

Valve Proving System

VDK 200 A S06*

DUNGS[®]
Combustion Controls



Valve proving system with the following approvals.

UL Recognized

- File # MH17004

CSA Certified

- File # 1637485
- CSA Requirement No. 4-01 (USA)
- Technical Information Letter R-15 (Canada)

FM Approved

- File # J.I. 0T2A4.AF

New York City Accepted

- File # MEA 51-05-E

Commonwealth of Massachusetts Approved Product

- Approval code G1-1107-35
- Valve Proving System

Codes and Standards

This product is intended for installations covered by but not limited to NFPA 86, NFPA 85, Swiss Re (formerly IRI) or CSA B149.3.

DUNGS is an ISO 9001 manufacturing facility.



Description

The VDK is a valve proving system for safety shutoff valves. It verifies that both safety shutoff valves in a gas train are fully closed before a system start-up or after system shutdown when wired and interlocked to a suitable flame safeguard control. The VDK will halt the start-up sequence and prevent ignition when the VDK detects an open automatic shutoff valve or valve leakage exceeding the detection limit (see page 5 for detection limits).

- Max. test volume 0.7 ft³
- Release Signal Timing: (approx. 26 s for RUN and 32 s for ALARM)
- "RUN" or "ALARM" indicated by a light.
- Electrical connection at screw terminals via 1/2" NPT conduit connection.
- Detectable leakage rate: < 1.76 ft³/hr

- Field adjustable needle valve to accommodate various pipe volumes.

Application

The VDK is recommended for industrial and commercial heating applications. Some authorities having jurisdiction accept the VDK in lieu of "proof of closure" when integrated with the preignition system and/or in lieu of a vent valve when it checks the valves at start up and shut down. It can also be used as a valve seat tightness check when used within its capabilities.

The VDK is suitable for dry natural gas, propane, butane, air and inert gases. Not suitable for hydrogen gas.

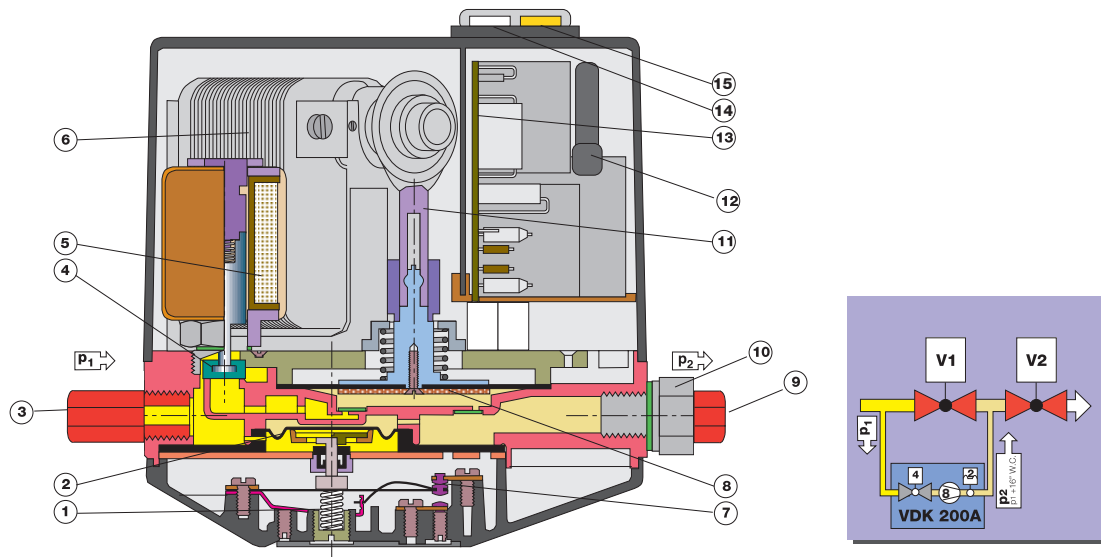
A "dry" gas has a dew point lower than +15 °F and its relative humidity is less than 60 %.

*Formerly VDK 200A S02

VDK 200 A S06 Valve proving system for automatic safety shutoff valves.**Specifications**

Pipe size / Thread	1/4" NPT Connections
Max. operating pressure	5 PSI (360 mbar)
Max body pressure	15 PSI (1000 mbar)
Electrical rating	120 VAC / 60 Hz (50 Hz versions not available)
Switch output ratings	Run T13: 4 A res, 2 A FLA @120 VAC 60 Hz Alarm T14: 1 A res, 0.5 A FLA @120 VAC 60 Hz
Power ratings (consumption)	During valve proving period: 80 VA In operation (after valve proving sequence is complete): 20 VA
Enclosure rating	NEMA Type 12
Electrical connection	Screw terminals with 1/2" NPT conduit connection standard on 216352 Optional Brad Harrison connector available on 266903
Operating time	100 % duty cycle, max. 15 test cycles/hr
Ambient operating temperature	+14 °F to +140 °F (-10 °C to +60 °C)
Materials in contact with gas	Housing: Aluminium Sealings on valve seat and pump diaphragm: NBR-based rubber
Installation position	Upright to horizontal, not inverted (cover facing downwards)
Test volume	Volume between upstream and downstream valves (0.7 ft ³ max).
Release Signal Timing	32 s ± 3 s for ALARM; 26 s maximum for RUN
Detectable leakage rate (each valve)	< 1.76 ft ³ /hr
Detectable gas leakage through both valves	0.2 to 1.0 ft ³ /hr for worst case scenario: both valves leak 0.88 ft ³ /hr)
Maximum backpressure on upstream valve during valve proving	14 - 17 in. W.C. (35 - 40 mbar) above inlet pressure.
Piping	Schedule 40 piping or steel tubing only
Fuse (one installed and one replacement under cover)	T 7A 250 VAC

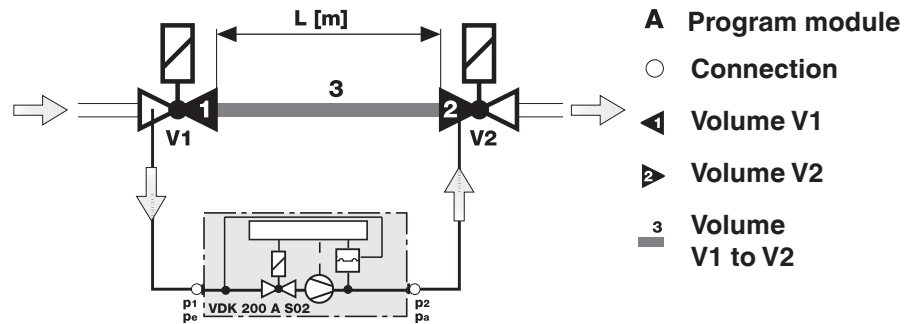
VDK sectional diagram



- | | | | | | |
|---|------------------------------|----|-----------------------------|----|---------------|
| 1 | Pressure spring | 6 | Pressure pump motor | 11 | Pump linkage |
| 2 | Pressure sensor diaphragm | 7 | Switch contact | 12 | Fuse housing |
| 3 | 1/4" NPT Inlet | 8 | Pump diaphragm | 13 | PCB |
| 4 | Solenoid valve armature (V3) | 9 | 1/4" NPT Outlet | 14 | Operation LED |
| 5 | Solenoid valve coil | 10 | 1/2" NPT Conduit connection | 15 | Alarm LED |

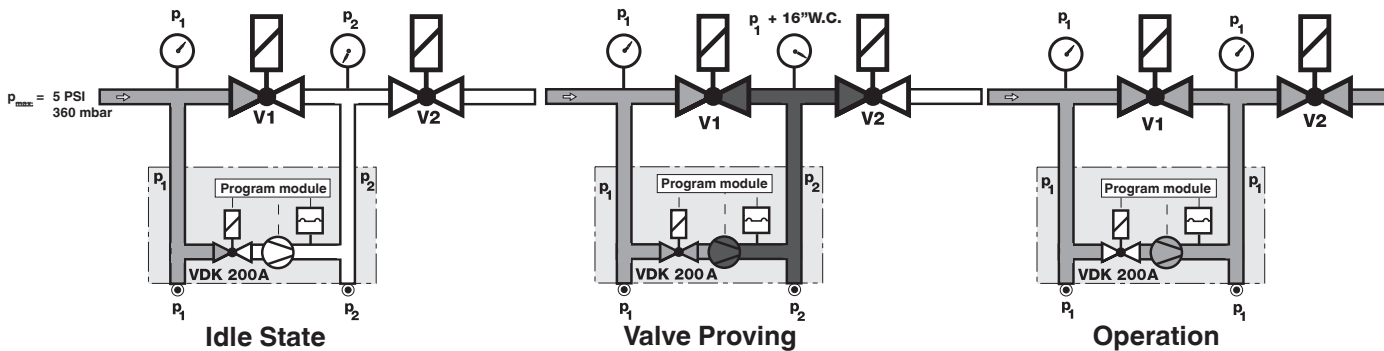
Functional principle

The VDK proves the integrity and the effective closure of the automatic shut-off valve seats by pumping gas from upstream of the main automatic shutoff valve to the volume between the two automatic shutoff valves and detecting leakage. The VDK proves the valves as soon as power is applied.



Test volume = Volume V1 + Volume V2 + Volume V3

Program sequence



Idle state: Valves 1 and 2 are closed.

Valve proving: The internal pump pumps gas pressure from upstream the first safety valve, p_1 , to the volume between the two safety valves. The gas pressure between the two safety shut-off valves, p_2 , increases approx. 16 in. W.C. above p_1 .

During valve proving, the internal differential pressure switch monitors the pressure between the two safety valves.

If p_2 increases approx. 16 in. W.C. above p_1 , the motor pump is switched off (end of valve proving) and the contact "RUN" (T5) is energized after the release period is complete (26 s max.). The yellow signal lamp glows continuously.

If p_2 does not increase approx. 16 in. W.C. above p_1 , the motor pump is switched off (end of valve proving) and the contact "ALARM" (T9) is energized after the release period is complete (32 +/- 3 s max.). The red signal lamp glows continuously.

The operation is independent of the test volume and input pressure. In the case of short-term voltage failure during test or burner operation, an automatic restart is performed.

Operation:

VDK internal valve closes, pump remains off, and "RUN" contact (T5) remains energized. Valve 1 and valve 2 are energized by flame safety control at appropriate time.

Setting

The VDK is factory preset for min. volume. Setting the VDK to a different pipe volume is possible on site by adjusting the needle valve.

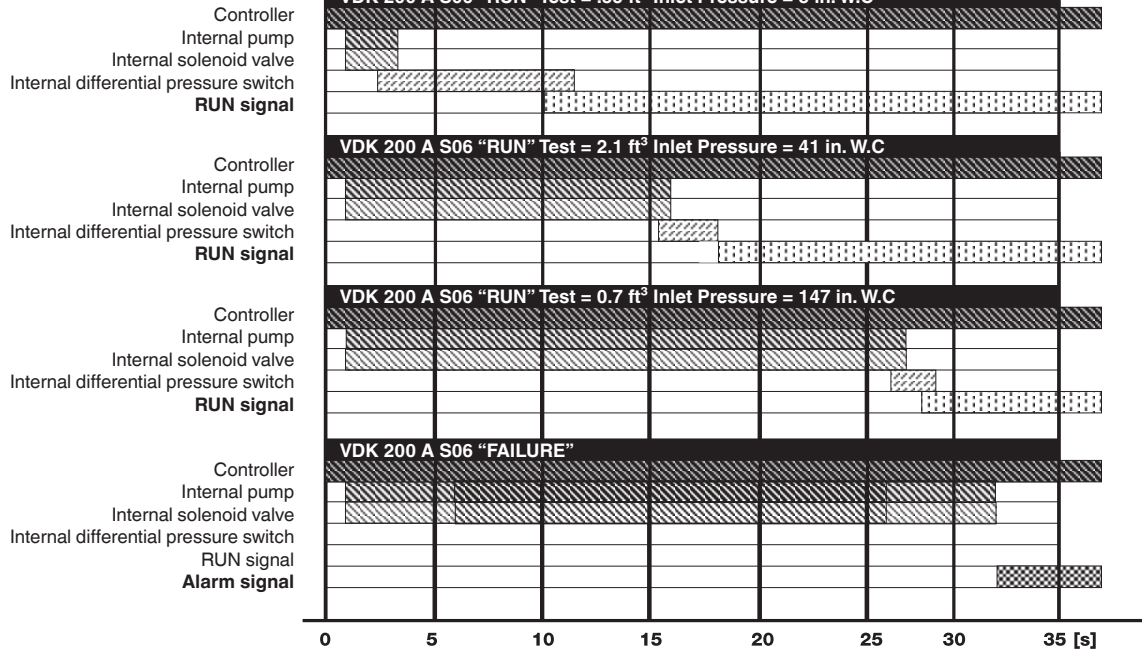


In order to prevent problems, we recommend the use of approved, direct acting safety shutoff valves; not diaphragm assisted safety shutoff valves.



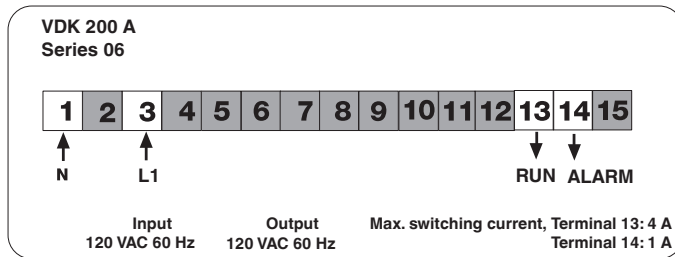
The gas piping between VDK and the safety shutoff valves must be used to provide mechanical support only for the VDK, and the gas piping must be protected from corrosive chemicals or thermal stresses that exceed the ratings of the pipe or that of the VDK.

Program flowchart

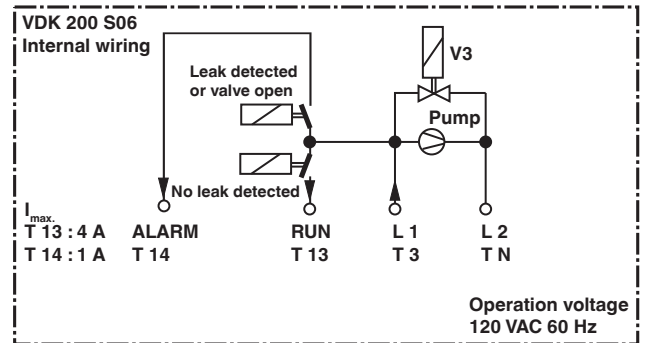


Electrical connection

1/2 in. conduit connection to screw terminals below cover in housing.



! Only use terminals No. 1, 3, 13 & 14. Otherwise injury or damage will occur.



! Operating voltage 120 VAC / 60 Hz.

VDK leak detection limit and allowed volumes between safety shutoff valves

Approx. Leak Detection Limits for each valve Using natural gas and maximum valve proving time				
Inlet Pressure (in. W.C.)	Test Volume (ft ³)			
	0.010	0.035	0.208	0.347
8	0.25	0.25	0.25	0.25
20	0.50	0.50	0.50	0.50
40	0.70	0.70	0.80	0.70
60 (2.1 PSI)	0.90	0.90	1.00	0.90
80 (2.8 PSI)	1.20	1.20	1.40	1.20
100 (3.6 PSI)	1.60	1.60	1.70	1.60
135 (5 PSI)	1.76	1.76	1.76	1.90

Leak Detection Limit (ft³/hr)

NOTE: Detection limit depends on inlet pressure, test volume, gas density, and valve proving time.

To obtain detectable leakage through both valves, divide the leakage rate above by 1.6.

		Pipe Length (ft) between safety valves			
		1.5	3.25	5	6.5
Pipe Size (NPT)	3/8"	0.002	0.004	0.006	0.007
	1/2"	0.006	0.010	0.013	0.017
	3/4"	0.010	0.015	0.020	0.025
	1"	0.016	0.025	0.034	0.042
	1-1/2"	0.042	0.064	0.088	0.109
	2"	0.067	0.102	0.138	0.173
	2 1/2"	0.130	0.177	0.247	0.304
	3"	0.222	0.311	0.400	0.487
	4"	0.370	0.508	0.650	-----

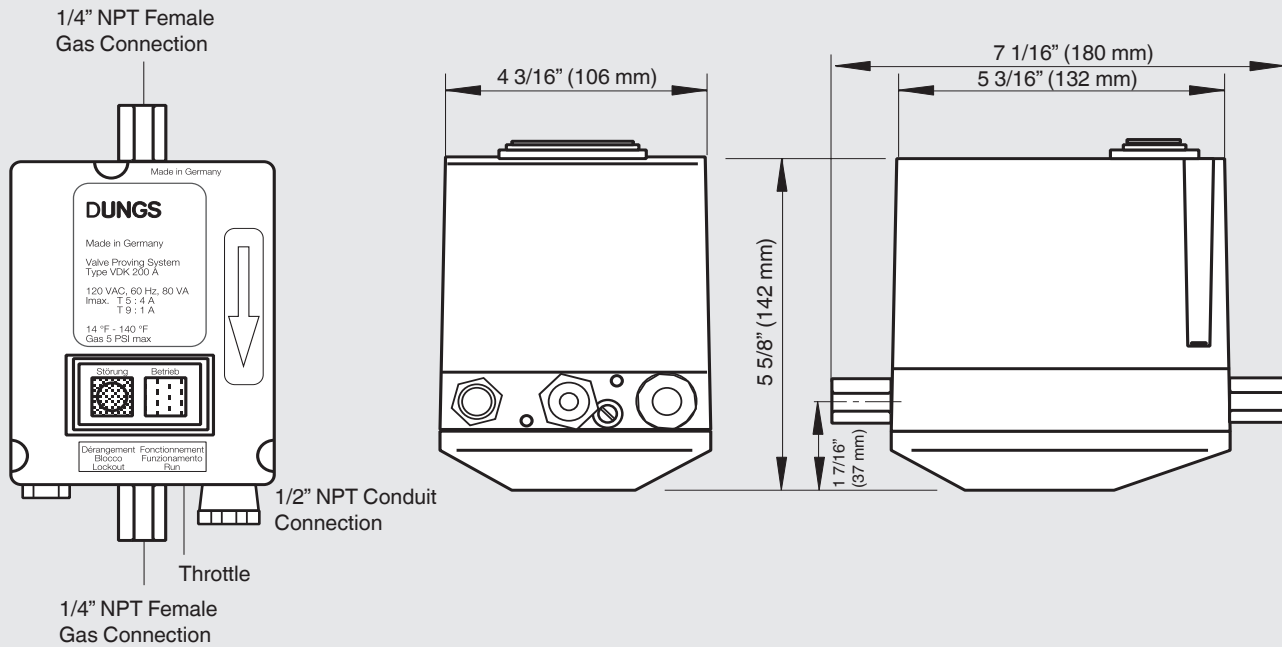
Estimated Gas Volume (ft³)

Valve Proving System

VDK 200 A S06

DUNGS[®]
Combustion Controls

Dimensions inch (mm)



Version	Voltage	Order No.
VDK 200 A S06	120 VAC 60 Hz	253734
VDK 200 A S06 (Brad Harrison™)	120 VAC 60 Hz	267131
Accessory	Voltage	Order No.
Brad Harrison™ Connector		267357

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



Karl Dungs, Inc.
3890 Pheasant Ridge Drive NE
Suite 150
Blaine, MN 55449, U.S.A.
Phone 763 582-1700
Fax 763 582-1799
e-mail info@karldungsusa.com
Internet <http://www.dungs.com/usa/>

Karl Dungs GmbH & Co. KG
P.O. Box 12 29
D-73602 Schorndorf, Germany
Phone +49 (0)7181-804-0
Fax +49 (0)7181-804-166
e-mail info@dungs.com
Internet <http://www.dungs.com>