

**VDK 200 A S02  
Valve Proving System  
Installation Instructions**

**SPECIFICATIONS**

**VDK** The VDK 200 A S02 valve proving system checks that both safety shutoff valves in a gas train are closed before either a system start-up or after shutdown when wired and interlocked with a suitable flame safeguard. The VDK will halt the start-up sequence to a burner if it detects an open or damaged safety shutoff valve, thus preventing ignition under potentially dangerous conditions.

**Gases**

Natural gas, propane, air and other inert gases.  
(Not Hydrogen)

**Maximum Operating Pressure**

5 PSI (360 mbar)

**Maximum Body Pressure**

15 PSI (1000 mbar)

**Ambient / Fluid Temperature**

+14 °F to +140 °F (-10 °C to +60 °C)

**Electrical Rating**

110-120 Vac / 60 Hz

**Power Consumption**

During valve proving period 80VA  
Standby/In operation after valve proving 20 VA

**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

**Enclosure Rating**

NEMA Type 12

**Electrical Connection**

Screw terminals with 1/2" NPT conduit connection  
Optional model with Brad Harrison™ connector (46021-1)

**Operating Time**

100 % duty cycle; Maximum 15 test cycles per hour

**Test Volume**

Volume between upstream and downstream valves  
(0.7 ft<sup>3</sup> Max).

**Release Period (time to get a RUN or ALARM)**

Alarm = 32 s ± 3 s; RUN = 26 s maximum.

**Detection Limits of Natural Gas (each valve)**

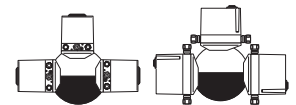
0.3 - 1.76 ft<sup>3</sup>/h (0.2 - 1.0 ft<sup>3</sup>/h leakage through both valves)

**Materials in Contact with Gas**

Housing: Aluminum  
Seals: NBR-based rubber

**Mounting/Installation Position**

Upright to horizontal, not inverted  
(cover facing downwards)



**Piping**

Schedule 40 piping or steel tubing only

**Approvals**

UL Recognized Component File # MN 17004  
CSA Certificated: File # 1637485  
FM Approved File # J.I. 3004006 (7411)  
New York City: File # MEA 51-05-E  
Commonwealth of Massachusetts Approved Product  
Approval code G1-1107-35



**ATTENTION**

- Read these instructions carefully.
- Failure to follow them and/or improper installation may cause explosion, property damage and injuries.
- Installation must be done with the supervision of a licensed burner technician.
- The system must meet all applicable national and local code requirements such as but not limited to NFPA 86, NFPA 85, Swiss Re (formerly IRI), or CSA B149.3.
- Check the ratings in the specifications to make sure that they are suitable for your application.
- Never perform work if gas pressure or power is applied, or in the presence of an open flame.
- Once installed, perform a complete checkout including leak testing.
- Verify proper operation after servicing.

**MOUNTING**

**Pipe Cleaning Before installing the VDK 200 A S02**

- Remove pipe scale and other foreign matter that may have accumulated within gas pipes or connections.

**Flow Direction**

- The inlet side of the VDK 200 A S02 must be piped to the inlet side of the upstream valve. The outlet side of the VDK 200 A S02 must be piped to the inlet side of the downstream valve.

**Piping Installation**

- Use the appropriate tools to secure the VDK 200 A S02 and apply counter pressure when threading pipe into its housing. Do not over tighten.

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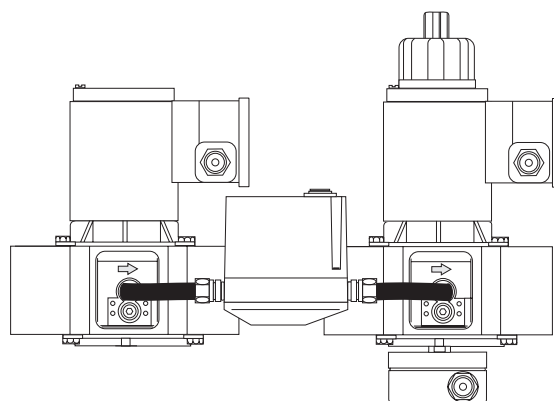
## MOUNTING (continued)

### Support & Protection

- This device is not intended to support any weight. Do not use the VDK 200 A S02 to support adjacent piping. A metal support structure should be used, dependent on the environment where the VDK 200 A S02 will be placed. The structure should provide adequate support and eliminate vibration.

### Recommended Mounting Procedure

- Verify that the internal pipe surfaces are clean and free of debris. Clean if necessary.
- Mount the inlet connection of the VDK 200 A S02 connecting pipe to the upstream side of valve 1; mount the outlet side of the VDK 200 A S02 to the upstream side of valve 2.
- DO NOT exceed 400 lb-in of torque on VDK 200 A S02 pipe connections.
- DO NOT use the VDK 200 A S02 as a lever.
- Perform a complete leak test to verify that no leakage occurs at any gas connection between the VDK 200 A S02 and the automatic 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.**

## WIRING

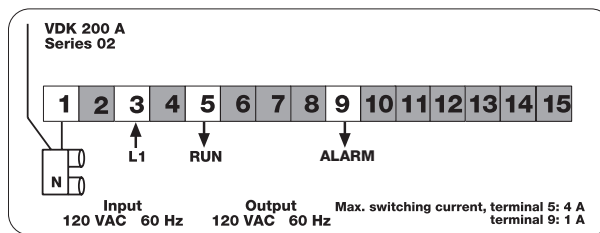
- Use 14 or 16 gauge wire rated for 95°C(200°F).
- Disconnect all power to the VDK 200 A S02 before beginning the wiring to prevent electrical shock and equipment damage.
- Do not exceed the terminal ratings given in the specifications and on the VDK 200 A S02.
- Remove the cover of the VDK 200 A S02 by loosening the three screws on the sides of the VDK 200 A S02.
- Attach 1/2" NPT conduit to the black conduit adapter.
- Route the wires through the conduit connector.
- Connect the wiring to the appropriate screw terminals on the terminal strip. Replace the cover, and secure the screws. Typical wiring diagrams for operating the VDK 200 A S02 are shown on the next page.



Frequency converters with insufficient shielding can cause faults in the VDK 200 A S02 as the result of transients. Verify that the equipment is provided with sufficient shielding.

### Accessory: CM 100, CM 101

The DUNGS 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.

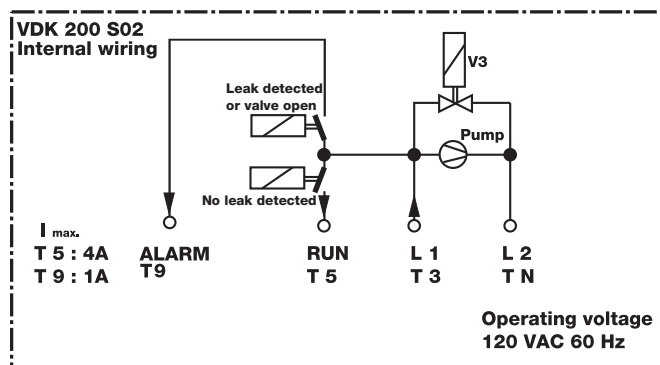


ALAR



**CAUTION:** All wiring must comply with local electrical codes, ordinances and regulations.

## Internal Wiring



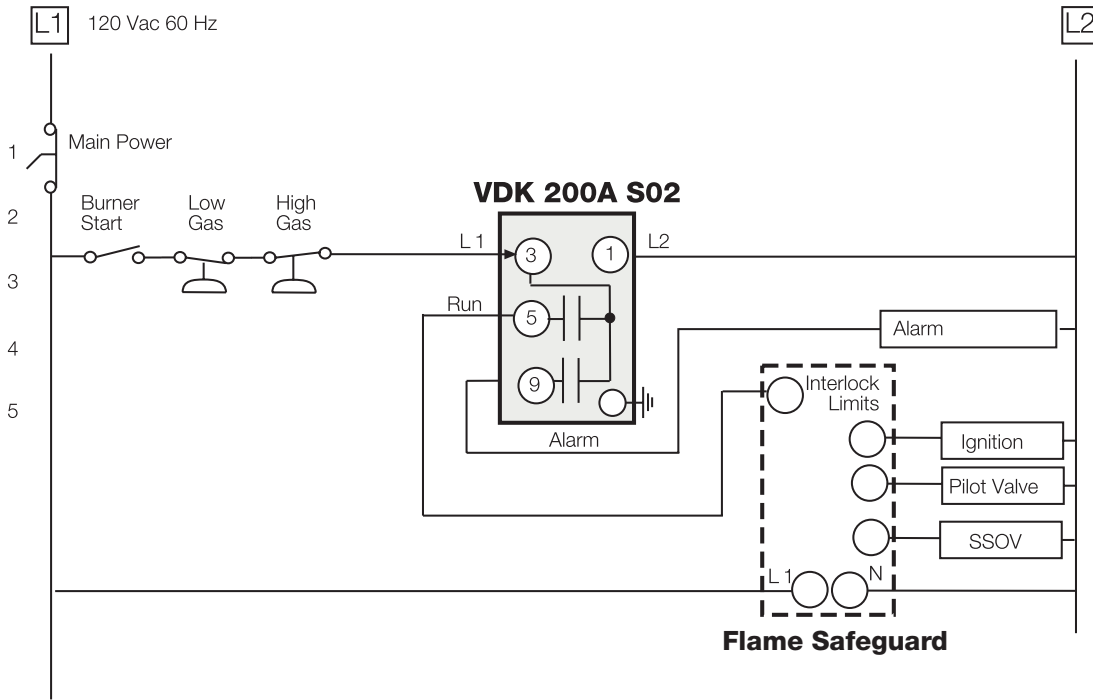
**Operating voltage 120 Vac / 60 Hz**



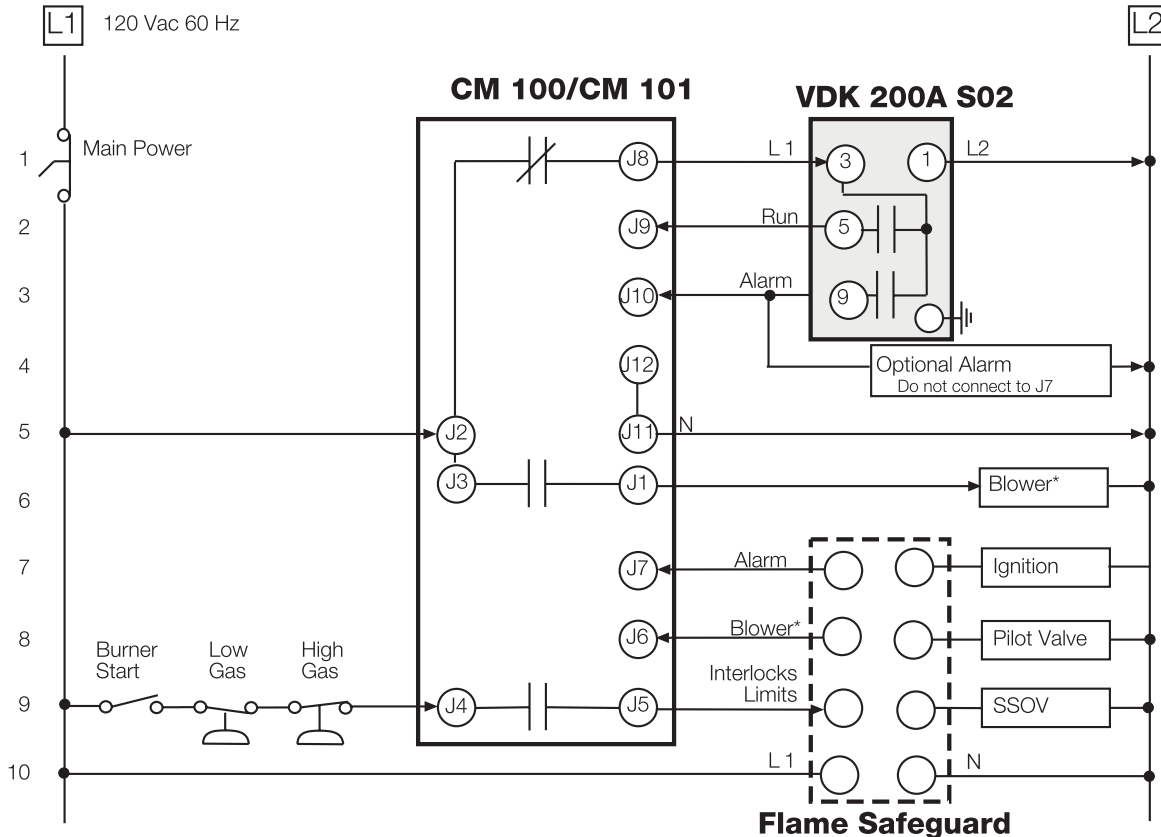
**Only use terminals N, 3, 5 and 9. Otherwise injury or damage will occur.**

# VDK WIRING WITH AND WITHOUT CM MODULE

## VDK wired as proof of closure to prove safety shutoff valves on a startup



## VDK wired with CM 100 or CM 101 relay module for proving safety shutoff valves on startup and shutdown



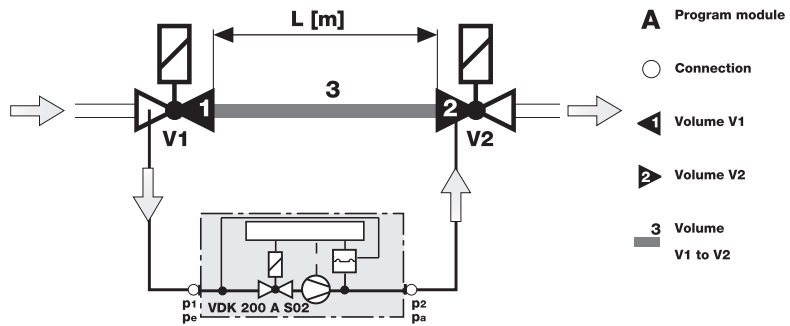
\*Connect flame safeguard blower terminal directly to blower if blower should not turn on when VPS alarms.

# OPERATION

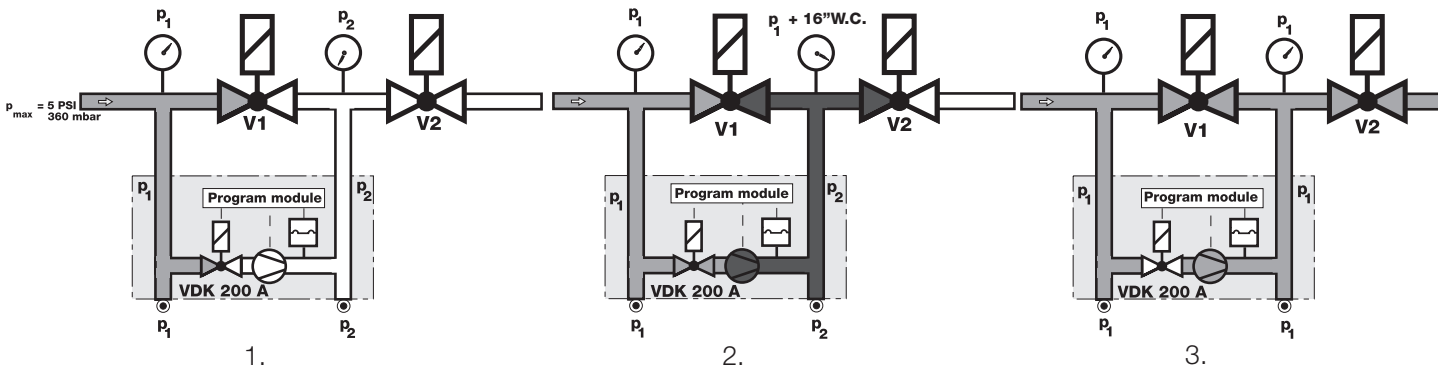
## Functional principle

The VDK 200 A S02 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 200 A S02 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 200 A S02 to be used in lieu of a vent valve when accepted by the authority having jurisdiction.



## Program sequence



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

2. **Valve proving:** The internal pump pumps gas pressure from upstream the first automatic shutoff valve,  $p_1$ , to the volume between the two automatic shutoff valves. The gas pressure between the two automatic shutoff valves,  $p_2$ , increases approx. 16 in. W.C. above  $p_1$ .

3. **Operation:** VDK 200 A S02 internal valve closes, pump remains off, and "RUN" contact (T5) remains energized. Valve 1 and valve 2 are energized by the flame safeguard at an appropriate time.

During valve proving, the internal differential pressure switch monitors the pressure between the two automatic shutoff 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.

## ADJUSTMENTS AND LEAK DETECTION LIMITS

The VDK 200 A S02 is factory set for a minimum pipe volume. Depending on the application, the VDK 200 A S02 may require an additional adjustment to function properly. This setting is dependent on the area of the Test Volume (volume between the valves). The volume adjustment is located on the outlet side of the VDK 200 A S02. (See drawing below)



Do not adjust or remove any screws or bolts which are sealed with a Red or Blue colored compound. Doing so will void all approvals, warranties and exchange policies.

The table below lists typical gas volumes determined by pipe size and length. The gas volume numbers that are shaded should have a pump time of 26 seconds or more. All other volumes should have a 24 second pump time or less.

### Adjustment Procedure - Non-Shaded Test Volumes

1. After installing the VDK 200 A S02 and opening the upstream ball valve, perform an external leak test on the Test Volume (Volume between the valves) and all gas fittings on the VDK 200 A S02. (The VDK 200 A S02 can be used to pressurize the Test Volume).
2. The piping upstream of the VDK 200 A S02 cannot contain air during calibration. (Only fuel gas should be present).
3. Depressurize the Test Volume by an appropriate tap between the 2 shutoff valves. Close the tap after Test Volume is fully depressurized.
4. Having a stopwatch ready, power the VDK 200 A S02, or depress the red reset button. Measure the pump time from start to finish.
5. If the pump time lasts for 24 seconds or less, no adjustment is required. The VDK 200A S02 is then set at the minimum detection limit for the application. If the pump time runs for 24 seconds or more, turn the volume adjustment screw counterclockwise in 90 degree increments until the pump time is about 24 seconds.

6. Confirm the volume setting by repeating this procedure three times (Procedures 3-6). Once satisfied with the volume setting, seal the volume adjustment screw with an appropriate compound.

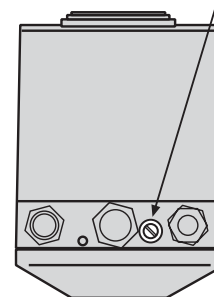
### Adjustment Procedure - Shaded Test Volumes

1. After installing the VDK 200 A S02 and opening the upstream ball valve, perform an external leak test on the Test Volume (Volume between the valves) and all gas fittings on the VDK 200 A S02. (The VDK 200 A S02 can be used to pressurize the Test Volume).
2. The piping upstream of the VDK 200 A S02 cannot contain air during calibration. (Only fuel gas should be present)
3. Depressurize the Test Volume by an appropriate tap between the 2 shutoff valves. Close the tap after Test Volume is fully depressurized.
4. Having a stopwatch ready, power the VDK 200 A S02 or depress the red reset button. Measure the pump time from start to finish.
5. If the pump time lasts for more than 26 seconds, turn the volume adjustment screw counterclockwise in 90 degree increments until the test time is 26 seconds.
6. Confirm the volume setting by repeating this procedure three times (Procedures 3-6) Once satisfied with the volume setting, seal the volume adjustment screw with an appropriate compound.



**In order to prevent functional or leakage problems, we recommend the use of approved, direct acting safety shutoff valves. Do not use diaphragm assisted safety shutoff valves.**

**Volume Adjustment**



<b>Approx. Leak Detection Limits for each valve</b>				
<b>Using natural gas and maximum valve proving time</b>				
<b>Inlet Pressure (in. W.C.)</b>	<b>Test Volume (ft<sup>3</sup>)</b>			
	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.**

<b>Pipe Length (ft) between safety valves</b>					
		1.5	3.25	5	6.5
<b>Pipe Size (NPT)</b>	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 (ft<sup>3</sup>)

## MAINTENANCE AND ANNUAL TESTING

The VDK 200A S02 is a protective device. Check it at least annually for proper operation.



Verify that both automatic shutoff valves are de-energized prior to testing the VDK 200 A S02.

### Test Procedure

1. **With the upstream ball valve opened**, disconnect the 1/4" pipe connection downstream the VDK. Cover the 1/4" pipe connection leading to the downstream side of the VDK using your finger, and then apply a soapy solution to this area. Allow a small gap to form between your finger and the 1/4" connection, and watch for bubbles. Apply more solution if needed. If no bubbles form, the VDK's safety valve is tight. If bubbles form, the leakage rate can then be estimated by connecting a 1/4" flexible hose (having a 45° cut at the end) to the 1/4" connection of the VDK. Obtain a glass of water and immerse the 1/4" tubing about 1/2" below the water line. If the number of bubble exceeds 20 over a 10 second period, replace the VDK.

2. Verify that there is power to the VDK 200 A S02 and **that the upstream ball valve is opened**. Then, reset the VDK 200 A S02 by pressing the red reset button on top of the black cover. After the VDK 200 A S02 stops pumping (approx. 32 s +/- 3 s), the VDK 200 A S02 should lock out. Verify this by observing the illuminated red light and by measuring 120 Vac at the alarm circuit (Terminal T9).

**Note:** When the internal pump of the VDK 200 A S02 is running, a small amount of gas will flow from the opened tap.

If test procedure 2 fails, immediately remove and replace the VDK 200 A S02.



All connections must be properly tightened and leak tested before any gas is reapplied to the system.



Do not try to repair the unit. An attempt to repair the VDK could interfere with its normal operation which may result in a fire or explosion. If the VDK 200 A S02 is disassembled, all approvals, warranties, and exchange policies will be void.

## TROUBLE SHOOTING

**#1** VDK alarms, and there are no external leaks or valve seat leakage on either valve.

**#1** On a new installation, the test volume could be too large. Either increase the „volume adjustment“ to accommodate the larger volume, or decrease the test volume. It could also be that the VDK was cycled more than 15 times within 60 minutes, which causes the pump to temporarily weaken, resulting in a lockout (alarm). Allow the pump to cool for 60 minutes, and try again.

If the installation is not new, it could be that the pump has slightly weakened over time. Increase the „volume adjustment“ to accommodate the weakened pump. Or, it could be that the pump is worn out or a part on the printed wiring board failed. If increasing the „volume adjustment“ does not fix the fault, the VDK needs to be replaced.

**#3** VDK indicator light keeps blinking, and there is never an alarm or run signal.

**#3** The printed wiring board is defective.

## PART NUMBERS

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
VDK replacement cover		224 098

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