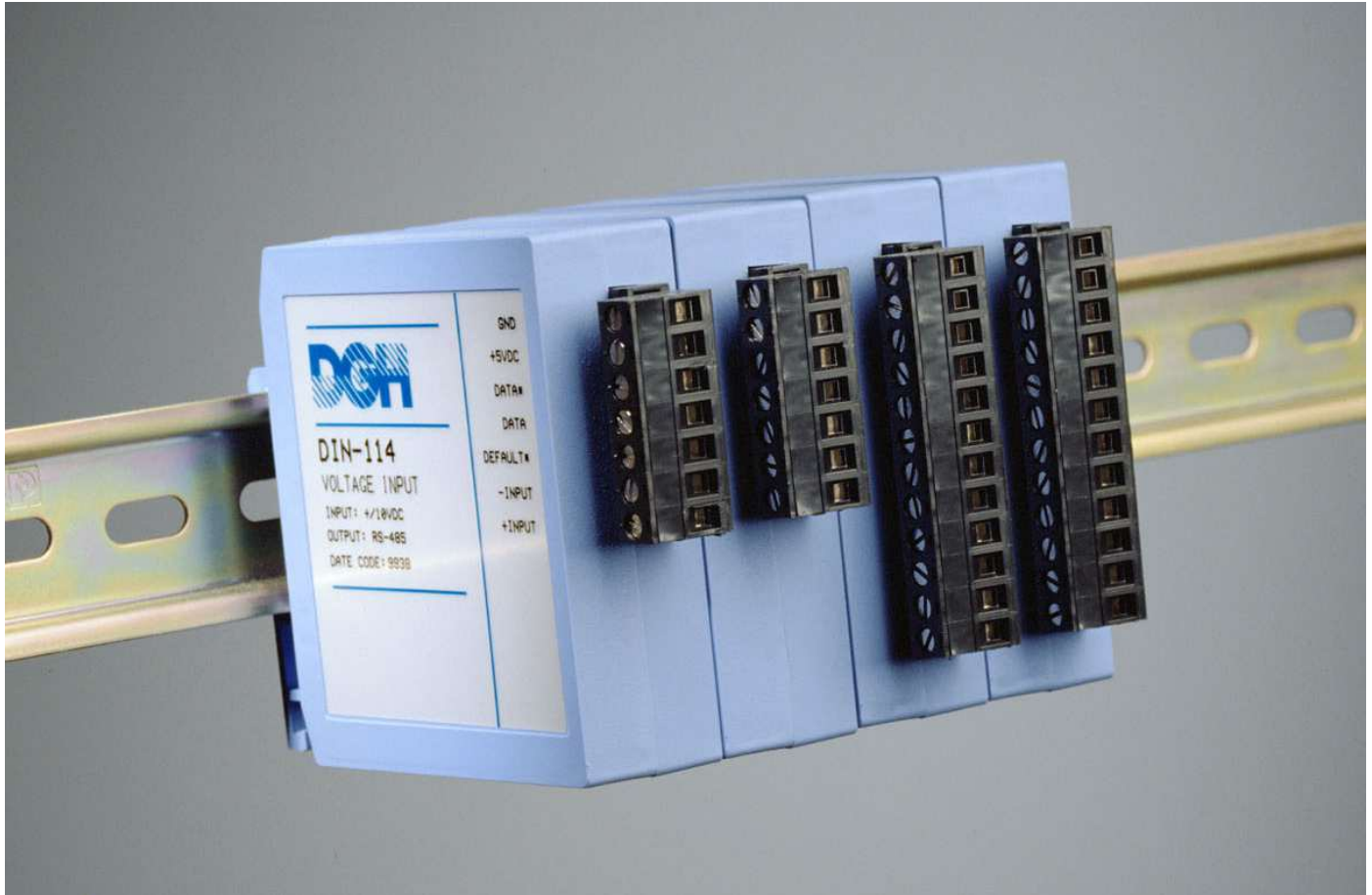




## DIN-100 SERIES SENSOR TO COMPUTER INTERFACE MODULES



### DIN-100 FEATURES

- Complete sensor to RS-485 interface.
- 500V rms analog input isolation.
- 15 bit measurement resolution.
- Continuous self-calibration; no adjustments of any kind.
- Programmable digital filter.
- Requires +5VDC supply.
- Transient suppression on RS-485 communications lines.
- Screw terminal plug connectors supplied.

### APPLICATIONS

- Process monitoring and control
- Remote data logging to any host computer
- Product testing
- Interface to PLC

### GENERAL DESCRIPTION

The DIN-100 Sensor to Computer Modules are a family of data acquisition modules that convert analog input signals to digital data and transmit via RS-485 to a controller which may be a computer or other processor-based equipment. The modules can measure temperature, pressure, voltage, current, digital input or digital output signals. The modules provide direct connection to a wide variety of sensors and perform all signal conditioning, scaling, linearization and conversion to either linearized ASCII data values or Modbus RTU data values.

Features such as address, baud rate, parity, echo, etc., are selectable using simple commands over the RS-485 port. The selections are stored in nonvolatile EEPROM which maintains data even after power is removed.

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## DIN-100 SPECIFICATIONS (typical at +25°C and nominal power supply unless otherwise noted)

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### Analog

- Single channel analog input.
- Maximum CMV, input to output at 60Hz: 500V rms.
- Leakage current, input to output at 115Vrms, 60Hz: <2μA rms.
- 15 bit measurement resolution.
- 8 conversions per second.
- Autozero & autocalibration—no adjustment pots.

### Digital

- 8-bit CMOS microcomputer.
- Digital scaling, linearization and calibration .
- Nonvolatile memory eliminates pots and switches.

### Digital filtering

- Small and large signal with user selectable time constants from 0 to 16 seconds.

### Communications

- Communications in MODBUS-RTU via RS-485 ports.
- Selectable baud rates: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400.
- NRZ asynchronous data format; 1 start bit, 8 data bits, 1 parity bit and 1 stop bit.
- Parity: odd, even, none.
- User selectable channel address.
- Up to 247 multidrop modules per host serial port.
- Communications distance up to 4,000 feet (RS-485).
- Transient suppression on RS-485 communications lines.
- All communications setups stored in EEPROM.

### Power

Requirements: Regulated +5Vdc ,  
0.75W max (DIN-150, 2.0W max.).  
Protected against power supply reversals.

### Environmental

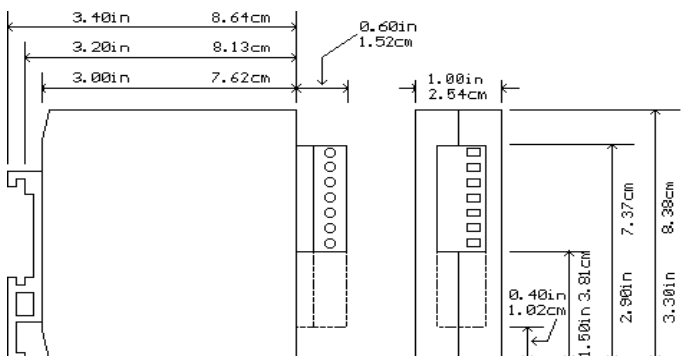
Temperature Range: Operating -25°C to +70°C.  
Storage -25°C to +85°C.  
Relative Humidity: 0 to 95% noncondensing.

### Warranty

12 months on workmanship and material.

### Mechanicals and Dimensions

ABS case with screw terminal barrier plug (supplied).



### DIN-100 Voltage Inputs

- Voltages: ±10mV, ±100mV, ±1V, ±5V, ±10V, ±100Vdc.
- Resolution: 0.01% of FS (4 digits).
- Accuracy: ±0.02% of FS max.
- Common mode rejection: 100dB at 50/60Hz.
- Zero drift: ±1 count max (autozero).
- Span tempco: ±50ppm/°C max.
- Input burnout protection to 250Vac .
- Input impedance: ≤ ±1V input = 100MΩ min.  
≥ ±5V input = 1MΩ min.

### DIN-120 Current Inputs

- Currents: 4-20mAdc.
- Resolution: 0.04% of FS.
- Accuracy: 0.04% of FS.
- Common mode rejection: 100dB at 50/60Hz.
- Zero drift: ±1 count max (autozero).
- Span tempco: ±50ppm/°C max.
- Voltage drop: ±0.1V max.

### DIN-130 Thermocouple Inputs

- Thermocouple types: J, K, T, E, R, S, B, C (factory set).
- Ranges: J = -200°C to +760°C    B = 0°C to +1820°C  
K = -150°C to +1250°C    S = 0°C to +1750°C  
T = -200°C to +400°C    R = 0°C to +1750°C  
E = -100°C to +1000°C    C = 0°C to +2315°C
- Resolution: ±1°.
- Overall Accuracy (error from all sources) from 0 to +40°C ambient: ±1.0 °C max (J, K, T, E).  
±2.5 °C max (R, S, B, C)(300°C TO FS).
- Common mode rejection: 100dB at 50/60Hz.
- Input impedance: 100MΩ min.
- Lead resistance effect: <20μV per 350Ω.
- Open thermocouple indication.
- Input burnout protection to 250Vac.
- Overrange indication.
- Automatic cold junction compensation and linearization.

### DIN-140 RTD Inputs

- RTD types: α = .00385, .00392, 100Ω at 0°C,  
.00388, 100Ω at 25°C.
- Ranges: .00385 = -200°C to +850°C.  
.00392 = -200°C to +600°C.  
.00388 = -100°C to +125°C.
- Resolution: 0.1°.
- Accuracy: ±0.3°C.
- Common mode rejection: 100dB at 50/60Hz.
- Input connections: 2, 3, or 4 wire.
- Excitation current: 0.25mA.
- Lead resistance effect: 3 wire - 2.5°C per Ω of imbalance.  
4 wire - negligible.
- Max lead resistance: 50Ω.
- Input burnout protection to 120Vac .
- Automatic linearization and lead compensation.

Specifications are subject to change without notice.

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#### DIN-145 Thermistor Inputs

- Thermistor types: 2252Ω at 25°C, TD Series
  - Ranges: 2252Ω = -0°C to +100°C.  
TD = -40°C to +150°C.
  - Resolution: 2252Ω = 0.01°C or F.  
TD = 0.1°C or F
  - Accuracy: 2252Ω = ±0.1°C.  
TD = ±0.2°C
  - Common mode rejection: 100dB at 50/60Hz.
  - Input burnout protection to 30Vdc .
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#### DIN-150 Bridge Inputs

- Voltage Ranges: ±30mV, ±100mV.
  - Resolution: 10μV (mV spans).  
0.02% of FS (V span).
  - Accuracy: ±0.05% of FS max.
  - Common mode rejection: 100dB at 50/60Hz.
  - Input burnout protection to 30Vdc .
  - Offset Control: Full input range.
  - Excitation Voltage: 5V, 10Vdc, 50mA max.
  - Zero drift: ±1μV/°C max.
  - Span tempco: ±50ppm/°C max.
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#### DIN-160 Frequency Inputs

- Range: 1Hz to 20KHz.
  - Resolution: 0.005% of reading + 0.01Hz.
  - Accuracy: ±0.01% of reading ±0.01Hz.
  - Tempco: ±20ppm/°C.
  - Input impedance: 1MΩ.
  - Switching level: selectable 0V, +2.5V.
  - Hysteresis: Adjustable 10mV-1.0V.
  - Input burnout protection: 250Vac .
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#### DIN-170 Digital Inputs/Outputs

- 6 digital inputs or 6 digital outputs.
  - Input voltage levels: ±30V without damage.
  - Input switching levels: High, 3.5V min., Low, 1.0V max.
  - Outputs: open collector to 30V, 100mA max. load.
  - Vsat: 1.0V max @ 100mA.
  - Inputs/Outputs are read/set in parallel.
  - Isolated from power supply ground.
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#### DIN-190 RS-232/485 Converter/Repeater

- Baud Rates: 300-115200 (Dip-switch selectable).
  - Termination and biasing resistors included (selectable via internal jumpers).
  - Isolated to 500Vrms.
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**General Description continued:** The key to the DGH product concept is that the modules are easy to use. You do not need engineering experience in complicated data acquisition hardware. With the DGH modules, anyone familiar with a personal computer can construct a data acquisition system. This modular approach to data acquisition is extremely flexible, easy to use and cost effective. Data is acquired on a per channel basis so you only buy as many channels as you need. The modules can be mixed and matched to fit your application. They can be placed remote from the host and from each other. You can string up to 247 modules on a twisted pair of wires by using RS-485 with repeaters.

All modules are supplied with screw terminal plug connectors. The connectors allow system expansion, reconfiguration or repair without disturbing field wiring.

Utility software is available from DGH to make the DIN-100 easier to learn and use. The software is provided at no charge on request with a purchase order and is not copy protected.

#### THEORY OF OPERATION

Each DGH module is a complete single-channel data acquisition system. Each unit contains analog signal conditioning circuits optimized for a specific input type. Sensor signals are converted to digital data with a microprocessor-controlled integrating A/D converter. Offset and gain errors in the analog circuitry are continuously monitored and corrected using microprocessor techniques. The DIN-100 converts the digital signal data and stores the resultant data in a memory buffer. The modules continuously convert data at the rate of 8 conversions per second and store the latest result in the buffer.

Host processors may request data by sending a query to the module. The DIN-100 will instantly respond by communicating the memory buffer data back to the host processor. Up to 247 modules may be linked to a single RS-485 port. Each module on a serial line is identified by a unique user-programmable address. This addressing technique allows modules to be interrogated in any order.

#### DIGITAL INPUTS/OUTPUTS

DIN-170 digital output modules contain open-collector transistor switches that may be controlled by the host processors. These switches may be used to control solid-state relays which in turn may control heaters, pumps and other power equipment. The digital inputs may be read by the host processor and used to sense the state of remote digital signals. They are ideal for sensing the state of limit or safety switches.

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## DIGITAL FILTER

The DIN-100 analog input modules include two unique programmable single pole digital filters. The filter is used to smooth analog data in noisy environments. Separate time constants may be specified for small and large signal changes. Typically a large time constant is specified for small signal changes to filter out noise and provide stable output readings. A smaller time constant may be chosen for large signal changes to provide fast response to such changes.

## COMMAND SET

The DIN-100 series uses the Modbus RTU or the DGH ASCII protocol for communication.

The Modbus RTU binary protocol uses a master-slave technique, in which only the master device can initiate transactions. The slave devices respond by supplying the requested data to the master or by taking the action requested in the query. The master can address any slave device. The returned messages are considered response messages. The supported master codes are:

### Modbus RTU Functions and Descriptions

- 01 Read Coil Status (Digital Inputs)
- 04 Read Input Register (Analog Inputs)
- 05 Force Single Coil (One Digital Input)
- 06 Preset Single Register (DGH/RTU Protocol)
- 15 Force Multiple Coils (Multiple Digital Output)

The DGH ASCII protocol is a command and response protocol using ASCII characters for easy troubleshooting and interpretation of data values.

## DIN-100 Series ASCII Command Set.

Command and Definition	Typical Command Message (\$ prompt)	Typical Response Message
DI Digital Input	\$1DI	*0003
DO Digital Output	\$1DOFF	*
RD Read Data	\$1RD	*+00072.00
RS Read Setup	\$1RS	*31070142
RSU Read Setup	\$1RSU	*31070142
RZ Read Zero	\$1RZ	*+00000.00
WE Write Enable	\$1WE	*

### Write Protected Commands.

CZ Clear Zero	\$1CZ	*
RR Remote Reset	\$1RR	*
SU Setup Module	\$1SU31070142	*
TS Trim Span	\$1TS+00600.00	*
TZ Trim Zero	\$1TZ+00000.00	*

## SETUP

The DIN-100 series are initiated at the factory using the DGH ASCII protocol. This allows setup and configuration, including the Modbus device address, to be easily performed using the DGH setup software or a dumb terminal. Each DIN-

100 module must be properly configured before installation into a Modbus system.

## UTILITY SOFTWARE

Complimentary Utility Software is included with each purchase order. The software is compatible with Windows 95, 98, NT 4.0+, 2000 operating systems and distributed on CD-ROM. The Utility Software simplifies configuration of all user-selectable options such as device address, baud rate and filtering constants. The latest version of our software is always downloadable from our web site at [www.dghcorp.com](http://www.dghcorp.com).

## PROCESS CONTROL SOFTWARE

Modbus RTU protocol is supported by virtually all commercial process control software programs available today. These programs operate on IBM and compatible personal computers in the Windows 95, 98, NT and IBM OS/2 environments.

## DIN-100 SERIES ORDERING GUIDE

### Voltage Input

- DIN-110 10mV Input/RS-485 Output
- DIN-111 100mV Input/RS-485 Output
- DIN-112 1V Input/RS-485 Output
- DIN-113 5V Input/RS-485 Output
- DIN-114 10V Input/RS-485 Output
- DIN-115 100V Input/RS-485 Output

### Current Inputs

- DIN-125 4-20mA Input/RS-485 Output

### Thermocouple Inputs

- DIN-131 J Thermocouple Input/RS-485 Output
- DIN-132 K Thermocouple Input/RS-485 Output
- DIN-133 T Thermocouple Input/RS-485 Output
- DIN-134 E Thermocouple Input/RS-485 Output
- DIN-135 R Thermocouple Input/RS-485 Output
- DIN-136 S Thermocouple Input/RS-485 Output
- DIN-137 B Thermocouple Input/RS-485 Output
- DIN-138 C Thermocouple Input/RS-485 Output

### RTD/Thermistor Inputs

- DIN-141 .00385 RTD Input/RS-485 Output
- DIN-142 .00392 RTD Input/RS-485 Output
- DIN-143 .00388 RTD Input/RS-485 Output
- DIN-145 2252Ω Thermistor Input/RS-485 Output
- DIN-146 TD Thermistor Input/RS-485 Output

### Bridge Inputs

- DIN-151 30mV Bridge Input, 5V Excitation/RS-485 Output
- DIN-152 30mV Bridge Input, 10V Excitation/RS-485 Output
- DIN-153 100mV Bridge Input, 5V Excitation/RS-485 Output
- DIN-154 100mV Bridge Input, 10V Excitation/RS-485 Output

### Timer and Frequency Inputs

- DIN-161 Frequency Input/RS-485 Output

### Digital Inputs/Outputs

- DIN-171 6 Digital Inputs/RS-485 Output
- DIN-172 6 Digital Outputs/RS-485 Output

### RS-232/485 Converter/Repeater

- DIN-191 RS-232/485 Converter
- DIN-192 RS-485 Repeater