

Thermocouple Meter

FEATURES & BENEFITS

- Digital Indicator, Alarm, and Transmitter Package.
- Dual Alarms.
- Boiler Energy-saving Tool.
- ISA Sequence M Alarm Capability.
- Low Cost.
- Surface & Panel Mount.
- “Open” Thermocouple Indication.
- Alarm Displays & Digital Outputs.
- Modbus Communications.
- Retransmit Temperature as 4-20 mADC.
- Bright LED Display.
- Temperature Display, °F or °C.
- Easy to install, low power consumption.
- UL, CUL pending.

APPLICATIONS

The **Hays Cleveland Model 6120 Thermocouple Meter** offers accurate measurement and display of boiler exit, oven, dryer, or other process temperatures. The **Model D-06120** may be used to measure any process gas temperature within the limits of its specifications.

BOILER FUEL-SAVINGS TOOL

Hays Cleveland offers many safety and efficiency products such as draft controllers, O₂ analyzers, O₂ trim systems, lead lag sequencers and boiler and combustion efficiency monitors. One of our most common applications is boiler flue gas monitoring. **Model D-06120** is the third generation of flue gas temperature monitors provided by **Hays Cleveland**, updating the D-06111 Series.

Fuel savings are achieved by recognizing and reacting to increases in flue gas temperature. Every boiler has an optimum differential temperature between flue gas temperature and the steam or hot water temperature. Your boiler supplier can provide the specific information for your boiler, but a typical differential is 75 °F to 100 °F. For every 40 °F rise **above** the design differential, the fuel costs can increase by more than 1%!

Some boilers are supplied with a flue gas temperature gauge for monitoring the temperature rise and identifying when maintenance on the boiler is required. Gauges do not have operational interface with other equipment such as Building Management Systems, recorders, controllers, annunciators or alarms. By their nature, gauges offer poor visibility and are one-dimensional.

The **Thermocouple Meter** solves the deficiencies of a gauge. Its low cost justifies it as a standard feature of every



Model C-06120 Electronics

new boiler and as a retrofit for existing boilers. Even a 1% fuel savings will mean an excellent return on investment.

The **Thermocouple Meter** has a highly visible, active display of flue gas temperature with dual alarm settings and outputs. Typically, the operator sets the first alarm to the temperature at which maintenance should be scheduled to maintain the optimum fuel use. The second alarm is set to shut down the boiler at the temperature that indicates excessive fouling and mechanical problems. The alarm signals interface with remote audible alarms (such as **Hays Cleveland Model L-05500**), and cause a safety shutdown through the BMS. The meter outputs provide permanent records by recording (via the analog signal) or BMS (via the Modbus communications).

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**When the flue gas temperature rises,
the fuel cost increases!
SO WHAT MAKES THE
TEMPERATURE GO UP?**

Rising flue gas temperature is a symptom of many possible problems **including fouling of the tubes, air/fuel ratio problems and mechanical problems such as baffle or seal failure**. These problems increase fuel consumption and can potentially damage equipment. Scaling and fouling of the tube surfaces *alone* can increase fuel consumption by 3% to 8% depending on the scale thickness! And excessively high flue gas temperature due to fouling and mechanical failure **can also cause severe damage to the boiler**.

DESCRIPTION

The **Series 6120 Thermocouple Meter** has an LED display for the temperature variable. It is available in either panel-mounting or surface-mounting configurations. A thermocouple and cable assembly in a convenient range of lengths is also provided.

The **thermocouple/cable assembly** (Figures 1 and 2) consists of a Type J thermocouple with mounting hardware for insertion into the process, and an insulated iron constantan cable of required length to connect the sensor to the electronics. The thermocouple, when exposed to the process media, generates a millivolt electrical current in direct proportion to the process temperature. This millivolt output is transmitted through the cable to the electronics assembly, where it is converted to a displayed temperature reading.

The **electronics** has dual fail-safe SPDT contacts (10-amp rated) for remote alarm or indication. A 4-20 mA DC “retransmit” output is provided for remote data acquisition, recording, etc. The alarm set points are adjustable from the face of the instrument. Two alarms are offered: alarm #2 has the option of manual reset.

Thermocouple failure results in a “fail-safe” response: a visual “*open thermocouple*” indicator lights up, and the meter and retransmit outputs immediately go to maximum.

The output of the **Hays Cleveland Series 6120 SOLID STATE MICROPROCESSOR THERMOCOUPLE METER** is *cold-junction compensated*; an internal chip continuously monitors the temperature of the meter-thermocouple junction to compensate the meter reading for changes in ambient temperature.

In addition, the meter output is *external-resistance compensated*: the accuracy of the meter is independent of the length of the thermocouple leads, up to 100-foot maximum, with minimum 18 gauge wire.

Modbus communication for interface with SCADA systems or other controls is standard. Baud rate is selectable (9600 or 19.2 K).

OPERATION

The meter continuously displays the process temperature. The parameters are set and changed by entering the scrolling display. The following parameters are accessible and can be changed:

- FGU: Flue Gas Units (°F or °C).
- AL1: Alarm 1 set point.
- AL2: Alarm 2 set point.
- SCA: Serial Communication Address (Modbus).
- SCR: Serial communication rate (9600 or 19.2 K).

As the temperature climbs above the set point for each alarm, its relay changes state, and the LED indicator flashes. When the temperature drops below its set point, Alarm 1 automatically resets, i.e., its contacts return to the normal state. Alarm 2 functions in exactly the same way if set up in the **automatic mode**. If set up in the **manual reset mode**, however, Alarm 2 will not reset when the temperature drops below its set point until the **local reset button** on the face of the meter is manually depressed, or until the **remote reset button** (ISA Sequence M) is manually depressed. In this case, the local reset button remains functional.

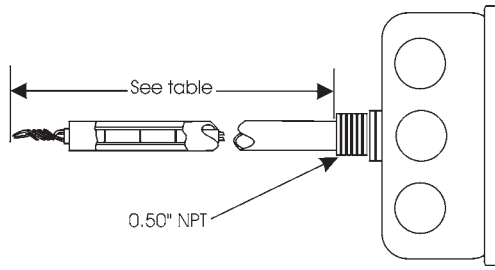
INSTALLATION

The Thermocouple Meter is easy to install. For boiler applications, the thermocouple should be installed at the boiler flue gas exit above or as near to the point where the gases leave the last pass of tubes or baffles. Simply drill a 5/8" hole for the thermocouple and mount the flange (see Figure 2). Another option is to replace the flue gas gauge with the thermocouple using 0.5" NPT connection (see Figure 2). The cable that is part of the package is connected to the electronics. The electronics can be panel-mounted or surface-mounted (Figure 3). The electronics wiring schematic is shown in Figure 4. Mount the electronics in an operator-visible location away from hot areas and close to a source of power. Once power is set, the temperature is displayed without programming the electronics (“install & read feature”). The alarms are set via the front panel in a few easy steps.

GUIDE SPECIFICATION

A flue gas temperature meter and alarm system (ISA Sequence M) shall be provided for each unit. The meter shall consist of an electronics with Type J thermocouple for insertion into the process. The microprocessor-based electronics shall accept direct thermocouple input, provide LED display of temperature and alarms, flashing display of alarms and open thermocouple indication, dual alarm settings and digital outputs, Modbus communications, and retransmit temperature as a 4-20 mA DC signal. The electronics shall display temperature without the need for programming of the range (except for selection of °F or °C units). Supply **Hays Cleveland Model C-06120-A0-2422**.





Type J, 2.5" Insertion	P/N 31138-025
Type J, 4.5" Insertion	P/N 31138-045
Type J, 12" Insertion	P/N 31138-120

Figure 1: Thermocouple options B = 1, 2, or 3.

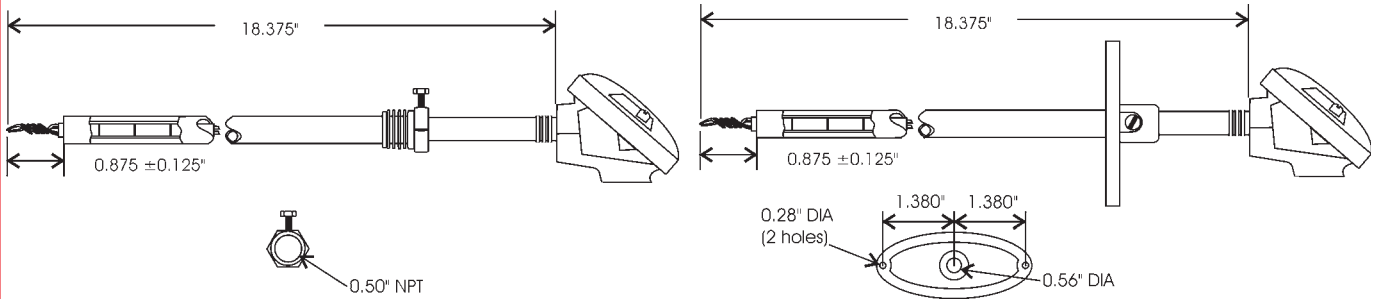


Figure 2: Thermocouple option B = 4.

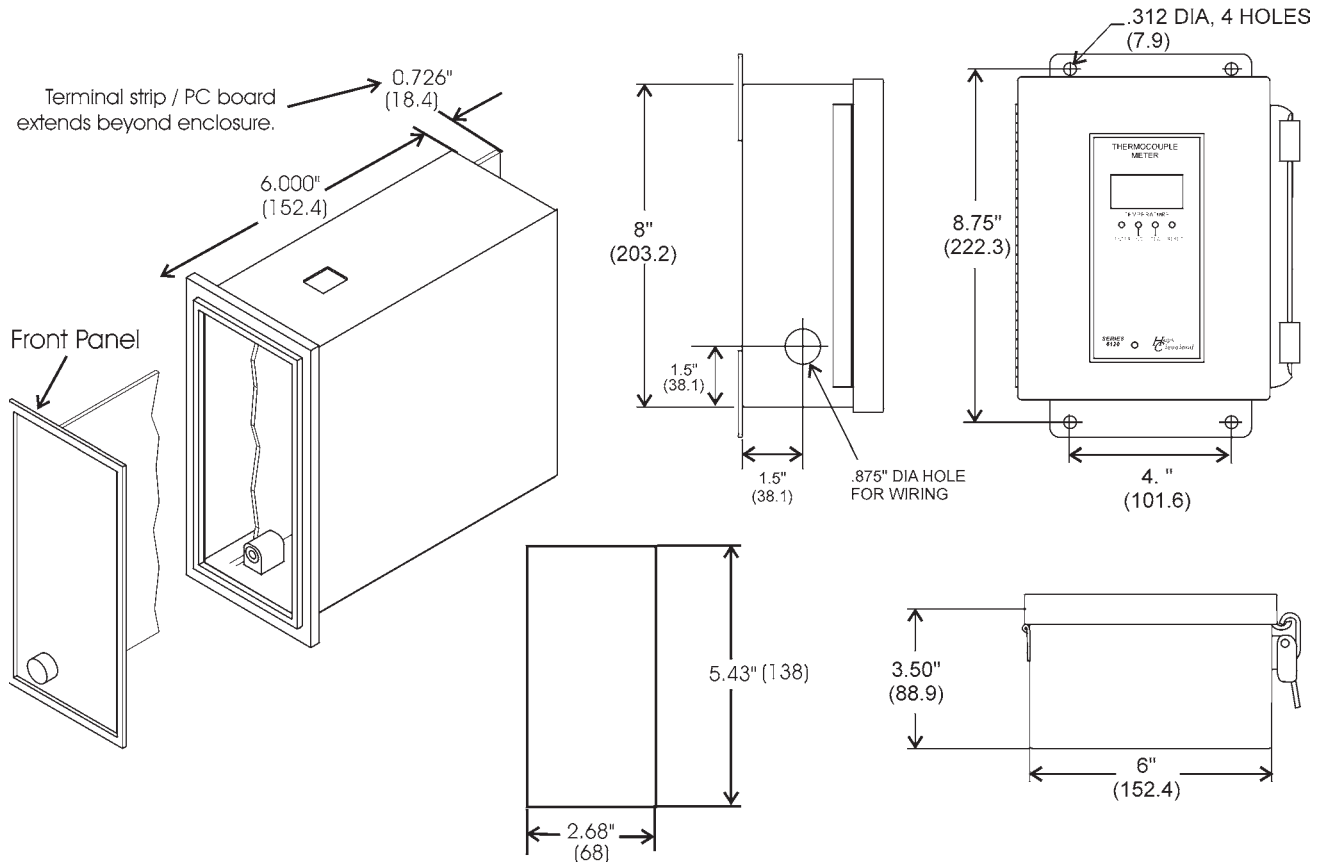


Figure 3: Dimensions for Panel and Surface Mounting.

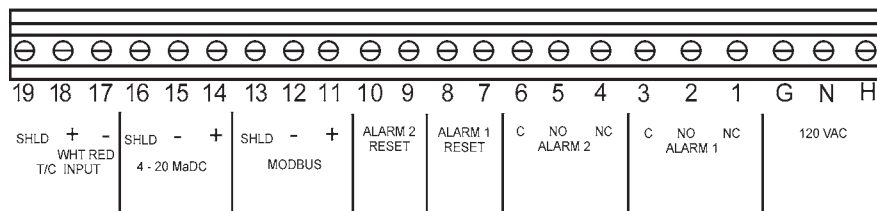


Figure 4: Terminal Strip Designations.

SPECIFICATIONS

Thermocouple Specification:

Type J, Iron and Constantan is standard: linear range 32 to 999F or 0 to 537C. Suitable for use in oxidizing or reducing environments. If other material is required (for instance, because of a nonstandard temperature range), please contact **Hays Cleveland**. Probe insertion up to 18".

Indication:

- LED Display, 0.43" Height.
- Visual Display Indicators for Alarm 1 and Alarm 2.
- "Open Thermocouple" Indication: In the event of thermocouple failure, the over range reading is displayed on the meter.
- Temperature Units: operator set for °F or °C.

Display range settings:

- 32 - 999F.
- 0 - 537C.

Alarm Settings:

2 alarms, independently adjustable, 32 to 999F or 0 to 537C. Contact rating: 10 amps, 12 v. AC SPDT, non-inductive.

Retransmit Output:

4-20 mADC, directly proportional to thermocouple temperature, where **32F = 4 mADC and 999F = 20 mADC**. 750 Ω maximum. (Output is grounded but not isolated.)

Alarm Contact Rating:

10 amps, 120 V AC SPDT, non-inductive.

Accuracy:

± 4 °F (± 2.2 °C) over entire operating range.

Power Requirements:

120 V AC $\pm 10\%$, 50/60 Hz.

Ambient Temperature Limits for Meter Housing:

32 to 130F. 0 to 60C.
Fuse: One, @ 1 amp.

Relative Humidity:

0-90% non-condensing.

Mounting:

Panel or surface-mountable housings available.

Shipping Dimensions:

To be determined at order entry.

Shipping Weight:

To be determined at order entry.

Construction Material:

Durable plastic construction.

Approvals:

UL and CUL pending.

SPECIFICATIONS ARE SUBJECT TO CHANGE.

HOW TO ORDER

The basic catalog number for the **Hays Cleveland Series 6120 THERMOCOUPLE METER** is shown below. Use this table to select the complete model nomenclature to suit mounting and cable length requirements.

6120-A*0-ABCD

A = Package

- 1 Semi-Flush for Panel Mounting
- 2 Surface Mount

B = Thermocouple Options:

- 0 Customer supply.
- 1 Type J, 2.5" insertion (P/N 31138-025)
- 2 Type J, 4.5" insertion (P/N 31138-045)
- 3 Type J, 12" insertion (P/N 31138-120)
- 4 Type J, Flue Gas Temperature, variable insertion, 6" to 18" (P/N 31138-618)

C = Alarm #2 Setup (Factory Set, Field Adjustable)

- 1 Local Manual Reset of Alarm #2 included.
- 2 Remote Manual Reset of Alarm #2 included.
- 3 Auto Reset of Alarm #2 included.

D = Thermocouple Cable for Code B, above:

- 0 Customer Supply-N/A
- 1 50' length (P/N 31139-050)
- 2 100' length (P/N 31139-100)
- 3 Special length exceeding 100' (specify with order)

*Current Model Designation =A



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