Valve testing system
VPS 504
for multiple actuators

8.10

Technical description
The VPS 504 is the valve proving system for DUNGS multiple actuators. The valve proving system complies with EN 1643:
- Equipment operates independent of residual pressure in the range of the permissible operating range.
- Test volume ≤ 4 l
- Setting work not necessary on site
- Short test period: ≈ 10 s, max. 36 s
- Tightness or leaks are displayed by an LED
- External fault display possible for series 02, series 04 and S05
- Group fault alarm optional for S01 (SSM)
- Suitable for TRD systems
- Electrical connection possible by plug connection S01, 02, 03. No rewiring is required for contact allocation as per DIN 4791.
- S04 and S05: electrical connection at screw terminals via PG 13.5 cable entry

Application
Valve proving system for DUNGS single valves, DMV double solenoid valve and GasMultiBloc MB. The VPS504 can also be used for monitoring the DUNGS solenoid valves up to DN 80, with and without bypass connection. 24 VDC design for gas motors. Suitable for gases of gas families 1, 2, 3 in the gaseous state and other neutral gaseous media.

Approvals
EC type testing certificate as per:
• EC-Gas Appliances Regulation
• EC-Pressure Equipment Directive

Approvals in other important gas consuming countries. Special design for the North American market with UL, FM and CSA registration.
## Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating pressure</td>
<td>max. 500 mbar (50 kPa)</td>
</tr>
<tr>
<td>Test volume</td>
<td>≥ 0.1 l&lt;br&gt;≤ 4.0 l</td>
</tr>
<tr>
<td>Pressure increase by motor pump</td>
<td>≈ 20 mbar</td>
</tr>
<tr>
<td>Nominal voltage, Frequency</td>
<td>refer to type overview page 11</td>
</tr>
<tr>
<td>Rating requirement</td>
<td>During pumping time approx. 60 VA, in operation 17 VA</td>
</tr>
<tr>
<td>Prefuse (provided by customer)</td>
<td>10 A quick-acting or 6.3 A slow-acting fuse</td>
</tr>
<tr>
<td>Fuse installed in housing cover, replaceable</td>
<td>Microfuse 6.3 slow-blow L 250 V; IEC-127-2/III (DIN 41 662)</td>
</tr>
<tr>
<td>Switching current</td>
<td>Operating output VPS 504 S01, 02, 03, 04, 05: max. 4 A&lt;br&gt;Interference output VPS 504 S02, 04, 05: max. 1 A</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>VPS 504 S01, 02, 03: IP 40&lt;br&gt;VPS 504 S04, 05: IP 54</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>50 Hz 230 VAC -15°C to +70°C&lt;br&gt;others: -15°C to +60°C</td>
</tr>
<tr>
<td>Operational attitude</td>
<td>Suitable for use up to 2000 m above sea level</td>
</tr>
<tr>
<td>Release time</td>
<td>Approx. 10 - 36 s, depending on test volume and input pressure</td>
</tr>
<tr>
<td>Sensitivity limit</td>
<td>max. 50 l/h&lt;br&gt;At inlet pressures of &lt; 50 mbar, limit pressure rates well below 50 l of air per hour occur due to the mode of operation. This allows for applications involving low inlet pressures.</td>
</tr>
<tr>
<td>Switch-on duration of control</td>
<td>100 % ED</td>
</tr>
<tr>
<td>Max. number of test cycles</td>
<td>20/h. Wait for at least 2 minutes after carrying out more than 3 consecutive test cycles.</td>
</tr>
<tr>
<td>Installation position</td>
<td>vertical, horizontal, not upside down</td>
</tr>
<tr>
<td>Media</td>
<td>Gas families 1, 2, 3, sewage gas, landfill gas and biogas (dry, H2S &lt; 0.1% by volume) and other gaseous media&lt;br&gt;For gases with a butane content &lt; 60 % and gases with a density &lt; 1 kg/m³.</td>
</tr>
</tbody>
</table>
1 Hall switch
2 Solenoid
3 Pressure switch diaphragms
4 Compression spring
5 Filter
6 Solenoid valve anchor
7 Solenoid valve coil
8 Pressure pump
9 Unlock switch
10 Fault lamp
11 Operating lamp
12 Test nipple
13 Volume restrictor
14 Pump diaphragm
15 Pump linkage
16 PCB
17 Plug connection
18 Equipment fuse
19 Spare fuse
**Functional description**
The VPS 504 operates depending on pressure build-up.
The program module starts to function when heat is requested.
Test is performed depending on the burner functional procedure:

Check **prior** to burner start or Check **during** pre-purge period or Check **after** burner shut-down

**Release period** \( t_F \)
Period which a VPS requires to perform a complete operation procedure. The release period of the VPS 504 depends on **test volume and input pressure**:

\[
\begin{align*}
V_{\text{Test}} < 1.5 \text{ l} & \quad \Rightarrow t_F = 10 \text{ s} \\
\rho_{\text{a}} > 20 - 500 \text{ mbar} & \\
V_{\text{Test}} > 1.5 \text{ l} & \quad \Rightarrow t_F = 10 \text{ s} \\
\rho_{\text{a}} > 20 \text{ mbar} & \\
t_F \text{ max. } = 36 \text{ s}
\end{align*}
\]

**Test period** \( t_{\text{test}} \)
Pumping time of motor pump.

**Test volume** \( V_{\text{test}} \)
Volume between V1 output-side and V2 input-side and the intermediate tube pieces.

\[
V_{\text{Test max.}/\text{VPS 504}} = 4 \text{ l}
\]

**Field of application**

**Release period**

\[
\begin{align*}
\rho_{\text{a}} + 20 \text{ mbar} & \quad \text{at test volume } > 1.5 \text{ l} \\
& \quad \text{max. } = 36 \text{ s}
\end{align*}
\]

**Program sequence**

**Idle state:** Valves 1 and 2 are closed.

**Pressure build-up:** The internal motor pump increases the gas pressure in the test section by approx. 20 mbar compared to the input-side pressure applied to valve V1.

During the test period, the installed differential pressure switch monitors the test section for leakage. If the test pressure is attained, the motor pump is switched off (end of test period). The release time (10-36 s) depends on the test volume (max. 4.0 l) and input pressure (max. 500 mbar). If the test section is tight, the contact is released to the automatic burner control after max. 36 s - the yellow signal lamp lights up.

If the test section is leaky or if the pressure increase by +20 mbar is not attained during the test period (max. 26 s), the VPS 504 switches to fault. The red signal lamp lights as long as the contact release by the regulator or thermostat is present (heat requirement).

If there is a short power failure during the test or burner operation, the test is started again automatically.

If the pumping time < approx. 10s, the pressure difference between the testing system and the inlet pressure is balanced after pumping is finished.

**Operation:** The internal valve of the VPS 504 is closed.
Electrical connection
VPS 504 S01
The VPS 504 S01 is connected in series between temperature regulator and automatic burner control via a 7-pole connector. Connector pin assignment between burner and boiler is performed as per DIN 4791. For pin assignment, refer to connection diagram.
If the heat generator is wired as per DIN 4791, no boiler- or burner-side rewiring is necessary for electrical connection.
The burner female connector is connected with the cable-to-cable male connector of VPS 504 S01.
The female connector VPS 504 S01 is connected with the cable-to-cable male connector of the heat generator.

- F1: Fuse
- F2: Switch or limiter
- F3: Regulator
- H1: Fault signal
- H2: Operation signal
- P1: Operating hours counter
- S1: Switch
- X1B: Female connection
- X1s: Male connection
Electrical connection
VPS 504 S01 SSM
Group fault alarm
The electrical connection of VPS 504 S01 SSM is performed the same way as with the VPS 504 S01 (see page 5).

Additional switching characteristic of VPS 504 S01 SSM
If the test path is „untight“, the VPS switches to fault. An additional relay in the VPS interrupts the burner fault line S3 between burner and heat generator. At the same time, voltage is applied from the heat generator to S3 line and the LED H1 lights up.

Electrical connection
VPS 504 S02
The VPS 504 S01 is connected in series between temperature regulator and automatic burner control via a 7-pole connector.
The boiler male connector is inserted into the female connector of VPS 504.
For pin assignment of female connector VPS 504 and heat generator male connector, refer to connection diagram.
Switching feature: No disconnection between operating voltage circuit and control circuit.

Electrical connection
VPS 504 S03
The electrical connection of VPS 504 S03 is performed as in VPS 504 S01.

Additional switching feature of VPS 504 S03
If a fault signal is existent on S3 (burner fault), the regulator chain is bridged to the burnervia an additional relay in VPS 504 S03 and at the same time the operating voltage of VPS 504 S03 is interrupted.
After eliminating the burner fault, the valve proving system is restarted.

Only the fault signal coming from the automatic burner control of the burner may be connected to connection S3. If you do not observe this instruction, persons may be injured or objects may be damaged. Therefore, strictly keep to this instruction.
Electrical connection
VPS 504 S04
PG 13.5 cable duct and connection
to screw terminals below cover in
housing (see Dimensions VPS 504
S04, S05).

⚠ Floating control room signal
may only be used for signal-
ing, never for burner release.

Electrical connection
VPS 504 S05
PG 13.5 cable duct and connection
to screw terminals below cover in
housing (see Dimensions VPS 504
S04, S06).

⚠ Operating voltage range
20 V - 30 V DC. Refer to mo-
tor startup current!

Test volume of DUNGS multiple actuators MB-D..., MB-ZR..., MB-VEF..., DMV..., MBC..., MB-E...

<table>
<thead>
<tr>
<th>Type</th>
<th>Nominal diameter Rp/DN</th>
<th>Test volume [l]</th>
<th>Type</th>
<th>Nominal diameter Rp/DN</th>
<th>Test volume [l]</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMV-D(LE) 503/11</td>
<td>Rp 3/8</td>
<td>0.03 l *</td>
<td>MB-D(LE) 403</td>
<td>Rp 3/8</td>
<td>0.04 l *</td>
</tr>
<tr>
<td>DMV-D(LE) 507/11</td>
<td>Rp 3/4</td>
<td>0.10 l</td>
<td>MB-D(LE) 405</td>
<td>Rp 1/2</td>
<td>0.11 l</td>
</tr>
<tr>
<td>DMV-D(LE) 512/11</td>
<td>Rp 1 1/4</td>
<td>0.24 l</td>
<td>MB-D(LE) 407</td>
<td>Rp 3/4</td>
<td>0.11 l</td>
</tr>
<tr>
<td>DMV-D(LE) 520/11</td>
<td>Rp 2</td>
<td>0.24 l</td>
<td>MB-D(LE) 410</td>
<td>Rp 1</td>
<td>0.33 l</td>
</tr>
<tr>
<td>DMV-D(LE) 525/11</td>
<td>Rp 2</td>
<td>0.44 l</td>
<td>MB-D(LE) 412</td>
<td>Rp 1 1/4</td>
<td>0.33 l</td>
</tr>
<tr>
<td>DMV-D(LE) 5040/11</td>
<td>DN 40</td>
<td>0.38 l</td>
<td>MB-D(LE) 415</td>
<td>Rp 1 1/2</td>
<td>0.24 l</td>
</tr>
<tr>
<td>DMV-D(LE) 5050/11</td>
<td>DN 50</td>
<td>0.39 l</td>
<td>MB-D(LE) 420</td>
<td>Rp 2</td>
<td>0.24 l</td>
</tr>
<tr>
<td>DMV-D(LE) 5065/11</td>
<td>DN 65</td>
<td>0.69 l</td>
<td>MB-ZRD(LE) 405</td>
<td>Rp 1/2</td>
<td>0.11 l</td>
</tr>
<tr>
<td>DMV-D(LE) 5080/11</td>
<td>DN 80</td>
<td>1.47 l</td>
<td>MB-ZRD(LE) 407</td>
<td>Rp 3/4</td>
<td>0.11 l</td>
</tr>
<tr>
<td>DMV-D(LE) 5100/11</td>
<td>DN 100</td>
<td>2.28 l</td>
<td>MB-ZRD(LE) 410</td>
<td>Rp 1</td>
<td>0.33 l</td>
</tr>
<tr>
<td>DMV-D(LE) 5125/11</td>
<td>DN 125</td>
<td>3.56 l</td>
<td>MB-ZRD(LE) 412</td>
<td>Rp 1 1/4</td>
<td>0.33 l</td>
</tr>
<tr>
<td>DMV-1500-D</td>
<td>Rp 2</td>
<td>0.44 l</td>
<td>MB-ZRD(LE) 415</td>
<td>Rp 1 1/2</td>
<td>0.24 l</td>
</tr>
<tr>
<td>DMV-...D (LE) -5065/12</td>
<td>DN 65</td>
<td>1.47 l</td>
<td>MB-ZRD(LE) 420</td>
<td>Rp 2</td>
<td>0.24 l</td>
</tr>
<tr>
<td>DMV-...D (LE) -5080/12</td>
<td>DN 80</td>
<td>2.28 l</td>
<td>MB-VEF 407</td>
<td>Rp 3/4</td>
<td>0.11 l</td>
</tr>
<tr>
<td>DMV-...D (LE) -5100/12</td>
<td>DN 100</td>
<td>3.55 l</td>
<td>MB-VEF 412</td>
<td>Rp 1 1/4</td>
<td>0.33 l</td>
</tr>
<tr>
<td>DMV-...D (LE) -5125/12</td>
<td>DN 125</td>
<td>6.00 l *</td>
<td>MB-VEF 415</td>
<td>Rp 1 1/2</td>
<td>0.24 l</td>
</tr>
<tr>
<td>MBE...</td>
<td></td>
<td></td>
<td>MB-VEF 420</td>
<td>Rp 2</td>
<td>0.24 l</td>
</tr>
<tr>
<td>VB050/2</td>
<td>DN 50</td>
<td>1.0 l</td>
<td>MB-VEF 425</td>
<td>Rp 2</td>
<td>0.44 l</td>
</tr>
<tr>
<td>VB065/2.5</td>
<td>DN 65</td>
<td>2.36 l</td>
<td>MBC 300</td>
<td>Rp 3/4</td>
<td>0.05 l</td>
</tr>
<tr>
<td>VB080/3</td>
<td>DN 80</td>
<td>2.68 l</td>
<td>MBC 700</td>
<td>Rp 1 1/4</td>
<td>0.05 l</td>
</tr>
<tr>
<td>VB100/4</td>
<td>DN 100</td>
<td>3.82 l *</td>
<td>MBC 1200</td>
<td>Rp 2</td>
<td>0.10 l</td>
</tr>
<tr>
<td>VB125/5</td>
<td>DN 125</td>
<td>5.35 l *</td>
<td>MBC 1900</td>
<td>DN 65</td>
<td>1.47 l</td>
</tr>
<tr>
<td>VB150/6</td>
<td>DN 150</td>
<td>7.0 l *</td>
<td>MBC 3100</td>
<td>DN 80</td>
<td>2.28 l</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>MBC 5000</td>
<td>DN 100</td>
<td>3.55 l</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>MBC 7000</td>
<td>DN 125</td>
<td>6.00 l *</td>
</tr>
</tbody>
</table>

* VPS 504 not suitable
Using the VPS 504 at DUNGS individual solenoid valves ...

For mounting the VPS 504 to valves Rp 1 1/2 to Rp 2, the adapter kit, Order No. 205 360 is required.

For mounting the VPS 504 to valves DN 40 to DN 80, the adapter kit, Order No. 222 740 is required.

**Determining test volume** $V_{\text{Test}}$

1. Determine output-side volume of V1. Refer to table for Rp 1/2 to DN 80.
2. Determine input-side volume of V2. Refer to table for Rp 1/2 to DN 80.
3. Determine volume of intermediate tube piece 3. Refer to table for Rp 1/2 to DN 80.
4. $V_{\text{Test}} = V_{\text{Valve 1}} + V_{\text{Intermediate tube piece}} + V_{\text{Valve 2}}$

![Diagram showing test volume determination](image)

**Program module** VPS 504

<table>
<thead>
<tr>
<th>Rp / DN</th>
<th>V1 outlet</th>
<th>V2 inlet</th>
<th>Test volume $V_{\text{outlet}}$ + $V_{\text{inlet}}$ + Pipeline length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rp 3/8</td>
<td>0,01 l</td>
<td></td>
<td>0,06 l + 0,11 l + 0,16 l + 0,21 l</td>
</tr>
<tr>
<td>Rp 1/2</td>
<td>0,07 l</td>
<td></td>
<td>0,17 l + 0,27 l + 0,37 l + 0,47 l</td>
</tr>
<tr>
<td>Rp 3/4 (DN 20)</td>
<td>0,12 l</td>
<td></td>
<td>0,27 l + 0,42 l + 0,57 l + 0,72 l</td>
</tr>
<tr>
<td>Rp 1 (DN 25)</td>
<td>0,20 l</td>
<td></td>
<td>0,45 l + 0,70 l + 0,95 l + 1,20 l</td>
</tr>
<tr>
<td>Rp 1 1/2 / DN 40</td>
<td>0,50 l</td>
<td>0,70 l</td>
<td>1,10 l + 1,35 l + 1,70 l + 2,00 l + 2,20 l + 2,65 l + 2,80 l + 3,30 l</td>
</tr>
<tr>
<td>Rp 2 / DN 50</td>
<td>0,90 l</td>
<td>1,20 l</td>
<td>1,90 l + 2,20 l + 2,90 l + 3,20 l + 3,90 l + 4,20 l + 4,90 l + 5,50 l</td>
</tr>
<tr>
<td>DN 65</td>
<td>2,0 l</td>
<td></td>
<td>3,7 l + 5,30 l + 7,00 l + 8,60 l</td>
</tr>
<tr>
<td>DN 80</td>
<td>3,8 l</td>
<td></td>
<td>6,3 l + 8,80 l + 11,30 l + 13,80 l</td>
</tr>
<tr>
<td>DN 100</td>
<td>6,5 l</td>
<td></td>
<td>10,5 l + 14,40 l + 18,40 l + 22,3 l</td>
</tr>
<tr>
<td>DN 125</td>
<td>12,0 l</td>
<td></td>
<td>18,2 l + 24,3 l + 30,50 l + 36,6 l</td>
</tr>
<tr>
<td>DN 150</td>
<td>17,5 l</td>
<td></td>
<td>26,5 l + 35,2 l + 44,10 l + 52,9 l</td>
</tr>
<tr>
<td>DN 200</td>
<td>46,0 l</td>
<td></td>
<td>61,7 l + 77,4 l + 93,10 l + 108,9 l</td>
</tr>
</tbody>
</table>

**Use VPM-VC for test volumes in excess of 20 l / 500 / 360 mbar**

**Test volume of DUNGS multiple actuators**

MB-D ..., MB-ZR..., MB-VEF..., DMV-..., MBC-..., MBE-...
Start

1. Check test section for leaks after assembly.
2. Start test by using temperature regulator and/or restart or by pressing the reset button of VPS 504.

3. If the test section is tight
   Depending on the length of the test section and the residual pressure applied, the pumping time is between 3 s and 26 s.
   The release for the automatic burner control is then given after approx. 10 s at the earliest (at small test volumes and small input pressures) and after approx. 36 s at the latest (at large test volumes and large input pressures) - the yellow signal lamp lights up.

   If the test section is leaky
   The test pressure is not attained.

   The motor pump switches off, the red fault lamp lights up. Switch-through to the automatic burner control does not take place.

Functional check
By opening a screw plug in test nipple \( p_2 \) (\( p_a \)) during test period (pumping time), leakage can be simulated and a function check can take place.

Setting
The VPS 504 must not be adjusted on site.

Assembly
Directly flange the VPS 504 laterally to the DUNGS multiple actuators (mounting is possible on left-hand or right-hand side) using two 10.5 x 2.25 O rings and four M4 x 16 self-tapping screws.

9 ... 12
Dimensions [mm]
VPS 504 S01, S03

Dimensions [mm]
VPS 504 S02

Dimensions [mm]
VPS 504 S04, 05

Achtung, Warning, Attention, Attentione
Vor dem Öffnen ist das Gerät stromlos zu schalten
Before opening switch off power supply
Ouverture uniquement hors tension
Prima di aprire l'aparecchio togliere la corrente
## VPS 504 type overview / accessories / order data

### Version

**VPS 504 Series** ...

<table>
<thead>
<tr>
<th>Nominal voltage, Frequency</th>
<th>20-30 VDC</th>
<th>230 V -15 %</th>
<th>220 V -15 %</th>
<th>120 V -15 %</th>
<th>110 V -15 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>240 V +6 % 50 Hz</td>
<td></td>
<td></td>
<td>+10 % 60 Hz</td>
<td>+10 % 60 Hz</td>
<td>+10 % 50 Hz</td>
</tr>
</tbody>
</table>

### VPS 504 S01

7-pole plug connection
Wiring as per DIN 4791
IP 40 degree of protection

<table>
<thead>
<tr>
<th>Cable length: 0.85 m</th>
<th>219 874</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable length: 2.00 m</td>
<td>219 876</td>
</tr>
</tbody>
</table>

Group fault alarm

| Cable length: 2.00 m | 227 527 |

### VPS 504 S02

7-pole plug connection
7-pole plug connection
IP 40 degree of protection

<table>
<thead>
<tr>
<th>with male connector</th>
<th>225 481</th>
</tr>
</thead>
<tbody>
<tr>
<td>with male connector, CSA</td>
<td></td>
</tr>
</tbody>
</table>

### VPS 504 S03

7-pole plug connection
Wiring as per DIN 4791
IP 40 degree of protection

| Cable length: 1.50 m | 223 590 |

### VPS 504 S04

Connection to screw terminals
PG 13.5 cable duct
Additionally, PG 11 possible
Floating fault signal (control room signal)
IP 54 degree of protection

| 219 881 | 222 388 | 223 426 | 221 327 |

### VPS 504 S05

(Gasmotors) CSA

### VPS 504 S06

U_L, FM, CSA

| 221 073 |

### Accessories/spare parts

- Adapter kit VPS 504 for solenoid valves up to Rp 2
- Adapter kit VPS 504 for solenoid valves from DN 40 to DN 80
- Adapter kit VPS / VDK
- 7-pole male connector, 2 cable inputs with strain relief (S02)
- Mounting kit (4 x M4 x 16, 2 x O-Ring, 2 x filter insert)
- Appliance fuse link (5 pieces)
- Spare parts set VPS filter

<table>
<thead>
<tr>
<th>224 983</th>
<th>205 360</th>
</tr>
</thead>
<tbody>
<tr>
<td>222 740</td>
<td>223 470</td>
</tr>
<tr>
<td>231 807</td>
<td>221 503</td>
</tr>
<tr>
<td>231 780</td>
<td>243 801</td>
</tr>
</tbody>
</table>
Valve testing system VPS 504
for multiple actuators

Head Offices and Factory
Karl Dungs GmbH & Co. KG
Karl-Dungs-Platz 1
D-73660 Urbach, Germany
Telephone +49 7181-804-0
Fax +49 7181-804-166

Postal address
Karl Dungs GmbH & Co. KG
Postfach 12 29
D-73602 Schorndorf, Germany
e-mail info@dungs.com
Internet www.dungs.com