**Technical features**

**Medium:**
Filtered, non-lubricated or dry compressed air, instrument air, nitrogen and other nonflammable neutral dry fluids.

**Operation:**
3/2 Direct solenoid operated poppet valves.

**Operating pressure:**
1 ... 10 bar
2 ... 8 bar (with 98025 Valves)

**Flow:**
Standard valves: 170 ... 250 l/min
High flow valves: 740 ... 1050 l/min

**Additional filter:**
Installation of an in-line filter is recommended (in the direction of flow from the actuator to the RVM).

**Port size:**
G1/4, 1/4 NPT, G1/2, 1/2 NPT

**Ambient/Media temperature:**
Up to -40 ... +80°C, see option selector page 2.
Depending on solenoid system, Air supply must be dry enough to avoid ice formation at temperatures below +2°C (35°F).
For outdoor installations must be protected against the penetration of moisture and a solenoid with IP66 protection must be used!

**Materials:**
Manifold and valve body: Anodized aluminium or stainless steel.
Seal: NBR, VMQ.
Internal parts: stainless steel, brass.

**Flow conversion:**
\[ Cv \text{ US Gallon/min (water)} = \text{l/min (air)} \times 0,001 \]
\[ Kv \text{ m³/h (water)} = \text{l/min (air)} \times 0,000906 \]

**1002 with exhaust guards**

**2002 with exhaust guards**

**2003 with exhaust guards *2)***

---

1) Details on data sheet en 5.8.300

*2) Details on data sheet en 5.8.300
### Option selector

<table>
<thead>
<tr>
<th>Valve function</th>
<th>Substitute</th>
</tr>
</thead>
<tbody>
<tr>
<td>1oo2 normally closed</td>
<td>1</td>
</tr>
<tr>
<td>2oo2 normally closed</td>
<td>3</td>
</tr>
<tr>
<td>2oo3 normally closed</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Port sizes</th>
<th>Substitute</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1/4 (Standard flow, 24011/24010)</td>
<td>11</td>
</tr>
<tr>
<td>1/4 NPT (Standard flow, 24011/24010)</td>
<td>12</td>
</tr>
<tr>
<td>G1/2 (High flow, 98015/98025)</td>
<td>23</td>
</tr>
<tr>
<td>1/2 NPT (High flow, 98015/98025)</td>
<td>24</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Valve type</th>
<th>Temperature *1</th>
<th>Substitute</th>
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<tbody>
<tr>
<td>24011 series</td>
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<td></td>
</tr>
<tr>
<td>Aluminium</td>
<td>-60°C...+60°C</td>
<td>01</td>
</tr>
<tr>
<td>Stainless steel</td>
<td>-60°C...+60°C</td>
<td>02</td>
</tr>
<tr>
<td>Aluminium with proximity sensor</td>
<td>-25°C...+70°C</td>
<td>03</td>
</tr>
<tr>
<td>Stainless steel with proximity sensor</td>
<td>-25°C...+70°C</td>
<td>04</td>
</tr>
<tr>
<td>98015 series</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aluminium</td>
<td>-25°C...+60°C</td>
<td>07</td>
</tr>
<tr>
<td>Stainless steel</td>
<td>-25°C...+60°C</td>
<td>08</td>
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</tr>
<tr>
<td>Stainless steel with proximity sensor</td>
<td>-25°C...+60°C</td>
<td>10</td>
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</tbody>
</table>

| 24010 series             |                |            |
| Aluminium                | -25°C...+60°C  | 21         |
| Stainless steel          | -25°C...+60°C  | 22         |
| Aluminium with proximity sensor | -25°C...+60°C | 23         |
| Stainless steel with proximity sensor | -25°C...+60°C | 24         |

| 98025 series             |                |            |
| Aluminium                | -25°C...+60°C  | 31         |
| Stainless steel          | -25°C...+60°C  | 32         |

<table>
<thead>
<tr>
<th>Manifold material</th>
<th>Substitute</th>
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<tr>
<td>Stainless steel</td>
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<tr>
<td>Aluminium</td>
<td>4</td>
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</table>

*1) Please note solenoid temperature

### Flow rates and valve combinations

<table>
<thead>
<tr>
<th>Flow direction (port to port)</th>
<th>Standard flow systems (24011/24010)</th>
<th>High flow systems (98015/98025)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1oo2</td>
<td>2 x 24011</td>
<td>2 x 98015</td>
</tr>
<tr>
<td>1 = 2 *6) [l/min]</td>
<td>170</td>
<td>750</td>
</tr>
<tr>
<td>2 = 3 *7) [l/min]</td>
<td>1000</td>
<td>3400</td>
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<tr>
<td>2oo2</td>
<td>2 x 24011</td>
<td>2 x 98015</td>
</tr>
<tr>
<td>1 = 2 *6) [l/min]</td>
<td>250</td>
<td>1050</td>
</tr>
<tr>
<td>2 = 3 *7) [l/min]</td>
<td>710</td>
<td>2690</td>
</tr>
<tr>
<td>2oo3</td>
<td>4 x 24011</td>
<td>4 x 98015</td>
</tr>
<tr>
<td>1 = 2 *6) [l/min]</td>
<td>190</td>
<td>740</td>
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<tr>
<td>2 = 3 *7) [l/min]</td>
<td>710</td>
<td>2420</td>
</tr>
</tbody>
</table>

*6) Flow characteristics conforms to ISO6358 from port 1 to port 2 (sub-base) [8 = 5 bar], see page 1

*7) Flow characteristics conforms to ISO6358 from port 2 (sub-base) to port 3 (sub-base) [10 = 0 bar], see page 1

### Standard

<table>
<thead>
<tr>
<th>Port size</th>
<th>Valve type</th>
<th>Temperature (°C)</th>
<th>Materials</th>
<th>Weight (kg)</th>
<th>Drawing</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4 NPT</td>
<td>2401109</td>
<td>-25...+80°C</td>
<td>Aluminium</td>
<td>3.7 kg</td>
<td>Page 4</td>
<td>V821120504**0000</td>
</tr>
<tr>
<td>1/2 NPT</td>
<td>9801595</td>
<td>-25...+60°C</td>
<td>Aluminium</td>
<td>4.4 kg</td>
<td>Page 7</td>
<td>V821240704**0000</td>
</tr>
<tr>
<td>2oo2</td>
<td>2401109</td>
<td>-25...+80°C</td>
<td>Aluminium</td>
<td>3.7 kg</td>
<td>Page 5</td>
<td>V823120504**0000</td>
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<tr>
<td>1/4 NPT</td>
<td>9801595</td>
<td>-25...+60°C</td>
<td>Aluminium</td>
<td>4.4 kg</td>
<td>Page 8</td>
<td>V823240704**0000</td>
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<tr>
<td>2oo3</td>
<td>2401109</td>
<td>-25...+80°C</td>
<td>Aluminium</td>
<td>3.7 kg</td>
<td>Page 6</td>
<td>V825120504**0000</td>
</tr>
<tr>
<td>1/2 NPT</td>
<td>9801595</td>
<td>-25...+60°C</td>
<td>Aluminium</td>
<td>9.3 kg</td>
<td>Page 9</td>
<td>V825240704**0000</td>
</tr>
</tbody>
</table>

** Solenoid code
Standard and optional accessories

Accessories
Standard (Included in the scope of supply)

Exhaust guard *2)  
Page 24
0613422 (G 1/4, 1/4 NPT)
0613423 (G 1/4, 1/4 NPT)

*1) For indoors use
*2) For outdoors use, opening pressure ~ 0.2 bar

Can be ordered separately
Other silencers, connectors (for valve position sensor)

Silencer (stainless steel) *1)  
Page 24
0014613 (G 1/4)  T48C2300 (G 1/4)
0613678 (1/4 NPT)  MS003A (1/4 NPT)
0014913 (G 1/2)  T48C4800 (G 1/2)
0613679 (1/2 NPT)  MS004A (1/2 NPT)

Silencer (brass) *1)  
Page 24
0613678 (1/4 NPT)  MS003A (1/4 NPT)
0014913 (G 1/2)  T48C4800 (G 1/2)

Silencer (plastic) *1)  
Page 24
0613678 (1/4 NPT)  MS003A (1/4 NPT)

Connector M12 x 1 (straight)  
Page 25
0523055 (without cable)  0523056 (90°, with cable)

Connector M12 x 1 (90°)  
Page 25
0523057 (cable length 2 m)  0523058 (90°, cable length 2 m)
0523052 (cable length 5 m)  0523053 (90°, cable length 5 m)

Cable glands (ordered separately)

Cable gland
Protection class Ex e, Ex d (ATEX), Nickel plated brass/stainless steel

Page 25
For solenoid
Thread
Material
Protection class (ATEX)
Model
42xx, 46xx
M 20x1,5
5.0...8.0
Nickel plated brass
I2GD Ex e
0588819
46xx
M 20x1,5
10...14
Nickel plated brass
I2GD Ex d
0588861
46xx
1/2-14-NPT
7.5...11.9
Nickel plated brass
I2GD Ex d
0588925
48xx
M 20x1,5
9.0...13
Stainless steel 1.4571
I2GD Ex e
0589385
48xx
M 20x1,5
7.0...12
Stainless steel 1.4404
I2GD Ex d
0589395
48xx
M 20x1,5
10...14
Stainless steel 1.4404
I2GD Ex d
0589397

Alternative valves with position sensors

Note: Valve position sensors are supplied complete with the valve. See pages 10, 15 & 18 for valve part numbers

Bracket, (stainless steel)

Page 24
A165-95
1002 (standard flow)
Weight: 1.0 kg aluminium (2.8 kg stainless steel) sub-base only, valves and accessories
see refer pages 10 and 15
2oo2 (standard flow)
Weight: 1.00 kg aluminium (2.8 kg stainless steel) sub-base only, valves and accessories
see refer pages 10 and 15
2oo3 (standard flow)

Weight: 2,8 kg aluminium (8 kg stainless steel) sub-base only, valves and accessories
see refer pages 10 and 15

- Valve 24011 and 24010 series
- Outlet port G 1/4 or 1/4 NPT
- Exhaust guard (sub-base), ports G1/2 or 1/2 NPT
- Dependent on solenoid models (see solenoid drawing)
- Inlet port G1/4 or 1/4 NPT
- Through mounting holes
- Mounting threads as standard or alternative to fix the bracket
1oo2 (high flow)
Weight: 1.4 kg aluminium (4 kg stainless steel) sub-base only, valves and accessories
see refer pages 18 and 22

- Valve 98015 series
- Outlet port G1/2 or 1/2 NPT
- Exhaust guard (sub-base), ports G1/2 or 1/2 NPT
- Dependent on solenoid models (see solenoid drawing)
- Inlet port G1/2 or 1/2 NPT
- Through mounting holes
- Mounting threads as standard or alternative to fix the bracket
2oo2 (high flow)
Weight: 1.4 kg aluminium (4 kg stainless steel) sub-base only, valves and accessories
see refer pages 18 and 22

- Valve 99015 series
- Outlet port G1/2 or 1/2 NPT
- Exhaust guard (sub-base), ports G1/2 or 1/2 NPT
- Dependent on solenoid models (see solenoid drawing)
- Inlet port G1/2 or 1/2 NPT
- Through mounting holes
- Mounting threads as standard or alternative to fix the bracket
2003 (high flow)
Weight: 3.3 kg aluminium (9.3 kg stainless steel) sub-base only, valves and accessories
see refer pages 18 and 22

Dimensions in mm
Projection/First angle

- Valve 98015 series
- Outlet port G1/2 or 1/2 NPT
- Exhaust guard (sub-base), ports G1/2 or 1/2 NPT
- Dependent on solenoid models (see solenoid drawing)
- Inlet port G1/2 or 1/2 NPT
- Through mounting holes
- Mounting threads as standard or alternative to fix the bracket
Technical features

**Medium:** Compressed air, filtered, non-lubricated and dry. Other gaseous or liquid fluids on request. (Viscosity for gaseous or liquid fluids up to 40 mm²/s)

**Operation:** Direct solenoid operated poppet valve

**Operating pressure:** 0 ... 10 bar (0 ... 145 psi)

**Orifice:** 5 mm

**Flow:** Gaseous fluids: 340 l/min

**Port size:** Flanged

**Flow direction:** Optional

**Ambient/Media temperature:**
- NBR: -25 ... +80°C (-13 ... +176°F)
- VMQ: -40 ... +60°C (-40 ... +140°F)

Depending on solenoid system

Air supply must be dry enough to avoid ice formation at temperatures below +2°C (35°F).

For outdoor installations must be protected all connections against the penetration of moisture and a solenoid with IP66 protection must be used!

**Materials:**
- Body: Aluminium anodized or stainless steel 1.4404 (316 L)
- Seal: NBR, VMQ
- Inner parts: stainless steel, brass

Technical data

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Temperature (°C)</th>
<th>Material housing</th>
<th>Material seat seal</th>
<th>Material seal</th>
<th>Position sensor</th>
<th>Weight (kg)</th>
<th>Test certificate IEC 61508 *2)</th>
<th>Dimension No.</th>
<th>Model *1)</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>-40 ... 60</td>
<td>VMQ aluminium</td>
<td>without</td>
<td>0,55 X</td>
<td>1</td>
<td></td>
<td>1025390</td>
<td>01</td>
<td></td>
<td></td>
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<tr>
<td>-40 ... 60</td>
<td>VMQ stainless steel</td>
<td>without</td>
<td>1</td>
<td></td>
<td></td>
<td>1160007</td>
<td>02</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>-25 ... 70</td>
<td>NBR stainless steel</td>
<td>integrated</td>
<td>0,62 X</td>
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<td></td>
<td>1025352</td>
<td>03</td>
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<tr>
<td>-25 ... 70</td>
<td>NBR stainless steel</td>
<td>integrated</td>
<td>1,07 X</td>
<td>2</td>
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<td>1160006</td>
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<td>05</td>
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<td></td>
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<tr>
<td>-25 ... 80</td>
<td>NBR stainless steel</td>
<td>without</td>
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<td></td>
<td></td>
<td>1025212</td>
<td>06</td>
<td></td>
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</table>

*1) When ordering please indicate solenoid, voltage and current type (frequency).

*2) Particulary for valves with TÜV approval and attachment in plants based on safety standards IEC 61508, taking into account to the operating and maintenance instructions document 7503444.
Solenoids operator, standard voltages

<table>
<thead>
<tr>
<th>Model</th>
<th>Power consumption 24 V d.c. (W)</th>
<th>Rated current 24 V d.c. (m A)</th>
<th>Protection class IP/NEMA</th>
<th>Ex-Protection (ATEX-Category)</th>
<th>Temperature Ambient/ Media (°C)</th>
<th>Electrical connection</th>
<th>Weight (kg)</th>
<th>Drawing No.</th>
<th>Circuit diagram No.</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>8,9</td>
<td>—</td>
<td>369</td>
<td>—</td>
<td>NEMA 4, 4X, 6, 6P, 7, 9</td>
<td>XP/P/DIP, Div. 1 &amp; 2</td>
<td>-20 ... +60</td>
<td>Flying leads 450 mm</td>
<td>0,5</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>—</td>
<td>9,5</td>
<td>—</td>
<td>NEMA 4, 4X, 6, 6P, 7, 9</td>
<td>XP/P/DIP, Div. 1 &amp; 2</td>
<td>-20 ... +60</td>
<td>Flying leads 450 mm</td>
<td>0,5</td>
<td>8</td>
<td>5</td>
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<tr>
<td></td>
<td>13,6</td>
<td>—</td>
<td>567</td>
<td>NEMA 4, 4X, 6, 6P, 7, 9</td>
<td>XP/P/DIP, Div. 1 &amp; 2</td>
<td>-20 ... +60</td>
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<td>8</td>
<td>1</td>
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<tr>
<td></td>
<td>—</td>
<td>15,7</td>
<td>—</td>
<td>NEMA 4, 4X, 6, 6P, 7, 9</td>
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<td>Flying leads 450 mm</td>
<td>0,5</td>
<td>8</td>
<td>5</td>
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<tr>
<td></td>
<td>3,9</td>
<td>—</td>
<td>162</td>
<td>IP66 (with cable gland)</td>
<td>Il 2 G Ex e mb IC T4/ T6 Gb</td>
<td>T4: -40 ... +80</td>
<td>M20 x 1,5 *1)</td>
<td>0,6</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
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<td>—</td>
<td>5,3</td>
<td>—</td>
<td>IP66 (with cable gland)</td>
<td>Il 2 G Ex e mb IC T4/ T6 Gb</td>
<td>T4: -40 ... +80</td>
<td>M20 x 1,5 *1)</td>
<td>0,6</td>
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<td>7</td>
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<tr>
<td></td>
<td>8,9</td>
<td>—</td>
<td>369</td>
<td>IP66 (with cable gland)</td>
<td>Il 2 G Ex e mb IC T4/ T5 Gb</td>
<td>T4: -40 ... +65</td>
<td>M20 x 1,5 *1)</td>
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<td>4</td>
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<td>10,0</td>
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<td>IP66 (with cable gland)</td>
<td>Il 2 G Ex e mb IC T4/ T5 Gb</td>
<td>T4: -40 ... +65</td>
<td>M20 x 1,5 *1)</td>
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<td>3,9</td>
<td>—</td>
<td>162</td>
<td>IP66 (with cable gland)</td>
<td>Il 2 G Ex e mb IC T4/ T6 Gb</td>
<td>T4: -40 ... +80</td>
<td>1/2 NPT *1)</td>
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<td>5,3</td>
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<td>IP66 (with cable gland)</td>
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<td>T4: -40 ... +80</td>
<td>1/2 NPT *1)</td>
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<td>21</td>
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<td>3,9</td>
<td>—</td>
<td>162</td>
<td>IP66 (with cable gland)</td>
<td>Il 2 G Ex e mb IC T4/ T6 Gb</td>
<td>T4: -40 ... +80</td>
<td>M20 x 1,5 *1)</td>
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<td>7</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>—</td>
<td>5,3</td>
<td>—</td>
<td>IP66 (with cable gland)</td>
<td>Il 2 G Ex e mb IC T4/ T6 Gb</td>
<td>T4: -40 ... +80</td>
<td>M20 x 1,5 *1)</td>
<td>0,8</td>
<td>7</td>
<td>21</td>
</tr>
</tbody>
</table>

Standard voltages (±10%) 24 V d.c., 230 V a.c., other voltages on request. Design according to VDE 0580, EN 50014/50028. 100% duty cycle.

*1) Connector/cable gland is not scope of delivery, see table «Accessories»

Attention: The protection class for coil series 46xx and 48xx is determined by the choice of cable gland. Example: If an ATEX-certified cable gland is used that has Ex d type of protection, the solenoid will have the protection class Ex d mb; if a cable gland with Ex e type of protection is used, the solenoid will have protection class Ex e mb.

Approvals

<table>
<thead>
<tr>
<th>Model</th>
<th>Approvals ATEX</th>
<th>IECEx</th>
<th>FM</th>
<th>Datasheet</th>
</tr>
</thead>
<tbody>
<tr>
<td>372x, 382x</td>
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<td>—</td>
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<td>N/n 7.1.575</td>
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<tr>
<td>42xx</td>
<td>NEMA 96 ATEX 4452 X</td>
<td>IECEx KEM 09.0068X</td>
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<td>N/n 7.1.580</td>
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<td>46xx</td>
<td>PTB 02 ATEX 2085 X</td>
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<td>N/n 7.1.585</td>
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Solenoids operator, standard voltages

<table>
<thead>
<tr>
<th>Power consumption 24 V d.c. (W)</th>
<th>Power consumption 230 V a.c. (VA)</th>
<th>Rated current 24 V d.c. (m A)</th>
<th>Rated current 230 V a.c. (m A)</th>
<th>Protection class IP/NEMA</th>
<th>Ex-Protection (ATEX-Catgerory)</th>
<th>Temperature Ambient/Media (°C)</th>
<th>Electrical connection</th>
<th>Weight (kg)</th>
<th>Drawing No.</th>
<th>Circuit diagram No.</th>
<th>Model</th>
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<tr>
<td>8,9 — 369 —</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Power consumption 24 V d.c. (W)</th>
<th>Power consumption 230 V a.c. (VA)</th>
<th>Rated current 24 V d.c. (m A)</th>
<th>Rated current 230 V a.c. (m A)</th>
<th>Protection class IP/NEMA</th>
<th>Ex-Protection (ATEX-Catgerory)</th>
<th>Temperature Ambient/Media (°C)</th>
<th>Electrical connection</th>
<th>Weight (kg)</th>
<th>Drawing No.</th>
<th>Circuit diagram No.</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>8,9 — 369 —</td>
<td></td>
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<td></td>
<td></td>
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</tr>
</tbody>
</table>

Standard voltages (±10%) 24 V d.c., 230 V a.c., other voltages on request. Design according to VDE 0580, EN 50014/50028. 100% duty cycle.

*1) Connector/cable gland is not scope of delivery, see table »Accessories«

Attention: The protection class for coil series 46xx and 48xx is determined by the choice of cable gland.

Example: if an ATEX-certified cable gland is used that has Ex d type of protection, the solenoid will have the protection class Ex d mb; if a cable gland with Ex e type of protection is used, the solenoid will have protection class Ex e mb.

Approvals

<table>
<thead>
<tr>
<th>Model</th>
<th>Approvals</th>
<th>IECEx</th>
<th>IEDEx PTB 11.0034X</th>
<th>IEDEx PTB 07.0038X</th>
<th>N/en 7.1.585</th>
<th>N/en 7.1.590</th>
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</thead>
<tbody>
<tr>
<td>46xx</td>
<td>PTB 02 ATEX 2085 X</td>
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<td></td>
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<tr>
<td>48xx</td>
<td>PTB 06 ATEX 2054 X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Position sensor

Supply voltage (Ub):
7.7 ... 9 V d.c.
Ripple:
15%
Frequency of operating cycles:
1000 Hz

Protection class:
IP68
Pressure-resistant:
500 bar
Ambient temperature:
-25 ... +70°C
Solenoids

1. Connector can be indexed by 4x90°
2. Ø 16 or 13 (with spacer tube)
3. M20 x 1,5 or 1/2 NPT
4. Flying leads AWG 18 (450 mm long)
5. With cable gland, Pg 13,5

Circuit diagrams

1
4
5
7
20
21
Technical features

Medium:
Compressed air, filtered, non-lubricated and dry. Other gases and liquid fluids on request. (Viscosity for gaseous or liquid fluids up to 40 mm²/s)

Operation:
Direct solenoid operated poppet valve

Operating pressure:
0 ... 10 bar (0 ... 145 psi)

Orifice:
5 mm

Flow:
Gaseous fluids: 340 l/min

Ambient/Media temperature:
-25 ... +80°C (-13 ... +176°F)

Depending on solenoid system
Air supply must be dry enough to avoid ice formation at temperatures below +2°C (35°F).
For outdoor installations must be protected all connections against the penetration of moisture and a solenoid with IP66 protection must be used!

Materials:
Body: Aluminium anodized or stainless steel 1.4404 (316 L)
Inner parts: stainless steel, brass
Solenoid housing: aluminium, anodized
Seals: NBR

Technical data

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Temperature (°C)</th>
<th>Material seat seal</th>
<th>Position sensor</th>
<th>Weight (kg)</th>
<th>Test certificate IEC 61 508 *2)</th>
<th>Dimension No.</th>
<th>Model *1)</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-25 ... +60</td>
<td>NBR</td>
<td>without</td>
<td>0.55</td>
<td>X</td>
<td>1</td>
<td>2401009.2003</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>-25 ... +60</td>
<td>NBR</td>
<td>without</td>
<td>1.00</td>
<td>X</td>
<td>1</td>
<td>2401097.2003</td>
<td>22</td>
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<tr>
<td></td>
<td>-25 ... +60</td>
<td>NBR</td>
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<td>0.62</td>
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<td>2</td>
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<td>23</td>
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<td></td>
<td>-25 ... +60</td>
<td>NBR</td>
<td>integrated</td>
<td>1.07</td>
<td>X</td>
<td>2</td>
<td>2401098.2003</td>
<td>24</td>
</tr>
</tbody>
</table>

*1) Solenoid to be included in scope of supply
*2) Particular for valves with TÜV approval and attachment in plants based on safety standards IEC 61508, taking into account to the operating and maintenance instructions document 7503444.
### Solenoid parameters for use in non hazardous locations (25)

<table>
<thead>
<tr>
<th>Switch-on voltage (V)</th>
<th>Allowed current (mA)</th>
<th>Holding current (mA)</th>
<th>Power consumption (W)</th>
<th>Protection class IP</th>
<th>Ex-Protection (ATEX-Category)</th>
<th>Temperature Ambient/Fluid (°C)</th>
<th>Electrical connection</th>
<th>Weight (kg)</th>
<th>Operating sequence</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>22 ... 26</td>
<td>&lt; 75</td>
<td>&gt; 40</td>
<td>1,8 at 24 V</td>
<td>IP66 (with cable gland)</td>
<td>—</td>
<td>-40 ... +80</td>
<td>M20 x 1,5 *2)</td>
<td>0,85</td>
<td>see below</td>
<td>2003</td>
</tr>
</tbody>
</table>

Standard voltages (+10%), Design according to VDE 0580, EN 50014/50028. 100% duty cycle.
Pick-up delay typical: 0,3 ... 2 s, depending on intrinsical current supply

*2) Connector cable gland is in scope of delivery

### Solenoid parameters for use in intrinsically safe circuits (25)

<table>
<thead>
<tr>
<th>Switch-on voltage (V)</th>
<th>Holding current (mA)</th>
<th>Holding voltage (V)</th>
<th>Pick-up delay typical *3) (s)</th>
<th>Protection class IP</th>
<th>Ex-Protection (ATEX-Category)</th>
<th>Temperature Ambient/Fluid (°C)</th>
<th>Weight (kg)</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>22 ... 28</td>
<td>40</td>
<td>approx. 5</td>
<td>0,3 ... 5</td>
<td>IP66 (with cable gland)</td>
<td>II 2 G Ex ia IIC T5/T6</td>
<td>T5: -40 ... +70</td>
<td>0,85</td>
<td>2003</td>
</tr>
</tbody>
</table>

*3) depending on intrinsical current supply

### Operating sequence

1. Supply voltage
2. Capacitor charging voltage
3. Solenoid current
4. Valve status

### Approvals

<table>
<thead>
<tr>
<th>Model</th>
<th>Approvals</th>
<th>IECEx</th>
<th>Datasheet</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>PTB 04 ATEX 2010</td>
<td>IECEx PTB 05.0020</td>
<td>N/en 7.1.530</td>
</tr>
</tbody>
</table>

### Function of solenoid drive

To switch the direct operated valve, a certain energy is required. This energy is stored in a capacitor. The charging voltage is 22 V. The higher the supply voltage, the shorter the charging time. As soon as the charging voltage has been reached, the valve switches. The small current now flowing through the coil is sufficient to hold the valve in the open position. At least 40 mA are required for this.

### Current supply units:

Intrinsically safe power supply units can be choosen in a list of compatibility in www.norgren.com. When selecting an intrinsically safe power supply, it is important to observe the maximum permissible values acc. to the EC-Type-Examination Certificate PTB 04 ATEX 2010 respectively IECEx PTB 05.0020 Ui 28 V, li 110 mA, Pi 1,5 W. The effective internal capacities Ci and inductivities li of the solenoid are negligibly low.
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24010 standard flow valve, 3/2
Direct solenoid actuated poppet valve

Position sensor
Supply voltage (Ub):
7.7 ... 9 V d.c.
Ripple:
15%
Frequency of operating cycles:
1000 Hz

Protection class:
IP68
Pressure-resistant:
500 bar
Ambient temperature:
-25 ... +70°C

Circuit diagram

Dimensions in mm
Projection/First angle
High flow range (950 l/min)

Main application:
Single acting actuators

TÜV-approval based on type examination DGRL 97/23/EG and IEC 61 508, multichannel up to SIL 3

Optional valve position sensors

Suitable for outdoor use under critical environmental conditions

Variable valve solenoid combination

### Technical features

**Medium:**
Filtered, non-lubricated and dried compressed air, instrument air, nitrogen and other non-flammable neutral, dry fluids

**Operation:**
Direct solenoid operated poppet valve

**Operating pressure:**
0 ... 10 bar (0 ... 145 psi)

**Orifice:**
8 mm

**Flow:**
Gaseous fluids: 950 l/min

**Port size:**
Flanged

**Flow direction:**
Optional

**Ambient/Media temperature:**
-40 ... +60°C (-40 ... +140°F)
-25 ... +60°C (-13 ... +140°F) (SIL version)

Depending on solenoid system
Air supply must be dry enough to avoid ice formation at temperatures below +2°C (35°F).
For outdoor installations must be protected all connections against the penetration of moisture and a solenoid with IP66 protection must be used!

**Materials:**
Body: Aluminium anodized or stainless steel 1.4404 (316 L)
Seals: NBR

### Technical data

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Temperature (°C)</th>
<th>Material seat seal</th>
<th>Inductive limit sensor</th>
<th>Weight (kg)</th>
<th>Test certificate IEC 61 508 *2)</th>
<th>Dimension No.</th>
<th>Model *1)</th>
<th>Substitute</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-40 ... +60</td>
<td>NBR</td>
<td>aluminium without</td>
<td>0.65</td>
<td>X</td>
<td>1</td>
<td>9801595</td>
<td>07</td>
</tr>
<tr>
<td></td>
<td>-40 ... +60</td>
<td>NBR</td>
<td>stainless steel without</td>
<td>1.50</td>
<td>X</td>
<td>1</td>
<td>9801795</td>
<td>08</td>
</tr>
<tr>
<td></td>
<td>-25 ... +60</td>
<td>NBR</td>
<td>aluminium integrated</td>
<td>0.72</td>
<td>X</td>
<td>2</td>
<td>9801594</td>
<td>09</td>
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<tr>
<td></td>
<td>-25 ... +60</td>
<td>NBR</td>
<td>stainless steel integrated</td>
<td>1.57</td>
<td>X</td>
<td>2</td>
<td>9801794</td>
<td>10</td>
</tr>
</tbody>
</table>

*1) When ordering please indicate solenoid, voltage and current type (frequency).

*2) For operation in plants according to IEC 61511/61508 (-25 ... +60°C)
## Solenoids

<table>
<thead>
<tr>
<th>Power consumption 24 V d.c. (W)</th>
<th>Rated current 230 V a.c. (m A)</th>
<th>Protection class IP/NEMA</th>
<th>Ex-Protection (ATEX-Category)</th>
<th>Temperature Ambient/ Media (°C)</th>
<th>Electrical connection</th>
<th>Weight (kg)</th>
<th>Drawing No.</th>
<th>Circuit diagram No.</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>8,9</td>
<td>369</td>
<td>NEMA 4, 4X, 6, 6P, 7, 9</td>
<td>XP/DP, Div. 1 &amp; 2 CI, Gr. A-D Cl II 3, Gr. E-G T3 (160°C)</td>
<td>-20 ... +60</td>
<td>Flying leads 450 mm</td>
<td>0,5</td>
<td>8</td>
<td>1</td>
<td>3824</td>
</tr>
<tr>
<td>—</td>
<td>9,5</td>
<td>NEMA 4, 4X, 6, 6P, 7, 9</td>
<td>XP/DP, Div. 1 &amp; 2 CI, Gr. A-D Cl II 3, Gr. E-G T3 (160°C)</td>
<td>-20 ... +60</td>
<td>Flying leads 450 mm</td>
<td>0,5</td>
<td>8</td>
<td>5</td>
<td>3825</td>
</tr>
<tr>
<td>13,6</td>
<td>367</td>
<td>NEMA 4, 4X, 6, 6P, 7, 9</td>
<td>XP/DP, Div. 1 &amp; 2 CI, Gr. A-D Cl II 3, Gr. E-G T3 (160°C)</td>
<td>-20 ... +60</td>
<td>Flying leads 450 mm</td>
<td>0,5</td>
<td>8</td>
<td>1</td>
<td>3826</td>
</tr>
<tr>
<td>—</td>
<td>15,7</td>
<td>NEMA 4, 4X, 6, 6P, 7, 9</td>
<td>XP/DP, Div. 1 &amp; 2 CI, Gr. A-D Cl II 3, Gr. E-G T3 (160°C)</td>
<td>-20 ... +60</td>
<td>Flying leads 450 mm</td>
<td>0,5</td>
<td>8</td>
<td>5</td>
<td>3827</td>
</tr>
<tr>
<td>8,9</td>
<td>369</td>
<td>IP66 (with cable gland)</td>
<td>II 2 Ex e mb IIC T4/T5 Gb II 2 Ex e mb IIC T130°C Db IP66</td>
<td>T4: -40 ... +65 T5: -40 ... +65 M20 x 1,5 (*1)</td>
<td>0,5</td>
<td>6</td>
<td>4</td>
<td>4270</td>
<td></td>
</tr>
<tr>
<td>—</td>
<td>10,0</td>
<td>IP66 (with cable gland)</td>
<td>II 2 Ex e mb IIC T4/T5 Gb II 2 Ex e mb IIC T130°C Db IP66</td>
<td>T4: -40 ... +65 T5: -40 ... +65 M20 x 1,5 (*1)</td>
<td>0,5</td>
<td>6</td>
<td>7</td>
<td>4271</td>
<td></td>
</tr>
<tr>
<td>8,9</td>
<td>369</td>
<td>IP66 (with cable gland)</td>
<td>II 2 Ex e mb IIC T4/T5 Gb II 2 Ex e mb IIC T130°C Db IP66</td>
<td>T4: -40 ... +70 T6: -40 ... +40 1/2 NPT (*1)</td>
<td>0,8</td>
<td>7</td>
<td>20</td>
<td>4670</td>
<td></td>
</tr>
<tr>
<td>—</td>
<td>10,0</td>
<td>IP66 (with cable gland)</td>
<td>II 2 Ex e mb IIC T4/T5 Gb II 2 Ex e mb IIC T130°C Db IP66</td>
<td>T4: -40 ... +70 T6: -40 ... +40 1/2 NPT (*1)</td>
<td>0,8</td>
<td>7</td>
<td>21</td>
<td>4671</td>
<td></td>
</tr>
<tr>
<td>8,9</td>
<td>369</td>
<td>IP66 (with cable gland)</td>
<td>II 2 Ex e mb IIC T4/T5 Gb II 2 Ex e mb IIC T130°C Db IP66</td>
<td>T4: -40 ... +70 T6: -40 ... +40 M20 x 1,5 (*1)</td>
<td>0,8</td>
<td>7</td>
<td>20</td>
<td>4672</td>
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</tr>
<tr>
<td>—</td>
<td>10,0</td>
<td>IP66 (with cable gland)</td>
<td>II 2 Ex e mb IIC T4/T5 Gb II 2 Ex e mb IIC T130°C Db IP66</td>
<td>T4: -40 ... +70 T6: -40 ... +40 M20 x 1,5 (*1)</td>
<td>0,8</td>
<td>7</td>
<td>21</td>
<td>4673</td>
<td></td>
</tr>
<tr>
<td>8,9</td>
<td>369</td>
<td>IP66 (with cable gland)</td>
<td>II 2 Ex em d IIC T4/T6 Gb II 2 Ex em d IIC T130°C Db T4/T6</td>
<td>T4: -40 ... +50 T6: -40 ... +40 M20 x 1,5 (*1)</td>
<td>1,2</td>
<td>10</td>
<td>4</td>
<td>4872</td>
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<tr>
<td>—</td>
<td>10</td>
<td>IP66 (with cable gland)</td>
<td>II 2 Ex em d IIC T4/T6 Gb II 2 Ex em d IIC T130°C Db T4/T6</td>
<td>T4: -40 ... +50 T6: -40 ... +40 M20 x 1,5 (*1)</td>
<td>1,2</td>
<td>10</td>
<td>7</td>
<td>4873</td>
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</tbody>
</table>

Standard voltages (±10%) 24 V d.c., 230 V a.c., other voltages on request. Design according to VDE 0580, EN 50014/50028. 100% duty cycle.

*1) Connector/cable gland is not scope of delivery, see table »Accessories«

Attention: The protection class for coil series 46xx and 48xx is determined by the choice of cable gland. Example: if an ATEX-certified cable gland is used that has Ex d type of protection, the solenoid will have the protection class Ex d mb; if a cable gland with Ex e type of protection is used, the solenoid will have protection class Ex e mb.

## Approvals

<table>
<thead>
<tr>
<th>Model</th>
<th>Approvals ATEX</th>
<th>IECEx</th>
<th>FM</th>
<th>Datasheet</th>
</tr>
</thead>
<tbody>
<tr>
<td>372x</td>
<td>KEMA 96 ATEX 4452 X</td>
<td>IECEx KEM 09.00068X</td>
<td>N/en 7.1.575</td>
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<tr>
<td>42xx</td>
<td>PTB 02 ATEX 2085 X</td>
<td>IECEx PTB 11.00094X</td>
<td>N/en 7.1.585</td>
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<tr>
<td>46xx</td>
<td>NEMA 96 ATEX 4452 X</td>
<td>IECEx KEM 09.00068X</td>
<td>N/en 7.1.585</td>
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</tr>
<tr>
<td>48xx</td>
<td>PTB 06 ATEX 2054 X</td>
<td>IECEx PTB 07.00309X</td>
<td>N/en 7.1.590</td>
<td></td>
</tr>
</tbody>
</table>
98015 high flow valve, 3/2
Direct solenoid actuated poppet valve

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**Position sensor**

Supply voltage (Ub):
7.7 ... 9 V d.c.
Ripple:
15%
Frequency of operating cycles:
1000 Hz

Protection class:
IP68
Pressure-resistant:
500 bar
Ambient temperature:
-25 ... +70°C

[Diagram of the position sensor]
Solenoids

1. Connector can be indexed by 4x90°
2. Ø 16 or 13 (with spacer tube)
3. M20 x 1,5 or 1/2 NPT
4. Flying leads AWG 18 (450 mm long)
5. With cable gland, Pg 13,5

Dimensions in mm
Projection/First angle

Circuit diagrams

1

4

5

7

20

21

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98025 high flow valve, 3/2
Indirect solenoid actuated poppet valve

> High flow range
(950 l/min)

> Main application:
Single acting actuators

> TÜV-approval based
on type examination
DGRL 97/23/EG and
IEC 61 508,
multichannel up to
SIL 3

**Technical features**

**Medium:**
Filtered, non-lubricated and
dried compressed air, instrument
air, nitrogen and other
non-flammable neutral, dry fluids

**Operation:**
Indirect solenoid operated
poppet valve.

**Operating pressure:**
2 ... 8 bar (29 ... 116 psi)
with internal air supply

**Flow:**
Gaseous fluids: 950l/min

**Orifice:**
8 mm

**Port size:**
Flanged

**Flow direction:**
Fixed

**Ambient/Media temperature:**
-40 ... +60°C (-40 ... +140°F)
-25 ... +60°C (-13 ... +140°F)
(SIL version)
Depending on solenoid system
Air supply must be dry enough
to avoid ice formation at
temperatures below +2°C (35°F).
For outdoor installations must be
protected all connections against
the penetration of moisture and
a solenoid with IP66 protection
must be used!

**Materials:**
Body: Aluminium anodized
(suitable for high humidity, sulphuric, sodium chloride or ammonia environments), stainless steel 1.4404 (316 L)
Seal: NBR
Inner parts: stainless steel

---

### Technical data

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Temperature (°C)</th>
<th>Material</th>
<th>Material seat seal</th>
<th>Housing</th>
<th>Inductive limit sensor</th>
<th>Weight (kg)</th>
<th>Test certificate IEC 61 508 *2)</th>
<th>Dimension No.</th>
<th>Model *1)</th>
<th>Substitute</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-40 ... +60</td>
<td>NBR</td>
<td>aluminium</td>
<td>without</td>
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<td>0,75</td>
<td>X</td>
<td>1</td>
<td>9802595</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>-40 ... +60</td>
<td>NBR</td>
<td>stainless steel</td>
<td>without</td>
<td></td>
<td>1,70</td>
<td>X</td>
<td>1</td>
<td>9802795</td>
<td>32</td>
</tr>
</tbody>
</table>

In order to ensure full flow and proper function make sure that sufficient pressure supply with feed pipe diameters according to the port size is available.

(Minimum pressure: 3 bar)

*1) When ordering please indicate solenoid, voltage and current type (frequency).

*2) For operation in plants according to IEC 61511/61508 (-25 ... +60°C)
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Solenoid actuators for intrinsically-safe circuits

<table>
<thead>
<tr>
<th>Nominal resistance RN coil (Ω)</th>
<th>Min. required switching current (mA)</th>
<th>Resistance Rw 60 coil (Ω)</th>
<th>Required voltage at terminal Rw 60 (V)</th>
<th>IP Protection class</th>
<th>Ex-Protection (ATEX-Category)</th>
<th>Temperature Ambient/Media (°C)</th>
<th>Weight (kg)</th>
<th>Circuit diagram No.</th>
<th>Model</th>
</tr>
</thead>
</table>
| 200                           | 33                                | 240                      | 8                                    | IP66 (with cable gland) | II 2 G Ex ia IIC T4/ T6 Db  
II 2 G Ex ia IIIC T80°C Db  
II 2 O Ex ia IIIC T100°C Db | T4: -40 ... +80  
T6: -40 ... +60  
-40 ... +80 | 0,85                             | 10                       | 2050                          |
| 391                           | 24                                | 460                      | 11                                   | IP66 (with cable gland) | II 2 G Ex ia IIC T4/ T6 Db  
II 2 G Ex ia IIIC T80°C Db  
II 2 O Ex ia IIIC T100°C Db | T4: -40 ... +80  
T6: -40 ... +60  
-40 ... +80 | 0,85                             | 10                       | 2051                          |
| 736                           | 17                                | 880                      | 15                                   | IP66 (with cable gland) | II 2 G Ex ia IIC T4/ T6 Db  
II 2 G Ex ia IIIC T80°C Db  
II 2 O Ex ia IIIC T100°C Db | T4: -40 ... +80  
T6: -40 ... +60  
-40 ... +80 | 0,85                             | 10                       | 2052                          |
| 1220                          | 13                                | 1460                     | 19                                   | IP66 (with cable gland) | II 2 G Ex ia IIC T4/ T6 Db  
II 2 G Ex ia IIIC T80°C Db  
II 2 O Ex ia IIIC T100°C Db | T4: -40 ... +80  
T6: -40 ... +60  
-40 ... +80 | 0,85                             | 10                       | 2053                          |

Cable gland (cable Ø 5 ... 10 mm) is in scope of delivery

When selecting an intrinsically safe power supply, the permissible maximum values according to the Certificate of Conformity should be taken into account.

Ui = 45 V, Ii = 500 mA according to Tab. A. 1, EN 60079-11

Pi = 2,0 W, Li and Ci can be ignored.

Approvals

<table>
<thead>
<tr>
<th>Model</th>
<th>Approvals ATEX</th>
<th>IECEx</th>
<th>Datasheet</th>
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Dimensions in mm

Projection/First angle

Circuit diagrams

<table>
<thead>
<tr>
<th>Drawings</th>
<th>Valves</th>
</tr>
</thead>
</table>

Our policy is one of continued research and development. We therefore reserve the right to amend, without notice, the specifications given in this document. (2013 - 5176c) © 2015 Norgren GmbH
V82 series - Redundant valve manifold systems - Compact
1002 “Safety”, 2002 “Availability” and 2003 “Safety and Availability”

Accessories
Exhaust guard (plastic) - standard option

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Silencer

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<table>
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Silencer (brass or stainless steel)

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<th>Ø</th>
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*1) Stainless steel

Cable gland

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<th>C</th>
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</table>
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Bracket
Model: A165-95
Weight: 0,61 kg

Dimensions in mm
Projection/First angle

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## Connector - valve position sensor

### 90°, 4 pin, with cable

![Diagram of 90°, 4 pin, with cable](image)

<table>
<thead>
<tr>
<th>Wire</th>
<th>Cable Material</th>
<th>Cable Length</th>
<th>Weight (g)</th>
<th>Model</th>
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</thead>
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<tr>
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<tr>
<td>0,34 mm²</td>
<td>PUR</td>
<td>5 m</td>
<td>180</td>
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</table>

### 90°, 4 pin, without cable

![Diagram of 90°, 4 pin, without cable](image)

<table>
<thead>
<tr>
<th>Cable Length</th>
<th>Weight (g)</th>
<th>Model</th>
</tr>
</thead>
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<tr>
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<td>5 m</td>
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</table>

### straight, 4 pin, with cable

![Diagram of straight, 4 pin, with cable](image)

<table>
<thead>
<tr>
<th>Wire</th>
<th>Cable Material</th>
<th>Cable Length</th>
<th>Weight (g)</th>
<th>Model</th>
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</thead>
<tbody>
<tr>
<td>0,34 mm²</td>
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<tr>
<td>0,34 mm²</td>
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### straight, 4 pin, without cable

![Diagram of straight, 4 pin, without cable](image)

<table>
<thead>
<tr>
<th>Weight (g)</th>
<th>Model</th>
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<tbody>
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### Warning

These products are intended for use in industrial compressed air and fluid systems only. Do not use these products where pressures and temperatures can exceed those listed under «Technical features/data». Before using these products with fluids other than those specified, for non-industrial applications, life-support systems, or other applications not within published specifications, consult IMI NORGREN.

Through misuse, age, or malfunction, components used in fluid power systems can fail in various modes. The system designer is warned to consider the failure modes of all component parts used in fluid power systems and to provide adequate safeguards to prevent personal injury or damage to equipment in the event of such failure.

System designers must provide a warning to end users in the system instructional manual if protection against a failure mode cannot be adequately provided.

System designers and end users are cautioned to review specific warnings found in instruction sheets packed and shipped with these products.

Functional safety (SIL): Suitable for certain applications can only be evaluated through examination of each safety-related overall system with regard to the requirements of IEC 61508/61511.