td>
</tr>
<tr>
<td>8240</td>
<td>3 Way</td>
<td>2</td>
<td>2</td>
<td>Y-Shape</td>
</tr>
<tr>
<td>8250</td>
<td>3 Way</td>
<td>2</td>
<td>2</td>
<td>T-Shape</td>
</tr>
<tr>
<td>2540</td>
<td>4 Way</td>
<td>3</td>
<td>3</td>
<td>Gatlin-Shape</td>
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<tr>
<td>2550</td>
<td>4 Way</td>
<td>3</td>
<td>3</td>
<td>Gatlin-Shape</td>
</tr>
<tr>
<td>2440</td>
<td>5 Way</td>
<td>4</td>
<td>4</td>
<td>Gatlin-Shape</td>
</tr>
</tbody>
</table>

Applicable Standards for medical tapered port connections: Hans Rudolph’s 15mm, 22mm & 30mm tapered port connections meet the ISO 5556-1:2015 (E) Standard for Conical Connectors, Cones and Sockets. Other non-standard tapered port connections 7.5mm & 10.5mm are also designed with the same conical taper specifications.

General Information

Intended Use

Inflatable Balloon-Type valves are designed for use as a directional flow control valve in a respiratory circuit. These valves can be assembled with two way non-rebreathing valves to provide additional functions as required by the application. These valves contain a proprietary inflatable silicone rubber balloon that when inflated occludes (closes off) a flow bore of the valve. When the balloon element is not inflated air flow is allowed through that flow bore of the valve. Valves are designed as one-way through five-way configurations. Typical applications are pulmonary function testing, exercise testing and respiratory research. These valves are not designed to be used in life support systems such as a ventilator circuit. The inflatable balloon component of the valve is a replacement item that will rupture after several thousand inflations. Pneumatic controllers are available for these valves.

Controller information refer to Data Sheet 691112

Manual Pneumatic Hand Control Switch for one or two balloon valves requires a regulated 6 PSI source refer to Data Sheet 691086 for one balloon and Data Sheet 691097 for two balloon switches

These Products are packaged and shipped clean, non-sterile

Other Inflatable Balloon-Type Valves configured with 2 Way Non-Rebreathing for specific applications:
- 8200 Series for Cardiac Output CO₂ Rebreathing Setup (Data Sheet 691097)
- 9300 Series for Inspiratory Occlusion Pressure Setup (Data Sheet 691096)

Cautions

1. These valves are not intended for use in a ventilator or other life support system
2. Do not ethylene oxide, steam sterilize or pasteurize these valves
3. Federal (USA) law restricts these devices to sale by or on the order of a physician

Warnings & Risks

Refer to the Instructions for Use 691198 shipped with the product

Ambient Conditions

- Temperature: 5°C to 40°C
- Relative Humidity: 0% - 95% (non-condensing)
**Product Description**

The Hans Rudolph line of Inflatable Balloon-Type directional control valves are designed specifically for use in respiratory circuits where a valve is required for directional control in the breathing circuit. These valves contain a proprietary inflatable silicone rubber balloon assembly that when inflated occludes (closes off) a flow bore of the valve. Valve configurations are available with one (one-way) through four balloons (five-way) depending on the directional control requirements of the circuit design. The inflatable balloon component will operate for several thousand inflations and is easily replaceable in the field. Controllers are available for use with these valves for manual and external input control of the balloon valve actuation. Typical applications include pulmonary function testing, exercise testing, and primarily respiratory research.

**Product Features**

- Valve housings machined and polished of clear Acrylic for balloon actuation visualization
- Balloon inflation and deflation actuation is quick at 120 ms response time
- Minimal valve breathing resistance to flow
- Minimal valve rebreathing dead space volume
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- Port connections thread into valve housing for ease of changing sizes
- Pneumatic Controllers available for one through four balloon valves
- Pneumatic hand controls available for one and two balloon valves
- Sampling ports standard at the common port on all valves
- Custom configurations of valves available
- Custom connections (medical tapered, o-ring slip-fit, coupler lock-ring assembly) available
- Reusable

**Specifications**

**Applicable Standards**

For medical tapered port connections: Hans Rudolph's 15mm, 22mm & 30mm tapered port connections meet the ISO 5356-1:2015 (E) Standard for Conical Connectors, Cones and Sockets. Other non-standard tapered port connections 7.5mm & 10.5mm are also designed with the same conical taper specifications.

**General Information**

**Intended Use**

Inflatable Balloon-Type valves are designed for use as a directional flow control valve in a respiratory circuit. These valves can be assembled with two way non-rebreathing valves to provide additional functions as required by the application. These valves contain a proprietary inflatable silicone rubber balloon that when inflated occludes (closes off) a flow bore of the valve. When the balloon element is not inflated air flow is allowed through that flow bore of the valve. Valves are designed as one-way through five-way configurations. Typical applications are pulmonary function testing, exercise testing and respiratory research. These valves are not designed to be used in life support systems such as a ventilator circuit. The inflatable balloon component of the valve is a replacement item that will rupture after several thousand inflations. Pneumatic controllers are available for these valves. Refer to Instructions for Use 691198 and Service Manual 691113 shipped with the Inflatable Balloon-Type Valves and Pneumatic Controller for product cleaning, disinfection, operating instructions and maintenance.

**Controller information**

refer to Data Sheet 691112 Manual Pneumatic Hand Control Switch for one or two balloon valves requires a regulated 6 PSI source refer to Data Sheet 691096 for one balloon and Data Sheet 691097 for two balloon switches

These Products are packaged and shipped clean, non-sterile

Other Inflatable Balloon-Type Valves configured with 2 Way Non-Rebreathing for specific applications:

- 8200 Series for Cardiac Output CO₂ Rebreathing Setup (Data Sheet 691097)
- 9300 Series for Inspiratory Occlusion Pressure Setup (Data Sheet 691096)

**Cautions**

1. These valves are not intended for use in a ventilator or other life support system
2. Do not ethylene oxide, steam sterilize or pasteurize these valves
3. Federal (USA) law restricts these devices to sale by or on the order of a physician

**Warnings & Risks**

Refer to the Instructions for Use 691198 shipped with the product

**Ambient Conditions**

- Temperature:  5ºC to 40ºC
- Relative Humidity:  0% - 95% (non-condensing)

**FLOW DIAGRAMS**

The arrows represent available gas flow paths through the valve with balloons in both available models of inflation and deflation.

**VOLUME DEAD SPACE ILLUSTRATIONS**

The shaded areas represent the rebreathing volume dead space, refer to Physical Characteristics Tabulation for data.

**Differential Pressure (dp)cm Water**

<table>
<thead>
<tr>
<th>Model Number</th>
<th>2440A</th>
<th>2440B</th>
<th>2440C</th>
<th>9340A</th>
<th>9340B</th>
<th>9340C</th>
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<tbody>
<tr>
<td>Flow Path Angle</td>
<td>180°</td>
<td>180°</td>
<td>180°</td>
<td>180°</td>
<td>180°</td>
<td>180°</td>
</tr>
<tr>
<td>50</td>
<td>.12</td>
<td>.09</td>
<td>.10</td>
<td>.19</td>
<td>.16</td>
<td>.10</td>
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<tr>
<td>100</td>
<td>.47</td>
<td>.32</td>
<td>.37</td>
<td>.75</td>
<td>.63</td>
<td>.35</td>
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<tr>
<td>200</td>
<td>1.68</td>
<td>1.23</td>
<td>1.48</td>
<td>3.02</td>
<td>2.57</td>
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<tr>
<td>300</td>
<td>4.20</td>
<td>2.93</td>
<td>3.34</td>
<td>6.78</td>
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<td>400</td>
<td>7.49</td>
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<td>600</td>
<td>16.93</td>
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<td>13.44</td>
<td>27.42</td>
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</table>

I - Balloon at Inlet Port
O - Balloon at Outlet Port
### TABULATION FOR EXPLODED ASSEMBLY DRAWINGS

Describes the models and components, replacement part numbers with material description, protective finish and appearance. Replacement available only at Hans Rudolph, Inc. Return to Hans Rudolph, Inc for a quotation on replacement, repair or other services.

#### Model Number

<table>
<thead>
<tr>
<th>Part Number (PIN)</th>
<th>9340A</th>
<th>9340B</th>
<th>9340C</th>
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<th>8240B</th>
<th>8240C</th>
<th>8250A</th>
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</tr>
</tbody>
</table>

### Prices & Specifications subject to change without notice


#### PHYSICAL CHARACTERISTICS

**Port Tube Size:** The 22mm diameter is tapered. All other size diameters are straight.

#### Port Tube Sizes:

<table>
<thead>
<tr>
<th>Inlet / Outlet Port Tubes</th>
<th>Outside Diameter: (mm)</th>
<th>22</th>
<th>26.6</th>
<th>35</th>
<th>22</th>
<th>26.6</th>
<th>35</th>
<th>22</th>
<th>26.6</th>
<th>35</th>
<th>22</th>
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<th>22</th>
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<td>26.6</td>
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<td>19</td>
<td>22</td>
<td>26.6</td>
<td>19</td>
<td>22</td>
<td>26.6</td>
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<td>26.6</td>
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<td>26.6</td>
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<td>26.6</td>
<td>35</td>
<td>22</td>
<td>26.6</td>
<td>35</td>
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<tr>
<td></td>
<td>Inside Diameter: (mm)</td>
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<td></td>
<td>19</td>
<td>22</td>
<td>26.6</td>
<td>19</td>
<td>22</td>
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<td>386</td>
<td>396</td>
<td>619</td>
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<tr>
<td>Overall Size (Subject to Mouth Port Tube):</td>
<td>Width (Side to Side): (mm)</td>
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<td>Height (Top to Bottom): (mm)</td>
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<td>91.1</td>
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<td>Depth (Front to Back): (mm)</td>
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<td>142.8</td>
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<tr>
<td>Rebreathing Volume Dead Space:</td>
<td>Total Vole (Housing &amp; Mouth Port Tube): (ml)</td>
<td>40.5</td>
<td>48.5</td>
<td>63.5</td>
<td>30</td>
<td>34</td>
<td>41.5</td>
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<td>35.5</td>
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<td>54.4</td>
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<td>74</td>
<td>86</td>
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<td>Housing Only (Balloons Inflated - except 9440): (ml)</td>
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<td></td>
<td>22.5</td>
<td></td>
<td>18</td>
<td>21</td>
</tr>
</tbody>
</table>

**†Rebreathing Volume Dead Space** is the measured volume of space in the common port / mouth port tube and the remaining space in the valve housing when the balloons are inflated.

**‡Flow Bore** is the minimal inside diameter (ID) which effects the flow characteristics of a valve.

1 Volume from inlet port to outlet port (end to end) with balloon deflated.
2 Volume of two ports (inlet and outlet) added together.
3 Volume of housing only (less the port tubes & with balloons deflated).

### Material Description


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ORDERING INFORMATION - Valve Models, Automated & Manual Controllers

- For information and order numbers of replacement parts, refer to exploded assembly drawings and tabulation.
- For prices, refer to Detailed Price List.
- Order by complete part number (P/N), Model Number and description.
- Valves are available with different sizes of Inlet / Outlet and Common Port / Mouth Port Tubes. The outside and inside diameter (OD & ID) combinations are as follows: 22mmOD taper / .750"(19.0mm) ID 1.125"(28.6mm) OD / 22mmID taper 1.375"(35.0mm) OD / 1.125" (28.6mm) ID
- All valves, except the model number series 9340 are provided with a Mouth Port Tube Sampling Port Hose Barb which fits into .093" ID tubing. Various types of sampling ports, for example, hose barb and female luver-lock are available installed per your required location, on special order as noted in the following ordering information - accessories.
- Automated Directional Control Valves - Large Inflatable Balloon-Type™ have a 1.087 inch (27.7mm) Flow Bore Passage Inside Diameter (ID).
- Automated Controllers and Manual Hand Control Switches are listed with each valve series.

RUDOLPH AUTOMATED DIRECTIONAL CONTROL VALVES - LARGE INFLATABLE BALLOON-TYPE™ AND CONTROLLERS

P/N-Model No.  Automated Directional Control Valve, Two-Way Shut-Off Valve, Large.

9340 Series:
112564-9340A  Automated Directional Control Valve, Two-Way Shut-Off Valve, Large. Both Inlet / Outlet Port Tubes are 22mmOD taper / .750"(19.0mm) ID. A Common Port / Mouth Port is not applicable. Automated Directional Control Valve, Two-Way Shut-Off Valve, Large. Both Inlet / Outlet Port Tubes are 1.125"(28.6mm)OD/22mmID taper. A Common Port / Mouth Port is not applicable.  
112565-9340B  Automated Directional Control Valve, Two-Way Shut-Off Valve, Large. Both Inlet / Outlet Port Tubes are 1.375"(35.0mm)OD/1.125" (28.6mm)ID. A Common Port / Mouth Port is not applicable. Automated Controller for Inflatable One Balloon, Two-Way Shut-Off Valves 9340 Series.
9330 Series:
112518-9330 One Balloon Controller, TTL Compatible Input.  
112520-9330F One Balloon Controller, TTL Compatible Input for Foreign 230V 50Hz, supplied less power plug unless country is noted on purchase order and Rudolph stocks that plug. 

Manual Hand Control Switch
This model operates all Three-Way Two-Balloon valve assemblies.

Automated Directional Control Valve, Four-Way T-Shaft™, Large.

2540 Series:
112403-2540A Automated Directional Control Valve, Four-Way T-Shaft™, Large. The Common Port / Mouth Port Tube and the three Inlet / Outlet Port Tubes are 22mm OD taper / .750"(19.0mm)ID. Automated Directional Control Valve, Four-Way T-Shaft™, Large. The Common Port / Mouth Port Tube and the Three Inlet / Outlet Port Tubes are 1.125"(28.6mm) OD / 22mmID taper. Automated Directional Control Valve, Four-Way T-Shaft™, Large. The Common Port / Mouth Port Tube and the Three Inlet / Outlet Port Tubes are 1.375" (35.0mm)OD / 1.125" (28.6mm) ID. Automated Directional Control Valve, Four-Way Gatlin-Shaft™ Large, (straight thru flow).

2550 Series:
112400-2550A Automated Directional Control Valve, Four-Way Gatlin-Shaft™, Large. The Common Port / Mouth Port Tube is 1.375"(35.0mm) OD/1.125" (28.6mm) ID. The three Inlet / Outlet Port Tubes are 22mm OD taper / .750" (19.0mm) ID. Automated Directional Control Valve, Four-Way Gatlin-Shaft™, Large. The Common Port / Mouth Port Tube is 1.375"(35.0mm) OD / 1.125" (28.6mm) ID. The three Inlet / Outlet Port Tubes are 1.125"(28.6mm) OD / 22mm ID taper. 

Automated Directional Control Valve, Four-Way Gatlin-Shaft™, Large. The Common Port / Mouth Port Tube and three Inlet / Outlet Port Tubes are 1.375" (35.0mm)OD / 1.125" (28.6mm) ID.
ORDERING INFORMATION - (Cont.)
Automated Controller for Inflatable Three Balloon, Four-Way Valves 2540 and 2550 Series.
2530 Series:
112509-2530 Three Balloon Controller, TTL Compatible Input.
112511-2530F Three Balloon Controller, TTL Compatible Input for Foreign 230V 50Hz, supplied less power plug unless country is noted on purchase order and Rudolph stocks that plug.

Automated Directional Control Valve, Five-Way Gatlin-Shape™, Large, (straight thru flow).
2440 Series:
112397-2440A Automated Directional Control Valve, Five-Way Gatlin-Shape™, Large. The Common Port / Mouth Port Tube is 1.375" (35.0mm) OD / 1.125" (28.6mm) ID. The four Inlet / Outlet Port Tubes are 22mm OD taper / .750" (19.0mm) ID.
112398-2440B Automated Directional Control Valve, Five-Way Gatlin-Shape™, Large. The Common Port / Mouth Port Tube is 1.375" (35.0mm) OD / 1.125" (28.6mm) ID. The four Inlet / Outlet Port Tubes are 1.125" (28.6mm) OD / 22mm ID taper.
112399-2440C Automated Directional Control Valve, Five-Way Gatlin-Shape™, Large. The Common Port / Mouth Port Tube is 1.375" (35.0mm) OD / 1.125" (28.6mm) ID. The four Inlet / Outlet Port Tubes are 1.375" (35.0mm) OD / 1.125" (28.6mm) ID.

Automated Controller for Inflatable Four Balloon Five-Way Valves 2440 Series.
2430 Series:
112505-2430 Four Balloon Controller, TTL Compatible input.
112507-2430F Four Balloon Controller, TTL Compatible input for FOREIGN 230V 50Hz supplied less power plug unless country is noted on purchase order and Rudolph stocks that plug.

ORDERING INFORMATION - Accessories for Automated Directional Control Valves.
Partial Listing. Refer to Data Sheets and Detailed Price List for additional information.

P/N-Model No.
1171218 Pliers. Tool for assembly and disassembly of retaining ring P/N 832201.

Sampling Ports - 1900 Series
200120-1914 Hose Barb Sampling Port 1915 Installed fits into .062" (1.6mm) bore flexible plastic tubing.
171161-1915 Hose Barb Sampling Port fits into .062" (1.6mm) bore flexible plastic tubing.
200121-1912 Hose Barb Sampling Port 1910 Installed fits into .093" (2.4mm) bore flexible plastic tubing.
171095-1910 Hose Barb Sampling Port fits into .093" (2.4mm) bore flexible plastic tubing.
200122-1922 Hose Barb Sampling Port 1920 Installed fits into .125" (3.2mm) bore flexible plastic tubing.
171163-1920 Hose Barb Sampling Port fits into .125" (3.2mm) bore flexible plastic tubing.
200123-1913 Female Luer-Lock Sampling Port 1917 Installed.
171179-1917 Female Luer-Lock Sampling Port.
EXPANDED ASSEMBLIES ILLUSTRATING REPLACEMENT OF BALLOON ASSEMBLY 200178-9308

Double Balloon Assembly. Applicable to Three-Way T-Shape™ Series 8250.

Single Balloon Assembly. Applicable to 2-Way Shut-Off, 3-Way Y-Shape™ 4-Way T-Shape™ 4-Way Gatlin-Shape™ and 5-Way Gatlin-Shape™ Series.

REPLACEMENT OF BALLOON ASSEMBLY 200178-9308
Refer to expanded Single or Double Balloon Assembly Illustrations while following these instructions.
- Un-thread Port Tubes from housing.
- Observe a shoulder on the center piece, which determines the direction to push for removing the balloon from the pneumatic housing. Note: The pneumatic housing having the gas supply hose barb connections is not to be removed.
- Place your finger inside of the valve housing and push out the balloon assembly with the center piece attached. (This balloon assembly is held in the pneumatic housing with an O-ring press fit.)
- Un-thread balloon assembly 9308 from center piece.
- Thread replacement balloon assembly onto center piece.
- Push complete assembly into pneumatic housing inside valve housing, note shoulder on center piece for direction of insertion.
- Replace port tubes following the suggested cleaning & maintenance procedure.

Assembly & Disassembly of Pneumatic Housing for complete valve cleaning.
Required Tool - Pliers P/N 171218 for removal and replacement of retaining ring, Large, P/N 832201, item 7 on exploded assembly drawing

CLEANING BALLOON ASSEMBLY P/N 200178-9308
(refer to line drawing below)
- Balloon Assembly consists of a two-part assembly. A Silicone Rubber Balloon mounted on a white plastic mandrel having a male thread for adapting to the center piece. This Balloon Assembly is a replaceable component and is not to be repaired, but disposed of after rupture or other failure.
- Cleaning the Balloon Assembly:
  1. Un-thread Balloon Assembly from Center Piece.
  2. At the male thread end, pull balloon lip out of groove. Use fingernails or tweezers which will not cut the Silicone Rubber Balloon. Peel the balloon membrane backwards to the opposite end where it is firmly held with an end cap. It is ready for cleaning.
  3. Dry thoroughly before returning membrane back to its original position into the groove.
  4. The Balloon Assembly is now ready for reassembly with center piece and reassembled in valve.

Line Drawing - Balloon Assembly

* If the end cap comes off, do not attempt to reassemble but dispose of it and replace it with a new balloon assembly.