GUIDANT

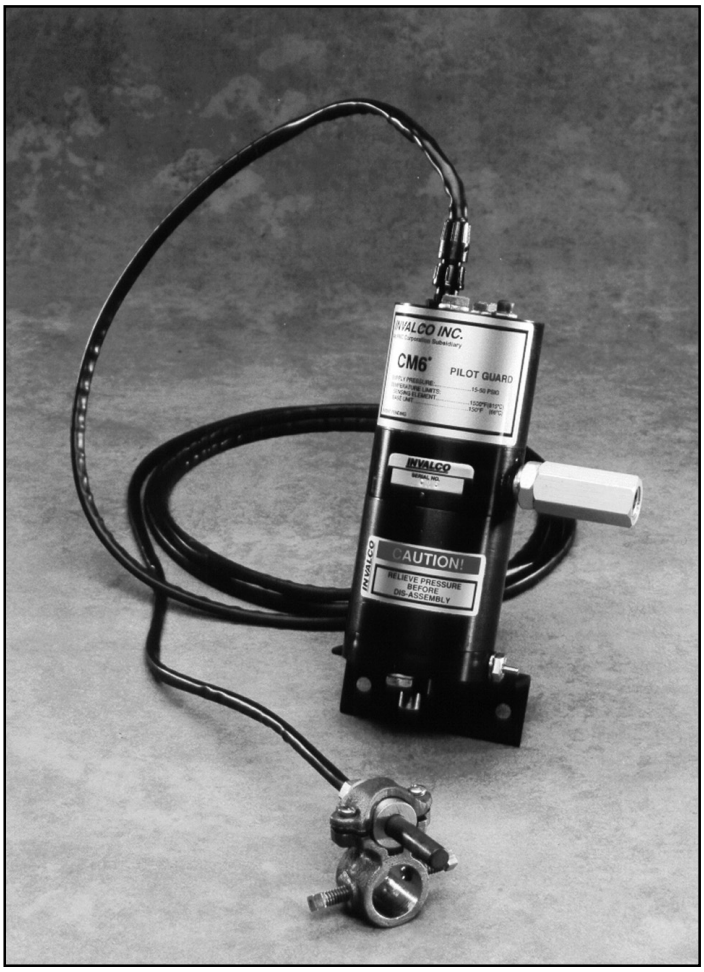
CM7

Pilot Guard

Installation/Operation Manual

September 2000

Bulletin MNIA001



Model CM7-15' Complete Assembly Part Number P511501

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Section I - Introduction

Introduction

The CM7 Pilot Guard is designed to provide positive shut-off of the gas supply to the pilot and main burner in the event of a pilot flame-out.

The CM7 Pilot Guard requires no external power source, so it is unaffected by power outages. It can be used in remote locations where no electrical power is available. The reset mechanism opens only the pilot port, so there is no dangerous gas build-up from the burner port while the pilot flame is being ignited. The temperature-sensing element contains no mercury or other hazardous substance. The temperature-sensing element mount is designed to work with the RHSB Pilot Burner. The CM7 has a field adjustable sensitivity potentiometer, which can be set with the small supplied screwdriver to give good stable operation with quick actuation with a “cool” pilot flame, or a very strong hot flame. Actuation time normally is from 12 to 20 seconds after pilot outage. The main factors determining actuation time are “closeness” of pot setting and fire tube drafting.

Caution: Be sure to replace cap nut covering sensitivity pot after adjusting to keep out water, dust, etc.

Theory of Operation

Depressing the reset button opens an internal valve, allowing gas to flow out the pilot port so the pilot flame can be ignited (see Figure 1). Latching the reset button for 60-90 seconds after the pilot flame is ignited will allow the temperature-sensing element to come up to temperature. The reset button is then fully depressed to engage the magnetic circuit and release the reset latch. Releasing the reset button allows gas to flow out the pilot and burner ports.

If the pilot flame should go out, causing the temperature-sensing element to cool, the CM7 Pilot Guard will snap closed, shutting off the gas pressure to both the pilot and burner ports simultaneously. In the “off” position, the burner port is open to the pilot port, allowing diaphragm pressure from the burner fuel valve to vent out through the pilot line.

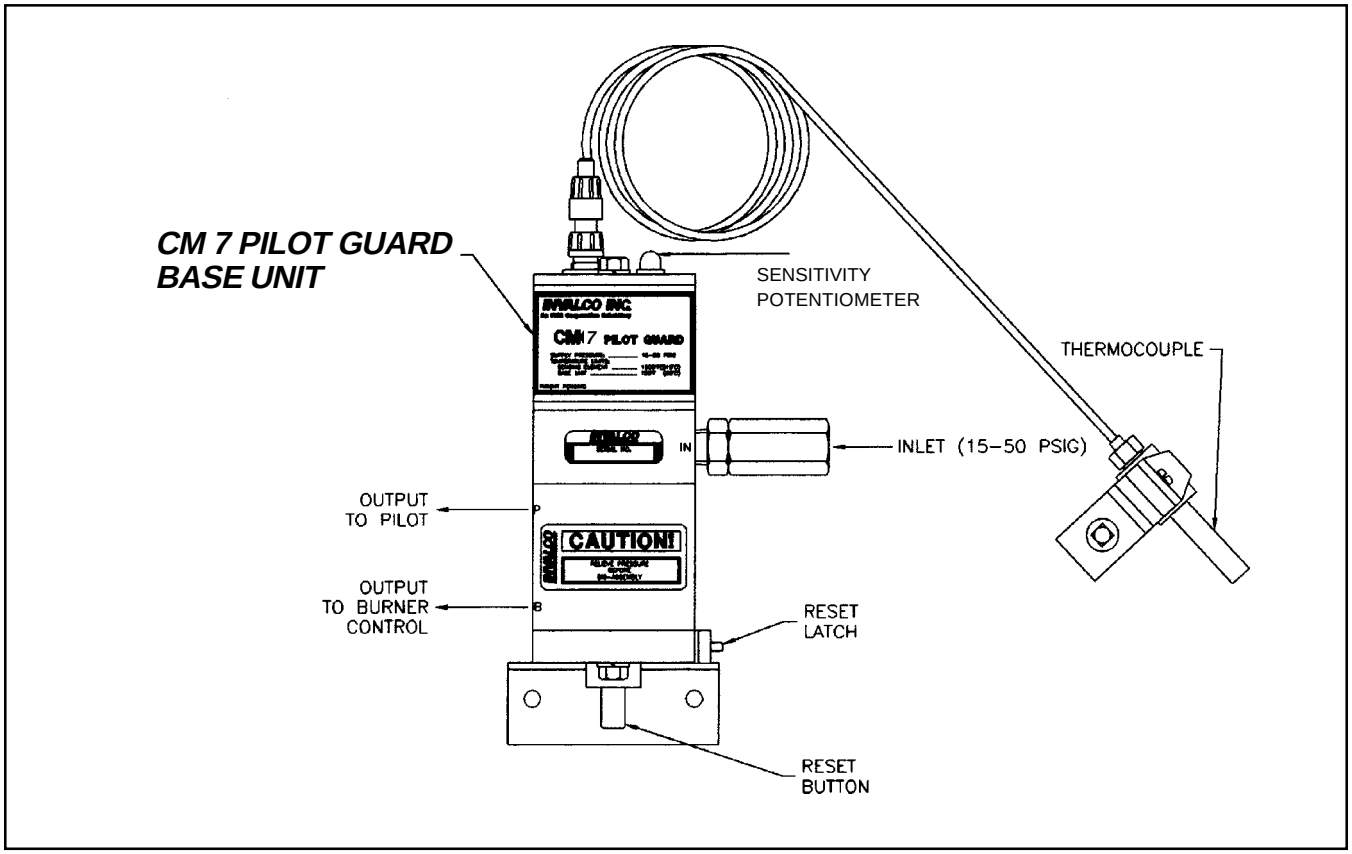


Figure 1

Section II - Specifications and Installation

Specifications

Materials

Body	Anodized Aluminum
Elastomer seals	Viton
Internals	Stainless Steel
Supply pressure	15-50 psig

Temperature Limits

Sensing Element	1500° F
Base Unit	150° F

Installation

1. Use only with the RHSB burner nozzle and Model 100 Mixer (#70 or #72 orifice).
2. Include a manual shut-off valve in the main burner line and in the pilot line (see Figure 2).
3. The temperature element must be installed on the lower half (between 3 and 9 o'clock) of the pilot burner, as shown in Figure 3.
4. Enlarge one hole in the side of the RHSB to 3/8" as shown in Figure 3.
5. Supply with 15-50 psig filtered and regulated gas at the inlet port.

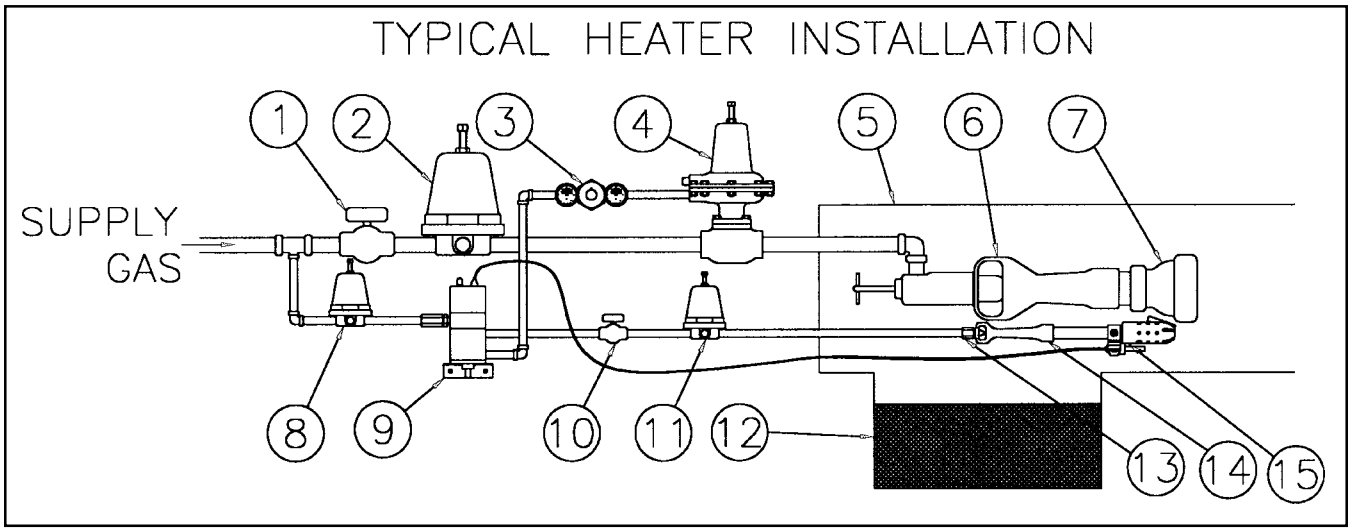


Figure 2

Item	Invalco Part Number	Description
1	Cust. Supplied	Manual Shut-off Valve
2	Cust. Supplied	Low Pressure Gas Regulator
3	80003505	CTS-5025 Temperature Control
4	80004509	DSG-7501-468 Fuel Valve
5	Cust. Supplied	Fire Tube
6	80000403	2" Adjustable Gas Mixer
7	80000408	2"x3" Burner Nozzle
8	Cust. Supplied	Low Pressure Gas Regulator
9	P511501	CM7-15' Pilot Guard
10	Cust. Supplied	Manual Shut-off Valve
11	Cust. Supplied	Low Pressure Gas Regulator
12	Cust. Supplied	Flame Arrestor
13	45002892	#71 Gas Mixer Orifice
14	45008576	Model 100 Mixer
15	48729558	RHSB Pilot Burner Nozzle

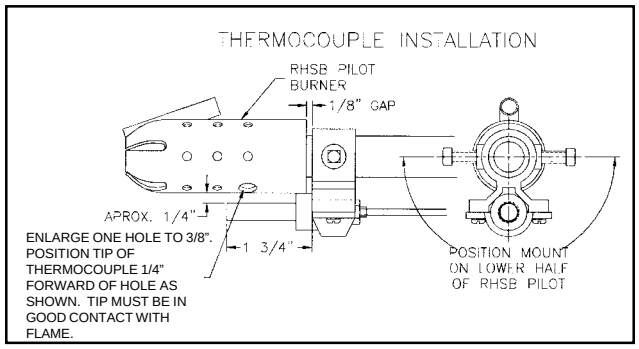


Figure 3

Operation

1. Be sure the area is free of combustibles.
2. Close shut-off valves in the main burner line and pilot line; wait for gas to vent from the system.
3. Turn potentiometer 20 turns counterclockwise.
4. Stand to the side of the burner and light a torch. Insert the torch into the fire tube next to the pilot burner.
5. Open the pilot shut-off valve.
6. Depress and latch the CM7 Pilot Guard reset button. This allows the gas to flow to the pilot burner and the pilot should ignite.
7. When the temperature-sensing element has come up to temperature (60 to 90 seconds after ignition), fully depress then slowly release the reset button. The CM7 Pilot Guard should "latch" in the open position, allowing gas to flow to both the pilot and main burner ports. If the pilot does not remain lit, refer to the troubleshooting guide in Section IV.
8. Adjust the sensitivity potentiometer as follows:
   a. Slowly turn the potentiometer clockwise until CM-7 "drops out", then stop.
   b. Now turn the potentiometer back counter clockwise 4 turns. Relight pilot by repeating Step 1 through 7, except do not turn potentiometer as per Step 3. If unable to get the CM-7 to stay latched open - turn the potentiometer counter clockwise 1 more turn. Keep repeating this procedure, if necessary, until the CM-7 stays latched open. Then turn the pot 2 turns clockwise. This procedure should result in a 12-20 second shut down time after pilot outage. To get an even shorter drop out time, you can slowly turn the potentiometer clockwise to find the maximum number number of turns you can make before the CM-7 drops out. The setting gets more sensitive the closer you get to the drop out point.
9. Check the output pressure at the burner port. If this is not within 2 psig of the supply to the CM7 Pilot Guard, refer to the troubleshooting guide.
10. Slowly open the manual shut-off valve to the main burner line. The main burner will light if the temperature controller is sending an opening signal to the main fuel valve. If the main burner does not light, follow separate instructions for the main burner.
11. Test for proper operation by extinguishing the pilot flame and, with the manual shut-off valve to the pilot open, observing that gas pressure to the pilot and burner control is shut off within 45 sec onds. To shorten the drop out time, slowly turn the potentiometer more counterclockwise.
12. Return to Step 1 to restart.

Caution: Be sure to replace cap nut covering sensitivity pot after adjusting to keep out water, dust, etc.

Thermocouple Principle

The thermocouple used to power the CM7 Pilot Guard is a power-generating device. It converts the heat energy produced by the pilot flame into electrical energy. It differs from the thermocouples used in digital thermometers in the amount of power produced. While most digital thermometer probes generate only a couple of millivolts per 100°F temperature difference, the thermocouple used to power the CM7 Pilot Guard generates around 10 mV per 100°F temperature difference. This temperature difference is sensed between the tip of the sensing bulb and its base. In other words, the greater the difference in temperature between the tip and the base of the sensing bulb, the more power it will produce.

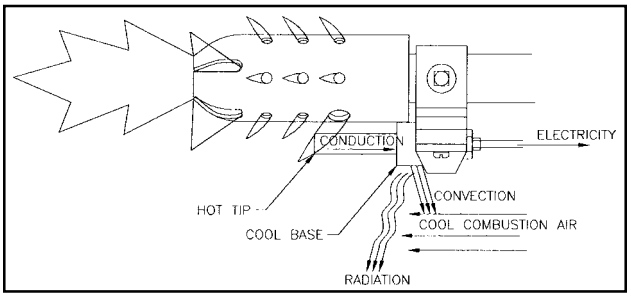


Figure 4

It is therefore desirable to install the thermocouple sensing bulb in such a manner as to have the tip be a hot as possible, or directly in the flame, and the base be as cool as possible, in the cool combustion air behind the flame. (See Figure 4). Terms such as hot and cool are relative, but as a general rule, if a temperature difference of 600-800°F can be maintained, the CM7 Pilot Guard should operate satisfactorily. This means that if the flame temperature is 1300-1500°F, the base of the sensing bulb can be as hot as 500-900°F. Of course, the greater the difference, the better.

The thermocouple achieves its steady state temperature in several ways. The tip is heated by direct impingement of the flame. Heat from the tip as well as the pilot burner is transferred to the base by conduction through the metal. Heat is carried away from the base via convection to the "cool" combustion air, radiated to the "cool" inside surface of the fire tube, and finally carried away in the form of the electricity that powers the CM7 Pilot Guard.

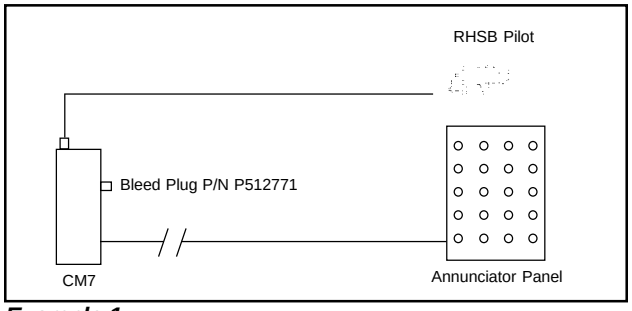
Once every six months perform the test outlined in

Thermocouple Principle (con't)

When installing and starting up a CM7 Pilot Guard, it is possible to monitor the output of the thermocouple as it heats up to its steady state. Using a good quality multimeter with low internal resistance wired in series with the thermocouple, the output should steadily climb until there is adequate power for the electromagnet to latch and hold the inner valve in the open position. The reading should climb to over 100mA. As the heat from the tip is carried by conduction to the base, the current will drop slightly until it stabilizes. The potentiometer should be adjusted after the readings stabilize. However, the milliampmeter should be removed prior to making the final adjustment in order to have the resistance in the milliamp circuit exactly as it will be in actual operation.

When the pilot flame goes out, the tip is no longer being heated and the temperature differential begins to decrease. The magnetic field created by the output of the thermocouple weakens and at 60-70 mA is no longer strong enough to overcome the pull of the spring. This causes the CM7 Pilot Guard's inner valve to snap closed, stopping the flow of gas to the pilot and main burner.

Using the CM7 for BSL Service



Example 1

This hookup may be used to feed a pneumatic signal to a remotely located annunciator panel. Since the annunciating device must be depressurized in order to signal a flame out condition, a vent path must be provided. Normally venting would be back through the tubing to the CM7 and out the pilot. Since there is not line a to the pilot to provide venting, a special bleed plug, P/N P512771 may be purchased for venting at the CM7. This plug has a .020 inch hold in it and will vent 900 SCF/day at 30 psig pressure. Use of the plug will greatly reduce the volume of gas/air that will be venting. If greater flexibility in control is

Using the CM7 for BSL Service (con't)

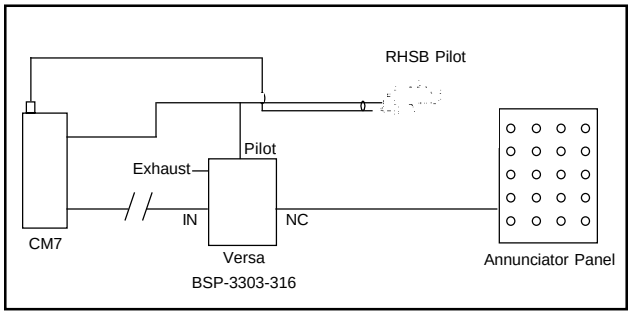
required, a needle valve can be substituted for the fixed orifice plug.

As the venting will be continuous when the CM7 is in the "on" condition, this hookup is not recommended for gas unless the venting gas is tubed to a nonhazardous location. Mounting the bleed plug on the end of a vent line may be done to move the vent point and still accomplish reduced venting volume.

If instrument air is used instead of gas, the bleed plug may be installed in the pilot connection at the CM7.

The speed of response for this hookup will be affected by the supply pressure plus the length and diameter of the tubing used between the CM7 and the panel.

Using small diameter tubing and as low a pressure as possible will reduce the volume of gas that must be vented and will increase the speed of actuation of the BSL after the CM7 snaps closed on a pilot outage.



Example 2

This hookup illustrates one method of firing a pilot and also operating a panel using an auxiliary relay valve for quicker actuation of the panel after the CM7 "snaps" closed. In the above illustration, a Versa Series "B" three-way valve Model BSP-3303-316 is used.

The auxiliary relay can exhaust the pressure from the panel locally instead of back through the CM7 and its associated tubing, as described on the previous page. This reduces the vent time.

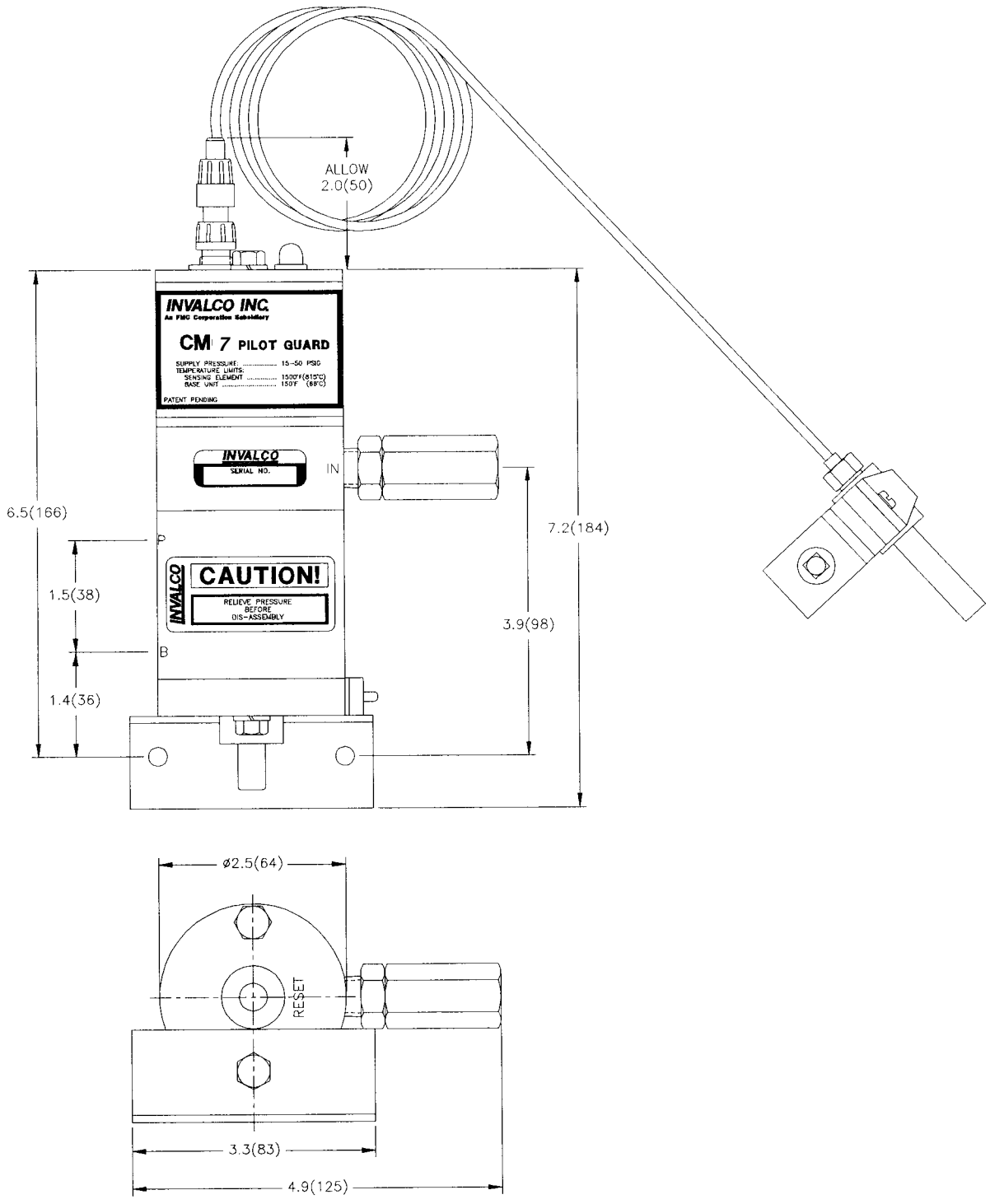
Care should be taken to pipe the exhaust gas from the relay to a nonhazardous area in accordance with your company's safety requirements.

Section IV - Troubleshooting

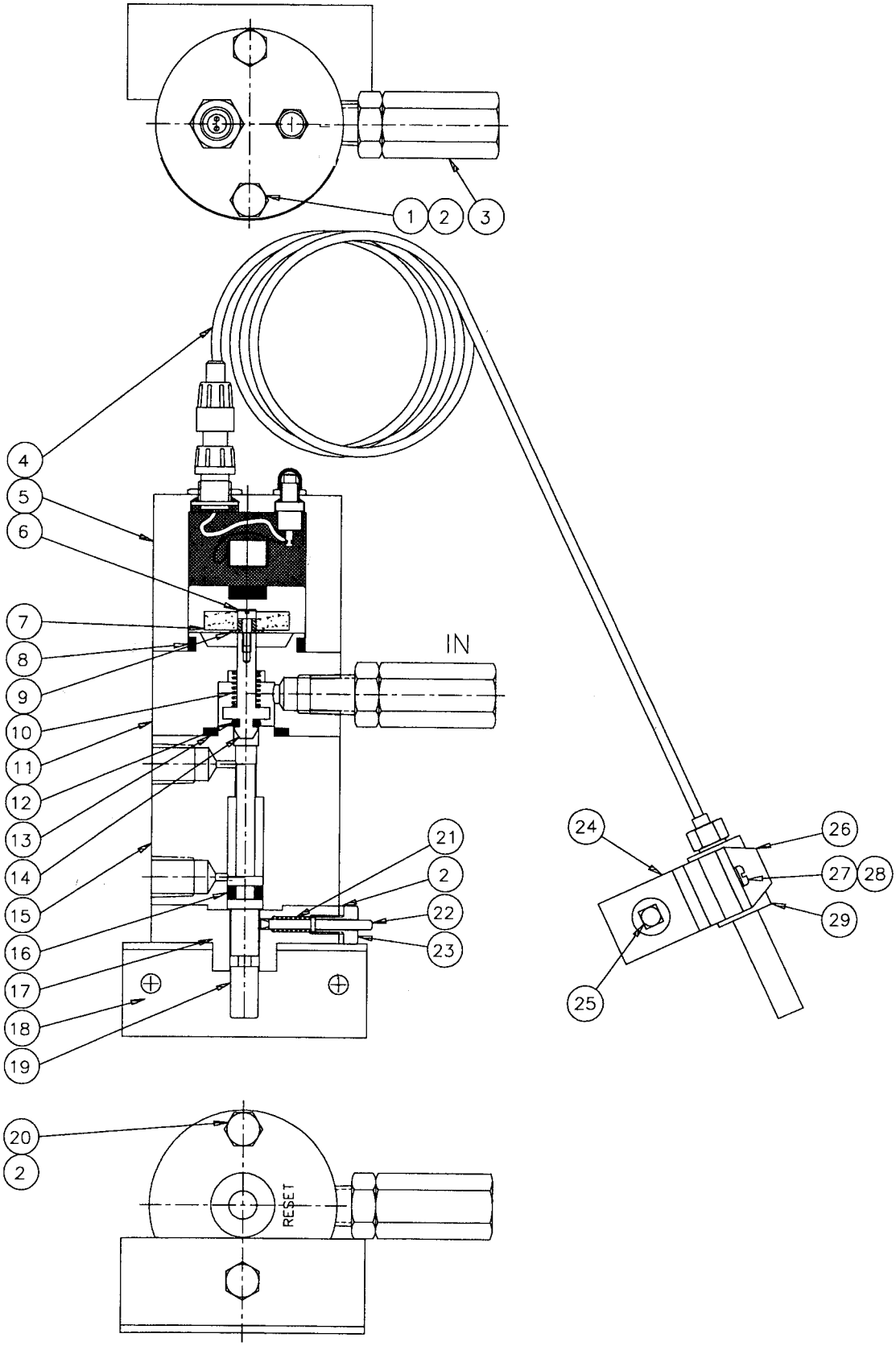
Trouble Shooting Guide

Symptom	Remedy
Pilot will not ignite when reset button is latched.	1. Check that the torch is burning and placed such that it will ignite the pilot. 2. Check for adequate supply pressure (15-50 psig) to the CM7 Pilot Guard 3. Check that the manual shut-off valve in the pilot line is open. 4. Check pilot low pressure regulator for proper adjustment. 5. Check CM7 Pilot Guard supply filter for clogging. 6. Check Model 100 Mixer for proper adjustment
Pilot goes out when reset latch is released.	1. The temperature-sensing element has not come up to temperature and will not engage the magnetic circuit. Re-light the pilot and leave the reset button latched longer. 2. The reset button was not fully depressed prior to release. (Partially depressing the reset button will allow gas to flow to the pilot but will not engage the CM7 Pilot Guard magnetic circuit. Prior to releasing, bottom out the reset button. 3. The reset button was not released smoothly, causing the inner valve to close. Always release the reset button slowly after bottoming it out. 4. The temperature-sensing element is improperly installed. Refer to Figure 3 and adjust as necessary. 5. The temperature-sensing element has been disconnected. Check plug. 6. The sensitivity pot is not turned full clockwise.
CM7 Pilot Guard fails to shut off gas to pilot or burner, or does not react within 45 seconds.	1. The temperature-sensing element is improperly installed. Refer to Figure 3 and adjust as necessary. 2. Check for damage to the inner valve seal (O-ring 67321473). Replace if necessary. 3. Check setting of sensitivity potentiometer.
Low output pressure to pilot or burner control.	Check for: 1. Adequate supply pressure 2. Obstructed or disconnected lines. 3. Clogged inlet filter.

Section V - Dimensions



Measurements shown are inches (mm).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RESET

Item		Description	Qty.	Part Number
1		Screw 1/4-20 x 4 HHCS	2	65016436
2		Washer 1/4 Lock	5	65000613
3	*	Filter	1	45016110
4	*	Thermocouple Assembly 15’	1	46121955
5		Electromagnet Assembly	1	P510710
6		Shoulder Screw 4-40 x 3/8	1	65016453
7	*	Mating Disk	1	48016473
8	*	O-Ring VIT-29-75	1	67310409
9		Washer #8 Flat	1	65007698
10	*	Shut-off Spring	1	P509585
11		Inlet Disk	1	45016430
12	*	O-Ring VIT-106-70	1	67321473
13	*	O-Ring VIT-210-75	1	67311714
14		Stop Shuttle	1	45016433
15		Output Disk	1	45016431
16	*	O-Ring VIT-202-50	1	67321466
17		Bottom Cover Disk	1	45016432
18		Mounting Bracket	1	45015473
19		Reset Shuttle	1	45016434
20		Screw 1/4-20 x 1 HHCS	2	65002341
21	*	Reset Latch Spring	1	45016460
22		Reset Latch	1	45016458
23		Reset Latch Bushing	1	45016459
24		Thermocouple Mount	1	46002045
25		Screw 1/4-20 x 3/4 SQHSS	2	65011422
26		Hold Down Strap	1	46001176
27		Screw 6-32 x 3/8 BHMS	2	65005866
28		Washer #6 Lock	2	65007693
29		Thermocoupler Adapter	1	45016440
30		Nameplate (not shown)	1	45016475
31		Serial Number Tag (not shown)	1	45314070
32		Caution Tag (not shown)	1	45012812
33		Instruction Label (not shown)	1	P510723

*Recommended spare parts

Section VII - Index

USA Operation
1602 Wagner Avenue
Erie, Pennsylvania 16510 USA
P:+1 814.898.5000

Germany Operation
Smith Meter GmbH
Regentstrasse 1
25474 Ellerbek, Germany
P:+49 4101 304.0