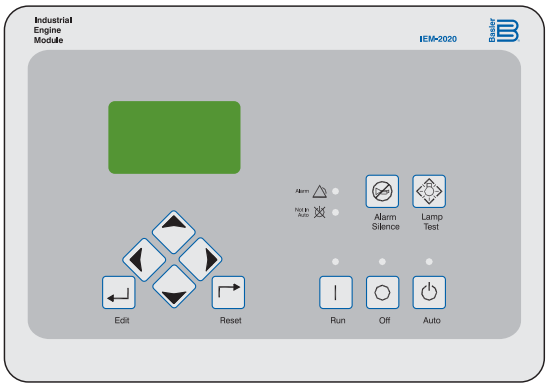

IEM-2020 INDUSTRIAL ENGINE MODULE

Basler Electric's Industrial Engine Module is an advanced technology device designed to make the control and monitoring of industrial engines simple and reliable. The IEM-2020 combines high end programmable logic with field proven technology gained from many years of experience with genset control products. This device provides engine protection, engine metering, J1939 engine communications and extreme ruggedness in an affordable package.

The IEM-2020 is easy to use, with front panel programming on a large LCD display that is fully functional from -40 to +70°C. It can be programmed and monitored via our BESTCOMS*Plus* PC software, which is included with every unit. BESTCOMS*Plus* includes programmable engine sender curves for nonelectronic engines, programmable logic for any starting scenario, and remote monitoring via Ethernet or modem communications.

FEATURES

- Engine Metering
- Engine Protection
- Engine Control
- BESTCOMS*Plus* (included with every IEM-2020 at no additional cost)
  - Programming and setup software
  - Intuitive and powerful
  - Remote control and monitoring
  - Programmable Logic
  - USB communications
- Exercise Timer
- SAE J1939 Engine ECU communications
- Multilingual capability
- Extremely rugged, fully potted design
- 16 programmable contact inputs
- 7 Contact outputs: (3) 30 Adc and (4) Programmable 2 Adc rated contacts
- Additional (8) Programmable 2 Adc contacts (optional)
- Wide Ambient Temperature range
- Remote Dial-out and Dial-in capability with Internal Modem (optional)
- Modbus Communications with RS-485 (optional)
- Ethernet communications (via LSM-2020 Load Sharing Module)
- Expandable I/O capability via J1939 CANBUS (optional)
- UL recognized, CSA certified, CE approved
- HALT (Highly Accelerated Life Tests) tested
- IP 54 Front Panel rating with integrated gasket
- **Expandable functionality via add-on modules**
  - LSM-2020 Load Sharing Module
  - CEM-2020 Contact Expansion Module
  - AEM-2020 Analog Expansion Module

ADDITIONAL INFORMATION

INSTRUCTION MANUAL

Request Publication 9441000990

DESCRIPTION, FUNCTIONS and SPECIFICATIONS
pages 2 through 4

FRONT PANEL DISPLAY and DIMENSIONS
pages 5 and 6

INTERCONNECT DRAWING
page 7

ORDERING INFORMATION
page 8

ENHANCEMENT ACCESSORIES
pages 9 through 12

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DESCRIPTION

The IEM-2020 incorporates designs and technology acquired from our years of experience with genset controllers. It provides many features and functions not found in any other engine controller on the market. It is a fully potted design and provides the most rugged and reliable controller found anywhere. It provides front panel and PC programming. It can sense engine parameters directly from analog engine senders that are fully programmable, or it can communicate directly with the engine's ECU using SAE J1939 CANBUS communications. This device offers programmable inputs and outputs. This very powerful and flexible programmable logic program allows the user to configure the IEM to meet any application need.

The IEM is configured via a style number. This allows the user to purchase only the features that are needed to meet the application's needs.

FUNCTIONS

PROTECTION

Engine

Alarms (Shutdowns)

Low Oil Pressure
High Coolant Temperature
Low Coolant Level
Overspeed
Overcrank
Engine Sender Unit Failure
Fuel Leak/Fuel Sender Failure
Emergency Stop
Battery Charger Failure

Pre-Alarms (Warnings)

Low Oil Pressure
High Coolant Temperature
Low Coolant Temperature
Battery Overvoltage
Weak Battery
Battery Charger Failure
Engine Sender Unit Failure
Engine kW Overload (3)
Maintenance Interval Timer
Low Coolant Level
High Fuel Level
Low Fuel Level
Fuel Leak Detect

All Alarms and Pre-Alarms can be enabled or disabled via the BESTCOMS*Plus* PC software or the front panel.

METERING

Metered engine parameters include oil pressure, coolant temperature, RPM, battery voltage, fuel level, engine runtime, and various J1939 supported parameters.

ENGINE CONTROL

Cranking Control: Cycle or Continuous (Fully Programmable)
Engine Cooldown: Smart Cooldown function saves fuel and engine life.
Successful Start Counter: Counts and records successful engine starts
Timers:

- Engine Cooldown Timer
- Engine Maintenance Timer
- Pre-Alarm Time Delays for Weak/Low Battery Voltage
- Alarm Time Delay for Overspeed
- Alarm Time Delay for Sender Failure
- Arming Time Delays after Crank Disconnect:
  - Low Oil Pressure
  - High Coolant Temperature
- Pre-Crank Delay
- Continuous or Cycle Cranking Time Delay

EVENT RECORDING

The IEM has an event recorder that provides a record of alarms, pre-alarms, engine starts, engine runtime loaded, engine runtime unloaded, last run date, and many other events that are all date and time stamped to help the user determine the cause and effect of issues related to the engine.

RS-485 (Modbus) (Optional)

An optional RS-485 communication port uses Modbus communication protocol and enables remote control and monitoring of the DGC-2020 over a polled network.

BATTERY BACKUP FOR REAL TIME CLOCK

A ten-year (typical life) lithium battery is used to provide long-term maintenance of the real time clock setting. This battery is serviceable by removing the rear cover. Please note that the settings, programming, and event records are saved in non-volatile memory and do not require battery backup.

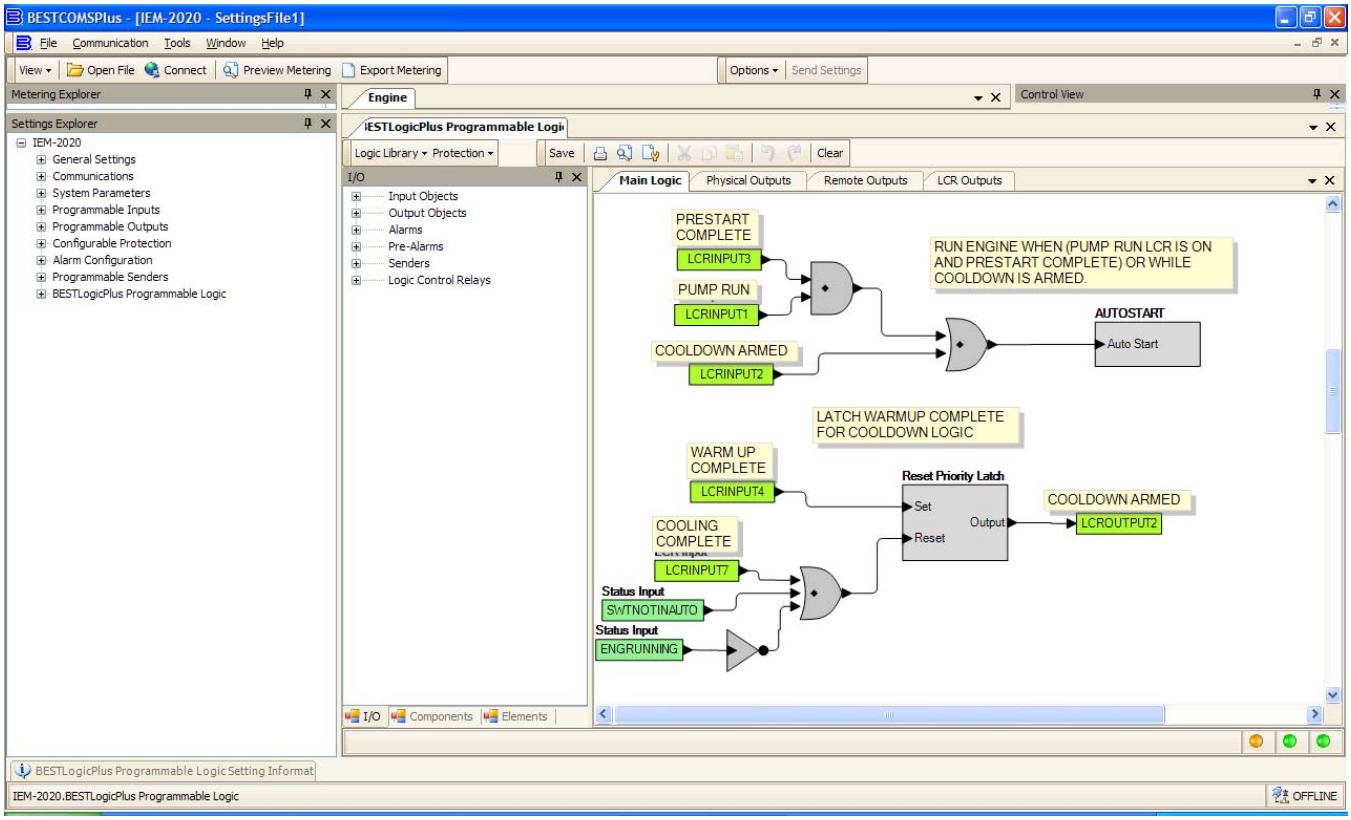
FUNCTIONS, continued

J1939 COMMUNICATIONS

J1939 CANBUS communications allows the IEM to communicate to the engine's ECU (Engine Control Unit) to gather critical engine information like oil pressure, engine coolant temperature, RPM, battery voltage, and many more. By utilizing the ECU, adding analog engine senders is no longer required. This can save substantial money for the installer. It also eliminates any errors or discrepancies between the ECU data and the data displayed on the IEM that may be present due to analog sender inaccuracies or incompatibility. A total of 47 engine parameters can be obtained via the ECU. You also can derive the added benefit of having access to the ECU's diagnostic troubleshooting codes, or DTCs. The DTCs provide information about the engine's operating conditions and communicates these via J1939, to the IEM, thus eliminating the need for hand-held service tools to diagnose simple engine issues. With the optional modem, the DTCs can be accessed remotely, and valuable service time can be saved by remote diagnostics and taking the right parts to fix the problem the first time.

PROGRAMMABLE LOGIC

The IEM-2020 offers a very powerful, yet easy to use, programmable logic scheme for custom programming of the various inputs, outputs, alarms, and pre-alarms. It allows these elements to be integrated into a complete logic scheme so that the user can meet even the most complex specification. The Programmable Logic control includes the selection of logic gates and timers with drag-and-drop technology to make it fast and simple.



MODEM (Optional)

A dial-out modem enables remote control, monitoring, and setting of the IEM-2020. When an alarm or pre-alarm condition occurs, the IEM-2020 can dial up to four telephone numbers, in sequence, until an answer is received and the condition is annunciated.

SPECIFICATIONS

Operating Power
Nominal: 12 or 24 Vdc
Range: 6 to 32 Vdc
Power Consumption:
Sleep Mode: 5W with all relays non-energized
Typical Operational Mode:
14.2W - Run mode, LCD heater on, 6 relays energized
Battery Ride Through: Withstands cranking ride-through down to 0 V for 50 ms (typical).

Contact Sensing
Contact sensing inputs include 1 emergency stop input and 16 programmable inputs. The emergency stop input accepts normally closed, dry contacts. All programmable inputs accept normally open, dry contacts.

Engine System Inputs
Fuel Level Sensing Resistance Range: 33 to 240 Ω nominal
Coolant Temperature Sensing Resistance Range: 62.6 to 637.5 Ω nominal
Oil Pressure Sensing Resistance Range: 34 to 240 Ω nom.
Engine Speed Sensing:
Magnetic Pickup
Voltage Range: 3 to 35 V peak (6 to 70 V peak-peak)
Frequency Range: 32 to 10,000 Hz
Stated accuracies are subject to the accuracy of the senders used.

Output Contacts
Fuel Solenoid, Engine Crank, Pre-Start Relays Rating: 30 Adc at 28 Vdc-make, break, and carry
Programmable Relays (up to 12) Rating: 2 Adc at 30 Vdc-make, break, and carry

Metering
Oil Pressure
Metering Range: 0 to 145 psi or 0 to 1,000 kPa
Accuracy: ±3% of actual indication or ±2 psi or ±12 kPa (subject to accuracy of sender)

Coolant Temperature
Metering Range: 32 to 410°F or 0 to 204°C
Accuracy: ±3% or actual indication or ±2° (subject to accuracy of sender)

Fuel Level
Metering Range: 0 to 100%
Accuracy: ±2% (subject to accuracy of sender)

Battery Voltage
Metering Range: 6 to 32 Vdc
Accuracy: ±3% of actual indication or ±0.2 Vdc

Engine RPM
Metering Range: 0 to 4,500 rpm
Accuracy: ±2% of actual indication or ±2 rpm

Engine Run Time
Engine run time is retained in nonvolatile memory.
Metering Range: 0 to 99,999 h
Update Interval: 6 min
Accuracy: ±1% of actual indication or ±12 min

Maintenance Timer
Maintenance timer indicates the time remaining until genset service is due. Value is retained in nonvolatile memory.
Metering Range: 0 to 5,000 h
Update Interval: 6 min
Accuracy: ±1% or actual indication or ±12 min

Environmental
Temperature
Operating: -40 to 70°C (-40 to 158°F)
Storage: -40 to 85°C (-40 to 185°F)
Humidity: IEC 68-2-38
Salt Fog: ASTM B 17-73, IEC 68-2-11 (tested while operational)
Ingress Protection: IEC IP54 for front panel
Shock: 15 G in 3 perpendicular planes
Vibration: Swept over the following ranges for 12 sweeps in each of 3 mutually perpendicular planes with each 15-min. sweep.
5 to 29 to 5 Hz: 1.5 G peak for 5 min.
29 to 52 to 29 Hz: 0.036 in. double amplitude for 2.5 min.
52 to 500 to 52 Hz: 5 G peak for 7.5 min.

HALT (Highly Accelerated Life Testing)
Halt Testing is a method used by manufacturers concerned about high quality to prove that their products will provide the user with many years of reliable service. Halt testing subjects the device to extremes in temperature, shock, and vibration to simulate years of operation, but in a much shorter time span. Halt testing allows Basler to evaluate all possible design elements that will add to an increase in the life of this device. As an example of some of the extreme testing conditions, the IEM-2020 was subjected to Temperature Tests (tested over a temperature range of -100°C to +115°C), Vibration Tests (swept over a frequency of 5 to 50G at +20°C), and Temperature/Vibration Tests (tested at 40G over a temperature range of -80°C to +90°C). Please note that the vibration and temperature extremes noted here are specific to HALT testing and do not reflect recommended operation level.

Agency Approvals
UL/CSA Approvals
"cURus" recognized to UL 508 R and CSA C22.2 No.14. (CEM-2020H: UL recognized to UL Standard 508 only.)

CE Compliance
Complies with the requirements of these EC Directives:
- Low Voltage Directive (LVD) - 73/23/EEC as amended by 93/68/EEC
- Electromagnetic Compatibility (EMC) - 89/336/EEC as amended by 92/31/EEC and 93/68/EEC
- EN 50178:1997 - Electronic Equipment for use in Power Installations
- EN 61000-6-4:2001 - Electromagnetic Compatibility (EMC), Generic Standards, Emission Standard for Industrial Environments
- EN 61000-6-2:2001 - Electromagnetic Compatibility (EMC), Generic Standards, Immunity for Industrial Environments

Physical
Weight: 2 kg (4.4 lb)

IEM-2020 FRONT PANEL DISPLAY

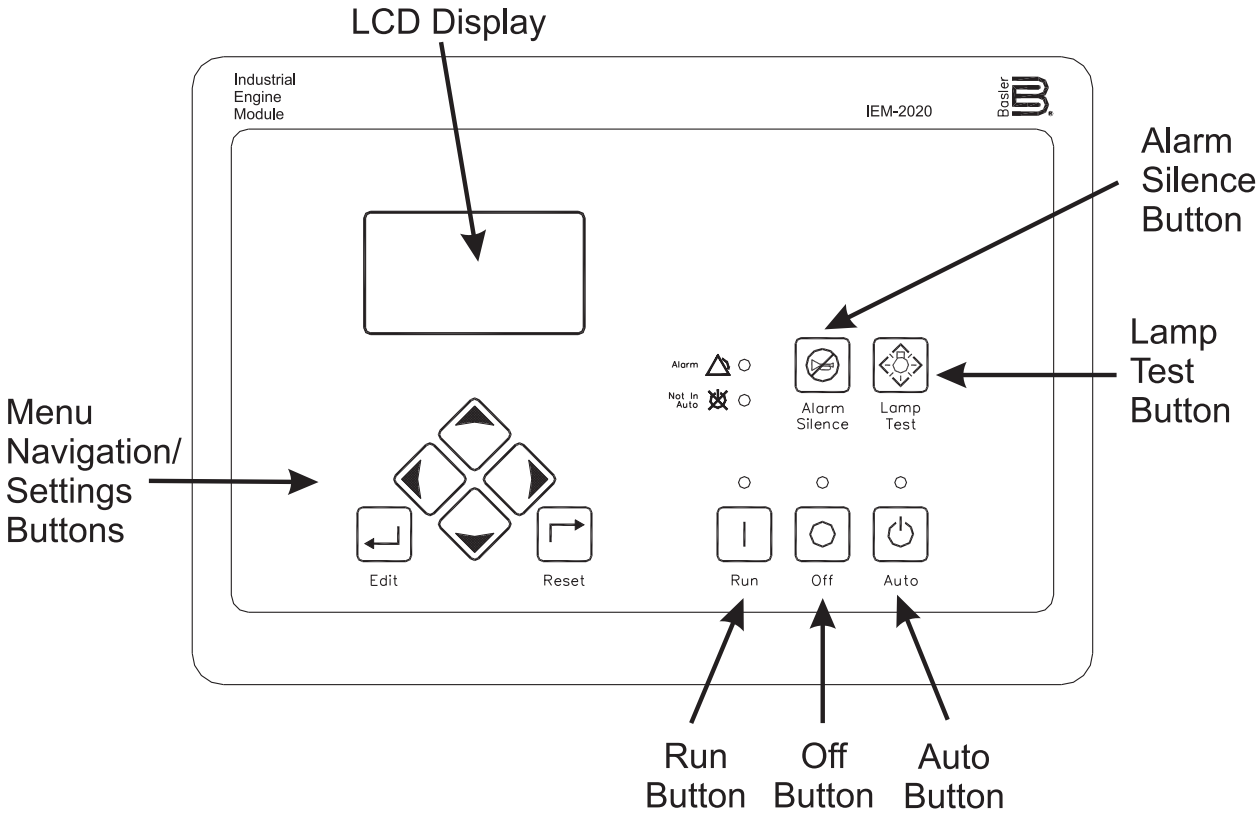


Figure 1 - Front Panel HMI (Human Machine Interface)

FRONT PANEL LED INDICATORS

Run:	*Green* - Indicates the DGC is in the RUN mode.
Off:	*Red* - Indicates the DC is in the OFF mode.
Auto:	*Green* - Indicates the unit is in the AUTO mode of operation.
Alarm:	*Red* - Indicates an alarm situation by continuous illumination. Indicates a Pre-alarm by flashing.
Not in Auto:	*Red* - Indicates unit is not in the AUTO mode.

PACKAGING

IEM-2020 offers a complete system of environmental hardening. Its design utilizes advanced engineering and design techniques to allow it to operate in the harshest environments. The IEM-2020 uses potted construction that has been successfully proven on hundreds of thousands of voltage regulators built by Basler. We have included an integrated gasket to seal the front panel to an IP54 rating, and we included a protective cover on the rear of the IEM-2020.

DIMENSIONS

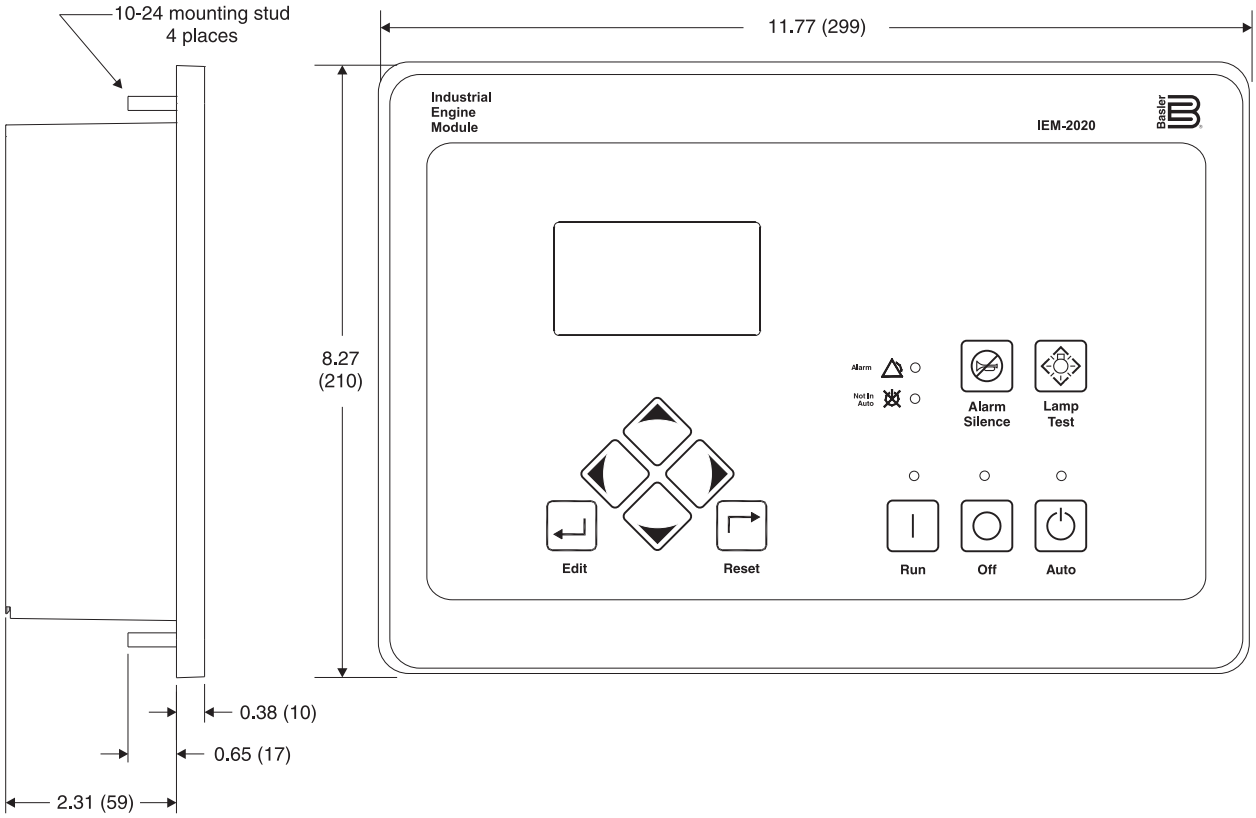


Figure 2 - Dimensions - Top and Side Views

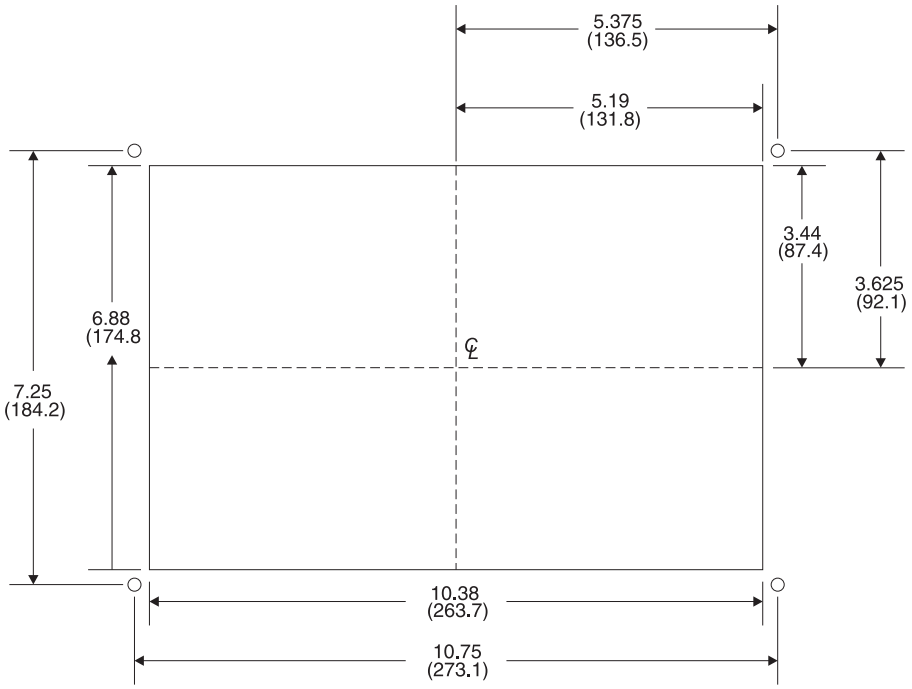


Figure 3 - Panel Cutting and Drilling Dimensions

NOTES: 1. Dimensions in parentheses are in millimeters.
2. All drawings and data subject to change without notice.

CONNECTIONS

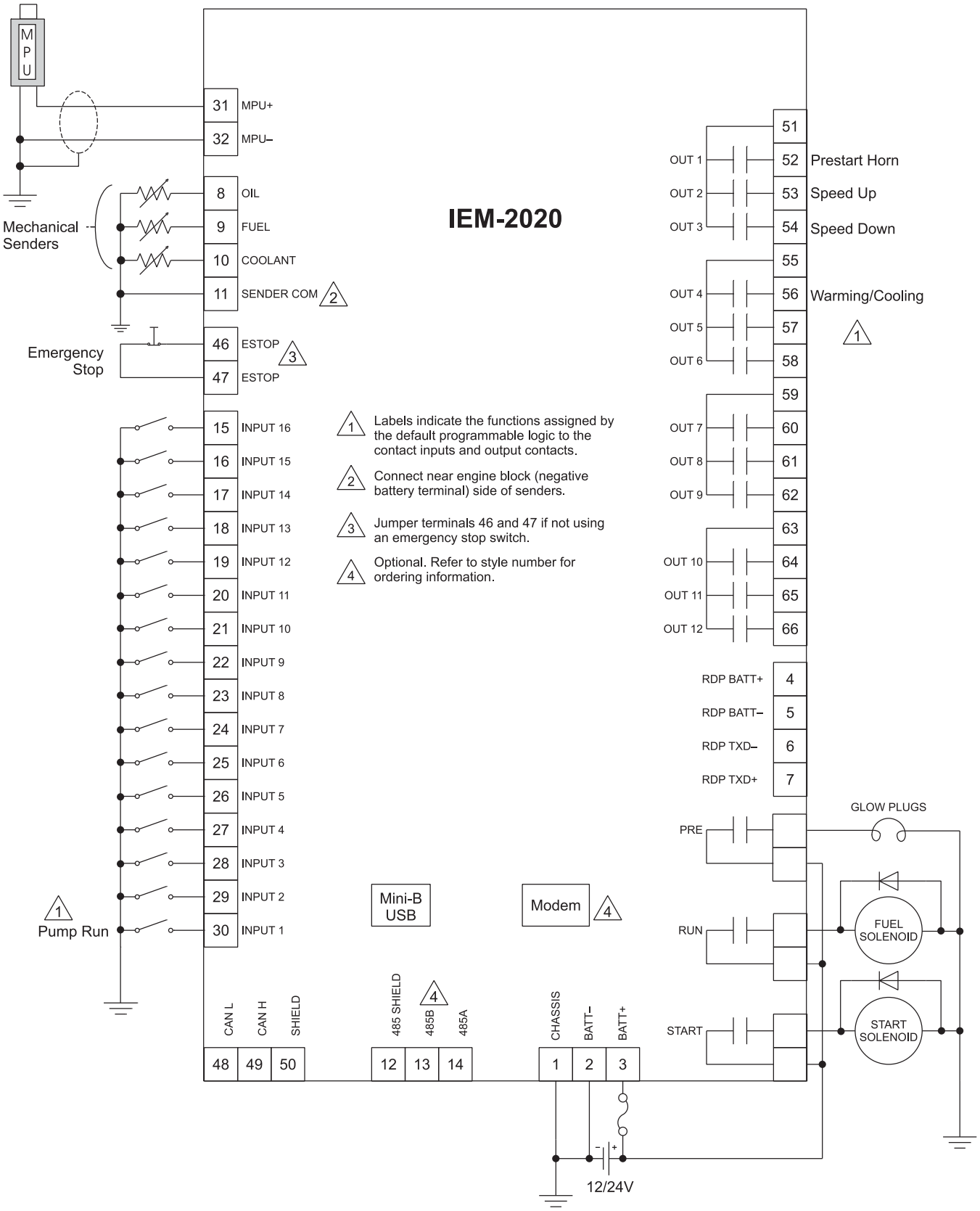


Figure 4 - IEM-2020 Typical Connections

ORDERING INFORMATION

OPTIONAL FEATURES

The IEM-2020 has been designed to provide maximum functionality at a minimum price. You only need to buy what you need. We have selected options to help maximize the value provided by the IEM-2020.

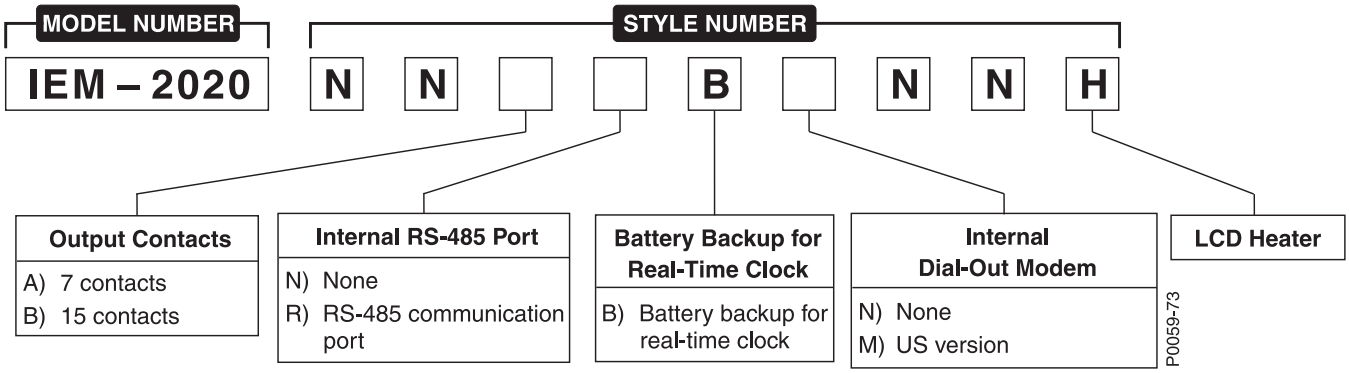
Additional Contact Outputs
For those applications where more output contacts are needed, the IEM-2020 can be adapted to include eight (8) additional 2 Adc rated dry contact outputs. These are real contacts and not the solid-state type that require additional external circuitry to properly operate. These contacts are fully programmable via the easy-to-use BESTCOMS*Plus* PC software and can be assigned for numerous user-defined functions.

RS-485 Communications
When the RS-485 option is selected, the user can send and receive information from the IEM-2020 via the RS-485 communications port and Modbus protocol. This feature allows the IEM-2020 controlled engines to be fully integrated into the application. Please see the Instruction Manual for the Modbus register list.

Battery Backup for Real Time Clock
A ten-year (typical life) lithium battery is used to provide long-term maintenance fo the real time clock setting. This battery is serviceable by removing the rear cover. Please note that the settings, programming, and event records are saved in non-volatile memory and do not require battery backup.

Internal Modem
The IEM-2020 can provide long distance communications by including an internal modem. When the modem is selected, the user can access the IEM-2020 from virtually anywhere via a telephone line. The user can control and monitor the engine as if standing right next to it. The IEM-2020 can also dial out for preprogrammed circumstances to alert the user of selected conditions.

STYLE CHART



ENHANCEMENT ACCESSORIES FOR THE IEM-2020

Load Sharing Module, LSM-2020

An easy to connect and use add-on module is available for the IEM-2020. The LSM-2020 is remotely mounted and communicates to the IEM-2020 via J1939 Canbus communications.

The LSM-2020 adds Ethernet communications to the many communications features of the IEM-2020. It is IP addressable and allows all of the functionality of BESTCOMS to be utilized via Ethernet.

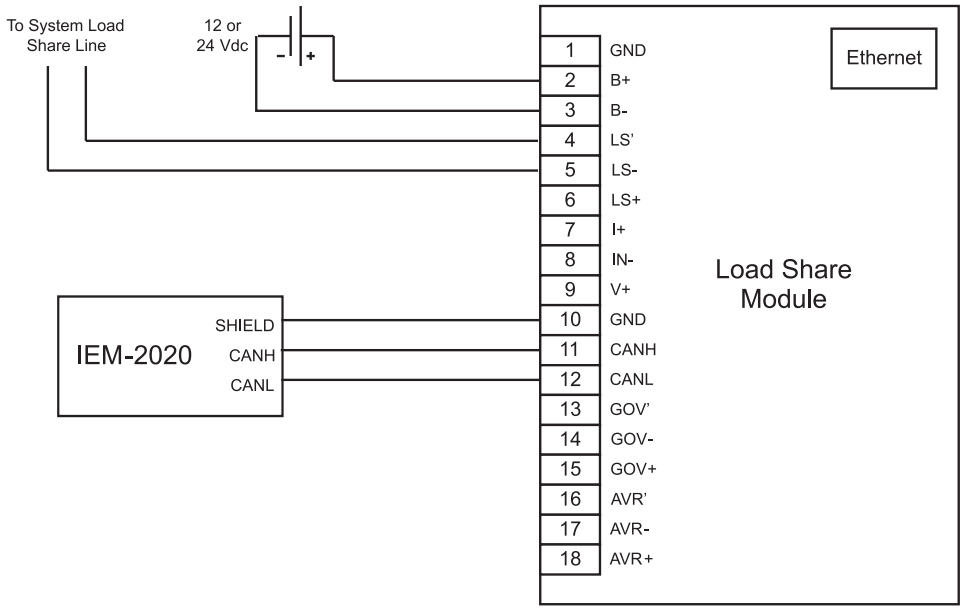


Figure 5 - Typical LSM-2020 Connections

ENHANCEMENT ACCESSORIES FOR THE IEM-2020 (Continued)

Load Sharing Module, LSM-2020 (continued)

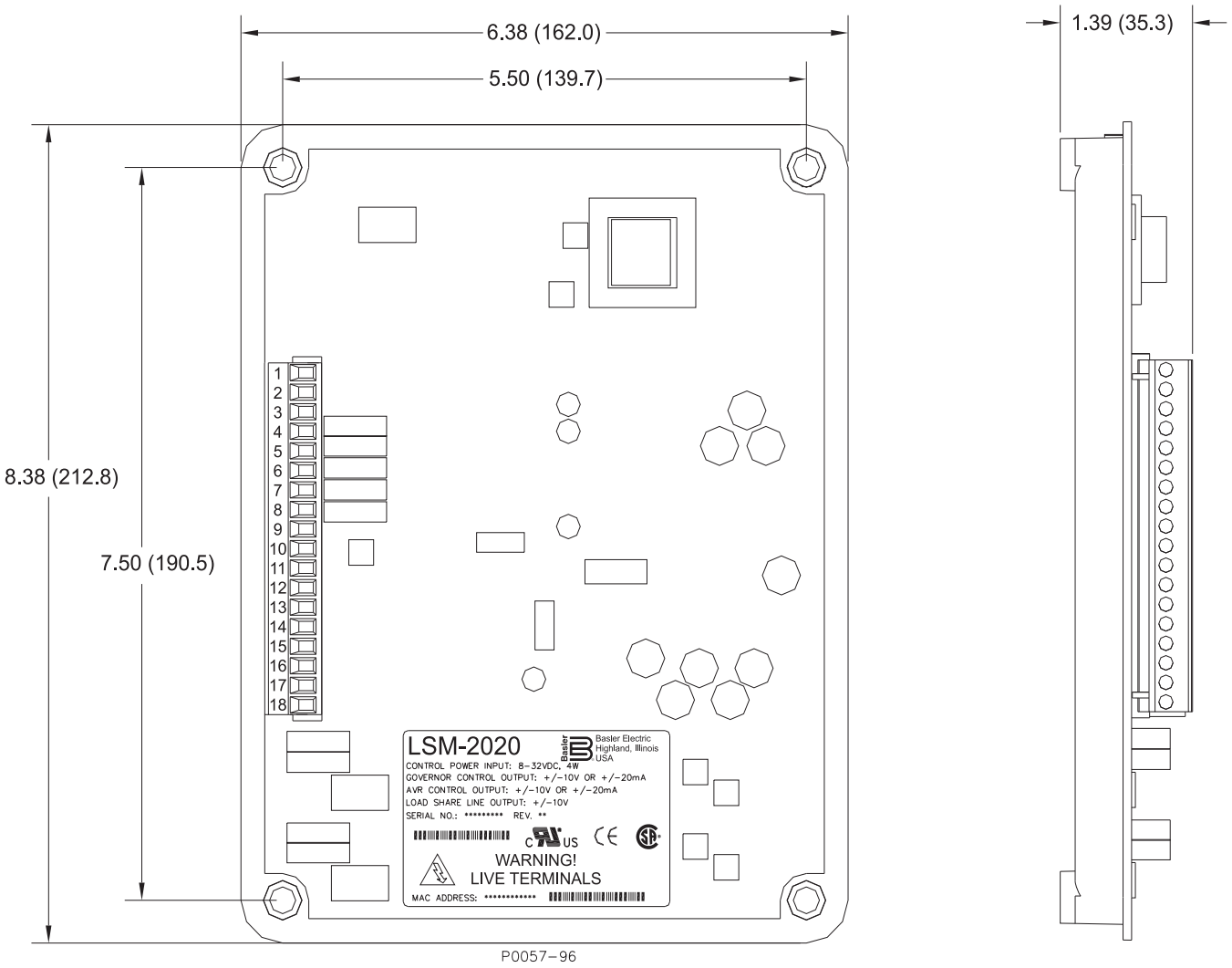


Figure 6 - LSM-2020 Overall Dimensions

ENHANCEMENT ACCESSORIES FOR THE IEM-2020 (Continued)

Contact Expansion Module, CEM-2020

Basler Electric offers a couple of add-on modules to increase the already abundant contact input and output capability of the IEM-2020. These modules add 10 contact inputs and 24 form C contacts to the contact-rich IEM-2020 capability. These modules communicate to the IEM-2020 via SAE J1939 Canbus and allow the user to program the functionality of these inputs and outputs in Basler's very powerful logic program. The user can add labels for the inputs and outputs that appear in BESTCOMS*Plus*, show up on the front panel, and in programmable logic. All of the functionality can be assigned to these inputs and outputs as if they were an integrated part of the IEM-2020. Two modules of the CEM are available, CEM-2020 and CEM-2020H. Both modules increase the number of contact inputs to the IEM-2020 by an additional ten.

The output ratings of the form C contacts are:

- (12 contacts) 4 A @ 30 Vdc
- (12 contacts) 1 A @ 30 Vdc

The output ratings of the form C contacts in the CEM-2020H are:

- (12 contacts) 2 A @ 30 Vdc
- (6 contacts) 10 A @ 30 Vdc

The 1 A rated contacts are gold contacts for low current circuits.

This IEM module provides the user with the flexibility to use the same model IEM-2020 engine for simple applications or more complicated applications that require contact functionality or duplication of contacts for remote annunciation. Pure flexibility is one of the benefits of the IEM-2020, and this add-on module enhances that benefit even further. Drop it in, connect it up, and you have added 10 more contact inputs and 24 or 18 more contact outputs. Nothing could be simpler.

For installation instructions, see Instruction Manual Publication 9441000990.

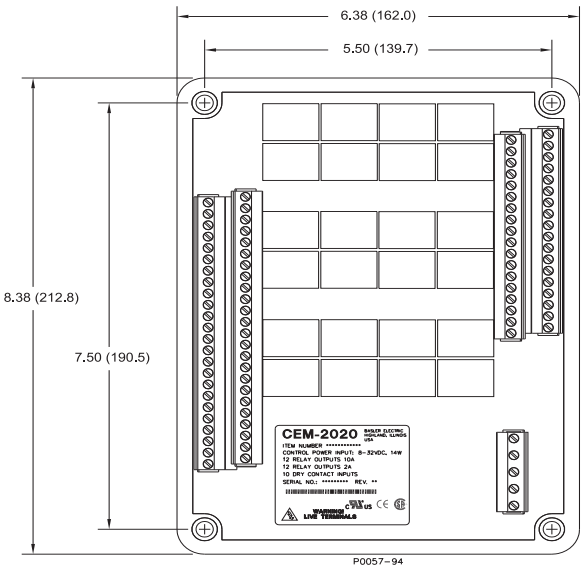


Figure 7 - CEM-2020 Overall Dimensions

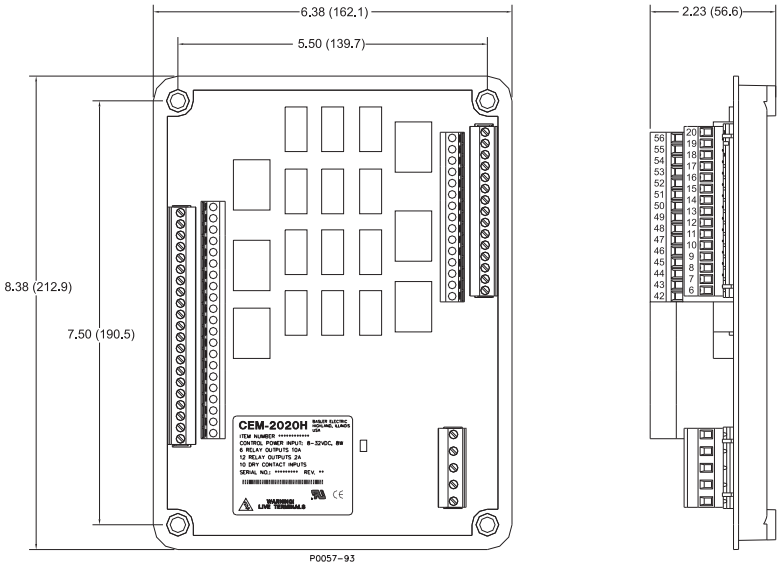


Figure 7A - CEM-2020H Overall Dimensions

ENHANCEMENT ACCESSORIES FOR THE DGC-2020 (Continued)

Analog Expansion Module for applications requiring analog inputs/outputs and temperature monitoring, AEM-2020

Basler's optional AEM-2020 module provides eight remote analog inputs, eight remote RTD inputs, two remote thermocouple inputs, and four remote analog outputs to the IEM-2020. The AEM-2020 communicates with the IEM-2020 through a CANbus interface.

The eight analog inputs are user-selectable for 4 to 20 mA or 0 to 10 Vdc. Each analog input has under/over thresholds that you can configure as status only, alarm, or pre-alarm.

Each of these inputs can be selected and used in our powerful programmable logic software.

For temperature measurement, the AEM provides for eight RTD inputs that can be configured for 10 or 100 Ohm RTDs. It also has two inputs for K-type thermocouples. Each of these ten temperature measurement inputs can be configured with high or low temperature thresholds. Each of these inputs can be selected and used in our powerful programmable logic software.

The analog outputs are user-selectable for 4 to 20 mA or 0 to 10 Vdc. These outputs are intended to drive external analog meters and can be configured for indication of a wide range of parameters, including oil pressure, fuel level, and coolant temperature.

For installation instructions, see Instruction Manual Publication 9441000990.

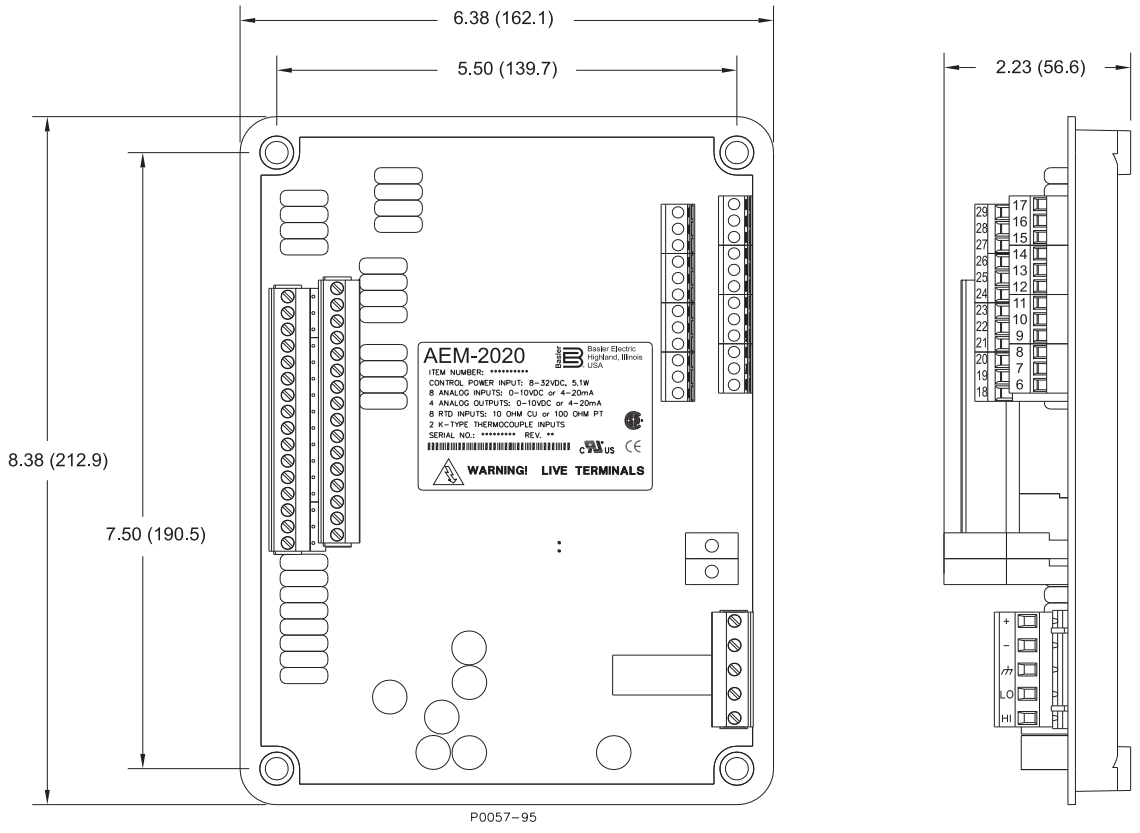


Figure 8 - AEM-2020 Overall Dimensions

ISO 9001-2008/2000
ISO 9001-2008 Highland, IL USA Taylor, TX USA
ISO 9001-2000 Wasselonne, France Suzhou, China

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