Operating instructions
Tightness control TC 410

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Safety

Please read and keep in a safe place

⚠️ Please read through these instructions carefully before installing or operating. Following the installation, pass the instructions on to the operator. This unit must be installed and commissioned in accordance with the regulations and standards in force. These instructions can also be found at www.docuthek.com.

Explanation of symbols

1, 2, 3... = Action
▷ = Instruction

Liability

We will not be held liable for damage resulting from non-observance of the instructions and non-compliant use.

Safety instructions

Information that is relevant for safety is indicated in the instructions as follows:

⚠️ DANGER
Indicates potentially fatal situations.

⚠️ WARNING
Indicates possible danger to life and limb.

⚠️ CAUTION
Indicates possible material damage.

All interventions may only be carried out by qualified gas technicians. Electrical interventions may only be carried out by qualified electricians.

Conversion, spare parts

All technical changes are prohibited. Only use OEM spare parts.

Changes to edition 04.17

The following chapters have been changed:
- Technical data
- Certification
Checking the usage

TC 410 for tightness test before every controlled start-up or after every controlled shut-down in systems with 2 safety valves. Tightness control TC 410 can be used for individual valves, quick opening or slow opening with start gas rate. The valves are controlled directly for testing by the TC 410. A pressure switch for gas must be mounted on the interspace between the valves to be monitored for the tightness test. This function is only guaranteed when used within the specified limits – see page 5 (Technical data). Any other use is considered as non-compliant.

Type code

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC</td>
<td>Tightness control</td>
</tr>
<tr>
<td>4</td>
<td>In control cabinet</td>
</tr>
<tr>
<td>1</td>
<td>Testing before or after burner run</td>
</tr>
<tr>
<td>0</td>
<td>External pressure switch required</td>
</tr>
<tr>
<td>T</td>
<td>T-product</td>
</tr>
<tr>
<td>-1</td>
<td>Test period: 10 to 60 s</td>
</tr>
<tr>
<td>-10</td>
<td>Test period: 100 to 600 s</td>
</tr>
<tr>
<td>K</td>
<td>Mains voltage: 24 V DC</td>
</tr>
<tr>
<td>N</td>
<td>110/120 V AC, 50/60 Hz</td>
</tr>
<tr>
<td>T</td>
<td>220/240 V AC, 50/60 Hz</td>
</tr>
</tbody>
</table>

Part designations

1 Upper housing section
2 Lower housing section

Type label

▷ Test period and gas type, mains voltage, power consumption, ambient temperature, enclosure, switching current and maximum inlet pressure – see type label.

Installation

⚠️ CAUTION
Please observe the following to ensure that the TC is not damaged during installation:
- Avoid condensation.
- Gas type and inlet pressure \( p_u \): dependent on external pressure switch.

▷ Any installation position.
▷ The device must not be in contact with masonry. Minimum clearance 20 mm (0.78”).
▷ In the case of very large test volumes \( V_p \), an installed relief line should be of nominal size 40 to allow for the discharge of the test volume \( V_p \).

1 Disconnect the system from the electrical power supply.
2 Shut off the gas supply.

3 Snap the lower section onto a 35 mm U-shaped mounting rail or screw on the lower section with two screws Ø 5 mm.
4 Mount the pressure switch on the interspace of the valves to be monitored – see operating instructions for pressure switch.
5 On VG 15 – 40/32, the test point is connected to the valve inlet.
6 Set the pressure switch to half the inlet pressure \( p_u /2 \).
The switching differential of the pressure switch may not exceed ±10% of the set value. Example:
inlet pressure \( p_u = 100 \text{ mbar} \),
set switching pressure \( p_o/2 = 50 \text{ mbar} \),
max. switching differential \( 50 \text{ mbar} \times 10\% = 5 \text{ mbar} \).
The switch-on and switch-off pressure must be between 45 mbar and 55 mbar.

### Wiring

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric shocks can be fatal!</td>
</tr>
<tr>
<td>- Before working on possible live components, ensure the unit is disconnected from the power supply.</td>
</tr>
<tr>
<td>Please observe the following to ensure that the TC is not damaged during installation:</td>
</tr>
<tr>
<td>- Incorrect wiring may result in unsafe states and the destruction of the tightness control, the automatic burner control unit or the valves.</td>
</tr>
<tr>
<td>- Do not reverse ( L1(+) ) and ( N(+) ).</td>
</tr>
</tbody>
</table>

1. Disconnect the system from the electrical power supply.
2. Shut off the gas supply.
3. Open the housing cover of the TC.
4. Electrical connection: 2.5 mm² terminals.
5. The data on the type label must comply with the mains voltage.

#### Setting the test period \( t_P \)

The test period \( t_P \) is set at the works to 10 s (100 s) on TC 410-1 (TC 410-10) and can be changed with a jumper in increments of 10 s (100 s) to a max. of 60 s (600 s).

- Without jumper = 60 s (600 s).
- The longer the test period \( t_P \), the smaller the leakage rate at which a safety shut-down is triggered.
- If no leakage rate is specified, we recommend the max. test period is set.
- If a leakage rate is specified, find the test period \( t_P \) from the following:
  \[
  Q_{\text{max}} = \text{max. flow rate} \quad [\text{m}^3/\text{h}]
  
  Q_L = Q_{\text{max}} \times 0.1\% \quad = \text{leakage rate} \quad [\text{l}/\text{h}]
  
  p_u = \text{inlet pressure} \quad [\text{mbar}]
  
  V_P = \text{test volume} \quad [\text{l}] , \quad \text{see page 3 (Values for valve and pipe volume)}
  
  t_P \quad [\text{s}] = 4 \times \left( \frac{p_u \times V_P}{Q_L} \right) + 1 \quad \text{s}
  
  \]

#### Values for valve and pipe volume

<table>
<thead>
<tr>
<th>Valves</th>
<th>Nominal size</th>
<th>Valve volume</th>
<th>Pipe volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>VG 10</td>
<td>10</td>
<td>0.01</td>
<td>0.1</td>
</tr>
<tr>
<td>VG 15</td>
<td>15</td>
<td>0.07</td>
<td>0.2</td>
</tr>
<tr>
<td>VG 20</td>
<td>20</td>
<td>0.12</td>
<td>0.3</td>
</tr>
<tr>
<td>VG 25</td>
<td>25</td>
<td>0.2</td>
<td>0.5</td>
</tr>
<tr>
<td>VG 40/VK 40</td>
<td>40</td>
<td>0.7</td>
<td>1.3</td>
</tr>
<tr>
<td>VG 50/VK 50</td>
<td>50</td>
<td>1.2</td>
<td>2</td>
</tr>
<tr>
<td>VG 65/VK 65</td>
<td>65</td>
<td>2</td>
<td>3.3</td>
</tr>
<tr>
<td>VG 80/VK 80</td>
<td>80</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>VG 100/VK 100</td>
<td>100</td>
<td>8.3</td>
<td>7.9</td>
</tr>
</tbody>
</table>

#### Setting the test instant

- The test instant (MODE) can be set inside the housing using a jumper.
- Mode 1: test before burner start-up with incoming \( \vartheta \) signal (factory setting).
- Mode 2: test after burner run with outgoing \( \vartheta \) signal and also after switching on the mains voltage.
- Without jumper = test before burner start-up.

1. Disconnect the unit from the electrical power supply.
2. Unscrew the housing cover.
3. Set the test instant with a jumper, MODE 1 or 2.
### Valves

<table>
<thead>
<tr>
<th>Valve</th>
<th>Volume $V_V$ [l]</th>
<th>Nominal Size DN</th>
<th>Pipe Volume $V_R$ [l/m]</th>
</tr>
</thead>
<tbody>
<tr>
<td>VK 125</td>
<td>13.6</td>
<td>125</td>
<td>12.3</td>
</tr>
<tr>
<td>VK 150</td>
<td>20</td>
<td>150</td>
<td>17.7</td>
</tr>
<tr>
<td>VK 200</td>
<td>42</td>
<td>200</td>
<td>31.4</td>
</tr>
<tr>
<td>VK 250</td>
<td>66</td>
<td>250</td>
<td>49</td>
</tr>
<tr>
<td>VAS 1</td>
<td>0.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VAS 2</td>
<td>0.32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VAS 3</td>
<td>0.68</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VAS 6</td>
<td>1.37</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VAS 7</td>
<td>2.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VAS 8</td>
<td>3.34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VAS 9</td>
<td>5.41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCS 1</td>
<td>0.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCS 2</td>
<td>0.18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCS 3</td>
<td>0.39</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCS 6</td>
<td>1.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCS 7</td>
<td>1.40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCS 8</td>
<td>2.82</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCS 9</td>
<td>4.34</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Calculation example:

\[ Q_{\text{max.}} = 100 \text{ m}^3/\text{h} \]
\[ p_u = 100 \text{ mbar} \]
\[ V_P = V_V + L \times V_R = 7 \text{ l} \]
\[ Q_L = 100 \text{ m}^3/\text{h} \times 0.1\% = 100 \text{ l/h} \]
\[ 4 \times \left( \frac{100 \times 7}{100} + 1 \text{ s} \right) = 32 \text{ s} \]

Set the next highest value (in this example 40 s) with the jumper.

2. Disconnect the unit from the electrical power supply.
3. Unscrew the housing cover.
4. Connect the jumper to the pin for the required test period $t_P$ between 10 and 60 s (100 and 600 s).
5. Position the housing cover and screw tight.
6. Mark the set test period $t_P$ on the type label with a waterproof pen.

#### Commissioning

- **Indicators and operating controls:**
  - **TEST** = TEST phase (yellow)
  - **OK** = operating signal (green)
  - **1** = fault valve 1 (red)
  - **2** = fault valve 2 (red)
  - **/** = reset button

1. Main switch on.
2. Apply mains voltage to terminal 1.
3. Start the tightness test.
4. **Mode 1**, test before burner start-up.
5. **Mode 2**, test after burner run.

**Mains voltage at terminal 1 and renewed test after switching off the voltage to terminal 3.**

The test begins:

- LED TEST is lit.
- After test, if the valves are tight:
  - LED OK is lit.
  - MODE 1: voltage at terminal 4.
  - MODE 2: voltage at terminal 4 does not arrive until voltage is applied to terminal 3.
- After test, if the valves are leaking: voltage at terminals 8 and 9.
  - LED 1 is lit.
  - LED 2 is lit.

**Power failure**

- If the power fails briefly during the test or during operation, the tightness test will restart automatically.
- After a power failure during a fault, both red fault lamps will be lit.

#### Assistance in the event of malfunction

**CAUTION**

Electric shocks can be fatal!

- Before working on possible live components, ensure the unit is disconnected from the power supply.
- Fault-clearance must only be undertaken by authorized trained personnel.
- (Remote) resets may only be conducted by authorized personnel.

- Faults may be cleared only using the measures described below.
Press the reset button, see page 4 (Commissioning).

If the tightness control will not start even though all faults have been remedied, remove the unit and send it to the manufacturer for inspection.

**Fault**

**Cause**

**Remedy**

**? No LED is lit although mains voltage and \( \vartheta \) signal are applied?**

! Fuse defective.

- Replace 5 A slow-acting fine-wire fuse – after replacing the fuse, start the tightness test several times and check the program sequence and the outputs of the tightness control.

- If it does not operate correctly, return the unit to the manufacturer.

! **Mode 1**: test before burner start-up is set; L1 and N are reversed on terminals 1 and 2.

- Connect L1 to terminal 1 and N to terminal 2.

- For 24 V DC: polarity of mains voltage on terminals 1 and 2 reversed.

- Connect + to terminal 1 and – to terminal 2.

- Mains voltage too low.

- Compare to details on the type label. Tolerance: -15/+10% for 110/120 V AC and 220/240 V AC, ±20% for 24 V DC.

**? TC repeatedly signals a fault?**

! A valve is leaking.

- Replace the valve.

! Pressure switch incorrectly set.

- Set the pressure switch to half the inlet pressure.

! Wiring to the valves reversed.

- Start the program and observe the interspace pressure \( p_z \). The pressure must change during the TEST phase. Check the wiring.

! Inlet pressure \( p_u < 10 \) mbar.

- Provide the min. inlet pressure of 10 mbar.

! Interspace pressure \( p_z \) cannot be reduced.

- The volume downstream of the valve on the burner side must be 5 times higher than the volume between the valves and atmospheric pressure must prevail.

! The test period \( t_P \) is too long.

- Adjust \( t_P \), see page 3 (Setting the test period \( t_P \)).

**? The downstream automatic burner control unit does not start?**

! On the tightness control, L1 (+) and N (-) on terminals 1 and 2 are reversed.

- Connect L1 (+) to terminal 1 and N (-) to terminal 2.

**? TEST phase running (yellow LED indicator is lit) although no \( \vartheta \) signal has been applied?**

! Mode 2 set.

- Set jumper to Mode 1, see page 3 (Setting the test instant).

**Maintenance**

Tightness controls TC require little servicing. We recommend a function check once a year.

**Technical data**

- **Mains voltage:** 110/120 V AC, -15/+10%, 50/60 Hz, 220/240 V AC, -15/+10%, 50/60 Hz, 24 V DC, ±20%.
- **Power consumption:** 10 VA for 110/120 V AC and 220/240 V AC, 1.2 W for 24 V DC.
- **Ambient temperature:** -15 to +60°C (5 to 140°F), no condensation permitted.
- **Storage temperature:** -15 to +40°C (5 to 104°F).
- **Fusing:** fine-wire fuse 5 A, slow-acting, H pursuant to IEC 127, also protects the valve outputs and external operating signal.
- **Screw terminals:** 2.5 mm².
- **Weight:** approx. 400 g (0.88 lbs).

**Designed lifetime**

Max. service life under operating conditions: 10 years after date of production or 250,000 operating cycles pursuant to EN 1643.
Contact

If you have any technical questions, please contact your local branch office/agent. The addresses are available on the Internet or from Elster GmbH.

We reserve the right to make technical modifications in the interests of progress.