



CATCO

INSTALLATION, OPERATION, & MAINTENANCE MANUAL

for

CATALYTIC INFRARED HEATERS

WARNING

Keep the face of the heater clear from combustible materials.

Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read the installation, operating and maintenance instructions thoroughly before installing or servicing this equipment.

Do not use heater if the catalytic pad becomes torn or damaged. Continuous use may result in injury or death due to fire, explosion, or carbon monoxide poisoning. The heater must be serviced by a licensed and qualified service person.

Do not attempt to clean catalytic pad. Follow cleaning instructions accompanying heater.



APPROVED

Explosion proof for
Class I, Div 1 & 2, Group D, T2A

$-30^{\circ}\text{C} \leq T_a \leq +45^{\circ}\text{C}$

FM18US0001X



Class I, Div 1 & 2, Group D, T2C
ANSI Z83.20/CSA 2.34

Safety

We appreciate your business and your choice of Catco products. The installation, operation, and maintenance liability for this equipment becomes that of the purchaser at the time of receipt. Reading the applicable Installation, Operation, and Maintenance (IOM) Manuals prior to installation and operation of this equipment is required for a full understanding of its application and performance prior to use. If you have any questions, please call Catco at 972-563-8065.

Install and operate heaters in accordance with local and national codes, including codes for electrical equipment in hazardous locations where applicable. The installation must conform with local building codes or, in the absence of local codes, with the National Fuel Gas Code, ANSI Z223.1/NFPA 54 or the Natural Gas and Propane Installation Code, CSA B149.1. When applicable, the heater must be electrically grounded in accordance with the National Electrical Code, ANSI/NFPA 70 or current Canadian Electrical Code, CSA C22.1.

Catco products carry certifications listed by the agencies for which they are marked and the product standards listed on the

product label. When installing a Catco heater in a classified area, ensure that all associated electrical equipment is appropriately rated for the area where it will be installed. Specific conditions of use: Class I, Division 1 or 2, Group D: for supply connection use wires rated for at least 90° C (194° F). Class I, Division 1, Group D: Seal all conduit within 18 inches. In Class I, Division 1 installations the heater shall have an on/off switch connected by a suitable wiring method in accordance with Article 501.10 of the NEC. The switch, when located within the hazardous area, shall be suitably rated for the intended application. The switch shall be located within the vicinity of the heater as the installation permits. A mushroom, push-button or equivalent emergency shut-off switch shall be located near the unit.

Catco products are intended for industrial use and should be installed and operated by personnel competent in gas, electrical, and general safety. With questions on the installation and operation of Catco products, contact your Catco distributor or the factory at 972-563-8065.

Product Information

Principles of Operation

Catalytic heating is brought about by using a catalyst to promote the reaction of combustible gases with oxygen or air, at a much slower rate, to produce heat without flame. When the temperature of the catalyst pad is elevated the combustible gas will react at a temperature in the range of 600-800 °F. This is far below the 1200-1300 °F ignition point of natural gas.

The result is a flameless heat that can be safely put to use in areas where hazards due to explosive vapors may exist.

Catalytic heaters produce radiant heat which can be focused on a particular area or object. Radiant heat, like light, is electromagnetic wave energy and travels in straight lines at 186,000 miles per second. Like light energy it can cast shadows, be transmitted, absorbed or reflected by matter, and be focused or dispersed by lenses or prisms of the proper material.

The intensity of heat energy varies with the square of the distance as does light. It will travel any distance without loss as long as it doesn't contact matter which absorbs it.

The absorption of radiant energy by various materials is a specific property of each material. Since the absorption of radiant heat is highly selective, there are opportunities for a wide variety of applications in industry.

In addition, the infrared energy emitted by catalytic heaters is in the lower end of the spectrum which means that nearly all of the energy produced is in the form of usable heat. Because of these characteristics, catalytic heaters are highly effective when heating specific objects such as valves and regulators. While other forms of heat often waste energy by heating the surrounding air and other objects in the vicinity, catalytic heaters heat only the objects at which they're directed which provides greater efficiency than other forms of heating.

Part Numbers & Configurations

Figure 1. Part Number Structure

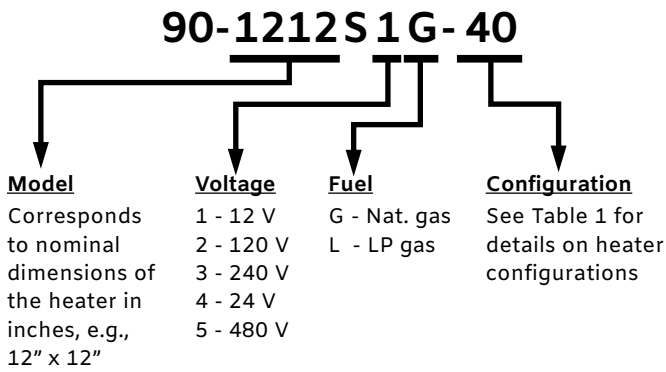


Table 1. Heater Configurations

| Config | Hazardous Location Listing | | Junction Box | | Valve and Thermo-couple |
|--------|----------------------------|-----------------------|--------------|----|-------------------------|
| | Class I Div 1 Group D | Class I Div 2 Group D | Plain | EP | |
| -10 | | | • | | |
| -20 | | | | • | |
| -30 | | FM | • | | • |
| -40 | FM | FM | | • | • |
| -50 | CSA | CSA | | • | • |

Specifications

Figure 2. Product Dimension Reference

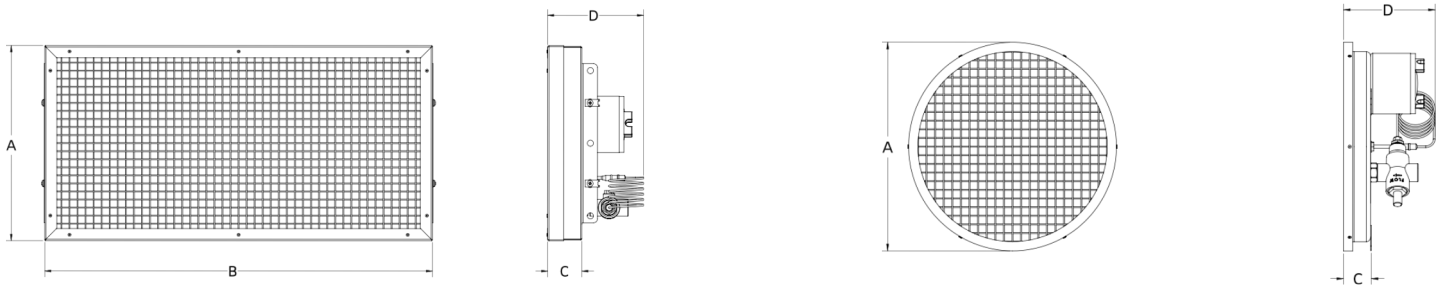


Table 2. Product Specifications

| Model | Rating, BTU/hr (kW) | Hourly Fuel Consumption | | Nominal Size, inches (mm), Dimensions from Figure 2 | | | | Approx. Weight, lb (kg) |
|-------|---------------------|--------------------------|-----------------------|---|-----------|------------|-------------|-------------------------|
| | | Natural Gas SCFH (m3/hr) | Propane lb/hr (kg/hr) | A | B | C | D | |
| 66 | 1500 (0.44) | 1.5 (0.04) | 0.07 (0.03) | 6 (152) | 6 (152) | 1 3/4 (44) | 7 (178) | 5 (2.3) |
| 88 | 2667 (0.67) | 2.7 (0.08) | 0.12 (0.06) | 6 (152) | 8 (203) | 1 3/4 (44) | 7 (178) | 5 (2.3) |
| 612 | 3000 (0.88) | 3.0 (0.08) | 0.14 (0.06) | 6 (152) | 12 (305) | 1 3/4 (44) | 7 (178) | 7 (3.2) |
| 1012 | 5000 (1.47) | 5.0 (0.14) | 0.23 (0.10) | 10 (254) | 12 (305) | 1 3/4 (44) | 7 (178) | 8 (3.6) |
| 1212 | 6000 (1.76) | 6.0 (0.17) | 0.28 (0.13) | 12 (305) | 12 (305) | 1 3/4 (44) | 7 (178) | 10 (4.5) |
| 624 | 6000 (1.76) | 6.0 (0.17) | 0.28 (0.13) | 6 (152) | 24 (610) | 2 (51) | 7 1/4 (184) | 10 (4.5) |
| 1224 | 12,000 (3.52) | 12.0 (0.34) | 0.56 (0.25) | 12 (305) | 24 (610) | 2 (51) | 7 1/4 (184) | 15 (6.8) |
| 1236 | 18,000 (5.28) | 18.0 (0.51) | 0.83 (0.38) | 12 (305) | 36 (914) | 2 (51) | 7 1/4 (184) | 20 (9.1) |
| 1248 | 24,000 (7.03) | 24.0 (0.68) | 1.11 (0.50) | 12 (305) | 48 (1219) | 2 (51) | 7 1/4 (184) | 30 (13.6) |
| 2424 | 24,000 (7.03) | 24.0 (0.68) | 1.11 (0.50) | 24 (610) | 24 (610) | 2 (51) | 7 1/4 (184) | 30 (13.6) |
| 1836 | 27,000 (7.91) | 27.0 (0.76) | 1.25 (0.57) | 18 (457) | 36 (914) | 2 (51) | 7 1/4 (184) | 30 (13.6) |
| 1260 | 30,000 (8.79) | 30.0 (0.85) | 1.39 (0.63) | 12 (305) | 60 (1524) | 2 (51) | 7 1/4 (184) | 40 (18.1) |
| 1848 | 36,000 (10.55) | 36.0 (1.02) | 1.67 (0.76) | 18 (457) | 48 (1219) | 2 (51) | 7 1/4 (184) | 40 (18.1) |
| 1860 | 45,000 (13.19) | 45.0 (1.27) | 2.08 (0.94) | 18 (457) | 60 (1524) | 2 (51) | 7 1/4 (184) | 45 (20.4) |
| 2448 | 48,000 (14.07) | 48.0 (1.36) | 2.22 (1.01) | 24 (610) | 48 (1219) | 2 (51) | 7 1/4 (184) | 45 (20.4) |
| 2460 | 60,000 (17.58) | 60.0 (1.70) | 2.78 (1.26) | 24 (610) | 60 (1524) | 2 (51) | 7 1/4 (184) | 60 (27.4) |
| 2472 | 72,000 (21.10) | 72.0 (2.04) | 3.33 (1.51) | 24 (610) | 72 (1829) | 2 (51) | 7 1/4 (184) | 65 (29.4) |
| 8RD | 1500 (0.44) | 1.5 (0.04) | 0.07 (0.03) | 8 (203) | - | 1 3/4 (44) | 7 (178) | 4 (1.8) |
| 12RD | 5000 (1.47) | 5.0 (0.14) | 0.23 (0.10) | 12 (305) | - | 1 3/4 (44) | 7 (178) | 5 (2.3) |

Installation

Installation and Mounting

Install the heater in a fixed position so that it can't be tipped over, dislocated, or otherwise compromised. Ensure units are installed where they don't pose a risk for personnel to come into contact with the heater face while it is operating. It's critical the unit be installed so the face of the heater is protected from rain and snow. When installed, the face of the heater shouldn't be angled up or down more than 45° from vertical.

Maintain clearance from combustible materials such as wood, cloth, paper, etc. as indicated in Table 3. Units are inches (mm).

Table 3. Minimum Clearance from Combustible Materials

| Distance From | Units up to 12,000 BTU/hr (3.52 kW) | | | Units greater than 12,000 BTU/hr (3.52kW) | | |
|-----------------|-------------------------------------|----------|------------|---|-----------|------------|
| | Burner Angle | | | Burner Angle | | |
| | Vertical | 0-45° Up | 0-45° Down | Vertical | 0-45° Up | 0-45° Down |
| Radiant Surface | 24 (610) | 24 (610) | 24 (610) | 42 (1067) | 42 (1067) | 42 (1067) |
| Top | 18 (458) | 18 (458) | 18 (458) | 18 (458) | 32 (813) | 18 (458) |
| Sides | 12 (305) | 12 (305) | 12 (305) | 12 (305) | 12 (305) | 12 (305) |
| Bottom | 6 (153) | 6 (153) | 6 (153) | 12 (305) | 12 (305) | 24 (610) |

Fuel Gas Setup

Do not alter or remove the heater orifice.

Catco catalytic heaters are designed to operate with input pressure of 4.5 inches water column (w.c.) (1.12 kPa) for natural gas fueled heaters or 11 inches w.c. (2.74 kPa) for LP gas fueled heaters.

For best performance, it's recommended to make the final pressure cut as close to the unit as possible. Cutting to manifold pressure more than several inches upstream of the fuel input can result in suboptimal performance.

An appliance regulator with a max inlet pressure of 0.50 psi (3.45 kPa) is included with and required for all CSA listed units. This appliance regulator is available as an optional accessory for other configurations.

A common piping arrangement including optional accessories for a catalytic heater is shown in Figure 3. Arrangement requirements vary depending on the details of the application. Not all accessories are available with all product configurations.

Installations for Direct Heating

Catalytic heaters heat objects via infrared energy. This energy is more readily absorbed by objects that are nonreflective and dark in color. The intensity of the energy dissipates rapidly as distance from the heater increases, so the closer the object is to the heater the more energy it will absorb.

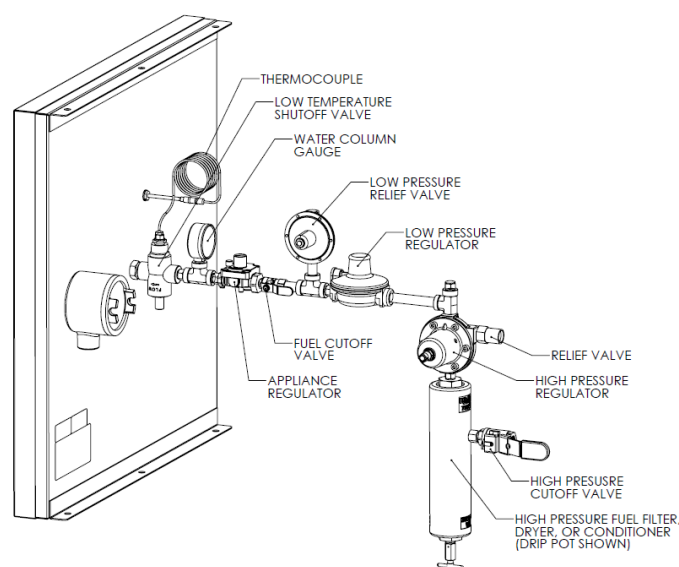
Catalytic heaters are often installed in stainless steel housings designed to heat objects such as valves, regulators, chokes, and process piping as efficiently as possible. For more information, refer to the product bulletins for those products.

Installations for Heating Buildings

The heat requirement for buildings depends on the size of the building being heated, the rate at which the building loses heat, and the required temperature increase. Heat losses depend on how well the building is insulated and the rate of air change.

Infrared energy heats objects, not air. Therefore, in space heating applications, heaters shouldn't be positioned near empty space. Heaters should be spaced evenly throughout the building near the objects or areas that need heat such as personnel work areas or equipment at risk for freezing.

Figure 3. Piping Arrangement with Optional Accessories



Electrical Setup

The only electrical component of the heater is the heating element(s) that preheat the catalyst bed during the start-up phase of operation (typically no more than 30 minutes). The element terminals are in the junction box in the back of the heater.

Depending on the heater model, there can be two or four terminal posts. When four posts are present, units can be bussed in parallel or in series. The heating elements have no polarity, so the positive and negative lead can be placed in either location. Table 4 shows possible terminal and bussing configurations. Table 5 shows the required starting amperage for each voltage.

Table 4. Bussing and Element Arrangements

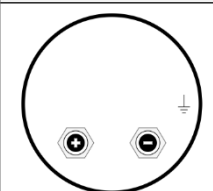
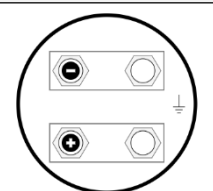
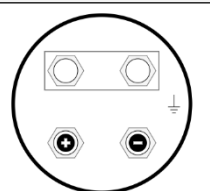
| Single Element | Dual Element, Parallel | Dual Element, Series |
|---|--|--|
| Two Terminals and Ground | Four Terminals and Ground | Four Terminals and Ground |
| No Bus Bars | Two Bus Bars | One Bus Bar |
|  |  |  |

Table 5. Amperage Requirements During Heater Startup

| Model | Starting Amps, A | | | | |
|-------|------------------|------|-------|-------|-------|
| | 12 V | 24 V | 120 V | 240 V | 480 V |
| 66 | 6.7 | 4.2 | 0.6 | – | – |
| 88 | 6.7 | 4.2 | 0.6 | 0.4 | – |
| 612 | 8.3 | 4.2 | 0.8 | 0.4 | – |
| 1012 | 8.3 | 4.2 | 0.8 | 0.4 | – |
| 1212 | 8.3 | 4.2 | 0.8 | 0.4 | – |
| 624 | 16.7 | 4.2 | 1.9 | 1.9 | – |
| 1224 | 16.7 | 8.3 | 1.7 | 0.8 | 0.4 |
| 1236 | 33.3 | 16.7 | 3.8 | 1.9 | 1.9 |
| 1248 | 33.3 | 16.7 | 3.8 | 1.9 | 1.9 |
| 2424 | 33.3 | 16.7 | 3.8 | 1.9 | 1.9 |
| 1836 | 33.3 | 16.7 | 3.8 | 1.9 | 1.9 |
| 1260 | 33.3 | 16.7 | 3.8 | 1.9 | 1.9 |
| 1848 | 33.3 | 16.7 | 3.8 | 1.9 | 1.9 |
| 1860 | 33.3 | 16.7 | 3.8 | 1.9 | 1.9 |
| 2448 | 33.3 | 16.7 | 8.3 | 4.2 | 2.1 |
| 2460 | 33.3 | 16.7 | 8.3 | 4.2 | 2.1 |
| 2472 | 33.3 | 16.7 | 8.3 | 4.2 | 2.1 |
| 8RD | 6.7 | 4.2 | 0.6 | – | – |
| 12RD | 8.3 | 4.2 | 0.8 | 0.4 | – |

Note: Not all voltages available in all configurations.

Hazardous Location Installations

Catco products carry certifications listed by the agencies for which they are marked and the product standards listed on the product label. When installing a Catco heater in an area that has been classified as Class I Division 1 or Class I Division 2, ensure that all associated electrical equipment is appropriately rated for the area where it will be installed.

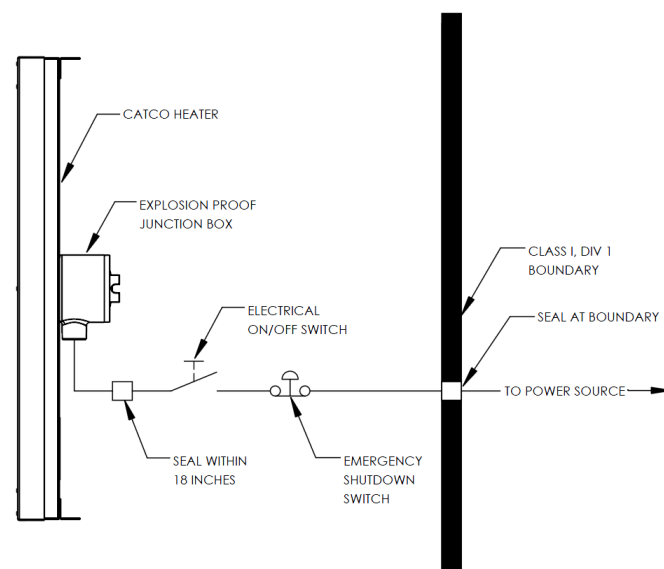
When the electrical supply is provided via a vehicle or other portable battery, electrical connections must be made outside of the classified area.

Specific conditions of use for installation and operation of heaters in Class I Division 1 and Class I Division 2 areas can be found in the safety section of this document.

A common arrangement for a Class I, Division 1 installation is shown in Figure 4 to the right.

Catco recommends that heaters only be installed in hazardous locations by professionals that are familiar with relevant codes and regulations.

Figure 4. Typical Class I, Division 1 Installation



Operation & Maintenance

Start-up

1. Verify the unit has been installed in accordance with the Installation, Operation, and Maintenance Manual and all applicable codes.
2. Make sure the electrical supply matches the voltage on the product label and turn on the electrical supply.
3. Wait 15 minutes to allow the catalyst bed to come up to temperature (may take longer in extremely cold weather).
4. Start gas flow to the heater. If the unit is configured with a shutoff valve and thermocouple, press and release the button on the valve. The plunger on the valve will return to its original position but the valve will be held open internally. This will start the catalytic reaction. If the valve doesn't stay open wait several more minutes and retry.
5. Continue electrical power until the catalytic reaction is fully established. This will be indicated by a rapid rise in face temperature and the emission of hot exhaust gases. Under normal conditions, this takes 5-10 minutes.
6. Once the reaction is established, turn off the electrical power. The heater is now in normal operation.

Normal Operation

The catalyst material is not consumed or destroyed by the catalytic reaction, and the reaction will continue as long as the heater is provided with a clean fuel supply and enough air to facilitate the reaction.

Troubleshooting

If the catalytic heater won't start:

1. Ensure the heater is receiving proper fuel pressure (Natural gas: 4.5 inches w.c.; LPG: 11 inches w.c.). Check the pressure while gas is flowing, not dead-headed.
2. Ensure fuel lines are aggressively purged of air.
3. Verify the heater orifice isn't obstructed.
4. Ensure the voltage applied for preheating is consistent with the voltage listed on the product label.
5. Make sure that electrical power is applied per instructions in the manual and on the label. Once the heater is preheated and gas is sent into the heater, the electrical power should be continued per instructions to allow the heater enough time to establish a robust reaction.
6. Ensure the heater has enough air. The heater should be in a well-ventilated area.
7. Check the face of the heater for discoloration or other signs of damage from water or other foreign substances. If the heater has been contaminated, it may need to be replaced.

Shut Down

1. Ensure the electrical power is turned off.
2. Turn off the fuel supply.
3. Removing the fuel supply will cause the catalytic reaction to stop. Don't handle the unit until it's sufficiently cooled.

Maintenance

Catco catalytic heaters contain no moving parts and maintenance is minimal. Sheet metal surfaces may be cleaned to prevent rust or corrosion, but take care to protect the face of the heater from contact with water, cleaners, or other foreign substances.

If an area is being cleaned with high pressure water spray or air pressure, shield the face of the heater, as the catalyst can be damaged by water or rough contact.

When not in use, heaters should be stored in a clean, dry area and covered to prevent damage from the environment, insects, and rodents.

Repair

Catco provides remanufacturing services on catalytic heaters. For information on this program or any other questions regarding the servicing or maintenance of your Catco products, please contact the factory at 972-563-8065.

If the heater starts but won't stay operating:

1. If the heater is equipped with a low temperature shutoff valve and a spare is available, replace the valve and restart the heater.
2. Ensure the heater is receiving proper fuel pressure (Natural gas: 4.5 inches w.c.; LPG: 11 inches w.c.). Check the pressure while gas is flowing, not dead-headed.
3. Check the face of the heater for discoloration or other signs of damage from water or other foreign substances. If the heater has been contaminated, it may need to be replaced.
4. Ensure that the heater has enough air. The heater should be in a well-ventilated area. In extremely cold weather, ice can build up over ventilation holes of enclosures and prevent adequate airflow.

Accessories & Replacement Parts

| Equipment Type | Catco Part Number | Description |
|-------------------------------|-------------------|---|
| Low Pressure Regulator | 50-005 | Zinc; 1/4" NPT; max inlet 250 psig, outlet 3-7 inches wc, for natural gas fueled heaters |
| | 50-010 | Zinc; 1/4" NPT; max inlet 250 psig, outlet 10-15 inches wc, for LP gas fueled heaters |
| Appliance Regulator | 50-000 | Aluminum; 1/4" NPT; max inlet 1/2 psig, outlet 3-7 inches wc, for natural gas fueled heaters |
| High Pressure Regulator | 50-035 | Brass; 1/4" NPT; max inlet 5500 psig, outlet range 0-75 psig; three outlets |
| | 50-040 | Brass; 1/4" NPT; max inlet 5500 psig, outlet range 0-75 psig; two outlets |
| | 50-037 | Stainless steel; 1/4" NPT; max inlet 5500 psig, outlet range 0-225 psig; three outlets |
| | 50-036 | Brass; 1/4" NPT; max inlet 5500 psig, max outlet 550 psig; two outlets; T-handle |
| Relief Valve | 30-058 | Brass; 1/4" NPT; relieves at 150 psig; Fisher H120 or similar |
| Low Temperature Shutoff valve | 30-127 | Sometimes called a "safety valve; 1/4" NPT; 1/2 psig max inlet |
| Thermocouple | 30-010 | 18" lead; for use in conjunction with low temperature shutoff valve |
| | | 72" lead; for use in conjunction with low temperature shutoff valve |
| Thermostat | 40-030 | 3/8" NPT; for ≤ 12,000 BTU/hr; set point range 60-250° F; specify BTU rating when ordering |
| | 40-006 | 3/8" NPT; for > 12,000 BTU/hr; set point range ???; specify BTU rating when ordering |
| Turndown Valve | 30-030 | 1/4" NPT; Specify BTU rating when ordering |
| Starting Cables | 20-020 | 16' cable; battery clips; 12 V start; for use with plain junction box |
| | 20-021 | 16' cable; battery clips; 12 V start; for use with EP junction box |
| | 20-023 | 16' cable; three-prong plug; 120 V start; for use with EP junction box |
| | 20-030 | 30' cable; battery clips; 12 V start; for use with plain junction box |
| | 20-031 | 30' cable; battery clips; 12 V start; for use with EP junction box |
| | 20-026 | 2' cable; explosion-proof male plug; 12 V start; for use w/ EP junction box; sealed at factory |
| | 20-032 | 2' cable; explosion-proof male plug; 120 V start; for use w/ EP junction box; sealed at factory |
| Wall Mount Brackets | 10-010 | Wall Mount Bracket for 6×12, 6×24, 12×12, 12×24 heaters; stainless steel |
| | 10-025 | Wall mount bracket for 12×36, 12×48, 12×60 heaters; stainless steel |
| | 10-026 | Wall mount bracket for 18×36, 18×48, 18×60 heaters; stainless steel |
| | 10-027 | Wall mount bracket for 24×24, 24×48, 24×60, 24×72 heaters; stainless steel |
| Gauge | 35-073 | 0-15 inches w.c.; 1/4" NPT; back mount |
| | 35-076 | 0-15 inches w.c.; 1/4" NPT; bottom mount |
| Filter | 30-090 | Fuel gas filter assembly; max inlet 150 psig; clear acrylic bowl |
| | 30-091 | Fuel gas filter assembly; max inlet 500 psig; aluminum bowl |
| Drip Pot | 30-070 | Max inlet 2000 psig |
| | 30-071 | Max inlet 6000 psig |

Warranty

Catco warrants that its products are free from defects in design, materials, and workmanship. In addition, Catco warrants its products are suitable for and will perform in accordance with the ordinary use for which they are intended as described in the Installation, Operation, and Maintenance Manual. Claims against this warranty may be made up to one year from the date of purchase by contacting Catco.