OMEGABUS® Series
DIN Rail Mount
Digital Transmitters

DIN-100 Series

- Complete Sensor to RS485 Interface
- 500V RMS Analog
- Input Isolation 15-Bit Measurement Resolution
- Continuous Self-Calibration; No Adjustments of any Kind
- Programmable Digital Filter
- Requires 5 Vdc Supply
- Transient Suppression on RS485 Communications Lines
- Screw Terminal Plug Connectors Supplied

APPLICATIONS
- Process Monitoring and Control
- Remote Data Logging to any Host Computer
- Product Testing
- Interface to PLC

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 RS485 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 RS485 port.

The selections are stored in nonvolatile EEPROM which maintains data even after power is removed.

The key to the DIN-100 Series is that the modules are easy to use. You do not need engineering experience in complicated data acquisition hardware. With these 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 RS485 with repeaters.

All modules are supplied with screw terminal plug connectors. The connectors allow system expansion, reconfiguration or repair without disturbing field wiring. No charge utility software is available to make the DIN-100 modules easier to learn and use.

THEORY OF OPERATION
Each 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 module 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 module will instantly respond by communicating the memory buffer data back to the host processor. Up to 247 modules may be linked to a single RS485 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.
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 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 below in the chart.

<table>
<thead>
<tr>
<th>Command and Definition</th>
<th>Typical Command Message ($ prompt)</th>
<th>Typical Response Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>DI Digital Input</td>
<td>$1D1</td>
<td>*0003</td>
</tr>
<tr>
<td>DO Digital Output</td>
<td>$1DOFF</td>
<td>*</td>
</tr>
<tr>
<td>RD Read Data</td>
<td>$1RD</td>
<td>*00072.00</td>
</tr>
<tr>
<td>RS Read Setup</td>
<td>$1RS</td>
<td>*31070142</td>
</tr>
<tr>
<td>RZ Read Zero</td>
<td>$1RZ</td>
<td>*00000.00</td>
</tr>
<tr>
<td>WE Write Enable</td>
<td>$1WE</td>
<td>*</td>
</tr>
</tbody>
</table>

Write Protected Commands

<table>
<thead>
<tr>
<th>Command and Definition</th>
<th>Typical Command Message ($ prompt)</th>
<th>Typical Response Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>CZ Clear Zero</td>
<td>$1CZ</td>
<td>*</td>
</tr>
<tr>
<td>RR Remote Reset</td>
<td>$1RR</td>
<td>*</td>
</tr>
<tr>
<td>SU Setup Module</td>
<td>$1SU31070142</td>
<td>*</td>
</tr>
<tr>
<td>TS Trim Span</td>
<td>$1TS+00600.00</td>
<td>*</td>
</tr>
<tr>
<td>TZ Trim Zero</td>
<td>$1TZ+00000.00</td>
<td>*</td>
</tr>
</tbody>
</table>

UTILITY SOFTWARE
Complimentary Utility Software is included with each purchase order. The software is compatible with Windows XP, Vista, 7 and 8 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 the software is always downloadable from our website.

PROCESS CONTROL SOFTWARE
Modbus RTU protocol is supported by virtually all commercial process control software programs available today.

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

ANALOG
Channels: Single channel analog input
Common Mode Rejection: 500V RMS max CMV, input to output at 60Hz
Leakage Current: input to output at 115V RMS, 60 Hz; <2μA RMS
Resolution: 15 bit measurement resolution
Conversion Speed: 8 conversions per second
Calibration: Autozero and autocalibration; no adjustment pots

DIGITAL
Microcomputer: 8-bit CMOS; digital scaling, linearization and calibration
Memory: Nonvolatile memory eliminates pots and switches

DIGITAL FILTERING
Filtering: Small and large signal with user selectable time constants from 0 to 16 seconds

<table>
<thead>
<tr>
<th>Modbus RTU Functions and Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>01 Read Coil Status (Digital Inputs)</td>
</tr>
<tr>
<td>04 Read Input Register (Analog Inputs)</td>
</tr>
<tr>
<td>05 Force Single Coil (One Digital Output)</td>
</tr>
<tr>
<td>06 Preset Single Register (RTU Protocol)</td>
</tr>
<tr>
<td>15 Force Multiple Coils (Multiple Digital Output)</td>
</tr>
</tbody>
</table>

SETUP
DIN-100 modules are initiated at the factory using the ASCII protocol. This allows setup and configuration, including the Modbus device address, to be easily performed using the utility setup software or a dumb terminal. Each DIN-100 module must be properly configured before installation into a Modbus system.
COMMUNICATIONS
Protocol: Communications in ASCII or MODBUS-RTU via RS485 ports
Baud Rates: Selectable baud rates; 300, 600, 1200, 2400, 4800, 9600, 19200, 38400
Data Format: NRZ asynchronous data format; 1 start bit, 8 data bits, 1 parity bit and 1 stop bit
Parity: Odd, even, none
Address: User selectable channel address
Multi-Drop Modules: Up to 247 multi-drop modules per host serial port

SPECIFICATIONS FOR SPECIFIC MODULES
DIN-100 VOLTAGE INPUTS
Voltage Ranges: +10 mV, +100 mV, +1V, +5V, +10V, +100 Vdc
Resolution: 0.01% of FS (4 digits)
Accuracy: ±0.02% of FS max
Common Mode Rejection: 100 dB at 50/60Hz
Zero Drift: +1 count max (autozero)
Span Tempco: ±50ppm/°C max
Input Burnout Protection: To 250 Vac normal mode
Input Impedance: < +1V input = 100MΩ min; > +5V input = 1MΩ min

DIN-130 THERMOCOUPLE INPUTS
Thermocouple Input: Automatic cold junction compensation and linearization, open thermocouple indication, overrange indication
Thermocouple Types: J, K, T, E, R, S, B, C (factory set)
Ranges: J = -200 to 760°C; B = 0 to 1820°C; K = -150 to 1250°C; S = 0 to 1750°C; T = -200 to 400°C; R = 0 to 1750°C; E = -100 to 1000°C; C = 0 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: 100 dB at 50/60 Hz
Input Impedance: 100 MΩ min
Lead Resistance Effect: <20μV per 350 Ω
Input Burnout Protection: to 250 Vac normal mode

DIN-120 CURRENT INPUTS
Currents: 4 to 20 mAdc
Resolution: 0.04% of FS
Accuracy: 0.04% of FS
Common Mode Rejection: 100 dB at 50/60 Hz
Zero Drift: +1 count max (autozero)
Span Tempco: ±50 ppm/°C max
Voltage Drop: ±0.1V max
Communications: Distance up to 4000 feet (RS485)
Transient Suppression: On RS485 communications lines
Communications Setups: Stored in EEPROM

ENVIRONMENTAL
Operating Temperature Range: -25 to 70°C (-13 to 158°F)
Storage Temperature Range: -25 to 85°C (-13 to 185°F)
Relative Humidity: 0 to 95% noncondensing

MECHANICALS AND DIMENSIONS
Case: ABS case with captive hardware
Connector: Screw terminal barrier plug (supplied)

DIN-140 RTD INPUTS
RTD Input: Automatic linearization and lead compensation
RTD Types: α = .00385, .00392, 100 Ω at 0°C; .00388, 100 Ω at 25°C
Ranges: 0.00385 = -200 to 850°C; 0.00392 = -200 to 600°C; 0.00388 = -100 to 125°C
Resolution: 0.1°C
Accuracy: +0.3°C
Common Mode Rejection: 100 dB at 50/60 Hz
Input Connections: 2, 3, or 4 wire
Excitation Current: 0.25 mA
Lead Resistance Effect: 3 wire = 2.5°C per Ω of imbalance; 4 wire = negligible
Max Lead Resistance: 50 Ω
Input Burnout Protection: To 120 Vac normal mode

DIN-145 THERMISTOR INPUTS
Thermistor Types: 2252 Ω at 25°C
Range: 0 to 100°C (32 to 212°F)
Resolution: 0.01°C or F
Accuracy: +0.1°C
Common Mode Rejection: 100 dB at 50/60 Hz
Input Burnout Protection: To 30 Vdc normal mode

DIN-150 BRIDGE INPUTS
Voltage Ranges: +30 mV, +100 mV
Resolution: 10 μV (mV spans); 0.02% of FS (V span)
Accuracy: +0.05% of FS max
Common Mode Rejection: 100 dB at 50/60 Hz
Input Burnout Protection: To 30 Vdc
Offset Control: Full input range
Excitation Voltage: 5V, 10 Vdc, 50 mA max
Zero Drift: +1μV/°C max
Span Tempco: +50 ppm/°C max

DIN-160 FREQUENCY INPUTS
Range: 1 Hz to 20 KHz
Resolution: 0.005% of reading + 0.01 Hz
Accuracy: +0.01% of reading +0.01 Hz
Tempco: +20 ppm/°C
Input Impedance: 1MΩ
Switching Level: Selectable 0V, +2.5V
Hysteresis: Adjustable, 10 mV-1.0V
Input Burnout Protection: 250 Vac

DIN-170 DIGITAL
INPUTS/OUTPUTS
Digital I/O: 6 digital inputs or 6 digital outputs; inputs/outputs are read/set in parallel
Isolation: isolated from power supply ground
Input Voltage Levels: +30V without damage
Input Switching Levels: High, 3.5V min: low, 1.0V max
Outputs: Open collector to 30V, 100 mA max load
Vsat: 1.0V max @ 100 mA

DIN-190 RS232/485 CONVERTER/REPEATER
Baud Rates: 300-115200 (dip-switch selectable)
Termination and Biasing
Resistors: included (selectable via internal jumpers)
Isolation: 500Vrms

To Order

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage Input</td>
<td></td>
</tr>
<tr>
<td>DIN-110</td>
<td>10 mV input/RS485 output</td>
</tr>
<tr>
<td>DIN-111</td>
<td>100 mV input/RS485 output</td>
</tr>
<tr>
<td>DIN-112</td>
<td>1V input/RS485 output</td>
</tr>
<tr>
<td>DIN-113</td>
<td>5V input/RS485 output</td>
</tr>
<tr>
<td>DIN-114</td>
<td>10V input/RS485 output</td>
</tr>
<tr>
<td>DIN-115</td>
<td>100V input/RS485 output</td>
</tr>
<tr>
<td>Current Inputs</td>
<td></td>
</tr>
<tr>
<td>DIN-125</td>
<td>4 to 20 mA input/RS485 output</td>
</tr>
<tr>
<td>Thermocouple Inputs</td>
<td></td>
</tr>
<tr>
<td>DIN-131</td>
<td>J thermocouple input/RS485 output</td>
</tr>
<tr>
<td>DIN-132</td>
<td>K thermocouple input/RS485 output</td>
</tr>
<tr>
<td>DIN-133</td>
<td>T thermocouple input/RS485 output</td>
</tr>
<tr>
<td>DIN-134</td>
<td>E thermocouple input/RS485 output</td>
</tr>
<tr>
<td>DIN-135</td>
<td>R thermocouple input/RS485 output</td>
</tr>
<tr>
<td>DIN-136</td>
<td>S thermocouple input/RS485 output</td>
</tr>
<tr>
<td>DIN-137</td>
<td>B thermocouple input/RS485 output</td>
</tr>
<tr>
<td>DIN-138</td>
<td>C thermocouple input/RS485 output</td>
</tr>
<tr>
<td>RTD/Thermistor Inputs</td>
<td></td>
</tr>
<tr>
<td>DIN-141</td>
<td>0.00385 RTD input/RS485 output</td>
</tr>
<tr>
<td>DIN-142</td>
<td>0.00392 RTD input/RS485 output</td>
</tr>
<tr>
<td>DIN-143</td>
<td>0.00388 RTD input/RS485 output</td>
</tr>
<tr>
<td>DIN-145</td>
<td>2252 Ω thermistor input/RS485 output</td>
</tr>
<tr>
<td>Bridge Inputs</td>
<td></td>
</tr>
<tr>
<td>DIN-151</td>
<td>30 mV bridge input, 5V excitation/RS485 output</td>
</tr>
<tr>
<td>DIN-152</td>
<td>30 mV bridge input,10V excitation/RS485 output</td>
</tr>
<tr>
<td>DIN-153</td>
<td>100 mV bridge input, 5V excitation/RS485 output</td>
</tr>
<tr>
<td>DIN-154</td>
<td>100 mV bridge input, 10V excitation/RS485 output</td>
</tr>
<tr>
<td>Timer and Frequency Inputs</td>
<td></td>
</tr>
<tr>
<td>DIN-161</td>
<td>Frequency input/RS485 output</td>
</tr>
<tr>
<td>Digital Inputs/Outputs</td>
<td></td>
</tr>
<tr>
<td>DIN-171</td>
<td>6 digital inputs/RS485 output</td>
</tr>
<tr>
<td>DIN-172</td>
<td>6 digital outputs/RS485 output</td>
</tr>
<tr>
<td>RS232/485 Converter/Repeater</td>
<td></td>
</tr>
<tr>
<td>DIN-191</td>
<td>RS232/485 converter</td>
</tr>
<tr>
<td>DIN-192</td>
<td>RS485 repeater</td>
</tr>
</tbody>
</table>

Comes complete with operator's manual and utility software on CD.
Ordering Example: DIN-132 type K thermocouple input, RS485 output DIN rail mount digital transmitter and OCW-1 OMEGACARESM 1-year extended warranty (adds 1 year to standard 1-year warranty).
DIN-191 RS232/485 converter and OCW-2 OMEGACARESM 2-year extended warranty (adds 2 years to standard 1-year warranty).