

Standard Control Options

Internal Wiring

Copper wire with a minimum of 105°C insulation is used throughout. Connections are made with either box lugs or connectors crimped on with calibrated tooling. Terminal blocks are provided for all field control and power wiring.

INDEECO developed the Control Option concept to maintain compliance with changing UL and NEC requirements and to stay current with new duct heater temperature control systems. The concept has also been broadened to include numerous “Special Features” to meet a wide variety of special requirements.

Control Option G – Basic

Control Option G is a basic package designed for normal comfort heating applications – i.e., those that do not require pneumatic control or the unique features of SCR control. With Option G, the temperature is controlled by a pilot duty thermostat or a step controller.

Control Option G includes the following:

- **Automatic and manual reset thermal cutouts** to protect against overheating. The automatic reset cutout is wired into the control circuit; the manual reset de-energizes the heater load.
- A differential pressure **airflow switch** to de-energize the heater control circuit upon loss of airflow.
- **De-energizing magnetic contactors** for each heater stage.
- **Fuses** to protect each circuit in any heater drawing more than 48 amps.
- A control circuit **transformer**, with 24 or 120 volt secondary as specified, including any overcurrent protection required by UL or the NEC.
- A built-in, snap-acting **disconnect switch** with door interlock to protect service personnel.

Control Option J – Pneumatic

Control Option J is designed for pneumatic temperature control.† The contractor need only connect one air line and the main power lines to the heater.

Option J includes the following:

- **Automatic and manual reset thermal cutouts** and a differential pressure **airflow switch**. The manual reset thermal cutouts always de-energize the heater load. The automatic reset cutout and airflow switch are normally wired in the control circuit. However, when single-phase KW ratings do not exceed the values in **Table II**, both of these devices also carry the heater load directly, eliminating the need for magnetic contactors.
- **PE switches** to control heater staging. To minimize field labor, multiple PE switches are factory-piped to a single port projecting through the terminal box. All PE switches close on pressure rise and open upon loss of pressure to de-energize the heater.
- **De-energizing magnetic contactors** on all three-phase Option J heaters and on single-phase heaters whose KW ratings exceed those shown in **Table II**.

Table II

Single-Phase Voltage	120	208	240	277
Maximum KW	1.8	3.1	3.6	4.1

- **Fuses** to protect each circuit in any heater drawing more than 48 amps.
- A **transformer**, with any overcurrent protection required by UL or the NEC, to supply the internal control circuit of heaters rated above 277 volts. All other heaters have line voltage control circuits.
- A built-in, snap-acting **disconnect switch** with door interlock to protect service personnel.

† Where more than six stages of pneumatic control are required, specify Option G with a step controller and pneumatic transducer as Special Features. Such a heater will function in the same manner as Option J but the number of stages is virtually unlimited.

Control Option K – Proportional

Control Option K is designed for the most precise temperature control, using SCR proportional power controllers and a matching electronic thermostat. For heaters above the KW ratings in **Table III**, an electronic step controller is also provided. It works with the SCR to provide vernier proportional control. For more details on this system, see page 21.

Table III

Voltage		120	208	240	277	480	600
Maximum KW	1 Phase	23.0	39.9	46.0	53.1	91.1	115.2
	3 Phase	—	34.5	39.9	—	79.8	99.7

In addition to these electronic components, Control Option K includes the following:

- **Automatic and manual reset thermal cutouts** and a differential pressure **airflow switch**. The manual reset thermal cutouts always de-energize the heater load. The automatic cutout and airflow switch are normally wired in the control circuit. However, when single-phase KW ratings do not exceed the values in **Table IV**, the automatic reset cutout carries the heater load directly and the airflow switch either carries the load directly or is wired into the control circuit of the SCR, eliminating the need for magnetic contactors.
- **Safety magnetic contactors** controlled by the automatic reset cutout, for each heater circuit, when the KW exceeds the ratings in **Table IV**.

Table IV

Single-Phase Voltage	120	208	240	277
Maximum KW	3.0	5.2	6.0	6.0

- **De-energizing, magnetic contactors** for each heater circuit, other than the SCR circuit, when the system includes a step controller.
- **Fuses** to protect each circuit in any heater drawing more than 48 amps.
- A **transformer**, with any overcurrent protection required by UL or the NEC, to supply the internal control circuit of 120 volts per heater with a step controller for vernier control and 24 volts for all other heaters with SCR control. Wiring to remotely mounted thermostats can be Class II since thermostat circuits are low voltage limited power circuits.
- A built-in, snap-acting **disconnect switch** with door interlock to protect service personnel.
- A choice of room thermostat, page 12, Figure 13 or 14; duct thermostat, page 13, Figure 18 or 19; built-in PE transducer, page 12, Figure 15; or field inputs of 135 ohms, 2200 ohms, 0-10 VDC and 4-20mA are available.



Standard Control Options

Thermostats

Room Thermostats

Single Stage, Catalog No. 1006998

- Built-in thermometer and adjustable heat anticipator
- Range: 50° to 90°F
- Differential: 1°F
- Inductive Rating: 1 amp at 30 volts max.



Figure 11.

Two Stage, Catalog No. 1007030

- Two mercury switches operated by a vapor-filled bellows
- Built-in thermometer
- Range: 46° to 84°F
- Differential: 1°F per stage
Adjustable 1° to 5°F between stages
- Resistive Rating per Heater Stage:
2.0 amps at 120 volts
1.0 amp at 240 volts



Figure 12.

Electronic Proportional, Catalog No. 1007101

- Tamperproof construction
- Range: 40° to 90°F
- Type: Ohmic – 2200 ohms
- For use with INDEECO S95 step controllers



Figure 13.

Electronic Thermostat, Catalog No. 1016941

- C1025 Thermostat is microcomputer-based, PI Control
- Range: 50° to 90°F
- Type: Proportional 0-10 VDC
- For use with INDEECO SCR's and S208 step controllers



Figure 14.

PE Transducer

Catalog No. 1020887

- Built into heater terminal box
- PSIG range: 0 to 15
- Throttling range: 1 – 12 psi
- Maximum pressure: 25 psi
- Type: Ohmic – 135 ohms
- For use with INDEECO SCR's and step controllers



Figure 15.

Standard Control Options Thermostats

Duct Thermostats

Single Stage Heavy Duty, Catalog No. 1019682

- Hydraulic-action element actuates silver contacts
- Range: 20° to 120°F
- Differential: 4° to 30°F Adjustable
- Bulb Dimensions: $\frac{3}{8}$ " x 6"
- Capillary Length: 8'
- Resistive Rating:
 - 25 amps at 120 volts
 - 22 amps at 240 volts
 - 18 amps at 277 volts



Figure 16.

Two Stage Light Duty, Catalog No. 1007044

- Two single-pole, double throw switches
- Adjustable by screw on graduated cam dial
- Range: 55° to 85°F
- Differential: 2°F between stages
- Bulb Dimensions: $\frac{5}{8}$ " x $11\frac{1}{16}$ "
- Capillary Length: 5'6"
- Resistive Rating per Heater Stage:
 - 13.3 amps at 120 volts
 - 6.6 amps at 277 volts



Figure 17.

Electronic Proportional

Catalog No.: Sensor, 1001083

Adjuster, 1001068

- Range: 60° to 120°F
- Type: Ohmic – 2200 ohms
- For use with INDEECO S95 step controllers



Figure 18.

Electronic Thermostat

Catalog No.: Sensor, 1016942

Adjuster, 1016941

- Range: 50° to 90°F
- Type: PI Proportional 0-10 VDC
- For use with INDEECO SCR's and S208 step controller



Figure 19.



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