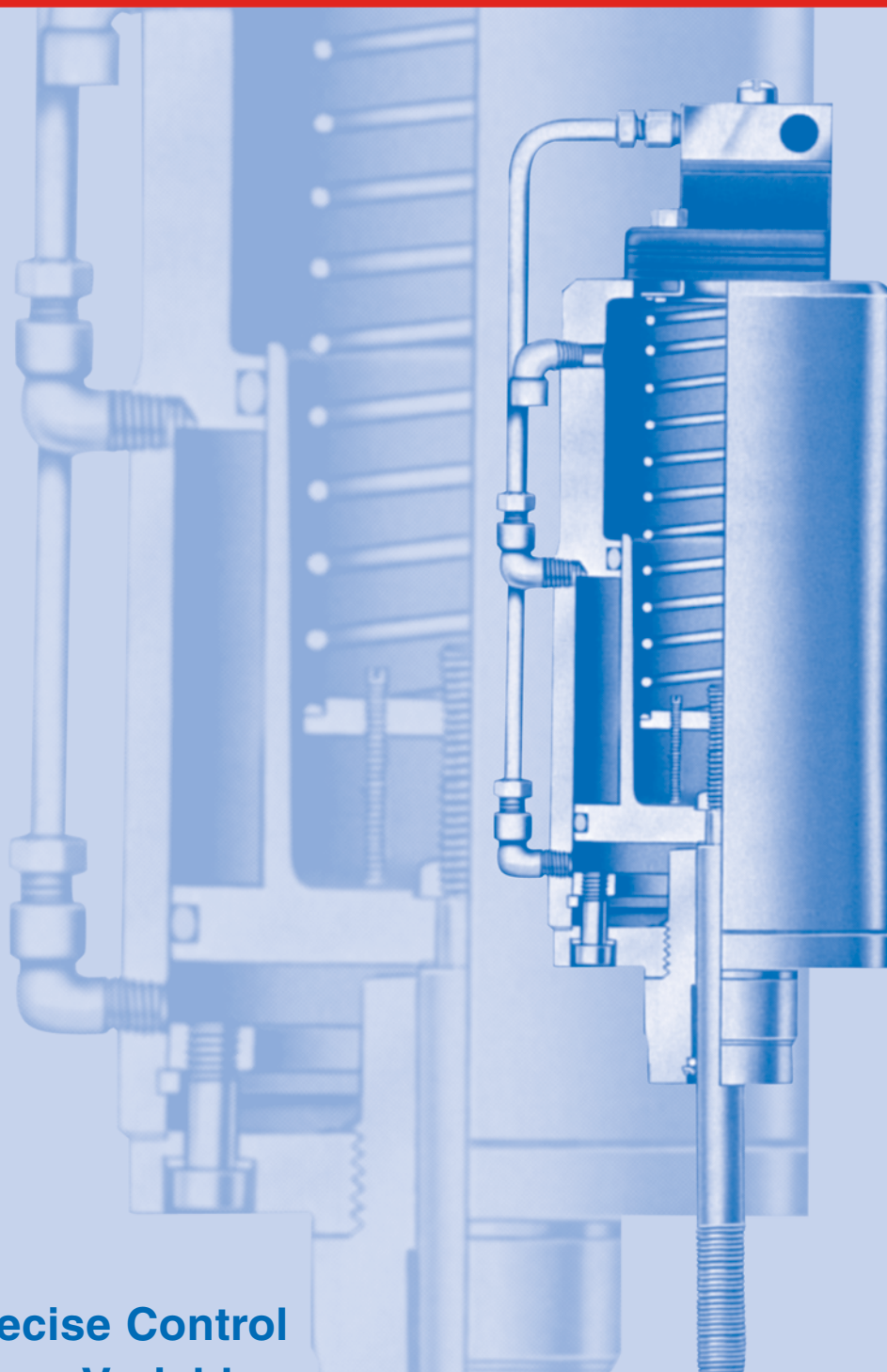


# Masoneilan® 600 Series Positioning Actuators

Specification Data

CR7000

9/92



**For Precise Control  
of Valves, Variable  
Speed Drives,  
Rheostats and Pumps**



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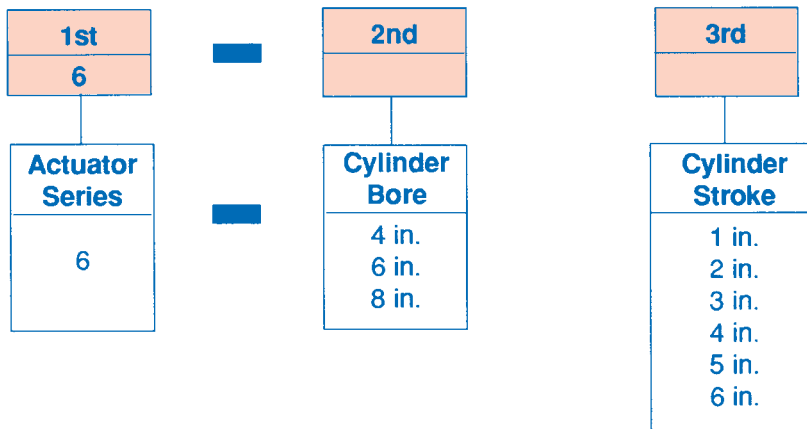
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# Foreword

Masoneilan's 600 Series cylinder actuator is designed for the control of variable speed drives, rheostats and pumps and incorporates the following design features:

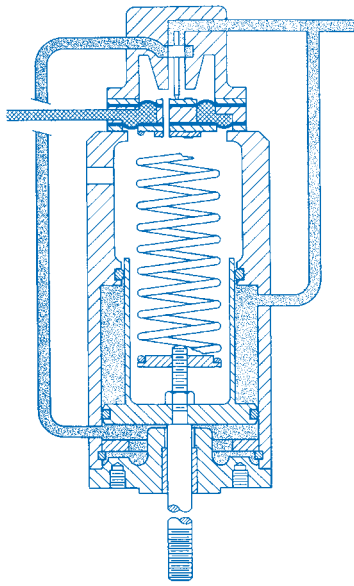
- Precise positioning and rigid operation due to small cylinder volumes
- High speed operation
- Compact and rugged - suitable for mounting in any orientation
- Suitable for unfriendly environments. The directly coupled feedback spring is housed inside the actuator, purged by instrument air bleed, eliminating corrosion problems with external feedback mechanisms

# Numbering System

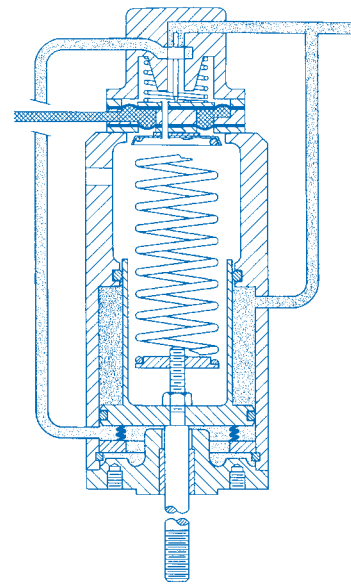


## General Data

- **Type**                                    positioning pneumatic cylinder with integral positioner
- **Ambient Temperature Limit**        +180°F (+82°C)  
   -40°F (-40°C)
- **Action**                                    increasing signal retracts stem (direct positioner)  
   increasing signal extends stem (reverse positioner)
- **Instrument Signal**                    3-15 psi
- **Supply Pressure**                      up to 100 psi
- **Characteristic**                         linear
- **Span Error**                             ± 3% of span
- **Repeatability**                         0.1% of span
- **Dead Band**                             0.4% or less of span
- **Conformity (Linearity)**             1.7% of span
- **Air Consumption (Steady State)**    0.6 scfm @ 60 psi supply
- **Air Connections**                     1/4" NPT instrument and supply



with direct action positioner



with reverse action positioner

controller signal

positioner output

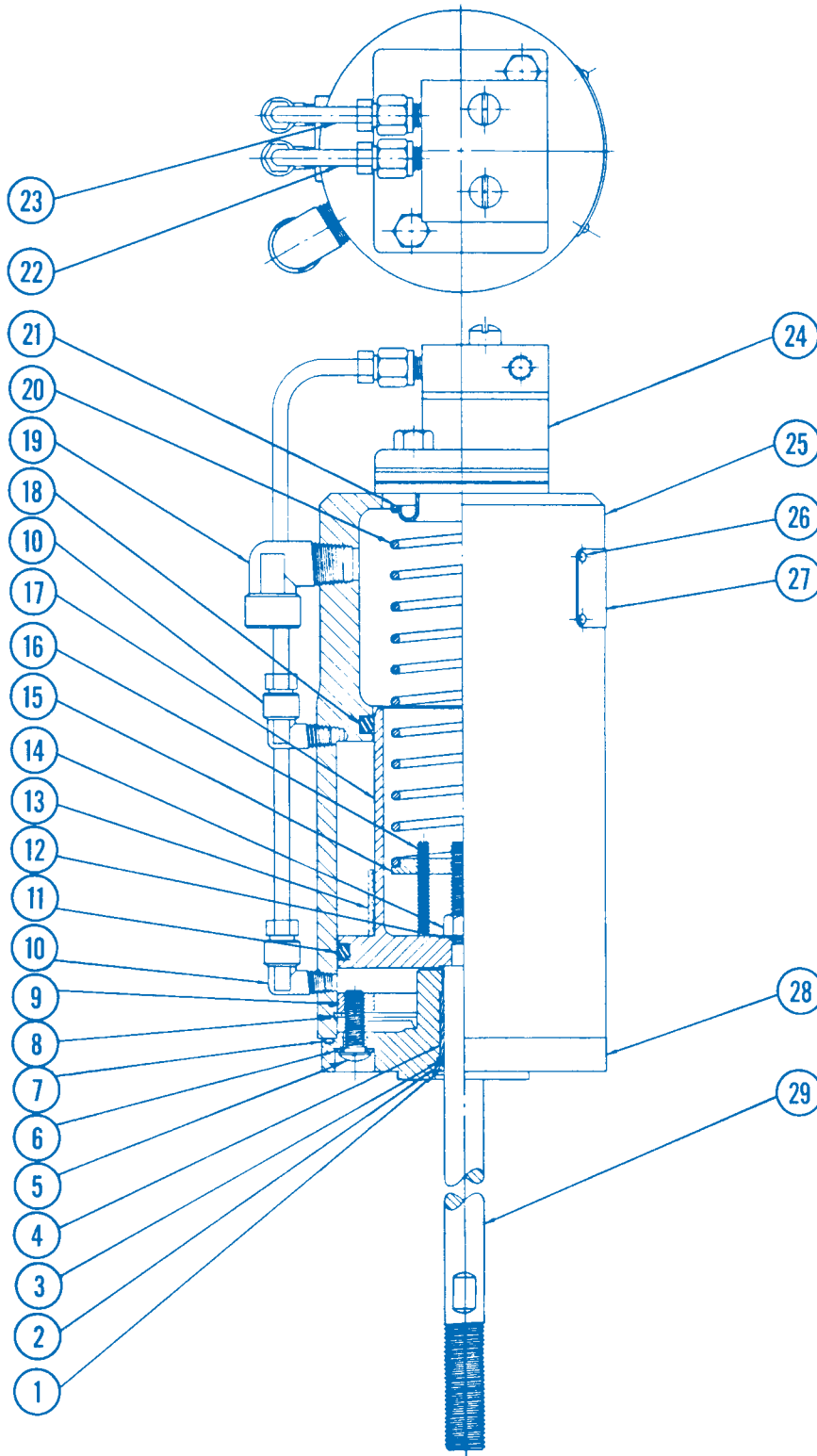
supply pressure

### Operation of Air to Open (Stem retracts on increased signal)

On an actuator supplied with a direct action positioner, air or gas at a pressure of 30-100 psi enters the positioner supply port. This supply pressure is also piped to the upper (or smaller area) side of the piston. The controller signal pressure acts within the positioner double diaphragm assembly. In this assembly, the area of the upper diaphragm is smaller than the area of the lower diaphragm. Positioner output pressure is connected to the lower or larger area on the underside of the piston. An increase in controller signal pressure causes the double diaphragm assembly to move down. This movement causes the positioner pilot valve to close the exhaust port and open the supply port to increase positioner output pressure under the piston, retracting the piston rod. The piston continues to move until the force exerted by the range spring balances the force exerted by the double diaphragm assembly. Positioner output then stabilizes to maintain the desired piston rod position.

### Operation of Air to Close (Stem extends on increased signal)

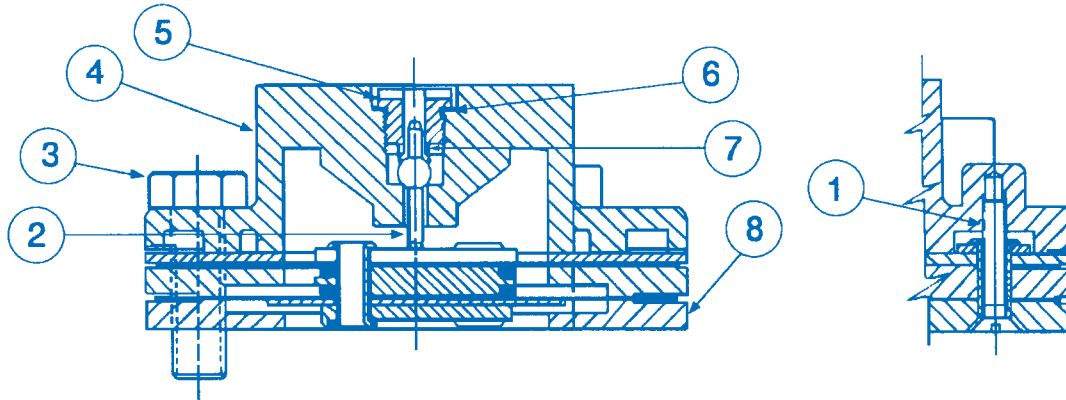
On an actuator supplied with a reverse action positioner, the larger area diaphragm of the positioner is at the top. Also a small spring is located on top of the larger area diaphragm to bias the positioner pilot valve toward the open position when minimum instrument signal pressure is exerted within the double diaphragm assembly. An increase in controller signal causes the positioner double diaphragm assembly to move up. This movement causes the positioner pilot valve to open the exhaust port and close the supply port to exhaust air from under the piston, extending the piston rod. The piston continues to move until the force exerted by the bias spring is equal to the combined range-spring and controller signal pressure forces. Positioner output then stabilizes to maintain the desired piston rod position.



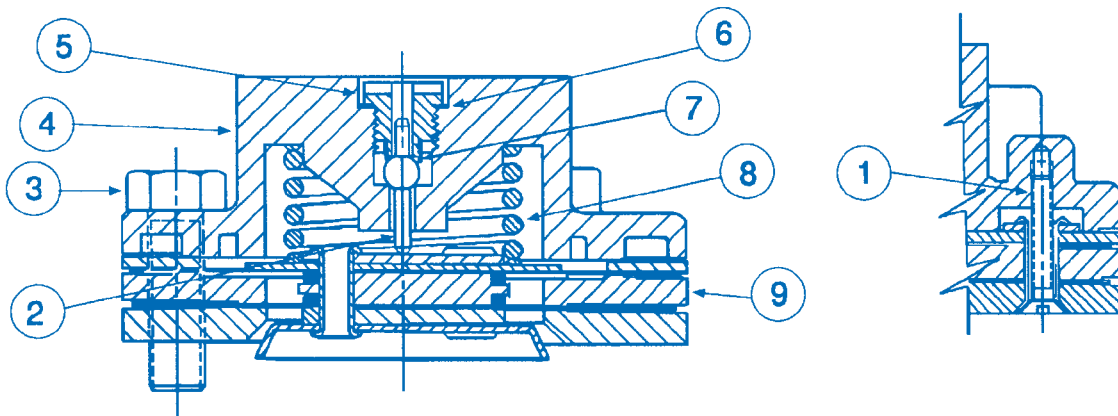
## Materials

| Ref. No. | Description  | Material        |
|----------|--|-----------------|
| 1        | Retaining Ring   | Carbon Steel    |
| 2        | O-ring Retaining Washer  | Brass           |
| 3        | Piston Rod O-ring  | Buna-N          |
| 4        | Piston Rod Bushing   | Bronze          |
| 5        | Mounting Head Capscrew   | Carbon Steel    |
| 6        | Dyna-Seal  | Steel & Rubber  |
| 7        | Mounting Head and Cylinder Extension O-ring  | Buna-N          |
| 8        | Retaining Ring Lock Plate  | Carbon Steel    |
| 9        | Lock Plate   | Carbon Steel    |
| 10       | Elbow  | Brass           |
| 11       | Piston O-ring  | Buna-N          |
| 12       | Piston Rod Gasket  | Fiber           |
| 13       | Travel Stop<br>Stroke: 1/8", 1/4", 3/8", 1/2", 3/4", 1 1/2", 2", 2 1/2",<br>3", 4", 4 1/2", 5"               | Aluminum        |
| 14       | Piston Lock Nut  | Stainless Steel |
| 15       | Lower Rate Spring Button   | Aluminum        |
| 16       | Spring Button Set Screw  | Stainless Steel |
| 17       | Piston   | Aluminum        |
| 18       | Seal Tube O-ring   | Buna-N          |
| 19       | Vent Elbow   | Stainless Steel |
| 20       | Rate Spring: 3-15 psi<br>Stroke: 1/8", 1/4", 3/8", 1/2", 3/4", 1", 1 1/2", 2",<br>2 1/2", 3", 4", 4 1/2", 5" | Spring Steel    |
| 21 A     | Upper Spring Button  | Carbon Steel    |
| 21       | Upper Spring Button (1/8" stroke only)   | Aluminum        |
| 22       | Loading Tubing   | 304 St. St.     |
| 23       | Actuating Tubing   | 304 St. St.     |
| 24       | Positioner Assembly<br>Direct (Air to Retract Shaft)<br>Reverse (Air to Extend Shaft)                        |                 |
| 25       | Cylinder   | Aluminum        |
| 26       | Mounting Nameplate Drive Screw   | 303 St. St.     |
| 27       | Nameplate  | 303 St. St.     |
| 28       | Operator Mounting Plate  | Carbon Steel    |
| 29       | Piston Rod   | 303 St. St.     |
| 30       | Mounting Positioner Assembly Plate*  | Carbon Steel    |
| 31       | Mounting Plate Cap Screw*  | Carbon Steel    |
| 32       | Spring Lockwasher*   | Carbon Steel    |

\*Not shown



**Direct Positioner Assembly  
Increasing Air to Retract Shaft**



**Reverse Positioner Assembly  
Increasing Air to Extend Shaft**

## Materials

### Direct Positioner

| Ref. No. | Description                            | Material          |
|----------|--|-------------------|
| 1        | Mounting Screw Diaphragm Assembly      | Stainless Steel   |
| 2        | Valve Positioner                       | Stainless Steel   |
| 3        | Hex Head Cap Screw                     | Stainless Steel   |
| 4        | Positioner Block (Direct)              | Alloy 380         |
| 5        | Valve Cage                             | Stainless Steel   |
| 6        | Shim                                   | Brass             |
| 7        | Spring                                 | Spring Steel      |
| 8        | Positioner Diaphragm Assembly (Direct) | Aluminum/Neoprene |
| 9        | Nameplate*                             | Aluminum Foil     |

\*Not shown

### Reverse Positioner

| Ref. No. | Description                             | Material          |
|----------|---|-------------------|
| 1        | Mounting Screw Diaphragm Assembly       | Stainless Steel   |
| 2        | Valve Positioner                        | Stainless Steel   |
| 3        | Hex Head Cap Screw                      | Stainless Steel   |
| 4        | Positioner Block (Reverse)              | Alloy 380         |
| 5        | Valve Cage                              | Stainless Steel   |
| 6        | Shim                                    | Brass             |
| 7        | Spring                                  | Spring Steel      |
| 8        | Bias Spring                             | Spring Steel      |
| 9        | Positioner Diaphragm Assembly (Reverse) | Aluminum/Neoprene |
| 10       | Nameplate*                              | Aluminum Foil     |

\*Not shown

## Travel Times - Typical Bench Values

| Cylinder Bore (in.) | Maximum Travel (in.) | Standard Full Stroke Time Maximum (Sec) @ 100 psi Supply |
|---------------------|----------------------|--|
| 4                   | 1                    | 0.5  |
|                     | 2                    | 1.3  |
|                     | 3                    | 2.0  |
| 6                   | 1                    | 1.7  |
|                     | 2                    | 2.5  |
|                     | 3                    | 3.3  |
|                     | 4                    | 4.1  |
| 8                   | 1                    | 3.4  |
|                     | 2                    | 4.2  |
|                     | 3                    | 5.0  |
|                     | 4                    | 5.7  |
|                     | 5                    | 6.5  |
|                     | 6                    | 7.2  |

### Available Thrust

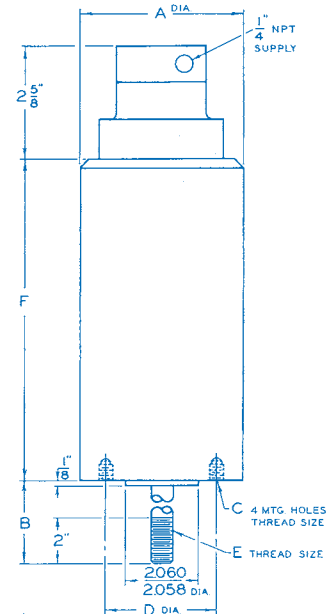
| Cylinder Bore (in.) | Maximum Travel (in.) | Maximum Thrust (lb) at Supply Pressures of: |         |          |
|---------------------|----------------------|---|---------|----------|
|                     |                      | 30 psig                                     | 60 psig | 100 psig |
| 4                   | 3                    | 185   | 375     | 625      |
| 6                   | 4                    | 420   | 845     | 1410     |
| 8                   | 6                    | 750   | 1500    | 2500     |

Stroking times may vary with operating supply pressure and external loads on actuator.

## Dimensions (inches)

| Model Number | A                             | B        |           | C                               | D                             | E*                              | F                              |
|--------------|-------------------------------|----------|-----------|---------------------------------|-------------------------------|---------------------------------|--------------------------------|
|              |                               | Extended | Retracted |                                 |                               |                                 |                                |
| 641          | 4 <sup>1</sup> / <sub>2</sub> | 6        | 5         | <sup>3</sup> / <sub>8</sub> -16 | 3 <sup>1</sup> / <sub>4</sub> | <sup>5</sup> / <sub>8</sub> -18 | 5 <sup>3</sup> / <sub>8</sub>  |
| 642          | 4 <sup>1</sup> / <sub>2</sub> | 6        | 4         | <sup>3</sup> / <sub>8</sub> -16 | 3 <sup>1</sup> / <sub>4</sub> | <sup>5</sup> / <sub>8</sub> -18 | 9 <sup>1</sup> / <sub>4</sub>  |
| 643          | 4 <sup>1</sup> / <sub>2</sub> | 6        | 3         | <sup>3</sup> / <sub>8</sub> -16 | 3 <sup>1</sup> / <sub>4</sub> | <sup>5</sup> / <sub>8</sub> -18 | 9 <sup>1</sup> / <sub>4</sub>  |
| 661          | 6 <sup>5</sup> / <sub>8</sub> | 7        | 6         | <sup>1</sup> / <sub>2</sub> -13 | 4 <sup>1</sup> / <sub>2</sub> | <sup>3</sup> / <sub>4</sub> -16 | 12 <sup>3</sup> / <sub>4</sub> |
| 662          | 6 <sup>5</sup> / <sub>8</sub> | 7        | 5         | <sup>1</sup> / <sub>2</sub> -13 | 4 <sup>1</sup> / <sub>2</sub> | <sup>3</sup> / <sub>4</sub> -16 | 12 <sup>3</sup> / <sub>4</sub> |
| 663          | 6 <sup>5</sup> / <sub>8</sub> | 7        | 4         | <sup>1</sup> / <sub>2</sub> -13 | 4 <sup>1</sup> / <sub>2</sub> | <sup>3</sup> / <sub>4</sub> -16 | 12 <sup>3</sup> / <sub>4</sub> |
| 664          | 6 <sup>5</sup> / <sub>8</sub> | 7        | 3         | <sup>1</sup> / <sub>2</sub> -13 | 4 <sup>1</sup> / <sub>2</sub> | <sup>3</sup> / <sub>4</sub> -16 | 12 <sup>3</sup> / <sub>4</sub> |
| 681          | 8 <sup>5</sup> / <sub>8</sub> | 9        | 8         | <sup>1</sup> / <sub>2</sub> -13 | 4 <sup>1</sup> / <sub>2</sub> | <sup>7</sup> / <sub>8</sub> -14 | 16 <sup>3</sup> / <sub>4</sub> |
| 682          | 8 <sup>5</sup> / <sub>8</sub> | 9        | 7         | <sup>1</sup> / <sub>2</sub> -13 | 4 <sup>1</sup> / <sub>2</sub> | <sup>7</sup> / <sub>8</sub> -14 | 16 <sup>3</sup> / <sub>4</sub> |
| 683          | 8 <sup>5</sup> / <sub>8</sub> | 9        | 6         | <sup>1</sup> / <sub>2</sub> -13 | 4 <sup>1</sup> / <sub>2</sub> | <sup>7</sup> / <sub>8</sub> -14 | 16 <sup>3</sup> / <sub>4</sub> |
| 684          | 8 <sup>5</sup> / <sub>8</sub> | 9        | 5         | <sup>1</sup> / <sub>2</sub> -13 | 4 <sup>1</sup> / <sub>2</sub> | <sup>7</sup> / <sub>8</sub> -14 | 16 <sup>3</sup> / <sub>4</sub> |
| 685          | 8 <sup>5</sup> / <sub>8</sub> | 9        | 4         | <sup>1</sup> / <sub>2</sub> -13 | 4 <sup>1</sup> / <sub>2</sub> | <sup>7</sup> / <sub>8</sub> -14 | 16 <sup>3</sup> / <sub>4</sub> |
| 686          | 8 <sup>5</sup> / <sub>8</sub> | 9        | 3         | <sup>1</sup> / <sub>2</sub> -13 | 4 <sup>1</sup> / <sub>2</sub> | <sup>7</sup> / <sub>8</sub> -14 | 16 <sup>3</sup> / <sub>4</sub> |

\*Consult factory for other requirements



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