

Valve Proving System

VDK 200 A S02

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. OT2A4.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

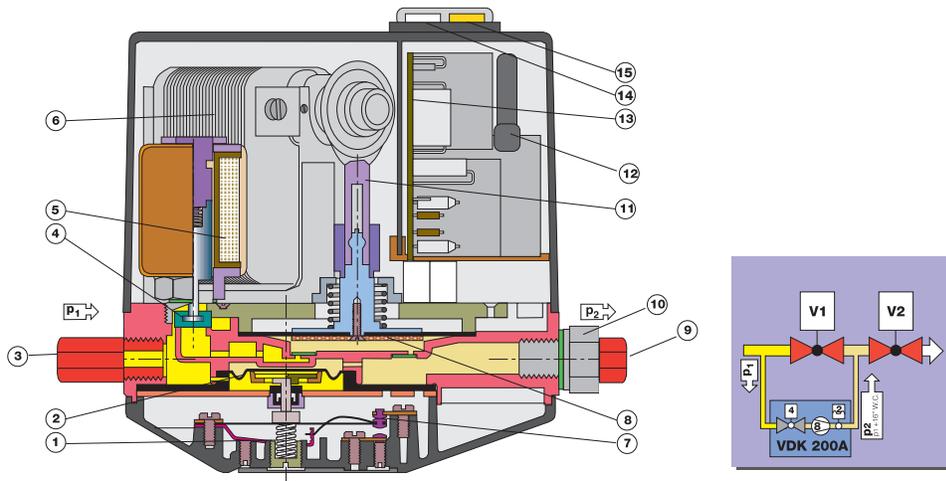
The VDK is recommended for industrial and commercial heating applications. Some authorities having jurisdiction accept the VDK in lieu of "proof of closure" when integrated with the preignition system and/or in lieu of a vent valve when it checks the valves at start up and shut down. It can also be used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

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

Specifications

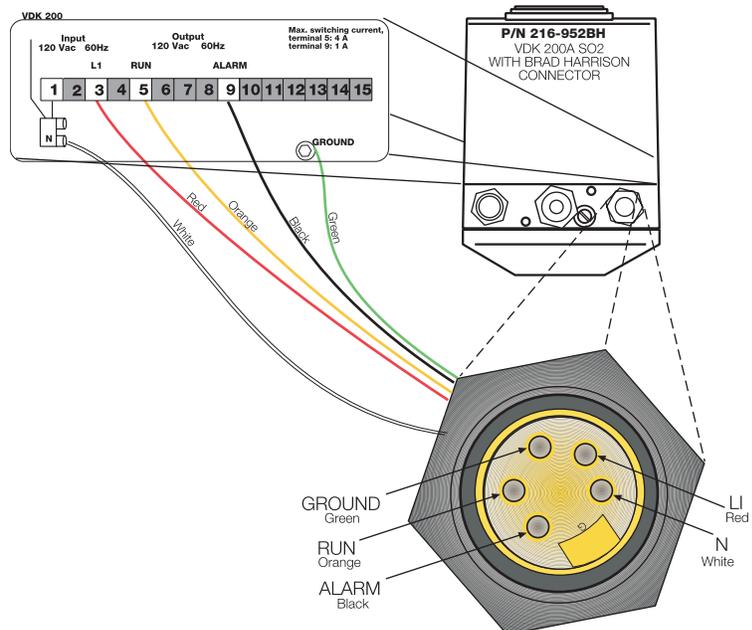
Pipe size / thread	1/4" NPT Connections
Max operating pressure	5 PSI (360 mbar)
Max body pressure	15 PSI (1000 mbar)
Electrical rating	110-120 VAC / 60 Hz (Other models for 50 Hz)
Switch output ratings	Run T5: 4 A res, 2A FLA @120 VAC 60 Hz Alarm T9: 1 A res, 0.5A FLA @120 VAC 60 Hz
Power ratings (consumption)	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 216-352 Optional Brad Harrison connector available on 216-352BH
Operating time	100 % duty cycle, max. 15 test cycles/hr
Ambient operating temperature	+15 °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 | 9 | 1/4" NPT Outlet |
| 2 | Pressure sensor diaphragm | 10 | 1/2" NPT Conduit connection |
| 3 | 1/4" NPT Inlet | 11 | Pump linkage |
| 4 | Solenoid valve armature (V3) | 12 | Fuse housing |
| 5 | Solenoid valve coil | 13 | PCB |
| 6 | Pressure pump motor | 14 | Operation LED |
| 7 | Switch contact | 15 | Alarm LED |
| 8 | Pump diaphragm | | |

VDK with Brad Harrison™ connector

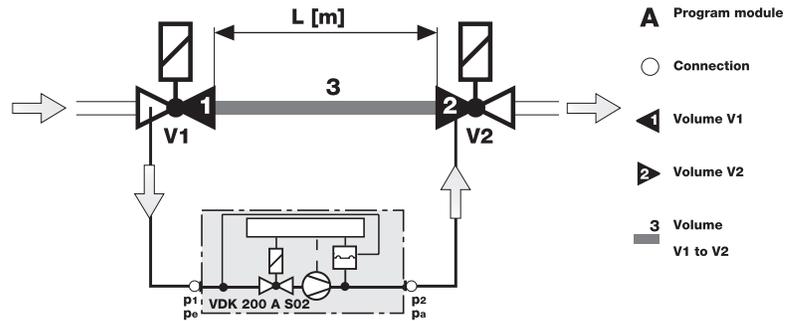


Brad Harrison™ connector only
P/N is 50003

Functional principle

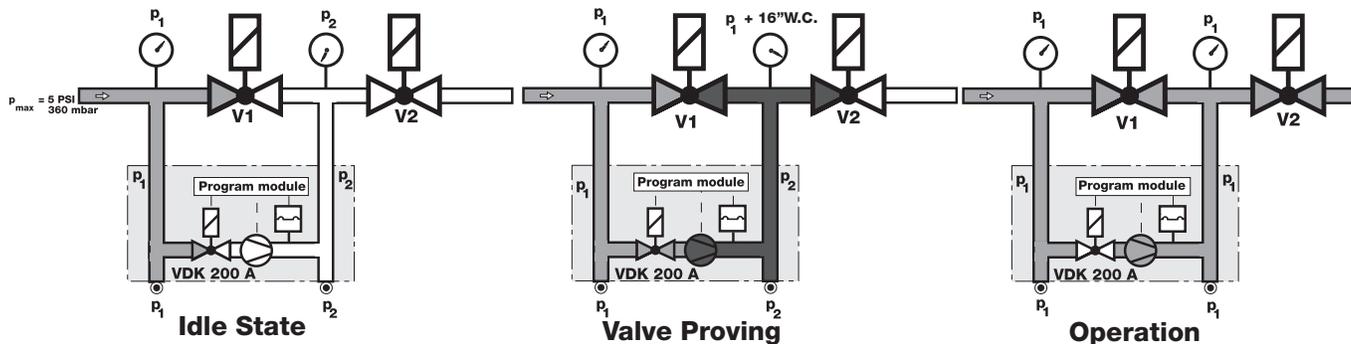
The VDK proves the integrity and the effective closure of the automatic shutoff valve seats by pumping gas from upstream of the main automatic shutoff valve to the volume between the two automatic shutoff valves and detecting leakage. The VDK proves the valves as soon as power is applied. Valve proving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

- Prior to each start-up, or
- Prior to start and after shutdown (safety or normal) when integrated with the CM 100 or CM 101 control module. This allows the VDK to be used in lieu of a vent valve when accepted by the authority having jurisdiction.



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 of the first safety valve, p_1 , to the volume 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.

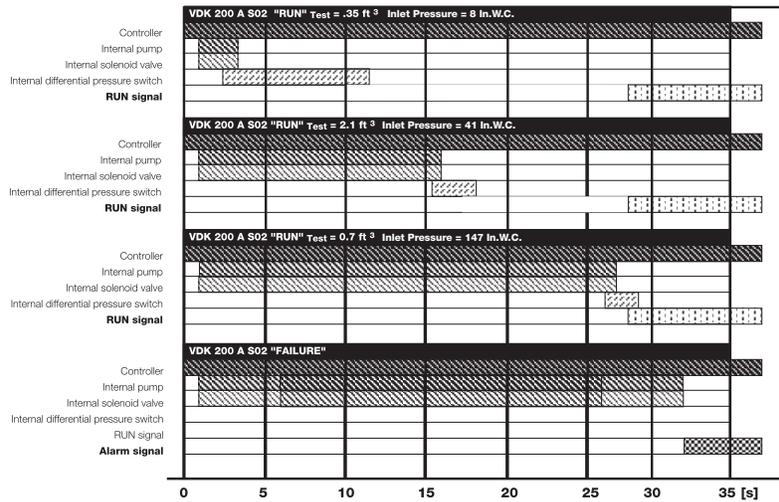


In order to prevent problems, we recommend the use of approved, direct acting safety shutoff valves; not diaphragm assisted safety shutoff valves.



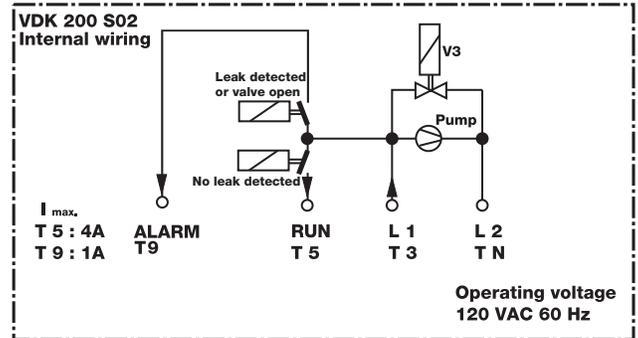
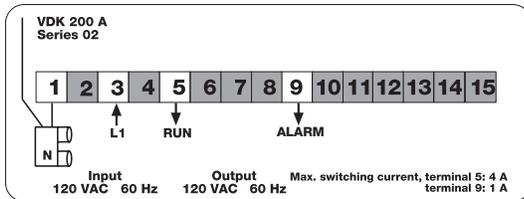
The gas piping between VDK and the safety shutoff valves must be used to provide mechanical support only for the VDK, and the gas piping must be protected from corrosive chemicals or thermal stresses that exceed the ratings of the pipe or that of the VDK.

Program flowchart



Electrical connection

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



Warning: Only use terminals N, 3, 5 and 9. Otherwise injury or damage will occur.

Warning: 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.

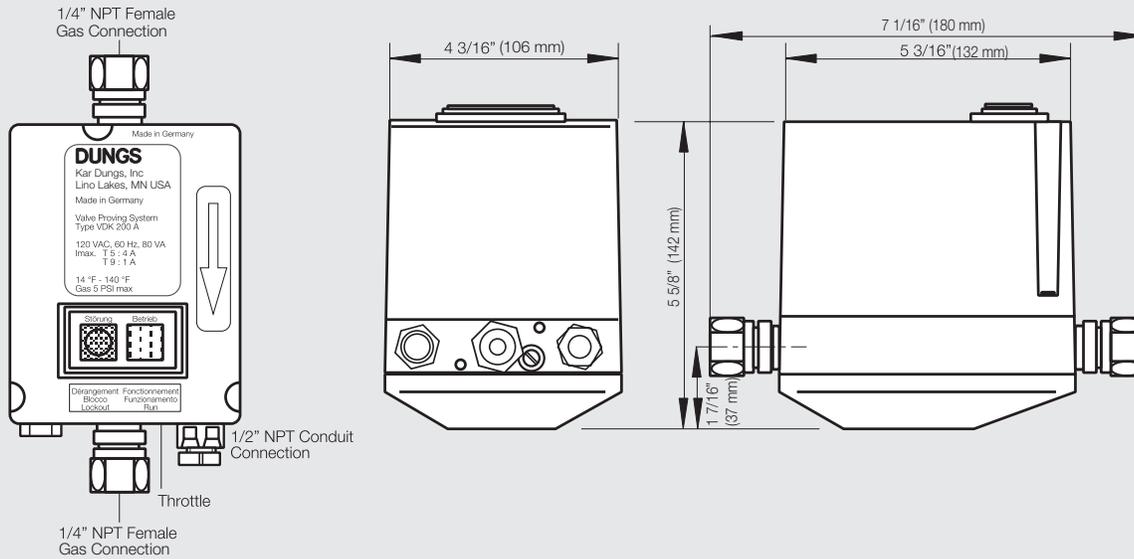
Pipe Size (NPT)	Pipe Length (ft) between safety valves				Estimated Gas Volume (ft ³)
	1.5	3.25	5	6.5	
3/8"	0.002	0.004	0.006	0.007	
1/2"	0.006	0.010	0.013	0.017	
3/4"	0.010	0.015	0.020	0.025	
1"	0.016	0.025	0.034	0.042	
1-1/2"	0.042	0.064	0.088	0.109	
2"	0.067	0.102	0.138	0.173	
2 1/2"	0.130	0.177	0.247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

Valve Proving System

VDK 200 A S02



Dimensions inch (mm)



Version

Voltage

Order No.

VDK 200 A S02

120 VAC 60 Hz

216-352

VDK 200 A S02 (Brad Harrison™)

120 VAC 60 Hz

216-352BH

Accessory

Voltage

Order No.

CM 100* with enclosure

120 VAC 60 Hz

46022

CM 101* panel mount

120 VAC 60 Hz

46023

Brad Harrison™ Connector

50003

* The CM 100 and CM 101 incorporate the relays and logic necessary to operate the VDK on a system start up and after shutdown when wired and interlocked with a suitable flame safeguard control. When the VDK is integrated with the CM 100 or CM 101, Swiss Re (formerly IRI) would allow the VDK to be used in lieu of a vent line.

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

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