

# Valve Proving System

## VDK 200 A S06\*

**DUNGS**<sup>®</sup>  
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 ft<sup>3</sup>
- 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 ft<sup>3</sup>/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.

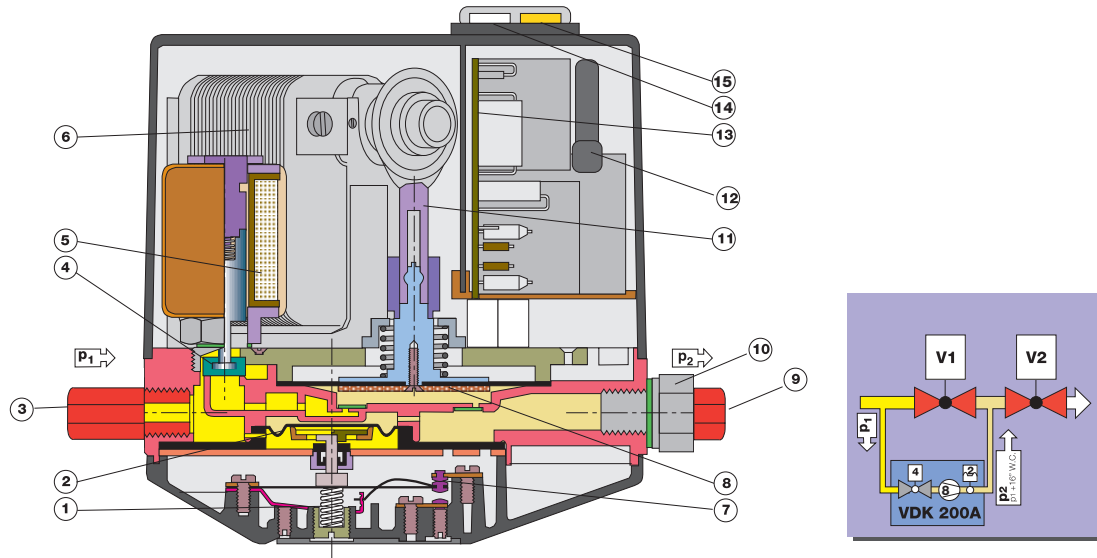
A "dry" gas has a dew point lower than +15 °F and its relative humidity is less than 60 %.

\*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 (Other models for 50 Hz)  |
| Switch output ratings                                       | Run T5: 4 A res, 2 A FLA @120 VAC 60 Hz<br>Alarm T9: 1 A res, 0.5 A FLA @120 VAC 60 Hz  |
| Power ratings (consumption)                                 | During valve proving period: 80 VA<br>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<br>Optional Brad Harrison connector available on 216-352BH |
| 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<br>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 <sup>3</sup> max).  |
| Release Signal Timing                                       | 32 s ± 3 s for ALARM; 26 s maximum for RUN  |
| Detectable leakage rate (each valve)                        | < 1.76 ft <sup>3</sup> /hr  |
| Detectable gas leakage through both valves                  | 0.2 to 1.0 ft <sup>3</sup> /hr for worst case scenario: both valves leak 0.88 ft <sup>3</sup> /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

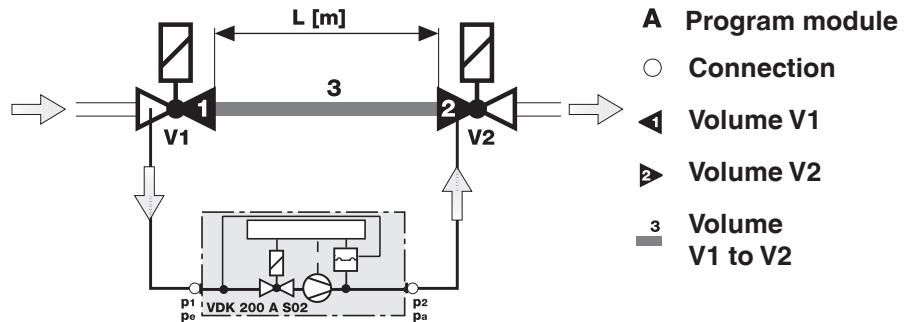


- |   |                              |    |                             |    |               |
|---|------------------------------|----|-----------------------------|----|---------------|
| 1 | Pressure spring              | 6  | Pressure pump motor         | 11 | Pump linkage  |
| 2 | Pressure sensor 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

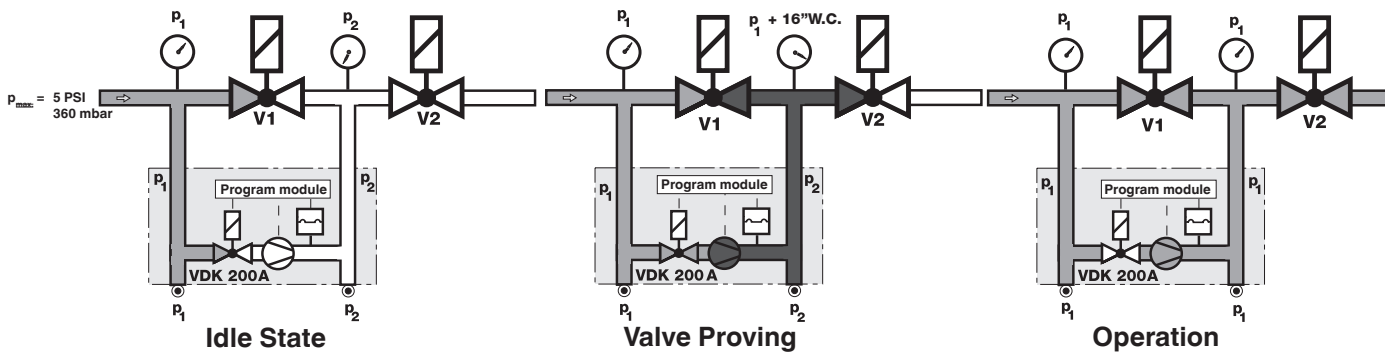
The VDK proves the integrity and the effective closure of the automatic shut-off valve seats by pumping gas from upstream of the main automatic shutoff valve to the volume between the two automatic shutoff valves and detecting leakage. The VDK proves the valves as soon as power is applied. Valve proving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

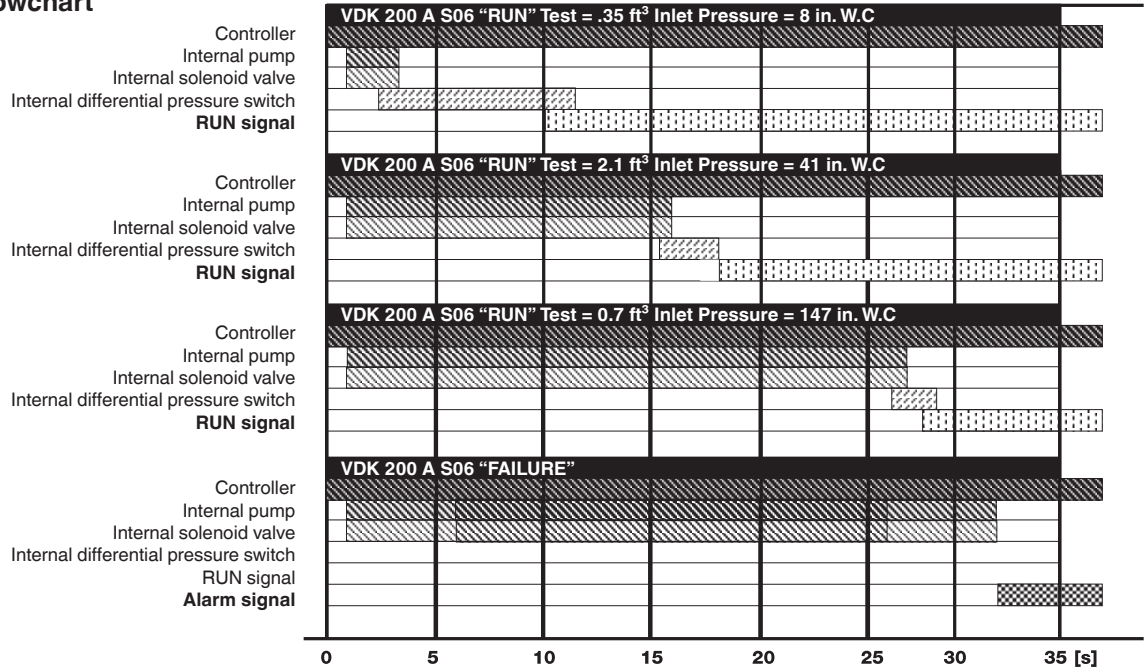
## Setting

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.

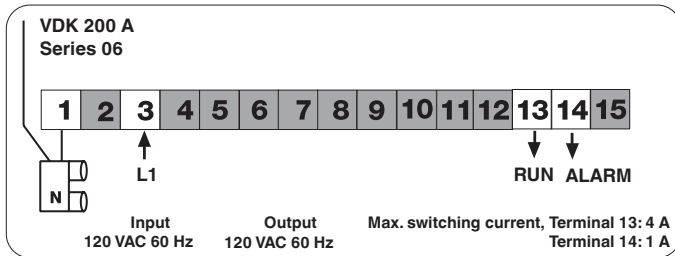
**!** The gas piping between VDK and the safety shutoff valves must be used to provide mechanical support only for the VDK, and the gas piping must be protected from corrosive chemicals or thermal stresses that exceed the ratings of the pipe or that of the VDK.

## Program flowchart

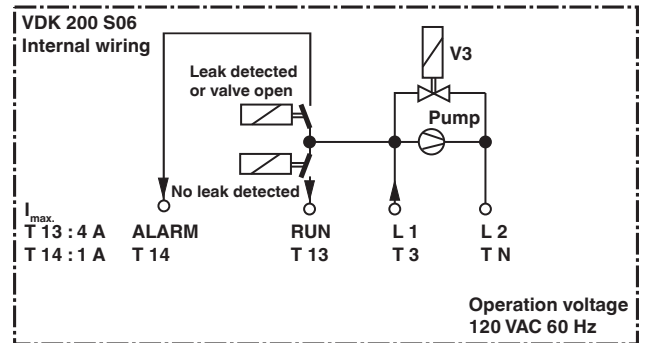


## Electrical connection

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



**⚠ Only use terminals No. 3, 5 and 9. 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 <sup>3</sup> ) |       |       |       |
|  | 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 (ft<sup>3</sup>/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.**

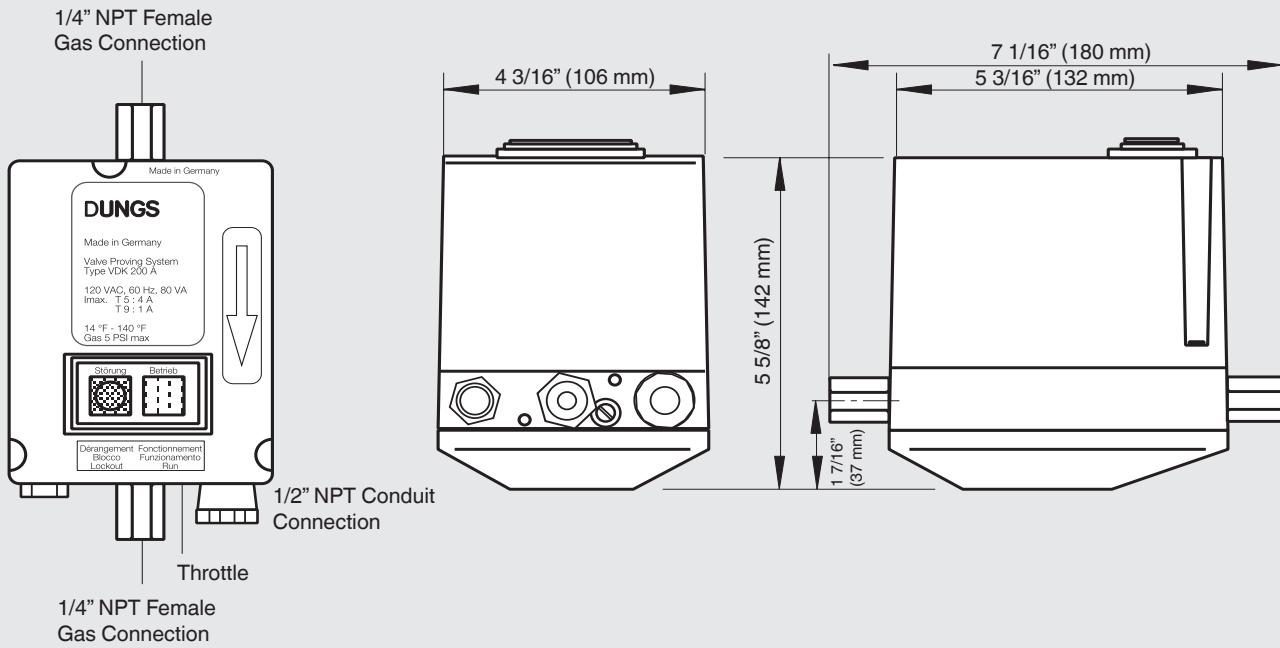
| Pipe Size (NPT) | Pipe Length (ft) between safety valves |       |       |       | Estimated Gas Volume (ft <sup>3</sup> ) |
|-----------------|--|-------|-------|-------|---|
|                 | 1.5                                    | 3.25  | 5     | 6.5   |   |
| 3/8"            | 0.002                                  | 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 S06



## Dimensions inch (mm)



| Version                        | Voltage       | Order No. |
|--------------------------------|---------------|-----------|
| VDK 200 A S06                  | 120 VAC 60 Hz | 216-352   |
| VDK 200 A S06 (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.

**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](mailto: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](mailto:info@dungs.com)  
 Internet <http://www.dungs.com>