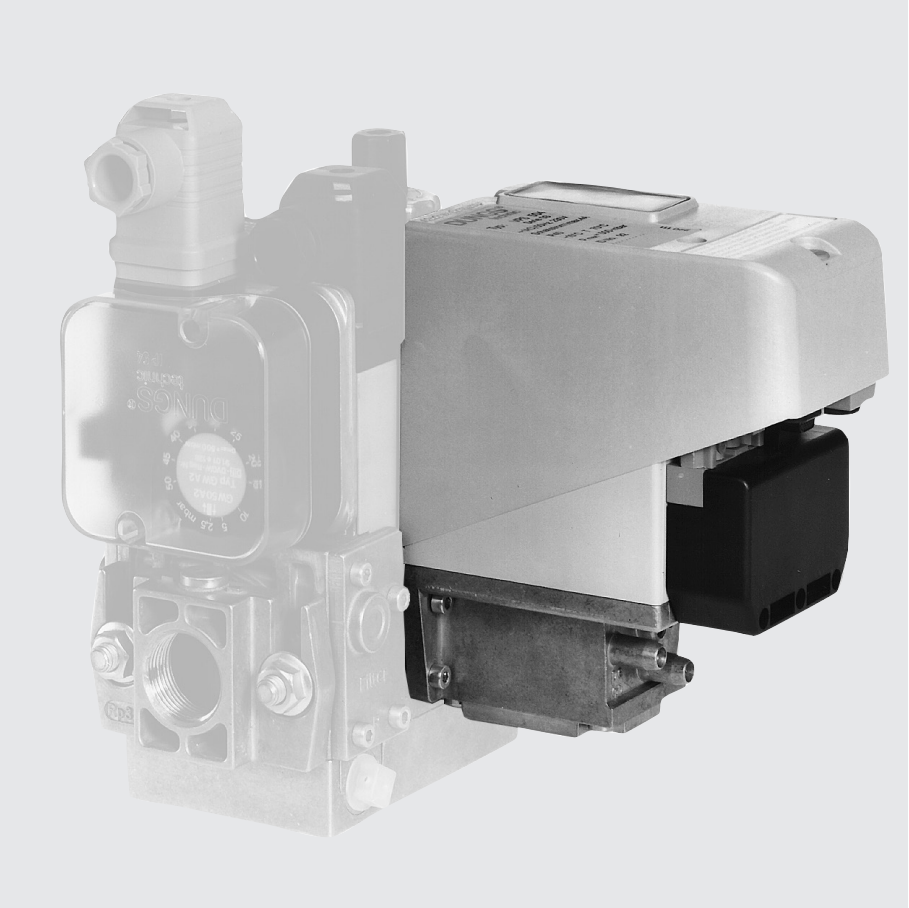
Valve testing system
VPS 504
for multiple actuators

8.10

DUNGS®
Combustion Controls



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: min. 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)
- 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 VPS 504 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

EU type testing certificate as per:

- EU-Gas Appliances Regulation
- EU-Pressure Equipment Directive

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

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VPS 504 Valve proving system for automatic shutoff valves as per EN 161, Class A and Class B
The VPS 504 may be used with any other valve whose tightness in counter-flow direction excludes by construction a leakage in flow direction.
The VPS 504 is suitable for all DUNGS valves according to EN 161 Classes A and B.

Specifications

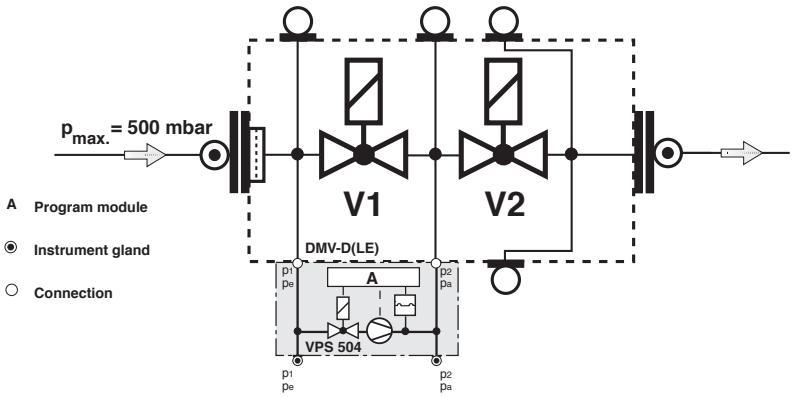
Operating pressure	max. 500 mbar (50 kPa)
Test volume	≥ 0.1 l ≤ 4.0 l
Pressure increase by motor pump	≈ 20 mbar
Nominal voltage, Frequency	refer to type overview page 11
Rating requirement	During pumping time approx. 60 VA, in operation 17 VA
Prefuse (provided by customer)	10 A quick-acting or 6.3 A slow-acting fuse
Fuse installed in housing cover, replaceable	Microfuse 6.3 slow-blow L 250 V; IEC-127-2/III (DIN 41 662)
Switching current	Operating output VPS 504 S01, 02, 03, 04, 05: max. 4 A Refer to motor startup current! Interference output VPS 504 S02, 04, 05: max.1A
Degree of protection	VPS 504 S01, 02, 03: IP 40 VPS 504 S04, 05: IP 54
Ambient temperature	50 Hz 230 VAC -15°C to +70°C others: -15°C to +60°C
Operational attitude	Suitable for use up to 2000 m above sea level Operating altitudes > 2000 m on request
Release tme	Approx. 10 - 36 s, depending on test volume **and** input pressure
Sensitivity limit	max. 50 l/h At inlet pressures of < 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.
Switch-on duration of control	100 % ED
Max. number of test cycles	20/h. Wait for at least 2 minutes after carrying out more than 3 consecutive test cycles.
Installation position	vertical, horizontal, not upside down
Media • Standard model	Gas families 1, 2, 3, sewage gas and biogas (dry, H2S < 0.1% by volume) and other gaseous media H_2 bis ≤ 20 % For gases with a butane content < 60 %
• Flüssiggasausführung	Gas family 3 for gases with a butane content > 60 %

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

Function principle



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**:

V_{Test} < 1.5 l
p_e > 20 – 500 mbar
} $t_F \approx 10$ s

V_{Test} > 1.5 l
p_e > 20 mbar
} $t_F > 10$ s

t_F max. ≈ 36 s

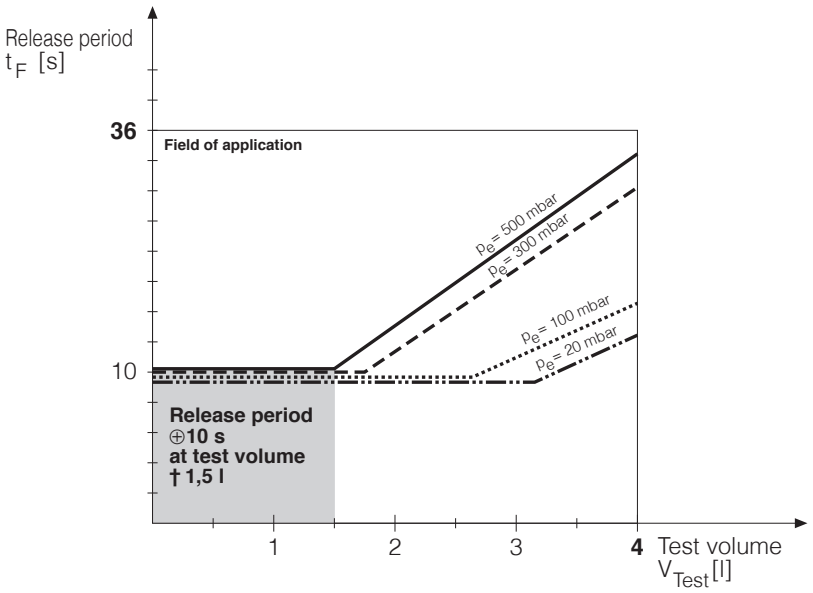
Test period t_{test}

Pumping time of motor pump.

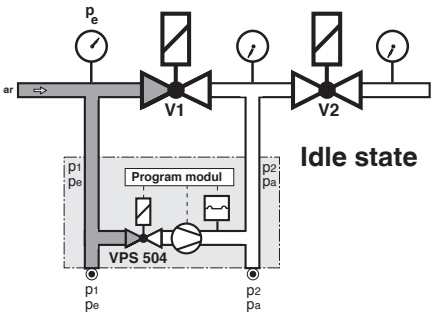
Test volume V_{test}

Volume between V1 output-side and V2 input-side and the intermediate tube pieces.

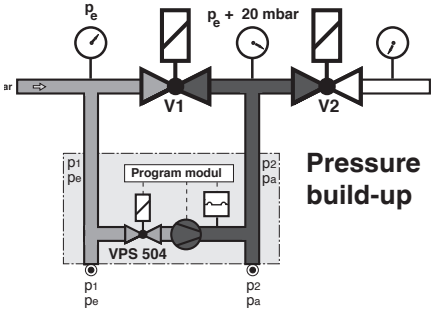
$V_{Test\ max./VPS\ 504}$ = 4 l



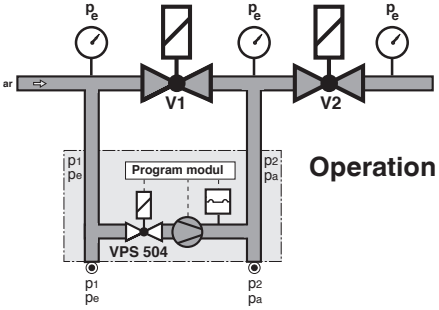
Program sequence



Idle state



Pressure build-up

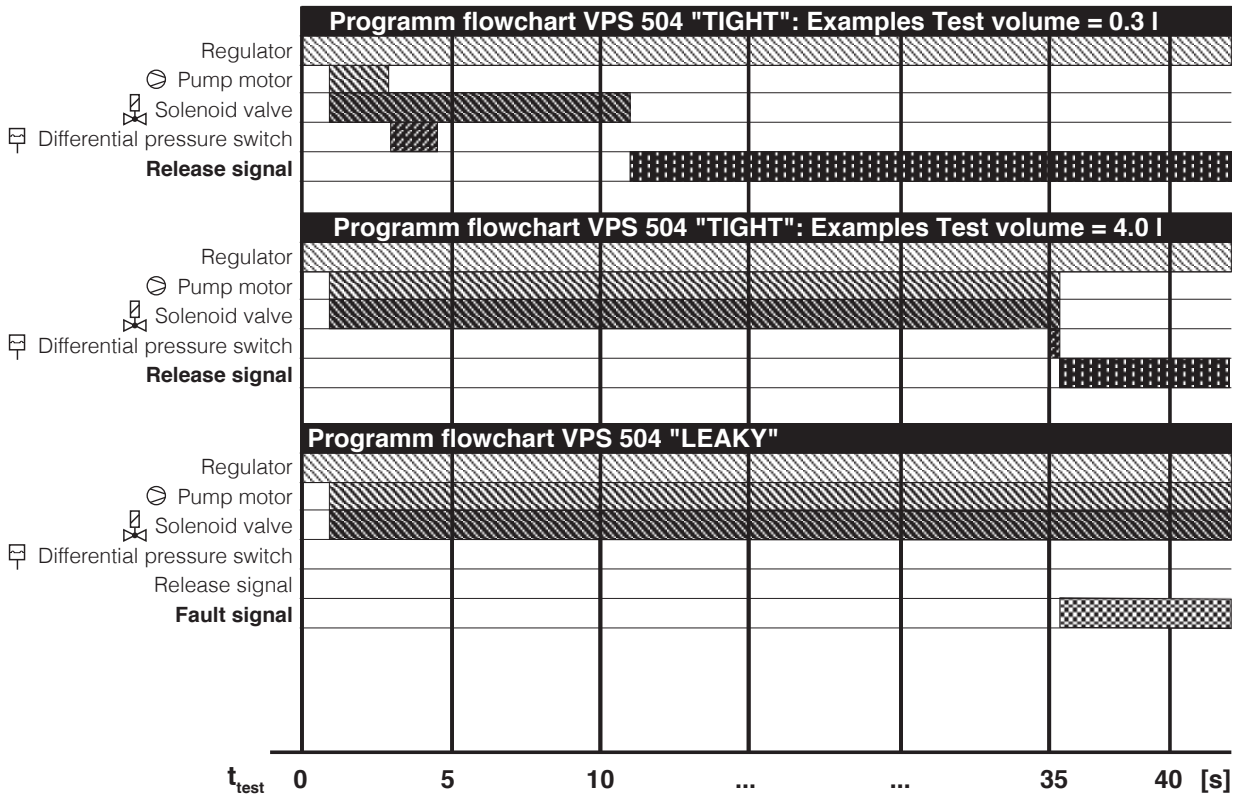


Operation

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. 36 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.

Program flowchart



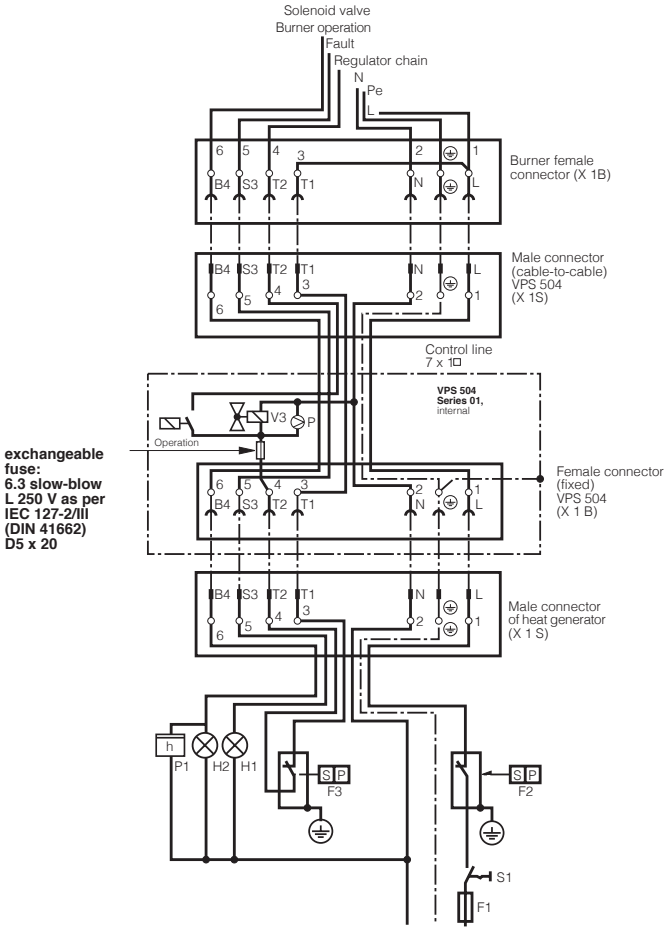
Electrical connection
VPS 504 S01

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.



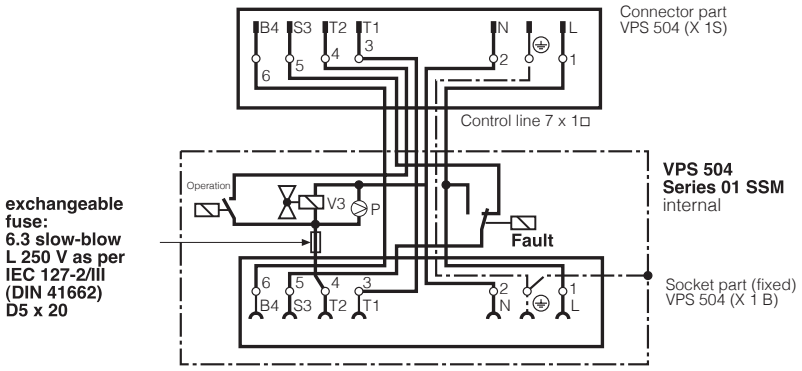
F1	Fuse
F2	Switch or limiter
F3	Regulator
H1	Fault signal
H2	Operation signal
P1	Operating hours counter Stage 1
S1	Switch
X1B	Female connection
X1s	Male connection

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).

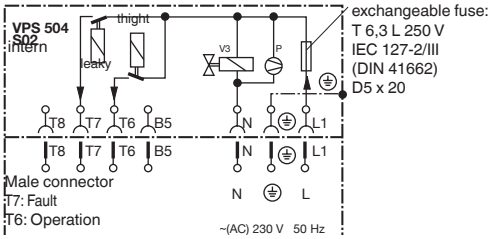
Additional switching characteristic of VPS 504 S01 SSM

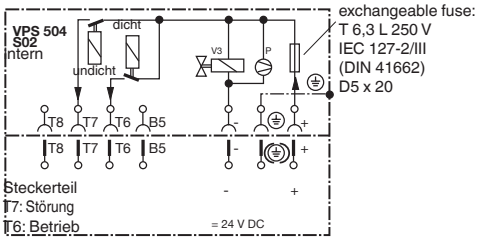
If the test path is „untight“, the VPS switches to fault.
An additional relay in the VPS interrupts the burner fault line S3 between burner and heat generator. At the same time, voltage is applied from the heat generator to S3 line and the LED H1 lights up.



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.



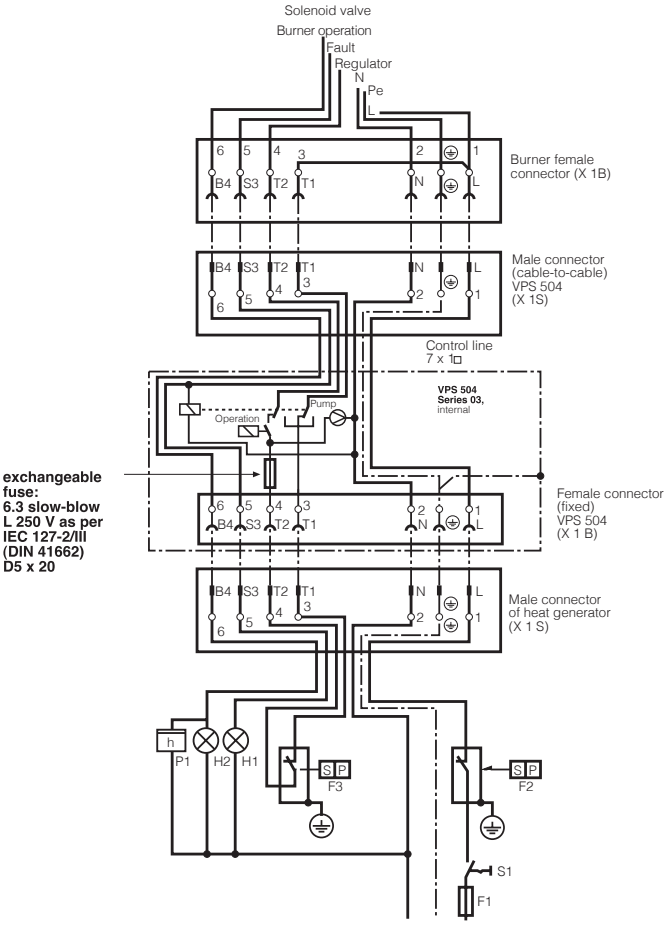


Electrical connection
VPS 504 S03

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

Additional switching feature of VPS 504 S03

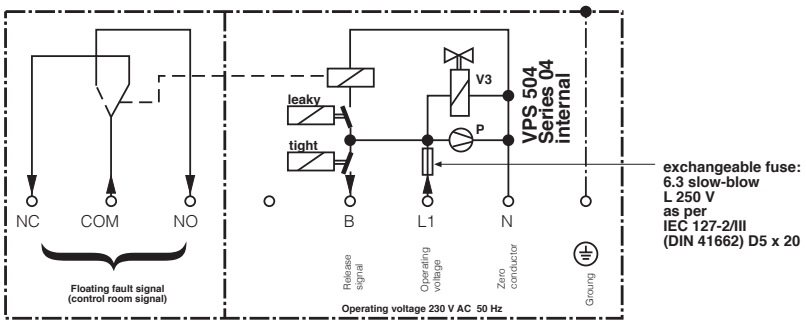
If a fault signal is existent on S3 (burner fault), the regulator chain is bridged to the burner via an additional relay in VPS 504 S03 and at the same time the operating voltage of VPS 504 S03 is interrupted.
After eliminating the burner fault, the valve proving system is restarted.



⚠ 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.

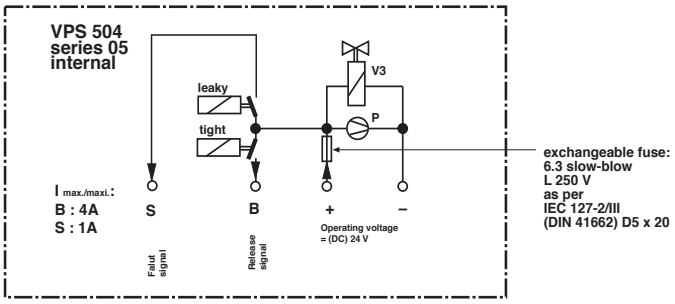
Electrical connection
VPS 504 S04
PG 13.5 cable duct and connection to screw terminals below cover in housing (see Dimensions VPS 504 S04, S05).

⚠ Floating control room signal may only be used for signalling, 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 motor startup current!



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

Type	Nominal diameter Rp/DN	Test volume [l]
DMV-D(LE) 503/11	Rp 3/8	0.03 l *
DMV-D(LE) 507/11	Rp 3/4	0.10 l
DMV-D(LE) 512/11	Rp 1 1/4	0.24 l
DMV-D(LE) 520/11	Rp 2	0.24 l
DMV-D(LE) 525/11	Rp 2	0.44 l
DMV-D(LE) 5040/11	DN 40	0.38 l
DMV-D(LE) 5050/11	DN 50	0.39 l
DMV-D(LE) 5065/11	DN 65	0.69 l
DMV-D(LE) 5080/11	DN 80	1.47 l
DMV-D(LE) 5100/11	DN 100	2.28 l
DMV-D(LE) 5125/11	DN 125	3.56 l
DMV-1500-D	Rp 2	0.44 l
DMV-...D (LE) -5065/12	DN 65	1.47 l
DMV-...D (LE) -5080/12	DN 80	2.28 l
DMV-...D (LE) -5100/12	DN 100	3.55 l
DMV-...D (LE) -5125/12	DN 125	6.00 l *
MBE...		
VB050/2	DN 50	1,0 l
VB065/2.5	DN 65	2,36 l
VB080/3	DN 80	2,68 l
VB100/4	DN 100	3,82 l
VB125/5	DN 125	5,35 l *
VB150/6	DN 150	7,0 l *

Type	Nominal diameter Rp/DN	Test volume [l]
MB-D(LE) 403	Rp 3/8	0.04 l *
MB-D(LE) 405	Rp 1/2	0.11 l
MB-D(LE) 407	Rp 3/4	0.11 l
MB-D(LE) 410	Rp 1	0.33 l
MB-D(LE) 412	Rp 1 1/4	0.33 l
MB-D(LE) 415	Rp 1 1/2	0.24 l
MB-D(LE) 420	Rp 2	0.24 l
MB-ZRD(LE) 405	Rp 1/2	0.11 l
MB-ZRD(LE) 407	Rp 3/4	0.11 l
MB-ZRD(LE) 410	Rp 1	0.33 l
MB-ZRD(LE) 412	Rp 1 1/4	0.33 l
MB-ZRD(LE) 415	Rp 1 1/2	0.24 l
MB-ZRD(LE) 420	Rp 2	0.24 l
MB-VEF 407	Rp 3/4	0.11 l
MB-VEF 412	Rp 1 1/4	0.33 l
MB-VEF 415	Rp 1 1/2	0.24 l
MB-VEF 420	Rp 2	0.24 l
MB-VEF 425	Rp 2	0.44 l
MBC 300	Rp 3/4	0.05 l**
MBC 700	Rp 1 1/4	0.05 l**
MBC 1200	Rp 2	0.10 l
MBC 1900	DN 65	1.47 l
MBC 3100	DN 80	2.28 l
MBC 5000	DN 100	3.55 l
MBC 7000	DN 125	6.00 l *

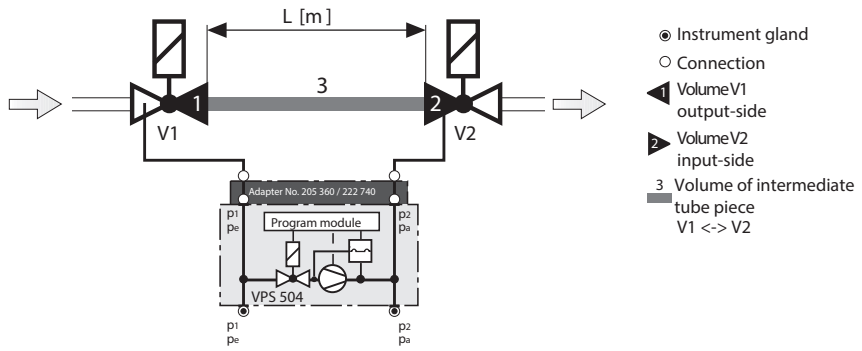
* VPS 504 not suitable
** VPS 504 einsetzbar

Using the VPS 504 at DUNGS individual solenoid valves .../5
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_{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_{Test} = Volume $_{Valve\ 1}$ + Volume $_{Intermediate\ tube\ piece}$ + Volume $_{Valve\ 2}$

V_{Test} = **Valve volume** V1 output-side+ V2 input-side + **Volume of tube line**

Determining test volume V_{Test}



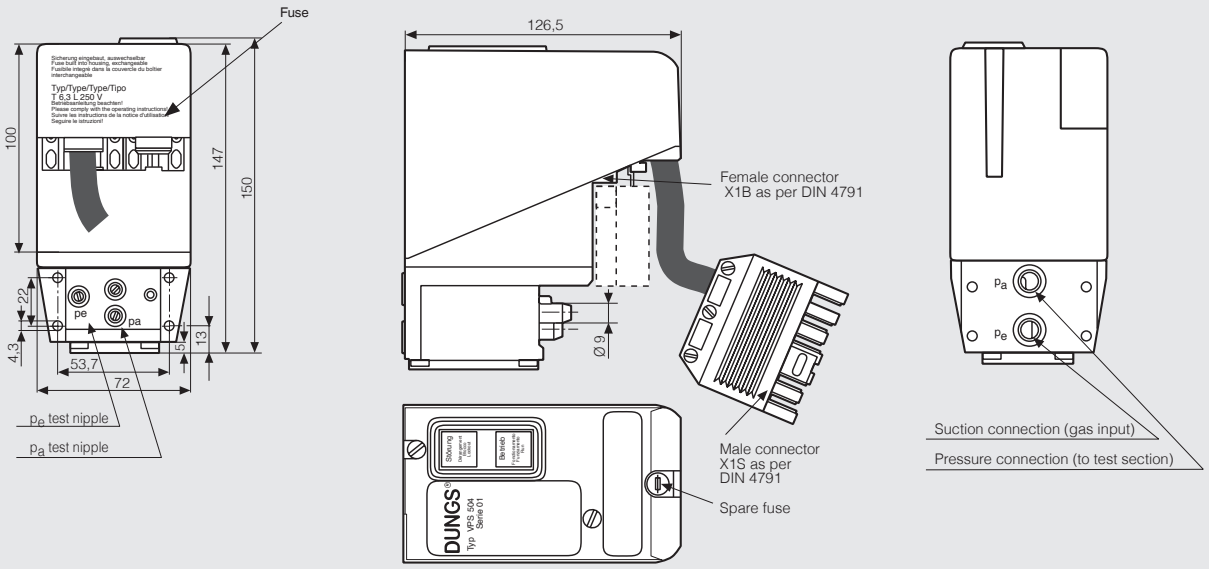
Rp / DN	Valve - Volume [l] V1 outlet + V2 inlet		Test volume [l] = Volume V1 outlet + V2 inlet + Pipeline length Pipeline lengths between individual valves L [m] 0,5 m		1,0 m		1,5 m		2,0 m	
	Rp	DN	Rp	DN	Rp	DN	Rp	DN	Rp	DN
Rp 3/8	0,01 l		0,06 l		0,11 l		0,16 l		0,21 l	
Rp 1/2	0,07 l		0,17 l		0,27 l		0,37 l		0,47 l	
Rp 3/4 (DN 20)	0,12 l		0,27 l		0,42 l		0,57 l		0,72 l	
Rp 1 (DN 25)	0,20 l		0,45 l		0,70 l		0,95 l		1,20 l	
Rp 1 1/2 / DN 40	0,50 l	0,70 l	1,10 l	1,35 l	1,70 l	2,00 l	2,20 l	2,65 l	2,80 l	3,30
Rp 2 / DN 50	0,90 l	1,20 l	1,90 l	2,20 l	2,90 l	3,20 l	3,90 l	4,20 l	4,90 l	5,50 l
DN 65		2,0 l		3,7		5,30 l		7,00 l		8,60 l
DN 80		3,8		6,3 l		8,80 l		11,30 l		13,80 l
DN 100		6,5 l		10,5 l		14,40		18,40 l		22,3 l
DN 125		12,0 l		18,2 l		24,3 l		30,50 l		36,6 l
DN 150		17,5 l		26,5 l		35,2 l		44,10 l		52,9 l
DN 200		46,0 l		61,7 l		77,4 l		93,10 l		108,9 l

——— VPS 504 $0,1\ l \le V_{prüf} \le 4,0\ l$
----- VPS 508 $1,5\ l \le V_{prüf} \le 8,0\ l$
——— VDK $0,4\ l \le V_{prüf} \le 20,0\ l$

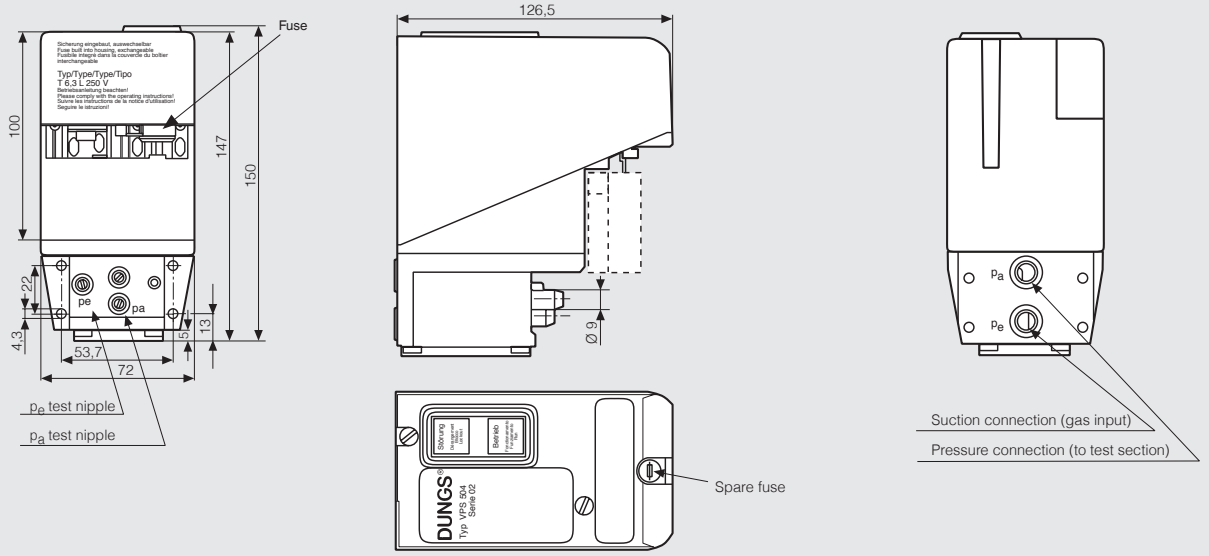
$1\ l = 1\ dm^3 = 10^{-3}\ m^3$

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-...

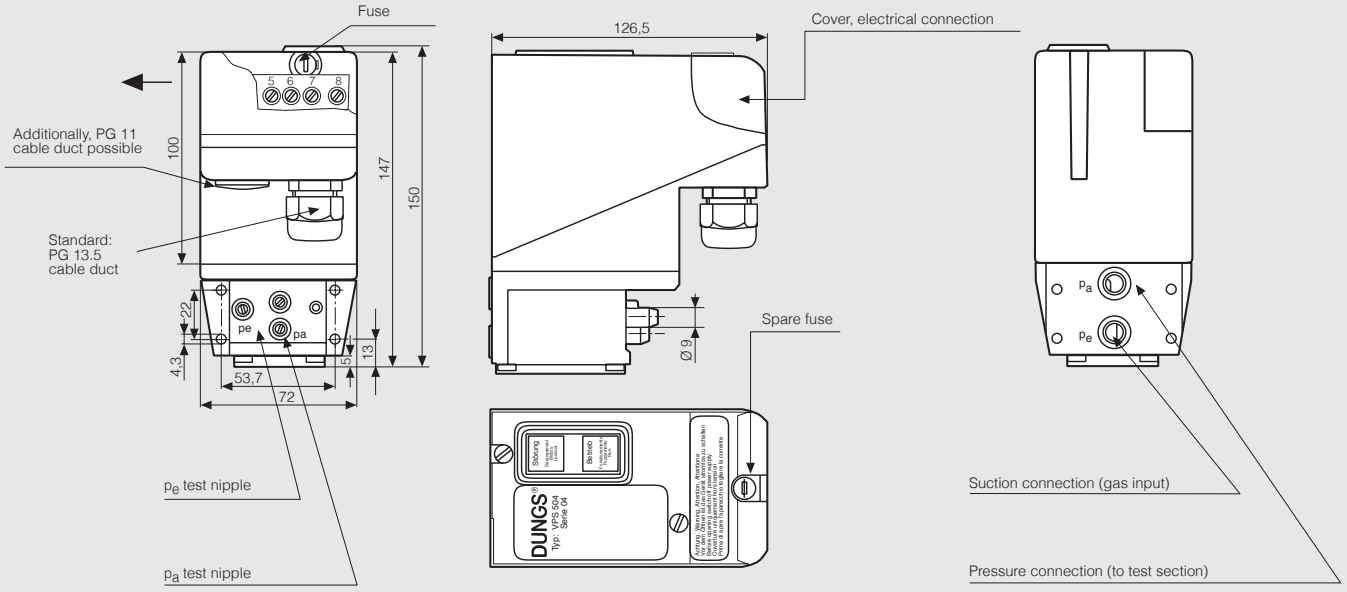
Dimensions [mm]
VPS 504 S01, S03



Dimensions [mm]
VPS 504 S02



Dimensions [mm]
VPS 504 S04, 05



VPS 504 type overview / accessories / order data						
Version **VPS 504 Series …**						
Nominal voltage, Frequency		**20-30 VDC**	**230 V -15 % 240 V + 6 % 50 Hz**	**220 V -15 % +10% 60 Hz**	**120 V -15 % +10% 60 Hz**	**110 V -15 % +10% 50 Hz**
VPS 504 S01 7-pole plug connection Wiring as per DIN 479 IP 40 degree of protection Group fault alarm	Cable length 0,85 m Cable length 2,00 m Cable length 2,00 m		219874 219876 227527			
VPS 504 S02 7-pole plug connection IP 40 degree of protection Liquid gas / LPG version with plug	with connector with connector, UL	 225481	219877 226315			
VPS 504 S03 7-pole plug connection Wiring as per DIN 4791 IP 40 degree of protection	Cable length 1,50 m		223590			
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 Liquid gas / LPG version			219881 226316	222388	223426	221327
VPS 504 S05	(Gasmotors) UL	224983				
VPS 504 S06	UL, FM				221073	

Accessories/spare parts	
Adapter kit VPS 504 for solenoid valves up to Rp 2	205360
Adapter kit VPS 504 for solenoid valves from DN 40 to DN 80	222740
Adapter kit VPS / VDK DN 40 - DN 80	223470
7-pole male connector, 2 cable inputs with strain relief (S02)	231807
Mounting kit housing flange 7 mm (4 x M4 x 16, 2 x O-Ring, 2 x filter insert)	221503
Mounting kit housing flange 11 mm (4 x M4 x 20, 2 x O-Ring, 2 x filter insert)	292210
Appliance fuse link (5 pieces)	231780
Spare parts set VPS filter	243801

DUNGS®
Combustion Controls

We reserve the right to make any changes in the interest of technical progress.

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