MOORE INDUSTRIES®

Description

The HIM HART Interface Module unlocks the full potential of new and in-place smart HART multivariable transmitters and valves.

Converts HART to 4-20mA Signals

The HIM allows up to three additional analog process variable measurements from a smart device with no additional process penetrations or wiring.

Installed transparently across the 4-20mA instrument loop, the HIM reads the HART digital process data that "rides" on the loop wires. It converts the digital information to up to three isolated analog (4-20mA) process signals that are readily accepted by in-place control systems, such as a DCS or PLC.

Take Full Advantage of "Legacy" Instruments

The HIM lets you leave trusted (and paid for) smart HART transmitters and valves in place, yet still take advantage of all the information they have to offer.

Works With Every Smart HART Device

The HIM programs in minutes to interface with every HART-compatible monitoring and control device:

- Multivariable Mass Flow Transmitters
- Dual-Sensor Temperature Transmitters
- Pressure Transmitters
- Coriolis, Magnetic, Ultrasonic and Vortex Flow Meters
- pH Transmitters
- Radar and Hydrostatic Level Transmitters
- Valve Positioners and Damper Operators

The HIM HART loop monitor features a compact metal housing that mounts on a standard DIN-rail or on a surface.

Features

- **"Break Out" up to three analog signals.** The HIM provides additional analog signals proportional to a multivariable transmitter's primary, second, third or fourth variables, or to user-selectable valve parameters such as stem position.

- **High/Low process and loop diagnostic alarms.** Two relays individually configure to respond to high or low process conditions, or trip when transmitter diagnostics or loop fault conditions are sensed.

- **Sets up as a Primary or Secondary Master, or in "Listen" Mode.** User Configurable to act as a HART Master, or in passive "Listen" Mode (see page 4 for details).

- **Normal or Burst HART Modes.** The HIM can be set to monitor smart HART instruments operating in either Normal (Poll/Response) Mode or in Burst Mode (see page 4 for details).

- **Large, 5-digit display.** Shows a selected process variable in engineering units (input or output) or toggles between any two variables. The display also provides on-site indication of HART instrument fault conditions.

- **Isolated output channels.** Delivers superior protection against the harmful effects of ground loops and other plant "noise".

Certifications

FM APPROVED

General/Ordinary and Hazardous Locations Non-Incendive
Class I, Division 2, Groups A, B, C, D
Suitable for: Class II & III, Division 2, Groups F, G

CE Conformant–EMC Directive 89/336/EEC
EN 50081-2, 1993; EN 50082-2, 1995

* FM and CSA certifications in submittal.

HIM
Smart HART® Loop
Interface and Monitor

Monitor Smart Multivariable Transmitters

The HIM extracts useful information from multivariable transmitters that was previously unavailable (see Table 1 for details).

For example, smart HART multivariable mass flow transmitters sense three process variables (pressure, temperature, and differential pressure or raw flow). Using these, they perform an internal calculation to derive mass flow. The mass flow information is transmitted as a 4-20mA signal to the control system.

Unfortunately, unless you have a HART-based control system, there is no way to continously monitor the non-primary variables used to make the calculation. Monitoring non-primary variables may be desirable if one or more of the variables is especially important to the quality or safety of the process.

Convert HART to 4-20mA Signals

The HIM reads the HART digital data that is continuously being transmitted on the smart transmitter's analog loop wires (Figure 1), and converts it to 4-20mA signals that can be readily

Figure 1. *The HIM converts HART digital data to 4-20mA values proportional to a multivariable transmitter's primary, second, third or fourth variables. Its alarm trip outputs warn of unwanted high/low process conditions or of instrument diagnostic problems.*
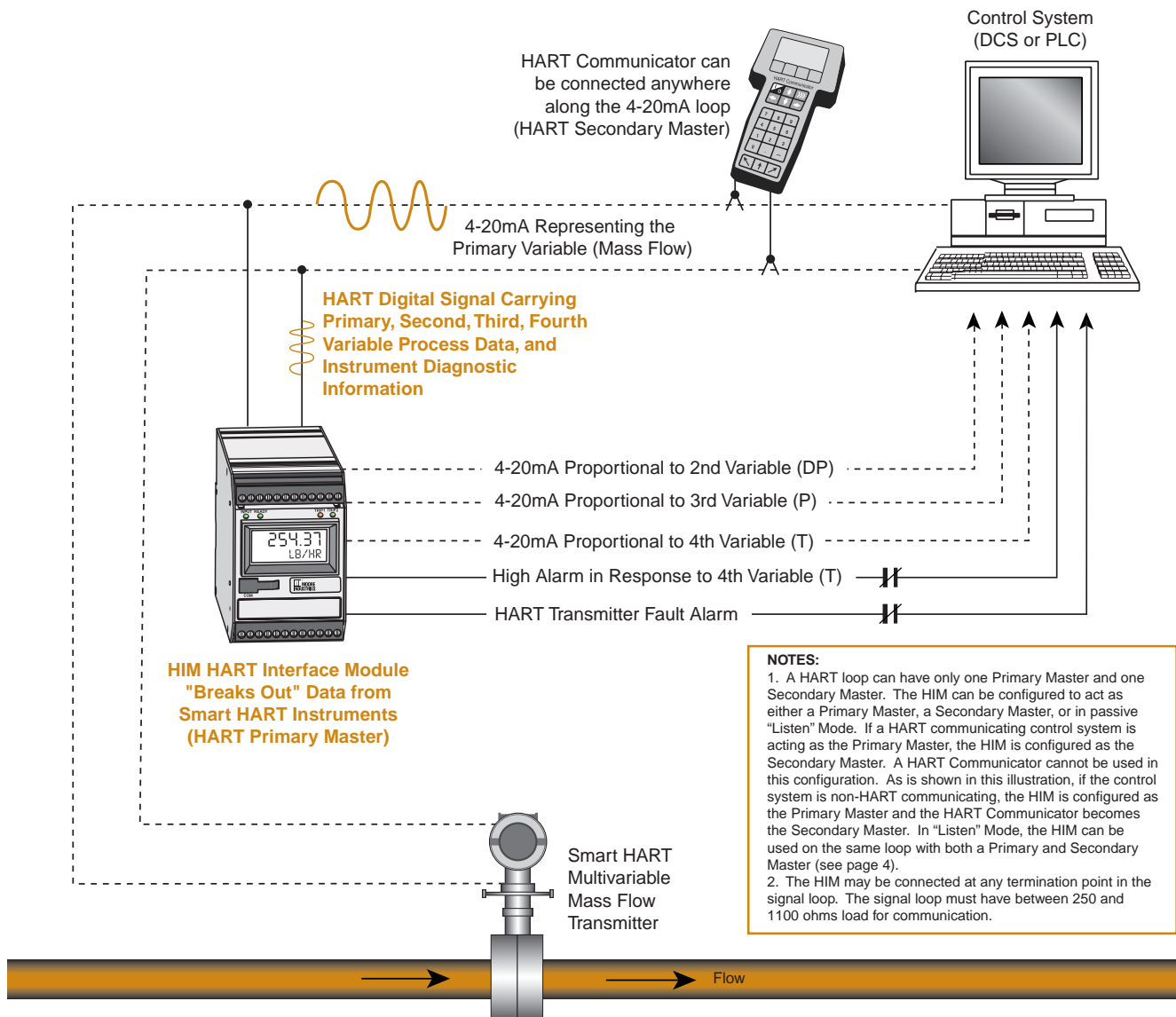

Control System
(DCS or PLC)

HART Communicator can be connected anywhere along the 4-20mA loop
(HART Secondary Master)

4-20mA Representing the Primary Variable (Mass Flow)

HART Digital Signal Carrying Primary, Second, Third, Fourth Variable Process Data, and Instrument Diagnostic Information

254.37
LB/HR

4-20mA Proportional to 2nd Variable (DP)
4-20mA Proportional to 3rd Variable (P)
4-20mA Proportional to 4th Variable (T)
High Alarm in Response to 4th Variable (T)
HART Transmitter Fault Alarm

HIM HART Interface Module "Breaks Out" Data from Smart HART Instruments (HART Primary Master)

Smart HART Multivariable Mass Flow Transmitter

NOTES:
1. A HART loop can have only one Primary Master and one Secondary Master. The HIM can be configured to act as either a Primary Master, a Secondary Master, or in passive "Listen" Mode. If a HART communicating control system is acting as the Primary Master, the HIM is configured as the Secondary Master. A HART Communicator cannot be used in this configuration. As is shown in this illustration, if the control system is non-HART communicating, the HIM is configured as the Primary Master and the HART Communicator becomes the Secondary Master. In "Listen" Mode, the HIM can be used on the same loop with both a Primary and Secondary Master (see page 4).
2. The HIM may be connected at any termination point in the signal loop. The signal loop must have between 250 and 1100 ohms load for communication.

Flow

Table 1. *Typical process data (primary and non-primary) available within the digital signal of smart HART devices.* *

Device Type	Typical Available Process Data*
Multivariable Mass Flow Transmitters	• Mass Flow • Pressure • Differential Pressure • Process Temperature • Flow Rate • Flow Total • Sensor Temperature
Coriolis Flow Meters	• Mass Flow • Volumetric Flow • Density • Process Temperature • Sensor Temperature • Brix/Baume • Concentration • Corrected Volume • Total Solute Flow
Magnetic Flow Meters	• Flow • Raw Flow • Volumetric Flow • Smoothed Flow • Positive Total • Negative Total • Net Total
Ultrasonic Flow Meters	• Flow • Sound Velocity • Positive Total • Negative Total
Vortex Flow Meters	• Flow • Total Flow • Process Temperature • Vortex Frequency
Hydrostatic Level Meters	• Level • Volume • Pressure • Differential Pressure • Sensor Pressure • Process Temperature • Sensor Temperature
Radar Level Transmitters	• Level • Distance • Interface Volume/Mass • Percent Level • Percent Range • Internal Temperature • Output Percentage • Percent Distance • Product Volume/Mass • Reflection • Volume of Empty Space (Ullage)
Pressure Transmitters	• Pressure • Differential Pressure • Percent Range • Electronics Temperature • Sensor Temperature
pH Transmitters	• pH • Process Temperature • Electrode Performance
Valve Positioners and Damper Operators	• Stem Position Percentage • Input • Supply Pressure • Set Point • Deviation from Set Point • Actuator Pressure • Positioner Temperature

* Available data differs from each manufacturer. Consult the HART device manufacturer or Moore Industries for variables available for a specific device.

accepted by a DCS or PLC. This allows you to continuously track a multivariable transmitter's second, third, and fourth variables. Each HIM analog channel may be individually programs to monitor the variables of your choice.

Process and Diagnostic Alarm Trips

The HIM can be ordered with one or two alarm trip (relay) outputs. These can be used just like a traditional alarm trip to warn of high and/or low process conditions based on user-set trip points. They can also be set as diagnostic alarms to warn of problems with a smart HART transmitter or valve postioner.

Process High/Low Alarms—The difference between the HIM and a traditional alarm trip is that the HIM responds to HART's digital information, rather than to a loop's analog signal. This allows the HIM to be set to monitor any available dynamic HART variable. For example, for a multivariable mass flow transmitter, a relay can be set to trip when the transmitter's Third Variable (temperature) exceeds a user-set trip point (Figure 1).

Each trip can be individually assigned. Both alarms can be assigned to monitor one process variable, or each can be set to respond to different process variables.
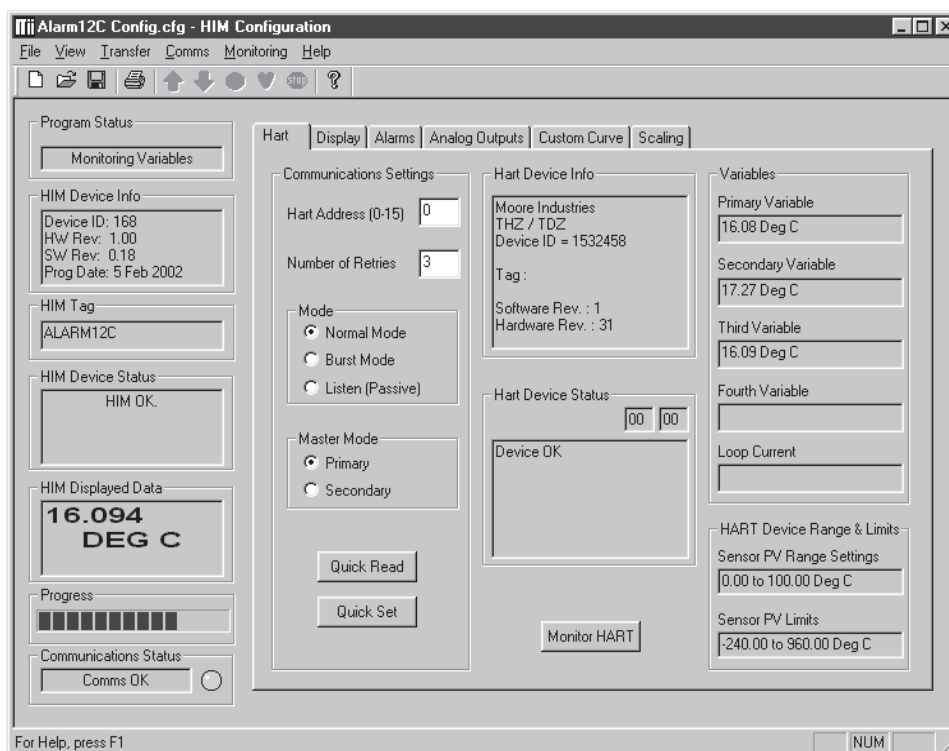
Monitor HART Instrument Diagnostics—Using the Field Device Status Byte data that is available in HART's digital information, the HIM can be set to initiate an alarm if any of the following fault conditions are detected:

- Smart Device Configuration Changed
- Primary Variable Out of Limits
- Non-Primary Variable Out of Limits
- Primary Variable Analog Output Out of Limits
- Primary Variable Analog Output Fixed
- Cold Start
- Field Device Malfunction
- More Status Available

Smart HART Valve Monitoring

The HIM HART Loop Interface and Monitor can also be used to monitor smart HART valve positioners and damper operators. Its 4-20mA analog outputs can be used to keep track of important parameters such as valve stem position, actuator pressure or temperature. Alarm (relay) outputs can also be set to alert of a smart valve condition such as valve position (open/closed), low actuator pressure, and positioner temperature (high/low).

HIM

Smart HART® Loop
Interface and Monitor

Programs as a Primary or Secondary Master or in "Listen" Mode

The HIM can be configured as a HART loop's Primary or Secondary Master (in a HART master/slave system), or in passive "Listen" Mode. A HART loop can have only one Primary Master and one Secondary Master

Primary Master—The HIM is set as a Primary Master when a HART master is not present on the loop, such as when the control system is non-HART communicating. This allows a Secondary Master, such as a HART hand-held communicator, to be used on the loop along with the HIM.

Secondary Master—When a HART-based control system, such as an Asset Management System, is acting as the Primary Master, the HIM can be set to act as the Secondary Master. However, since a HART loop can have only one Primary Master and one Secondary Master, a HART hand-held communicator can not be used in this configuration.

"Listen" Mode—If the loop has a Primary and Secondary Master, the HIM can be set in "Listen" Mode. In this mode, the HIM can be added to a loop with a Primary and Secondary HART Master because it connects passively without assuming the role of a Master (Figure 2). In the "Listen" Mode, the HIM continuously samples HART data from a smart instrument without affecting normal loop operation. When using "Listen" Mode, the smart HART instrument must be set in Burst Mode or a HART master must be continuously polling the smart HART device (slave).

Sets to Read Normal or Burst Mode

When configured as either the loop's Primary or Secondary Master, the HIM can be set to monitor:

Normal Mode—The HIM polls the HART instrument 2 times per second requesting the current process status and the HART instrument's diagnostic status. The HART instrument responds with the requested data.

Burst Mode—In this mode, the smart HART instrument is programmed to continuously transmit its process variable and health status. The HIM samples the continuous HART data 3 times per second.

Operates in Analog and Digital Multidrop HART Networks

Typically, HART instruments are used in the analog mode, with a 4-20mA signal being sent by the HART instrument to or from a control system (as shown in Figure 1). In this mode, the HIM is set to monitor address "0". In a digital HART multidrop network, up to 15 HART instruments digitally communicate on the same wires. The HIM can be set to monitor any instrument (address 1-15) within the network. The HART address that the HIM monitors can be changed at any time, allowing any of the instruments in the network to be periodically monitored.

Figure 2. *When in "Listen" Mode, the HIM can be used on the same loop with both a HART Primary Master and Secondary Master.*

SECONDARY MASTER (HART Communicator)

4-20mA with Superimposed HART Digital Data

Smart HART Device

PRIMARY MASTER (HART-Capable System)

HIM HART Interface Module in "Listen" Mode

Figure 3. *Up to 128 custom linearization points can be selected and saved in the SPA's memory to compensate for non-linear input signals.*

Output = Function of the Input

Full Scale

(20mA, 100%)
(16mA, 87%)
(12mA, 70%)
(8mA, 50%)
(6mA, 35%)

Custom Linearization Points

Full Scale

% Display — Input mA

Custom 128-Point Linearization Curves

The HIM can be programmed with up to 128 custom linearization points that can be applied to any one of the measured (primary, second, third or fourth) variables. The ability to plot a custom linearization curve is beneficial when non-linear input signals must be converted to linear output representations.

Figure 4. *In just a few minutes, you can set up the HIM using our single window Intelligent PC Configuration Software.*

PC-Programmable in Minutes

All operating parameters configure quickly and easily using our Intelligent PC Configuration Software. Programmable functions include:

• **HART Parameters**—Instrument (HART) address to monitor, number of retries, Normal or Burst Mode, and Primary/Secondary Master or "Listen" Mode.

• **Analog Outputs** —Selection of measured variables, source or sink, output range, output trimming, upscale or downscale on input failure.

• **Alarm Selections**—Process or fault alarms, trip points, high or low alarms, deadband, time delay, and failsafe or non-failsafe.

• **Display Parameters**—Selection of displayed variable, engineering unit readout, number of decimal points, and toggle between two measured process variables.

• **Custom Curves**—Number of linearization points (up to 128), linearization data and upload (or download) data using a PC database program (see Figure 3).

• **Output/Display Scaling**—Variable selection, zero and full scale values.

HelpMap Navigation System

Just click the Help icon on the toolbar of our Intelligent PC Configuration Software, and up pops HelpMap, our searchable help system. It provides quick and complete answers to performance, setup, installation, and maintenance questions, smoothly guiding you from hook-up to startup.

• **Easy to Use.** All the functions of a high-powered help system with the ease of a web site.

• **In-Depth Explanations.** Describes specific features as well as step-by-step directions on how to configure, install, and maintain the HIM.

• **Advanced Search and Index Features.** Our advanced search and index features help you quickly find the necessary information.

• **Context-Sensitive Help.** Need a quick definition? Concise information and software definitions regarding the part of the program you are using are available from our context sensitive help system.

HIM
Smart HART® Loop
Interface and Monitor

Specifications

Performance

Input Accuracy: Reflects the accuracy of the HART field device
Input Impedance: Transmit Mode: 150 ohms; Receive Mode: Less than 5K ohms
Input Over-Range Protection: ±5Vdc

ANALOG OUTPUTS
Output Accuracy: ±0.015% of maximum output span (20mA). Includes the combined effects of linearity, hysteresis, repeatability and adjustment resolution)
Output Response Time: <120ms, 10-90%
Isolation: 500Vrms channel-to-channel isolation; 1000Vrms between case, input, outputs and power terminals, and will withstand 1500Vac dialetic strength test for one minute with no breakdown
Ripple: Less than 10mV peak-to-peak when measured across a 250 ohm resistor
Output Limiting: 130% of span maximum; 125% of span typical
Output Protection: Transient protection on output
Load Capability: 0-20mA, 1100 ohms max.
Load Effect: ±0.01% of span from 0 to maximum load resistance
Line Voltage Effect: ±0.005% of output span for a 1% change in line voltage
Output Limits on Input Failure:

Performance (Continued)

0-20mA: Fail Low to 0mA or Fail High to 23.6mA

4-20mA: Fail Low to 3.6mA or Fail High to 23.6mA

X-20mA (0<X<4): Fail Low to 90% of XmA or Fail High to 23.6mA

ALARM OUTPUTS
Digital Response Time: Defined by HART protocol as 500 millisecond max. in Normal HART Mode; 333 milliseconds maximum in HART Burst Mode
Alarm Response Time: Digital Response Time + 150 milliseconds (Defined as time from the field instrument's reporting a fault until the HIM alarm is tripped)
Alarm Trip Delay: Programmable from 0-120 seconds

Power Consumption: 2-3.5W, nominal; 4.5W @24Vdc max. for units using transmitter excitation to supply loop power a 2-wire instrument

Indicators

LCD Type: Two-line LCD; Top Row, 10mm (0.4 inch) high black digits on a reflective background; Bottom Row, 6mm (0.225 inch) high digits on a reflective background; two-digit HART address indicator
Format: Top row is five alphanumeric characters, plus sign and decimal point; bottom row is five alphanumeric characters
Decimal Points: User-selectable for 0, 1, 2, or 3

Indicators (Continued)

places after the decimal point or automatically adjusting with a four decimal point maximum
Range: -99999 to 99999
Min. Display Span: 1.00
Display Update Rate: 100msec
LED Type: Dual color red/green indicate: INPUT LED: Whether (green) or not (red) the HART input is connected and functioning properly
READY LED: Whether (green) or not (red) the HIM is initialized and operating properly
TRIP 1 and 2 LED: Shows the status of alarm off (green) or alarm on (red)

Ambient Conditions

Operating & Storage Range: -40°C to +85°C (-40°F to +185°F)
Display Range: -25°C to +85°C (-13°F to +185°F)
Relay Range: -25°C to +70°C (-13°F to +158°F)
Relative Humidity: 0-95%, non-condensing
Ambient Temperature Effect: ±0.0065% of span/°C maximum
RFI/EMI Immunity (Standard): 20V/m@20-1000MHz, 1KHz AM, when tested according to IEC1000-4-3-1995
RFI/EMI Immunity (with -RF Option): 30V/m@ 20-1000MHz, 1KHz, when tested according to IEC1000-4-3-1995
Noise Rejection: Common Mode: 100dB@ 50/60Hz

567 grams (16 ounces)

Weight

Specifications and information subject to change without notice.

Ordering Information

Unit	Input	Output	Power	Options	Housings
HIM HART Interface Module	**HART** Accepts a HART digital protocol input directly from a smart HART multivariable temperature, pressure, level, flow transmitter or from a valve positioner	**2AO** Two programmable analog output channels (see Table 2 for details) **3AO** Three programmable analog output channels (See Table 2 for details) *A MODBUS RTU (RS485) output, in place of analog outputs, is also available. Consult the factory for details.	**24DC** ±10%	**-1PRG** One user-programmable alarm output; DPDT relay, 1 form C, rated 5A @250Vac, 50/60Hz, non-inductive (see Table 2 for details) **-2PRG** Two user-programmable alarm outputs; SPDT relay, 1 form C, rated 5A@250Vac, 50-60Hz, non-inductive (see Table 2 for details) **-RF** Enhanced RFI/EMI protection (see "Specifications" for details) *Hermetically sealed relays for intrinsically safe and Division 2 applications are also available. Consult the factory for details.	**DIN** Universal DIN-style housing mounts on 32mm (EN50035) G-type and 35mm (EN50022) Top Hat DIN-rails

To order, specify: Unit / Input / Output / Power / Options [Housing]
Model Number Example: HIM / HART / 3AO / 24DC / -2PRG [DIN]

Table 2. *The HIM converts HART digital data to analog and relay output signals.*

Channel	Order Type*	Output	Description
1	2AO Output	0-20mA 4-20mA	**Convert HART Digital Data to 4-20mA Signals**—Each user-programmable channel provides an analog value proportional to any available dynamaic HART variable (such as the primary, second, third or fourth variables of a multivariable transmitter or valve stem position); Outputs are fully scaleable for any range, such as 4-20mA, between 0-20mA (4mA span minimum) into 1100 ohms; Internally- or externally-powered, sink or source.
2	2AO Output	0-20mA 4-20mA	
3 (Optional)	3AO Output	0-20mA 4-20mA	
4 (Optional)	-1PRG Option	Relay	**Process and Diagnostic Fault (Relay) Alarms**—User-programmable alarm (relay) outputs are individually configurable:
5 (Optional)	-2PRG Option	Relay	• **Process and Status High/Low Alarm** with user-selectable trip point(s) that respond to any available dynamic HART variable (such as the primary, second, third or fourth variables of a multivariable transmitter; open/closed valve position; low valve actuator pressure; or high valve actuator temperature) • **HART Instrument Diagnostic/Fault Alarm** that responds to one, some or all (user-selectable) of the following HART Status Bit conditions: primary variable out of limits; non-primary variable out of limits; primary analog output out of limits; primary variable analog output fixed; cold start; field device malfunction; primary variable analog output fixed; and more diagnostic information available.

*See "Ordering Information for "Output Type" information.

Accessories

Each HIM order comes with one copy of our Intelligent PC Configuration Software (Windows® '95, '98, 2000, and NT compatible) and a configuration cable. Use the chart to the right to order additional parts.

Part Number **224-75120-01**	**HIM Intelligent PC Configuration Software** (One copy provided free with each order)
Part Number **803-053-26**	**HIM Configuration Cable** for use connecting the HIM to the PC.

HIM

Smart HART® Loop
Interface and Monitor

Figure 5. *HIM Installation Dimensions.*
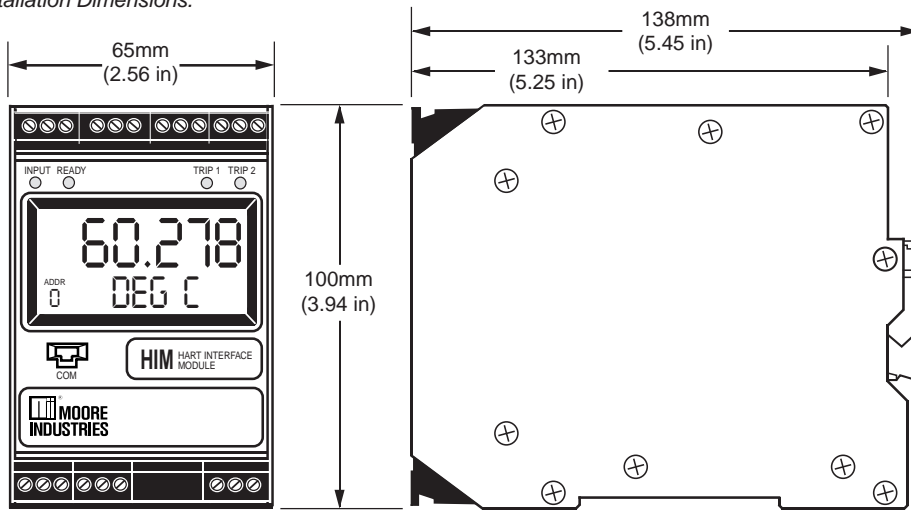
Table 3. *Terminal Designations.*

INPUT / OUTPUT	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
HART Input, 2 Analog Outputs (2AO)	TX	+IN	–IN	No Label			+I Source (AO2)	–I Source or +I Sink (AO2)	–I Sink (AO2)	+I Source (AO1)	–I Source or +I Sink (AO1)	–I Sink (AO1)
HART Input, 3 Analog Outputs (3AO)	TX	+IN	–IN	+I Source (AO3)	–I Source or +I Sink (AO3)	–I Sink (AO3)	+I Source (AO2)	–I Source or +I Sink (AO2)	–I Sink (AO2)	+I Source (AO1)	–I Source or +I Sink (AO1)	–I Sink (AO1)
HART Input, 2 Modbus Outputs	TX	+IN	–IN	No Label			A	B	Ground	A	B	Ground
ALARM RELAYS / POWER	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12
Single Alarm (–1PRG)	NO1	CM1	NC1	NO2	CM2	NC2	No Label			DC	DCC	Ground
	Relay 1											
Dual Alarm (–2PRG)	NO1	CM1	NC1	NO2	CM2	NC2				DC	DCC	Ground
	Relay 1			Relay 2								

KEY:

IN+/– = Current input from HART transmitter
+I/–I Source = Analog Source Output
A/B = Modbus Output
NC/NC# = Normally Closed
DC/DCC = 24VDC Connection

TX = Transmitter Excitation Current
+I/–I Sink = Analog Sink Output
NO/NO# = Normally Open
CM/CM# = Common
(AO#) = Analog Output

Terminal Position Guide

TOP (T)
TERMINALS

BOTTOM (B)
TERMINALS