These Five-Way T-Shape™ Stopcock-Type™ Series of Manual Directional Control Valves are available in multiple flow bore sizes to accommodate most respiratory flow circuit requirements, primarily low volume dead space & low resistance to flow. Four positions of the rotating plug (cone) control the direction of flow from the common port on the bottom to one of the four other selective inlet/outlet side ports on the housing. These valves have five ports in the valve housing. The flow path is right angled from the one common port located on the bottom to the four selective inlet/outlet ports on the side of the housing. These four port positions are at 90 degrees to each other. The plug is capable of 360 degrees rotation in either direction. There is an audible click at each position for exact alignment of the flow bores. If the plug is positioned in error between two side ports the flow path would become irregular, resulting in mixing of the flow gases between the ports. Refer to the illustrations in the flow diagram. This series of valves does not have any type of valve mounting.

The only other available Hans Rudolph Five-Way Directional Control Valves are a part of the group of Data Sheet 691106, Automated Directional Control Valves, Large Inflatable-Balloon Type™ and Five-Way Gallin-Shape™ Series 2440.

FLOW DIAGRAM
- The valve housing has four selective inlet/outlet side ports and one common port on the bottom.
- The four flow paths are right angled.
- Rotation of the plug is continuous throughout 360° in either direction.
- The “X” in the diagram represents flow path through the common port.

SPECIAL FEATURES
- Clear Plastic housing allows Visual Flow Confirmation & Inspection
- O-Rings and Washers are utilized in an aid in sealing.
- Housing Ports in each model have the same size female threads. This allows for interchangeability of adapters and other components.
- Valve is marked to indicate flow path.
- Audible click when flow bore is aligned.
- Valve mountings are NOT provided for connecting with Rudolph Valve Supports, because of insufficient space.
- Sampling Ports, Couplers & Tubing (Gas & Pressure) - ALL valves in this series have a sampling port on the common port tube.

RUDOLPH ACCESSORIES - Brief listing:
- Saliva Collectors - Standards NOT applicable with this series.
- Sampling Ports, Couplers & Tubing (Gas & Pressure).
- Valve Supports Head supports
- Rudolph Connectors (machined) - Medical Tapered, O-Ring, Slip Sealing Fit, Coupler (Lock-Ring) Assembly (CLR), and Low Dead Space Adapters (LDSA).
- Miscellaneous - Nose Clips, Reusable Silicone Rubber Mouthpieces, Lubricating Grease, Non-Diffusing Gas Collection Bags, Infant Face Masks.

RUDOLPH ACCESSORIES - Description
Refer to individual Data Sheets and Detailed Price List for additional details and ordering information.

Sampling Ports, Couplers & Tubing (Gas & Pressure):
For ordering information of the available types and sizes, refer to Detailed Price List Section-Sampling Ports, Couplers and Tubing (Gas & Pressure) 1900 Series.

Sampling Ports (Gas & Pressure) - Series 1900
All valves in this series have a sampling port on the common port tube. It is the most common hose barb type and size 171095-1910 which fits into .093 inch (2.4mm) Bore (ID) Flexible Plastic Tubing.

Front: Left 2460 Series, Right 2420 Series
Rear: Left 2410 Series, Right 2490 Series

RUDOLPH ACCESSORIES - Description (continued)
Sampling Ports - (Continued)
A particular type and size can be ordered as a Special, installed by Hans Rudolph, inc. or ordered as a replacement part for user installation. All sampling ports have a male screw thread #10-32 UNF (USA Unified Screw Thread Standards) for adapting, therefore, the recipient component needs to be drilled and tapped. For Hans Rudolph, inc. to install, a clear description of its location is essential. A sketch is a preferred method.

Couplers (Sampling Ports) - Series 1900
One end of the coupler connects to a female luer lock, the other end is a Hose Barb which fits into the bore (ID) of Flexible Plastic Tubing. Couplers with three sizes of Hose Barbs are available which fit into tubing (ID) of .062 inch (1.6mm), .093 inch (2.4mm) and .125 inch (3.2mm).

Tubing (Gas & Pressure) - Series 1900, Data Sheet 691062
Tubing for Gas & Pressure applications connecting with Hose Barb type Sampling Ports and Couplers Material is Tygon® a registered trademark name of the Norton Company. It is Surgical/Hospital Grade, Formulation S-50-HL, Glass Clear, Non-Toxic, Non-Pyrogenic & Compatible with blood. The three available sizes are noted in the preceding Couplers paragraph.

Valve Supports:
Rudolph Head Supports - Series-None, By Product, Data Sheet 691091.
They help to support and relieve some of the subject’s load from the valve setup especially during Exerciser/Stress Testing when using a treadmill or ergometer. Models are NOT available for this series of valves.

Rudolph Connectors (Machined):
Four Types are available for joining Rudolph Components with each other and with other equipment. The design of each type has its inherent parameters such as Volume Dead Space, Flow Characteristics, availability and location of Sampling Ports (Gas & Pressure).

Most Hans Rudolph components can be joined together with one or more types of these connectors. This results in there being too large a quantity for maintaining a realistic inventory on a large number of connector part numbers. The similarity of parts in this family of connectors allows Hans Rudolph, inc. to make specials at a reasonable price and delivery. Make inquiry for price and delivery.
RUDOLPH ACCESSORIES (Continued)

Sampling ports are NOT provided as standards on ALL four types of connectors. Even if a sampling port is or is not provided as a standard, special based on location, type and size can be ordered installed by Hans Rudolph or ordered as replacement ports for user installation. All sampling ports have a male screw thread #10-32 UNF (USA Unified Screw Thread Standards) for adapting, therefore the recipient component needs to be drilled and tapped. For Hans Rudolph to install, a clear description of its location is essential. A sketch is preferred. The standard Sampling Port is a 171096-1910 Hose Barb Type which fits into .093 (2.4mm) bore Flexible Plastic Tubing. For ordering information of other available types and tubing sizes refer to Detailed Price List section - Sampling Ports, Couplers & Tubing (Gas & Pressure) 1900 Series.

1. Medical Tapered (Macchined) - Series 7020, Data Sheet 691012
This type utilizes male and female tapered, (Conical) diameters (7.5mm, 10.5mm, 15mm, 22mm & 30mm). When joined together by a modest pressure and slight twist (wring), they maintain a leak free connection. They are supplied standard with two 171095-1910 Hose Barb Type Sampling Ports which fit into .093 (2.4mm) bore Flexible Plastic Tubing.

2. O-Ring Slip Sealing Fit (Macchined) - Series 7000, Data Sheet 691015
This type of design uses two O-Rings assembled on either a male or female straight diameter. The connector O-Ring diameter will slip together with a component having the same size male or female diameter. This type can be connected and disconnected repeatedly with ease and without developing leakage. This connector is standard less a sampling port, however, they can be ordered as a special with a sampling port installed as the connector configuration permits.

3. Coupler (Lock-Ring) Assemblies (CLRA)
The CLRA couples two valves or similar components together. Each component has a female threaded port that mates with the two male threaded base adapters of the CLRA. This design allows the components to be rotated 360 degrees and locked in the desired position by thread tightening the Knurled Tightener Ring. A sampling port is NOT applicable to this type of connector.

There are NOT any standard CLRA Connectors for coupling these valves to other components. Most Rudolph components can be joined with this type of connector. Make inquiry for your special needs.

All other standard CLRA's are listed in the Detailed Price List with the CLRA Complete Listing Section.

4. Low Read Space Adapters (LDSA)
LDSAs provide for a very close coupling between a variety of Rudolph components resulting in a very low volume dead space connection. This type of connection eliminates port adapters on the mating components by direct thread coupling onto the housing. LDSAs do not allow for rotational positioning as with the CLRAs.
They are available with and without a sampling port for gas or pressure sampling. The LDSA overall length is increased when a sampling port is incorporated thus, increasing its volume dead space. The common type and size sampling port is a 171095-1910 Hose Barb Type which fits into .093 (2.4mm) bore Flexible Plastic Tubing. For other available types and tubing sizes, refer to our Detailed Price List section "Sampling Ports Series 1900" for a description and ordering information.

Miscellaneous:
Nose Clips, Reusable Silicone Rubber Mouthpieces
Lubricating Grease -Series 9000, Data Sheet 691062.
Non-Diffusing Gas Collection Bags - Series 6000-5100, Data Sheet 691016.

SPECIAL PRODUCTS
We encourage users and Original Equipment Manufacturers (OEMs) to make inquiry with us for a quotation or your particular requirements for the design and manufacture of respiratory products.

OTHER STANDARD RUDOLPH MANUAL DIRECTIONAL CONTROL VALVES
- Three-Way Sliding-Type™, Series 2830, 2820, 2810, 2870, (J,K,L) Data Sheet 691108.
- Three-Way T-Shape™ Stopcock-Type™, Series 2130, 2120, 2110, 2100, Data Sheet 691004.
- Three-Way Y-Shape™ Non-Mixing Stopcock-Type™, Series 3900, 4000, Data Sheet 691006.
- Four-Way T-Shape™ Stopcock-Type™, Series 2560, 2520, 2510, 2500, Data Sheet 691005.
- Two-Position Four-Way Stopcock-Type™, Series 2020, 2010, Data Sheet 691119.
- Free-Breathing Spirometer, Stopcock-Type™, Series 3420, 3400, Data Sheet 691030.
- Cardiac Output CO2 Rebreathing Valve Setup, Sliding-Type™, Series 2870 (A-I), Data Sheet 691010.

CLEANING
This product requires special cleaning and care, which is described in our Cleaning, Disinfection, Sterilization and Maintenance Data Sheet 691196. Request this data sheet if not already in your possession. Make sure you fully comprehend this 691196 data sheet before proceeding with cleaning this Rudolph product.

Caution!
- Do Not expose this product to heat at or above a temperature of 45°C (113°F).
- This product is packaged and shipped clean, non-sterile.

APPLICABLE STANDARDS FOR MEDICAL TAPERED CONNECTIONS:
7.5mm, 10.5mm, 15mm, 22mm & 30mm
The 15mm, 22mm and 30mm tapered male and female diameter fitting connections are manufactured in accordance with the applicable standards as follows:
All 7.5mm and 10.5mm male and female diameters are also tapered, but at this printing there are not any standards available. Hans Rudolph, inc. has designed and manufactured these two sizes with parameters similar to the 15mm and 22mm standards. Diameters other than the above five sizes are straight unless otherwise noted.

Inspection and Usage
A visual inspection of the mating tapers should be made to verify a good clean surface free of nicks or scratches, which would allow a wrong grip to disconnect prematurely.

There should be no perceptible rocking in any direction when the components are wrung together.

If accidental disconnection is a safety or critical concern, the user should attach elastic band or other devices to prevent separations of the connection components.
**TABULATION FOR EXPLODED ASSEMBLY DRAWING** describes the models, components and 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.**

<table>
<thead>
<tr>
<th>MODEL NO.</th>
<th>2400A</th>
<th>2400B</th>
<th>2400C</th>
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<td>112662</td>
<td>112663</td>
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<td>One</td>
<td>Plug, (Rotating Piston)</td>
<td>Q1</td>
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</tr>
<tr>
<td>4</td>
<td>One</td>
<td>Common Port/Mouth Port</td>
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<td>One</td>
<td>Inlet/Outlet Port Tube</td>
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<td>One</td>
<td>Socket Head Cap Screw</td>
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<td>Flat Washer (For Stopscrew)</td>
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<td>10</td>
<td>One</td>
<td>O-Ring Set</td>
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**Items sold as set only.**

**NOTE:** All replacement parts will be shipped with O-Rings assembled if the part requires O-Rings. The 200 numbers above include an O-Ring assembled to the part.

**PHYSICAL CHARACTERISTICS**

Port tube sizes: The 22, 15, 10.5 & 7.5mm Diameters are tapered. All other size diameters 7.9mm (.312 inch) and 6.4mm (.250 inch) are straight.

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<th>10.5 (mm)</th>
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**EXPLODED ASSEMBLY DRAWING**

Material Description, Protective Finish and Appearance


**RESISTANCE TO FLOW DATA**

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<th>Flow L/min</th>
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<th>2460C</th>
<th>2460A</th>
<th>2460B</th>
<th>2460C</th>
<th>2460A</th>
<th>2460B</th>
<th>2460C</th>
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<td>.63</td>
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<td>.47</td>
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**PRESSURE TO FLOW DATA**

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<th>2460C</th>
<th>2460A</th>
<th>2460B</th>
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<tr>
<td>Differential Pressure (dp) - cm Water</td>
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<td>13.54</td>
<td>9.49</td>
<td>10.80</td>
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**Series 2460, 2420, 2410, 2400**
ORDERING INFORMATION - Valve Models
For information and ordering part 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 No. and description.
- All Common Port Tubes have a sampling port.
- Valve Mounting - A Mounting Hanger Rod Type is provided on this Valve Series.
- The Outside Diameters (OD) / Inside Diameters (ID) of the four selective port tubes and the one common port tube are available in combinations of the following sizes.
  7.5mm OD taper / .187" (4.8mm) ID
  10.5mm OD / 7.5mm ID tapers
  15mm OD / 10.5mm ID tapers
  22mm OD / 15mm ID tapers
  25mm OD taper / .750" (19.0mm) ID
  1.125" (28.6mm) OD/22mmID taper
  1.375" (35mm) OD / 1.125" (28.6mm) ID

MANUAL DIRECTIONAL CONTROL VALVES, Five-Way T-Shape™, Stopcock-Type™ are available in the following four flow bore sizes.

P/N-Model No. 2460 Series, .187" (4.8mm) Flow Bore

112581-2460A Manual Directional Control Valve, Five-Way T-Shape™ Stopcock-Type™ Four selective Port Tubes and One Common Port Tube are 7.5mm OD taper / .187" (4.8mm) ID

112662-2460B Manual Directional Control Valve, Five-Way T-Shape™ Stopcock-Type™ Four selective Port Tubes and One Common Port Tube are 10.5mm OD / 7.5mmID tapers

112663-2460C Manual Directional Control Valve, Five-Way T-Shape™ Stopcock-Type™ Four selective Port Tubes and One Common Port Tube are 15mm OD / 10.5mmID tapers

2420 Series, .375" (9.5mm) Flow Bore

112664-2420A Manual Directional Control Valve, Five-Way T-Shape™ Stopcock-Type™ Four selective Port Tubes and One Common Port Tube are 10.5mm OD / 7.5mmID tapers

112665-2420B Manual Directional Control Valve, Five-Way T-Shape™ Stopcock-Type™ Four selective Port Tubes and One Common Port Tube are 15mm OD / 10.5mmID tapers

112666-2420C Manual Directional Control Valve, Five-Way T-Shape™ Stopcock-Type™ Four selective Port Tubes and One Common Port Tube are 22mm OD / 15mmID tapers

2410 Series, .625" (15.5mm) Flow Bore

112667-2410A Manual Directional Control Valve, Five-Way T-Shape™ Stopcock-Type™ Four selective Port Tubes and One Common Port Tube are 1.125" (28.6mm) OD / 22mmID taper

112668-2410B Manual Directional Control Valve, Five-Way T-Shape™ Stopcock-Type™ Four selective Port Tubes and One Common Port Tube are 1.375" (35mm) OD / 1.125" (28.6mm) ID

2400 Series, .875" (22.2mm) Flow Bore

112254-2400A Manual Directional Control Valve, Five-Way T-Shape™ Stopcock-Type™ Four selective Port Tubes and One Common Port Tube are 22mm OD taper / .750" (19.0mm) ID

112255-2400B Manual Directional Control Valve, Five-Way T-Shape™ Stopcock-Type™ Four selective Port Tubes and One Common Port Tube are 1.125" (28.6mm) OD / 22mmID taper

112256-2400C Manual Directional Control Valve, Five-Way T-Shape™ Stopcock-Type™ Four selective Port Tubes and One Common Port Tube are 1.375" (35mm) OD / 1.125" (28.6mm) ID

ORDERING INFORMATION - Accessories
Partial List, refer to Data Sheet and Detailed Price List for details and replacement parts.

P/N-Model No. Rudolph Connectors (Machined):

200177-7020 Medical Tapered - (Individual sizes also available)
Medical Tapered connectors, set of six, (7020 thru 7026), Combinations of 15mm & 22mm Diameters.

O-Ring Slip Sealing Fit -
This 7000 Series includes connecting diameters from .937 inch (23.8mm) through 2.00 inch (50.8mm). Not listed here due to the extensive number of selections. Refer to Detailed Price List for complete listing.

P/N-Model No. Sampling Ports - Series 1900

200120-1914 Hose Barb Sampling Port 1915 Installed for .062" (1.6mm) bore tube.

171161-1915 Hose Barb Sampling Port for .062" bore tubing - replacement part.

200121-1912 Hose Barb Sampling Port 1910 Installed for .093" (2.4mm) bore tubing.

171095-1910 Hose Barb Sampling Port for .093" bore tubing - replacement part.

200122-1922 Hose Barb Sampling Port 1920 Installed for .125" (3.2mm) bore tubing.

171163-1920 Hose Barb Sampling Port for .125" bore tubing - replacement part.

200123-1913 Female Luer Lock Sampling Port 1917 Installed.

171179-1917 Female Luer Lock Sampling Port - replacement part.

171180-1918 Male Luer Plug to seal Female Luer Lock Sampling Port.

Couplers for Connecting Female Luer Lock Sampling Ports to flexible plastic tubing using a hose barb connection - Series 1900.

171210-1928 Coupler - one end male luer lock / other end hose barb for .062" (1.6mm) bore tubing.

171211 -1929 Coupler - one end male luer lock / other end hose barb for .093" (2.4mm) bore tubing.

171212-1930 Coupler - one end male luer lock / other end hose barb for .125" (3.2mm) bore tubing.

Tubing (Gas & Pressure) - Series 1900
This tubing is made of Surgical/Hospital Grade Tygon®, and is Glass Clear. Sampling Ports & Couplers with Hose Barb Type Connections mate into the tubing bore (ID).

666060 Tubing (Gas & Pressure), Tygon® .062" (1.6mm) ID / .125" (3.2mm) OD

666061 Tubing (Gas & Pressure), Tygon® .093" (2.4mm) ID / .156" (4.0mm) OD

666062 Tubing (Gas & Pressure), Tygon® .125" (3.2mm) ID / .187" (4.8mm) OD

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* Prices and Specifications subject to change without notice