Technical brochure

Pressure controls, differential pressure controls, Type RT

An RT pressure control contains a pressure operated single-pole changeover contact, the position of which depends on the pressure in the inlet connection and the set scale value.

The RT series includes pressure controls for general applications within industrial and marine refrigeration.

The RT series also includes differential pressure controls, pressure controls for neutral zone regulation, and special pressure controls with gold-plated contact surfaces for PLC applications.

Features

- Waterproof versions
- Wide regulating range
- Wide range of units for industrial and marine applications
- Suitable for alternating and direct current
- Interchangeable contact system
- Special versions for PLC applications
Technical brochure  Pressure controls, differential pressure controls, type RT

Approvals

<table>
<thead>
<tr>
<th>RT 1</th>
<th>RT 1A</th>
<th>RT 1AL</th>
<th>RT 2A</th>
<th>RT 2AL</th>
<th>RT 3A</th>
<th>RT 3AL</th>
<th>RT 4A</th>
<th>RT 4AL</th>
<th>RT 5A</th>
<th>RT 5AL</th>
<th>RT 6A</th>
<th>RT 6AL</th>
<th>RT 7A</th>
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</tr>
</tbody>
</table>

Technical data

Cable connection
Pg 13.5.
Cable diameter 6 → 14 mm

Enclosure
IP 66 to EN 60529 / IEC 529, except for versions with ext. reset which are to IP 54

Ambient temperature
−50 to +70°C for pressure control housing

Switches
See “Ordering, switches”.

Properties according to EN 60947:
- solid/stranded
- flexible, w/out ferrules
- flexible, with ferrules
- max. 1.5 NM
- 4 kV
- 3
- 10 Amp
- 400 V
- 54/66

Materials in contact with the medium

<table>
<thead>
<tr>
<th>Type</th>
<th>Material</th>
<th>W. no.</th>
<th>To EN</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT 117, RT 117L, RT 200, RT 200L</td>
<td>Stainless steel 18/8</td>
<td>1.4306</td>
<td>10088-2</td>
<td></td>
</tr>
<tr>
<td>Stainless steel 17/7</td>
<td>1.4568</td>
<td>10270-3</td>
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<tr>
<td>Brass</td>
<td>2.0402</td>
<td>12164</td>
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<td></td>
</tr>
<tr>
<td>Brass</td>
<td>2.0321</td>
<td>12449</td>
<td></td>
<td></td>
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</tbody>
</table>
| RT 1A, RT 1AL, RT 5A, RT 5AL, RT 260A, RT 262A, RT 265A | Stainless steel 18/8 | 1.4306 | 10088-2 | Zinc plated, passivated (RT 1A, RT 1AL only)
| Plain carbon steel | 1.0338 | DIN 17223 | |
| Deep drawing steel | 1.0402 | 10139 | |
| Plain carbon steel | 1.0401 | 10083 | Nickel-plated, tinned |
| Case-hardened steel | 3005 | 10277-2 | Zinc plated, passivated |
| Alumium | 3005 | 573 | Nickel-plated |
| RT 1 | Stainless steel 18/8 | 1.4306 | 10088-2 | Zinc plated, passivated (RT 1 only) |
| Plain carbon steel | 1.0338 | DIN 17223 | Nickel-plated, tinned |
| Deep drawing steel | 1.1141 | 10139 | |
| Case-hardened steel | 1.0718 | 10084 | |
| Free-cutting steel | 1.0402 | 10277-3 | |
| Plain carbon steel | 1.0401 | 10083 | Nickel-plated, tinned (RT 6AW, 6AB, 6AS only) |
| Alumium | 3005 | 573 | Nickel-plated |
| RT 6W, 6B, 6S, RT 6AW, 6AB, 6AS | Stainless steel 18/8 | 1.4306 | 10088-2 | Nickel-plated, tinned (RT 6AW, 6AB, 6AS) |
| Deep drawing steel | 1.0338 | 10139 | |
| Case-hardened steel | 1.1141 | 10084 | Nickel-plated |
| Free-cutting steel | 1.0402 | 10277-3 | |
| Plain carbon steel | 1.0401 | 10083 | Nickel-plated |
| STW 22 | | 1.0338 | 10111 | |
| Free-cutting steel | 1.0718 | 10277-3 | Nickel-plated |
Technical brochure Pressure controls, differential pressure controls, type RT

Ordering

<table>
<thead>
<tr>
<th>Pressure</th>
<th>Type</th>
<th>Regulation range</th>
<th>Differential ( \Delta p )</th>
<th>Reset</th>
<th>Max. working pressure PB</th>
<th>Max. test pressure p'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>RT 1</td>
<td>–0.8 → 5</td>
<td>0.5 → 1.6</td>
<td>aut.</td>
<td>22</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>–0.8 → 5</td>
<td>fixed 0.5</td>
<td>man.</td>
<td>22</td>
<td>25</td>
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<tr>
<td></td>
<td>RT 200</td>
<td>0.2 → 6</td>
<td>0.25 → 1.2</td>
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<td>25</td>
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<tr>
<td>High</td>
<td>RT 117</td>
<td>10 → 30</td>
<td>1 → 4</td>
<td>aut.</td>
<td>42</td>
<td>47</td>
</tr>
</tbody>
</table>

Safety - Pressure controls for R 717 (NH₃) and fluorinated refrigerants

<table>
<thead>
<tr>
<th>Pressure</th>
<th>Type</th>
<th>Regulation range</th>
<th>Differential ( \Delta p )</th>
<th>Reset</th>
<th>Max. working pressure PB</th>
<th>Max. test pressure p'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>RT 1A</td>
<td>–0.8 → 5</td>
<td>0.5 → 1.6</td>
<td>aut.</td>
<td>22</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>–0.8 → 5</td>
<td>fixed 0.5</td>
<td>man.</td>
<td>22</td>
<td>25</td>
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<tr>
<td></td>
<td></td>
<td>–0.8 → 5</td>
<td>1.3 → 2.4</td>
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<td>25</td>
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<td>High</td>
<td>RT 5A</td>
<td>4 → 17</td>
<td>1.2 → 4</td>
<td>aut.</td>
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<td>25</td>
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<tr>
<td></td>
<td></td>
<td>4 → 17</td>
<td>fixed 1.2</td>
<td>man.</td>
<td>22</td>
<td>25</td>
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</table>

Safety pressure controls w EN 12263 appr. and CE marked acc. PED, Pressure Equipment Directive

<table>
<thead>
<tr>
<th>Pressure</th>
<th>Type</th>
<th>Regulation range</th>
<th>Differential ( \Delta p )</th>
<th>Reset</th>
<th>Max. working pressure PB</th>
<th>Max. test pressure p'</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>RT 36B</td>
<td>0 → 25</td>
<td>max. 0.2</td>
<td>man.</td>
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<td>RT 36S</td>
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<td>max. 0.2</td>
<td>man.</td>
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<td>25</td>
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<td>RT 6W</td>
<td>5 → 25</td>
<td>2.0 → 3.0</td>
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<td>34</td>
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<td></td>
<td>RT 6B</td>
<td>10 → 28</td>
<td>max. 1.0</td>
<td>man.</td>
<td>34</td>
<td>38</td>
</tr>
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<td></td>
<td>RT 6S</td>
<td>10 → 28</td>
<td>max. 1.0</td>
<td>man.</td>
<td>34</td>
<td>38</td>
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<td>RT 30AW</td>
<td>1 → 10</td>
<td>0.2 - 0.8</td>
<td>aut.</td>
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<td>25</td>
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<td>RT 30AB</td>
<td>1 → 10</td>
<td>max. 0.4</td>
<td>man.</td>
<td>22</td>
<td>25</td>
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<tr>
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<td>RT 30AS</td>
<td>1 → 10</td>
<td>max. 0.4</td>
<td>man.</td>
<td>22</td>
<td>25</td>
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<tr>
<td></td>
<td>RT 6AW</td>
<td>5 → 25</td>
<td>2.0 - 3.0</td>
<td>aut.</td>
<td>34</td>
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<td>RT 6AB</td>
<td>10 → 28</td>
<td>max. 1.5</td>
<td>man.</td>
<td>34</td>
<td>38</td>
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<tr>
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<td>RT 6AS</td>
<td>10 → 28</td>
<td>max. 1.5</td>
<td>man.</td>
<td>34</td>
<td>38</td>
</tr>
</tbody>
</table>

*) Meets the requirements in VBG 20 on safety equipment and excess pressures. W=Wächter (pressure control). B=Begrenzer (pressure control with external reset). S=Sicherheitsdruckbegrenzer (pressure control with internal reset). A rupture in the bellows system of the unit will cause the compressor to stop.

¹) BSP ext. thread, ISO 228/1.

²) Pressure controls for fluorinated refrigerants.

³) Pressure controls for R 717 (NH₃) and fluorinated refrigerants

⁴) Approved for PED also acc. to EN12953-9 and EN12922-11

⁵) Max. working pressure acc. to PED is limited to 28 bar
Ordering (continued)

Pressure controls with adjustable dead zone for R 717(NH₃) and fluorinated refrigerants

<table>
<thead>
<tr>
<th>Pressure</th>
<th>Type</th>
<th>Regulation range</th>
<th>Differential ∆p</th>
<th>Dead zone NZ</th>
<th>Max. working Pressure PB</th>
<th>Max. test pressure p'</th>
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<tr>
<td></td>
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<td>bar</td>
<td>bar</td>
<td>bar</td>
<td>bar</td>
<td>bar</td>
</tr>
<tr>
<td>Low</td>
<td>RT 1AL³</td>
<td>- 0.8 → 5 fixed 0.2</td>
<td>0.2 → 0.9</td>
<td>22</td>
<td>25</td>
<td>017L001666</td>
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<tr>
<td></td>
<td>RT 200L²</td>
<td>0.2 → 6 fixed 0.25</td>
<td>0.25 → 0.7</td>
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<td>25</td>
<td>017L003266</td>
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<tr>
<td>High</td>
<td>RT 5AL²</td>
<td>4 → 17 fixed 0.35</td>
<td>0.35 → 1.4</td>
<td>22</td>
<td>25</td>
<td>017L001766</td>
</tr>
<tr>
<td></td>
<td>RT 117L²</td>
<td>10 → 30 fixed 1.0</td>
<td>1 → 3.0</td>
<td>22</td>
<td>47</td>
<td>017L004266</td>
</tr>
</tbody>
</table>

³BSP ext. thread, ISO 228/1.
²Pressure controls for (R 717 NH₃) and fluorinated refrigerants
¹Pressure controls for fluorinated refrigerants
⁴Without nipple

Differential pressure controls for R 717(NH₃) and fluorinated refrigerants

<table>
<thead>
<tr>
<th>Type</th>
<th>Regulation range</th>
<th>Differential Δp</th>
<th>Operating range for LP bellows</th>
<th>Max. working Pressure PB</th>
<th>Max. test pressure p'</th>
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<tbody>
<tr>
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<td>bar</td>
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<td>bar</td>
<td>bar</td>
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<td>RT 260A</td>
<td>0.5 → 4 fixed 0.3</td>
<td>- 1 → 18</td>
<td>22</td>
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<tr>
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<td>0.5 → 4 fixed 0.3</td>
<td>- 1 → 18</td>
<td>22</td>
<td>25</td>
<td>017D002266 ³</td>
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<tr>
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<td>0.5 → 6 fixed 0.5</td>
<td>- 1 → 36</td>
<td>42</td>
<td>47</td>
<td>017D001566</td>
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<td>1.5 → 11 fixed 0.5</td>
<td>- 1 → 31</td>
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<td>47</td>
<td>017D001666</td>
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<tr>
<td>RT 262A</td>
<td>0.1 → 1.5 fixed 0.1</td>
<td>- 1 → 9</td>
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<td>017D001366</td>
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<tr>
<td>RT 265A⁴</td>
<td>1 → 6 fixed 0.5</td>
<td>- 1 → 36</td>
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<td>017D007266</td>
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</tbody>
</table>

³BSP ext. thread, ISO 228/1.
²Man. reset.
¹Filter monitor: Alarm ∆p = 0.8 bar, cut-out ∆p = 1 bar (factory setting).
⁴Without nipple

Differential pressure controls with adjustable dead zone for R 717(NH₃) and fluorinated refrigerants

<table>
<thead>
<tr>
<th>Type</th>
<th>Regulation range</th>
<th>Differential Δp</th>
<th>Dead zone NZ</th>
<th>Operating range for LP bellows</th>
<th>Max. working Pressure PB</th>
<th>Max. test pressure p'</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>bar</td>
<td>bar</td>
<td>bar</td>
<td>bar</td>
<td>bar</td>
<td>bar</td>
</tr>
<tr>
<td>RT 262 AL</td>
<td>0.1 → 1.5 fixed 0.1</td>
<td>0.1 → 0.33</td>
<td>1 → 9</td>
<td>11</td>
<td>13</td>
<td>017D004366 ³</td>
</tr>
</tbody>
</table>

³BSP ext. thread, ISO 228/1.
²Differential pressure control for R 717 (NH₃) and fluorinated refrigerants.

Special versions
RT can be supplied with special switches as follows.

When ordering, please state:
1. Type
2. Code no. of standard unit
3. Code no. of special switch
### Switches ¹)

<table>
<thead>
<tr>
<th>Version</th>
<th>Symbol</th>
<th>Description</th>
<th>Contact load</th>
<th>Code no.</th>
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</thead>
<tbody>
<tr>
<td>Standard</td>
<td><img src="symbol" alt="SPDT" /></td>
<td>Single-pole changeover switch with terminal board proof against leakage current. Fitted in all standard versions of type RT. Snap action changeover contacts.</td>
<td>Alternating current ²) Ohmic: AC 1 = 10 A, 400 V</td>
<td>017-403066</td>
</tr>
<tr>
<td>With man. reset</td>
<td><img src="symbol" alt="SPDT" /></td>
<td>For manual reset of unit after contact changeover on rising pressure. For HP units prepared for reset facility.</td>
<td>Inductive: AC 3 = 4 A, 400 V AC 15 = 3 A, 400 V</td>
<td>017-404266 with man. reset</td>
</tr>
<tr>
<td>With man. reset</td>
<td><img src="symbol" alt="SPDT" /></td>
<td>For manual reset of unit after contact changeover on falling pressure. For LP-units prepared for reset facility.</td>
<td>Direct current DC 13 = 12 W, 220 V</td>
<td>017-404166</td>
</tr>
<tr>
<td>With dead zone</td>
<td><img src="symbol" alt="SPDT" /></td>
<td>Single-pole changeover switch with dead zone and terminal board proof against leakage current.</td>
<td>Available only as a component part of RT controls with adjustable dead zone</td>
<td></td>
</tr>
<tr>
<td>Standard</td>
<td><img src="symbol" alt="SPDT" /></td>
<td>Single-pole changeover switch with gold plated (oxide-free) contact surfaces. Increases cut-in reliability on alarm and monitoring systems, etc. Snap action changeover contacts. Terminal board proof against leakage current.</td>
<td>Alternating current ²) Ohmic: AC 1 = 10 A, 400 V</td>
<td>017-424066</td>
</tr>
<tr>
<td>With dead zone</td>
<td><img src="symbol" alt="SPDT" /></td>
<td>Single-pole changeover switch with dead zone and gold plated (oxide-free) contact surfaces. Increases cut-in reliability on alarm and monitoring systems, etc. Snap action changeover contacts. Terminal board proof against leakage current.</td>
<td>Inductive: AC 3 = 2 A, 400 V AC 15 = 1 A, 400 V</td>
<td>Available only as a component part of RT controls with adjustable dead zone</td>
</tr>
<tr>
<td>Cuts in two circuits simultaneously</td>
<td><img src="symbol" alt="SPDT" /></td>
<td>Single-pole changeover switch that cuts in two circuits simultaneously on rising pressure. Snap action changeover contacts. Terminal board proof against leakage current.</td>
<td>Alternating current ²) Ohmic: AC 1 = 10 A, 400 V</td>
<td>017-403466</td>
</tr>
<tr>
<td>With non-snap action changeover contacts</td>
<td><img src="symbol" alt="SPDT" /></td>
<td>Single-pole changeover switch with non-snap action changeover contacts.</td>
<td>Alternating or direct current 25 VA, 24 V</td>
<td>017-018166</td>
</tr>
</tbody>
</table>

¹) RT pressure controls meet the conditions of EN 60947-2-9.
²) Max. starting current (L.R.) = 7 × AC 3.
³) If current is led through the contacts 2 and 4, i.e. terminals and 4 connected but not terminal 1, the max. permissible load is increased by 90 W, 220V.

The switches are shown in the position they assume on falling pressure, i.e. after downward movement of the RT main spindle. The setting pointer of the control shows the scale value at which contact changeover occurs on falling pressure. An exception is RT with switch code no. 017-404266 with Man. reset, where the setting pointer shows the scale value at which contact changeover occurs on rising pressure.
The bellows in the RT pressure control is connected to the low or high pressure side of the controlled system via the connection. By turning the setting knob (5) the main spring (12) can be set to balance the pressure in the bellows.

A rise in pressure compresses the bellows and moves the main spindle (15) upwards until spring and bellows pressure are in equilibrium. The main spindle (15) is fitted with a guide bush (17) and a differential pressure setting nut (19) that together transfer the main spindle movement to the switch (16).

The RT 6W, 6B, 6S, RT 6AW, 6AB, 6AS, RT 30AW, 30AB, 30AS, RT 36B, 36S are equipped with a double bellows (an outer bellows and a regulating bellows).

These units have been tested and approved by TÜV (Technischer Überwachungs Verein, Germany) according to EN 12263.

W = Wächter (pressure controls)  
B = Begrenzer (pressure controls with external reset)  
S = Sicherheitsdruckbegrenzer (pressure controls with internal reset).

General for EN 12263 approved units
1. The units are equipped with a double bellows system. When pressure in the plant excee the set value, the unit will automatically shut off the plant. The double bellows system prevents loss of system charge in the event of bellows rupture.
2. Versions with designation W or AW cut automatically when the pressure falls below the set value by the differential.
3. Versions with designation B or AB are cut manually with the external reset button. This is possible when the pressure has fallen below the set value.
3. Versions with designation S or AS are cut in manually with the internal reset arm when the pressure has fallen below the set value.

As laid down by EN 12263 requirements, if a rupture occurs in the regulating bellows of the unit the refrigerating system compressor will be stopped and can only be restarted when the pressure control has been replaced.

A rupture in the outer bellows will cause the cut-out pressure of RT 36 to fall 2.5 bar, and the cut-out pressure of RT 6 and RT 30 to fall 4.5 bar under the set value. This means that the unit cuts out at normal condensing pressure and thus provides a fail-safe function.

All RT pressure controls, including those which are EN 12263 approved, operate independently of changes in the ambient temperature around the control housing.

Therefore the cut-out pressure and differential are held constant provided the permissible ambient temperatures are not exceeded.
RT L pressure controls are fitted with a switch with an adjustable neutral zone. This enables the units to be used for floating control. The neutral zone switch contact arms (18a) and (18b) are operated by the spindle guide bushes (17) and (20).

The upper guide bush (17) is fixed while the lower guide bush (20) can be moved up or down by the setting nut (40). In this way the neutral zone can be varied between a minimum value (equal to the mechanical differential of the unit) and a maximum value (depending on the type of RT unit).
An RT differential pressure control contains a single-pole changeover switch that makes or breaks depending on the pressure differential between two counteracting bellows elements (LP and HP).

Differential pressure controls are used primarily as protection against too low a differential pressure across liquid circulation pumps. A secondary application is the safeguarding of lubricating oil pressure in refrigeration compressors.

The function of the pressure control is conditional only on the differential pressure, i.e. the difference in pressure between the two counteracting bellows, whereas it is independent of the absolute pressure on both bellows. The bellows (4) and (24) are respectively connected to the LP port (lowest pressure) and the HP port (highest pressure).

The main spring (12) can be set for different differential pressures by the setting disc (5). If the differential pressure between highest and lowest pressures falls, the spindle (15) moves downwards and via the upper guide bush (17) actuates the switch contact arm (18). The reverse function occurs if the differential pressure rises.

For RT 260A controls used on screw compressors the following applies:

1. Max. pressure in low pressure bellows ~ condensing pressure = 21 bar.
2. Max. pressure in high pressure bellows ~ lubricating oil pressure = 24 bar.
3. Differential between condensing pressure and lubricating oil pressure must not exceed 3 bar.
4. Pressure change in the low and high pressure bellows from start to normal operation must not exceed 8 bar.

1) Since the operating conditions given, are outside the operating range of the unit, the life of the bellows will be reduced to approx. 10,000 operations as against approx. 400,000 operations.
Terminology

Floating control
A form of delayed control where the correcting element (e.g. valve, damper, or similar) moves towards one extreme position at a rate independent of the magnitude of the error when the error exceeds a definite positive value, and towards the opposite extreme position when the error exceeds a definite negative value.

Hunting
Periodic variations of the controlled variable from the Fixed reference.

Neutral zone
The interval between the make points of the two contacts.

“Snap function”
A certain contact force is maintained until irrevocable “snap” is initiated. The time during which the contact force approaches zero is thus limited to a very few milliseconds. Therefore contact bounce cannot occur as a result of, for example, slight vibrations, before the cut-out point. Contact systems with “Snap function” will change over even when micro-welds are created between the contacts during cut-in. A very high force is created during cut-out to separate the contacts. This force immediately shears off all the welds. Thus the cut-out point of the unit remains very accurate and completely independent of the magnitude of the current load.

Setting

RT with automatic reset - LP
The knob is used to set the lowest pressure at which the contact system must be activated (cut-out or cut-in).
This value can be read on the main scale of the unit.
The differential roller must be used to set the differential.
Highest activating pressure = lowest activating pressure + set differential.

RT with manual reset - LP
RT pressure controls RT 1 and RT 1A are obtainable in versions with min. reset. When the pressure falls to the setting value the pressure control cuts out.
Manual reset becomes possible when the pressure in the bellows system has risen to a value corresponding to the set value + the differential.
On falling pressure the follower activates the contact system arm and the contact changes over.
The scale is calibrated so that the scale value corresponds to contact changeover on falling pressure.

RT with automatic reset - HP
The knob can be used to set the lowest pressure at which the contact system must be activated (cut-out or cut-in).
This value can be read on the main scale of the unit.
The differential must be set with the differential roller. Highest activating pressure = lowest activating pressure + set differential.

RT with manual reset - HP
Pressure control RT 5A is obtainable with max. reset. When the pressure has risen to the set value the pressure control cuts out.
Manual reset only becomes possible when the pressure has fallen to a value corresponding to the set pressure minus the differential.
The differential roller is then used as a follower.
On rising pressure the differential roller activates the contact system arm and the contact changes over.
The scale is calibrated so that the scale values correspond to contact changeover on rising pressure, which is opposite to RT units with automatic reset.
Dimensions and weight

RT pressure control housing

Weight approx. 1 kg

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