Rugged Precision

The MAQ®20 Industrial Data Acquisition & Control System 2017 Product Catalog

The Company

"Our passion at Dataforth Corporation is designing, manufacturing, and marketing the best possible data acquisition and control, signal conditioning, and data communication products. Our mission is to set new standards of product quality, performance, and customer service." **Dataforth Corporation**, with 30+ years of experience, is the worldwide leader in Instrument Class® Industrial Electronics – rugged, high-performance data acquisition and control, signal conditioning, and data communication products that play a vital role in maintaining the integrity of industrial automation, data acquisition, and quality assurance systems. Our products directly connect to most industrial sensors and protect valuable measurement and control signals and equipment from the dangerous and degrading effects of noise, transient power surges, internal ground loops, and other hazards present in industrial environments.

Global Service and Support

Dataforth spans the globe with more than 50 International Distributors and US Representative Companies. Our customers benefit from a team of over 130 sales people highly trained in the application of precision products for industrial markets. In addition, we have a team of application engineers in our Tucson factory ready to solve any in-depth application questions. Upon receipt of a quote or order, our Customer Service Department provides fast one-day delivery information turnaround. We maintain an ample inventory that allows small quantity orders to be shipped from stock.

Research and Development Team

A professional staff of engineering and marketing personnel identify and develop products to satisfy our customers' most stringent requirements. Dataforth's design department is composed of advanced degree engineers specializing in innovative analog and isolation circuit development, high performance mixed signal design, and software development, ensuring our customers of the highest performance products at the lowest price.

Automated Manufacturing and Test

Automated manufacturing techniques and machines are employed to produce our state-of-the-art SMT designs in optimum time and at minimum cost. All products are tested multiple times in automated test fixtures, and many undergo a 48-hour burn-in at elevated temperatures.

Quality Control

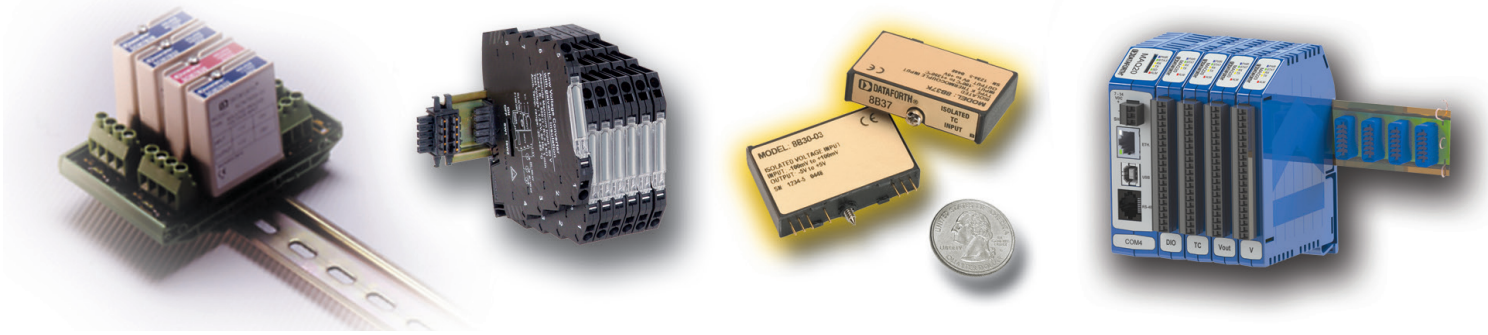
Dataforth operates under an ISO9001:2008 quality management system. Since our products are used in critical industrial data acquisition, control, and test and measurement applications, we strive to produce the highest quality, premier performance products available on the market. Zero defects and complete customer satisfaction are our goals. To further strengthen our commitment to quality, Dataforth secures certifications such as UL, CSA, ATEX, and CE.

www.dataforth.com

Utilizing the latest web development technology, our website presents visitors with an intuitive, informative layout that quickly leads them to their areas of interest. A parametric search engine efficiently locates products by model number or functional description, while an e-commerce section provides pricing information and order entry. Fully detailed product data sheets and application notes are available for download in PDF format. Visitors also can request literature, view new product release data, read our bi-monthly newsletters, get answers to technical questions, and quickly locate Distributors and Sales Representatives.

The Future

We fully understand that our ongoing success depends on satisfying our customers' requirements. Building upon our position as marketplace leader, Dataforth continues to seek out the most cost-effective emerging technologies in design and manufacturing in order to provide the highest performance quality products at the lowest price. Our expansion into a second building adds thousands of square feet to our manufacturing and test facilities and provides the flexibility and space for continued process-oriented growth. By intelligently observing and responding to constantly changing market forces, we ensure the continuation of our critical customer partnerships.



The Dataforth System Builder

Dataforth's System Builder is an innovative, interactive online feature that allows you to create your own system, module by module. Based on your stated requirements and parameters, suggestions are automatically given on which products to choose to build the most effective system. Pricing information is continuously updated, thereby enabling you to obtain the best system for your needs at the most cost-effective price.

Visit Dataforth's Full-Service Website: www.dataforth.com

Dataforth's full-service website is an easy-to-use, comprehensive source for sales, product, and applications information. The site includes:

- Fast, accurate parametric search capabilities for all Dataforth industrial signal conditioning, data acquisition, and data communication products
- Online product quote and purchase
- Online product data sheets, application notes, and user manuals
- Direct applications assistance, sales, and customer service help lines readily available
- Latest news on company operations and new products
- Comprehensive signal conditioning, data acquisition, and control tutorial
- Worldwide corporate and sales contact information
- Literature ordering center

Online Help

Online Ordering

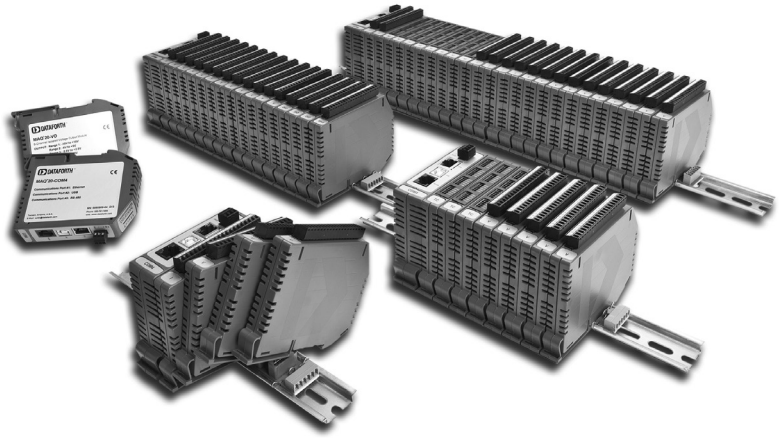
Data Sheets

Application Notes

Product Information

MAQ®20

Industrial Data Acquisition & Control System



Features

- Industry's Lowest Cost per Channel
- ±0.035% Accuracy (Typical)
- 1500Vrms Channel-to-Bus Isolation
- Up to 240Vrms Continuous Field I/O Protection
- ANSI/IEEE C37.90.1 Transient Protection
- Direct Connection to Internet Option
- Graphical Control Software
  - ReDAQ® Shape for MAQ20 Software
  - IPEmotion Software
- Advanced Features Including Integral PID Control, Alarms, Counters, Timers, PWMs, and more
  - Up to 32 PID Loops with ReDAQ Shape Sofware
  - Formulas, Data Logger, TEDS, PID, Scripting with IPEmotion Software
- Wide Range 7-34VDC Input Power
- –40°C to +85°C Industrial Operating Temperature
- Heavy Industrial CE Compliant
- UL/CUL Listing Pending (Class I, Division 2, Groups A, B, C, D)
- ATEX Compliance Pending
- Manufactured per RoHS II Directive 2011/65/EU

Description

The MAQ20 Industrial Data Acquisition and Control System encompasses more than 30 years of design excellence and quality in the industrial test and measurement and process control industry. This powerful, high performance, highly flexible system offers the industry's lowest cost per channel, integral PID loop control, and ±0.035% system accuracy (module dependent). It is ideal for test and measurement, factory and process automation, machine automation, military and aerospace, power and energy, environmental monitoring, and oil and gas applications. The MAQ20 family consists of DIN rail mounted, programmable, multi-channel, industrially rugged signal conditioning input and output modules and communications modules (Figure 1). Each I/O module has a 1500Vrms isolation barrier between field-side and system-side wiring, and many models offer per-channel isolation. All field wiring terminals are heavily protected against overload, accidental connection of incorrect signals, and ESD. Modules mount on the industry standard 35x7.5mm gull-wing DIN rail. A backbone mounts within the rail providing power and communication interconnections between the communications modules and each I/O module.

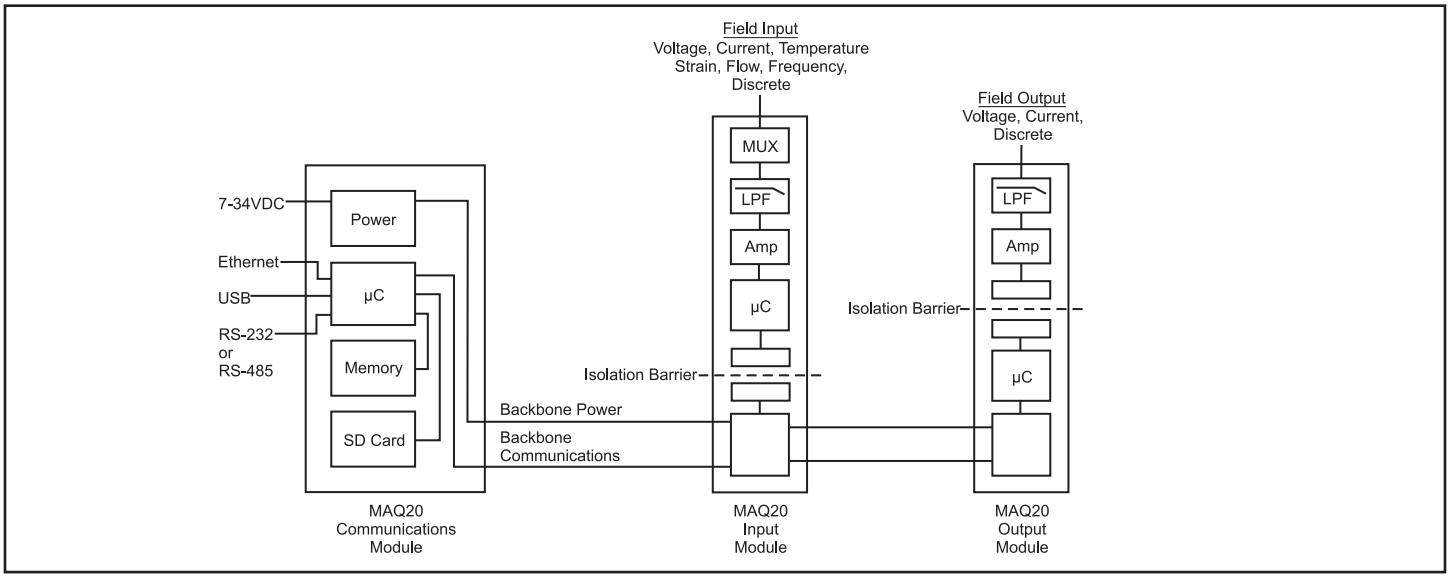


Figure 1: MAQ20 System Block Diagram

The Modules: Compact, Flexible, and Powerful

One MAQ20 communications module can interface to up to 24 I/O modules to construct a system with a maximum of 384 channels that fits within a standard 19" instrumentation rack. Processors within each module make this distributed system extremely powerful.

• **Communications Modules:** Ethernet, RS-232, RS-485, and USB with host application software interfacing to the system using Modbus TCP or Modbus RTU protocol.

• **Analog Input Modules:** Interface to a wide range of standard industrial sensors and equipment and offer up to 16 channels of input, each of which can be independently configured; signal ranges are user selectable and offered in differential and per-channel isolated single-ended configurations.

- **Process Voltage and Process Current Input Modules** offer 8-channel differential input or 16-channel single-ended input for precise measurement of voltage and current signals; all channels are individually configurable for range, alarm limits, and averaging.

- **Thermocouple Input Modules** offer 8 differential input channels, all of which are individually configurable for range, alarm limits, and averaging. Separate models are offered for interfacing to Type J, Type K, Type T and Types R and S sensors.

- **RTD and Potentiometer Input Modules** interface to 2-wire, 3-wire, and 4-wire sensors including five RTD types and potentiometers. Modules offer five or six channels, each configurable for sensor, range, alarm limits, and averaging.

- **Strain Gage Input Module** connects to full, half, and quarter bridge sensors and offers four channels; each channel is configurable for range, alarm limits, averaging, bandwidth, excitation, and gain. Additional features are autozero, shunt cal, and 6-wire connection.

- **Frequency Input Module** accepts zero-crossing and TTL signals with frequencies from 1Hz to 1MHz plus State Change and provides a DC stimulus for contact sensors. This module has eight channels, each configurable for range and alarm limits.

- **Isolated Process Voltage and Process Current Input Modules**◈ offer 8 isolated input channels with multiple ranges and high resolution conversion for precise measurement of voltage and current signals; channels are individually configurable for range, alarm limits, averaging, and high-speed burst scan.

Figure 2: Communications Module with I/O Modules

• **Analog Output Modules: Process Voltage and Process Current Output Modules** drive valves, perform other crucial process operations, and provide up to eight channels of output which can be independently configured.

• **Discrete Input/Output Modules:** Provide multiple channels of isolated AC/DC input and AC/DC output per module and offer advanced special functions as well as alarm capability. Twenty-channel input and 20-channel output models offer low per-channel cost.

- **High Density Input Modules with or without Compliance Voltage** offer 20 input channels that interface to 10-32VDC signals. One model has a 24VDC compliance voltage source on each channel for interfacing to relay contacts, solid state switches, or other devices requiring excitation.

- **High Density Isolated Output Module** provides 20 output channels that can switch up to 60VDC signals and sink up to 3A of current. Channels can be switched individually or in blocks and have user configurable default output states.

- **Discrete Relay Output Module**◈ provides 20 isolated SPST latching relay output channels with contact state readback that can switch between 2A at 30V and 0.4A at 150V. Relays can be controlled individually or in blocks and have user configurable default states.

The **System Backbone** resides within the DIN rail used for module mounting and provides power to and interface between the communications module and the I/O modules. Modules mount on industry standard 35x7.5mm gull-wing DIN rails.

◈Preliminary at date of printing. Contact factory for availability.

Figure 3: IPEmotion Screen Shots

Outstanding Functionality

The MAQ20 system can operate remotely without host PC intervention. It also can operate as a standalone data logger. Additional features include:

- Up to 4GB of logged data can be transferred via FTP during real-time acquisition
- System firmware automatically registers installation and removal of I/O modules
- Load share power supply modules enable system expansion, standby and redundant power
- Hot swappable I/O modules with field-side pluggable terminal blocks on most models
- Sophisticated packaging allows high density mounting in 3U increments
- I/O modules can be mounted remotely from the communications module

Output modules are programmable for user-defined waveforms. Discrete I/O modules offer seven high level functions including pulse/frequency counter, pulse/frequency counter with de-bounce, waveform measurement, time between events, frequency generator, PWM generator, and one-shot pulse generator.

System power is connected to the communications module, which in turn powers the I/O modules. For systems with power supply requirements greater than those the communications module provides, the MAQ20-PWR3 load share power supply module can provide additional power. When a MAQ20 I/O module is inserted into a system, module registration occurs automatically, data acquisition starts, and data is stored locally in the module. The system is based on a Modbus compatible memory map, which ensures easy access to acquired data, configuration settings, and alarm limits. Information is stored in consistent locations from module to module for ease of use and system design.

Software Options

The options for intuitive graphical control software include:

- ReDAQ® Shape Graphical HMI Design & Runtime Solution
- IPEmotion Advanced Control & Mathematical Functions Solution

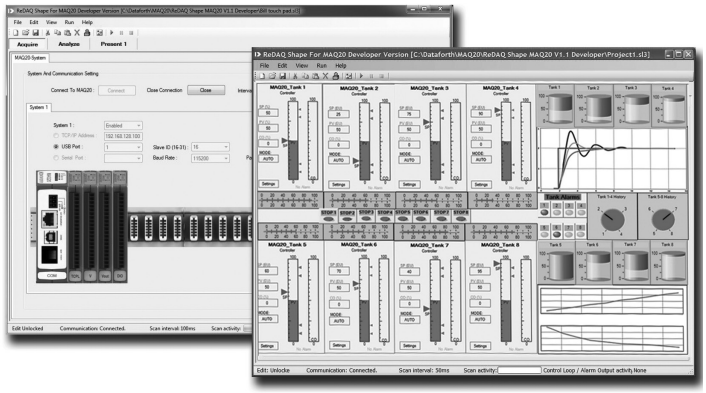


Figure 4: ReDAQ Shape for MAQ20 Screen Shots

The MAQ20 system comes with free configuration software; programming examples and LabVIEW VIs are also available.

Leading-Edge PID Loop Control

The MAQ20 provides PID loop control with both software packages that support the system: ReDAQ Shape for MAQ20 and IPEmotion. With ReDAQ Shape, the powerful Dataforth MAQ20 communications module is capable of autonomously running up to 32 PID control loops; faceplates within the software enable an engineer or operator to configure the many features of loop control and monitor processes. With IPEmotion software, PID loop control is extensive and highly functional. Additional advanced features include formulas, data logging, TEDS, and scripting. Typical PID applications include steam, water, and chemical flow control; tank level control; heat-exchanger / reactor temperature control, and pressure control.

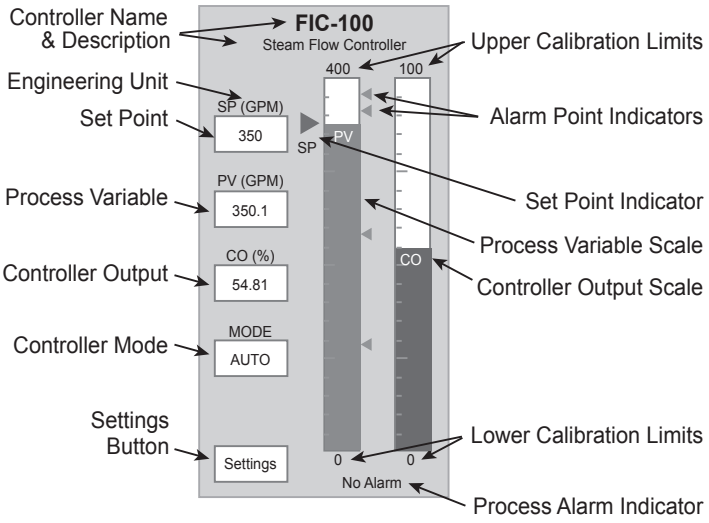


Figure 5: PID Faceplate in ReDAQ Shape Software

Like all Dataforth products, the MAQ20 system provides exceptional isolation, protection, accuracy, and reliability. All MAQ20 modules are designed for installation in Class I, Division 2 hazardous locations and have a high level of immunity to environmental noise commonly found in heavy industrial environments.

MAQ®20 Data Acquisition System Selection Guide

COMMUNICATIONS MODULES Page 6

MODEL	DESCRIPTION
MAQ20-COM2	Communications Module; Ethernet, USB, RS-232
MAQ20-COM4	Communications Module, Ethernet; USB, RS-485

VOLTAGE & CURRENT ANALOG INPUT MODULES Page 8

MODEL	DESCRIPTION
MAQ20-MVDN	Analog Input Module; mV, 8-ch, Differential
MAQ20-VSN	Analog Input Module; V, 16-ch, Single Ended
MAQ20-VDN	Analog Input Module; V, 8-ch, Differential
MAQ20-ISN	Analog Input Module; mA, 16-ch, Single Ended
MAQ20-IDN	Analog Input Module; mA, 8-ch, Differentia

ISOLATED VOLTAGE & CURRENT ANALOG INPUT MODULES Page 10

MODEL	DESCRIPTION
MAQ20-ISOMV1◈	Analog Input Module; mV, 8-ch, Isolated ch-ch
MAQ20-ISOV1◈	Analog Input Module; V, 8-ch, Isolated ch-ch
MAQ20-ISOI1◈	Analog Input Module; mA, 8-ch, Isolated ch-ch

THERMOCOUPLE ANALOG INPUT MODULES Page 12

MODEL	DESCRIPTION
MAQ20-JTC	Analog Input Module; Type J Thermocouple, 8-ch
MAQ20-KTC	Analog Input Module; Type K Thermocouple, 8-ch
MAQ20-TTC	Analog Input Module; Type T Thermocouple, 8-ch
MAQ20-RSTC	Analog Input Module; Type R and Type S Thermocouple, 8-ch

RTD and POTENTIOMETER ANALOG INPUT MODULES Page 14

MODEL	DESCRIPTION
MAQ20-RTD31	Analog Input Module; RTD/Potentiometer, 3-wire, Type Pt and Ni, 6-ch
MAQ20-RTD41	Analog Input Module; RTD, 4-wire, Type Pt and Ni, 5-ch

STRAIN GAGE ANALOG INPUT MODULE Page 16

MODEL	DESCRIPTION
MAQ20-BRDG1	Analog Input Module; Bridge/Strain Gage, 4-ch

FREQUENCY ANALOG INPUT MODULE Page 18

MODEL	DESCRIPTION
MAQ20-FREQ	Analog Input Module; Frequency, 8-ch

VOLTAGE & CURRENT ANALOG OUTPUT MODULES Page 20

MODEL	DESCRIPTION
MAQ20-VO	Analog Output Module; Voltage, 8-ch
MAQ20-IO	Analog Output Module; Current mA, 8-ch

DISCRETE INPUT / OUTPUT MODULES Page 22

MODEL	DESCRIPTION
MAQ20-DIOL	Discrete Input/Output Module; 3 to 60VDC In, 3 to 60VDC Out, 5-ch In, 5-ch Out
MAQ20-DIOH	Discrete Input/Output Module; 90 to 280VAC/VDC In, 24 to 280VAC Out, 4-ch In, 4-ch Out

DISCRETE HIGH DENSITY INPUT MODULES WITH OR WITHOUT COMPLIANCE VOLTAGE Page 24

MODEL	DESCRIPTION
MAQ20-DIV20	Discrete Input Module; 10 to 32VDC In, 20-ch
MAQ20-DIVC20	Discrete Input Module; 10 to 24VDC In, 24VDC Compliance, 20-ch

◈Preliminary at date of printing. Contact factory for availability.

DISCRETE HIGH DENSITY OUTPUT MODULE Page 26

MODEL	DESCRIPTION
MAQ20-DODC20SK	Discrete Output Module; 10 to 60VDC Out, 20-ch

DISCRETE RELAY OUTPUT MODULE Page 28

MODEL	DESCRIPTION
MAQ20-DORLY20◈	Relay Output Module; 2A at 30V, 0.4A at 150V, 20-ch SPST

SYSTEM BACKBONES Page 30

MODEL	DESCRIPTION
MAQ20-BKPL4	DIN Rail Backbone; 1 COM Module plus 4 I/O Modules
MAQ20-BKPL8	DIN Rail Backbone; 1 COM Module plus 8 I/O Modules
MAQ20-BKPL16	DIN Rail Backbone; 1 COM Module plus 16 I/O Modules
MAQ20-BKPL24	DIN Rail Backbone; 1 COM Module plus 24 I/O Modules

SOFTWARE Pages 32 and 34

MODEL	DESCRIPTION
MAQ20-940	ReDAQ Shape Software for MAQ20 – Developer Version
MAQ20-941	ReDAQ Shape Software for MAQ20 – User Version
MAQ20-945	MAQ20 Configuration Software Tool
MAQ20-951	IPEmotion Software for MAQ20 (1 COM module and 1 to 4 I/O modules)
MAQ20-952	IPEmotion Software for MAQ20 (Each additional 4 I/O modules)

POWER SUPPLIES Page 232 in 2017 Full-Line Catalog

PWR-PS5R7W	Power Supply, 24V, 0.3A, 100-240VAC Input
PWR-PS5R15W	Power Supply, 24V, 0.65A, 100-240VAC Input
PWR-PS5R30W	Power Supply, 24V, 1.3A, 100-240VAC Input
PWR-PS5R60W	Power Supply, 24V, 2.5A, 100-240VAC Input
PWR-PS5R120W	Power Supply, 24V, 5.0A, 100-240VAC Input

NOTE: MAQ20 and DSCA use same power supplies.

ACCESSORIES Page 36

Backbone Expansion Cables

MODEL	DESCRIPTION
MAQ20-XCA01	Backbone Expansion Cable; 1 meter
MAQ20-XCA02	Backbone Expansion Cable; 2 meter

Load Share Power Supply Module

MODEL	DESCRIPTION
MAQ20-PWR3	Load Share Power Supply Module

Cables to Interface 8B Backpanels to MAQ20-VSN Module

MODEL	DESCRIPTION
MAQ20-8B25-0.3	DB25-to-20 pos screw term Transition Cable, 0.3m long
MAQ20-8B25-0.6	DB25-to-20 pos screw term Transition Cable, 0.6m long
MAQ20-8B25-0	DB25-to-20 pos screw term Transition Cable, 1.0m long

USB and Ethernet Cables and Adapters

MODEL	DESCRIPTION
SLX147-01, -02, -05	USB Cable, Type A to Type B; 1m, 2m, 5m
SLX141-01, -02, -07	Ethernet Cable, 1m, 2m, 7m
SLX141-X01, -X02, -X07	Ethernet Crossover Cable, 1m, 2m, 7m
SLX146-02, -07	Null Modem Serial Cable, Female DB-9 to Female DB-9; 2m, 7m
SLX142, 143	RJ45 to DB9 Adapters
SLX144	RJ45 RS-485 Multidrop Adapter

MAQ20 Demonstration Suitcase

MODEL	DESCRIPTION
MAQ20DEMO-B	MAQ20 Demonstration Suitcase with Process Simulator for Sales Channels

Communications Modules

Provide Connection, Power, Interface

Description

The MAQ20 communications module is offered in two models and provides the connection between a host computer and a MAQ20 Data Acquisition System. MAQ20-COM4 communicates using Ethernet, USB, or RS-485; MAQ20-COM2 uses Ethernet, USB, or RS-232. Ethernet communications use the Modbus TCP protocol and USB communications are based on the Modbus RTU protocol, which RS-485 and RS-232 communications also use. Serial communications over RS-485 can be either 2-wire or 4-wire.

When using the Ethernet interface, up to four simultaneous socket connections are supported. Serial communications over RS-232 or RS-485 can be run at baud rates as fast as 921.6kbps.

A very useful feature of the MAQ20 system is the capability to store acquired data locally for later analysis. This is provided by the easily accessible and removable 4GB micro-SD memory card that is in the MAQ20-COMx module and can be used to log data acquired from all input modules.

Each MAQ20-COMx module can interface to up to 24 I/O modules in any combination, allowing high channel counts and great flexibility in system configuration.

To power the system, a 7-34VDC power source is connected to the communications module. Regulated and protected supplies within the module then provide power both to the internal circuits and to all I/O modules in the system. When many high power I/O modules are used in a system, MAQ20-PWR3 load share power supply modules can be installed in standard I/O module slots to provide the necessary additional power.

Features

- Connect Host Computer and MAQ20 System
- Communicate using Ethernet, USB, RS-485, RS-232
- Up to 4 Simultaneous Socket Connections with Ethernet
- Baud Rates to 921.6kbps with RS-232/RS-485
- Follow Modbus TCP or RTU Protocols
- Store Acquired Data Locally
- Interface to up to 24 I/O Modules
- 50VDC Communications Interface-to-Bus Isolation

To ensure robustness, the communications interface-to-bus isolation is 50VDC and power input terminals are protected against overvoltage, transient, and reverse connections.

As a minimum, a MAQ20 Data Acquisition System must have a communications module, a backbone, and one I/O module.

All MAQ20 modules are designed for installation in Class I, Division 2 hazardous locations and have a high level of immunity to environmental noise commonly present in heavy industrial environments.

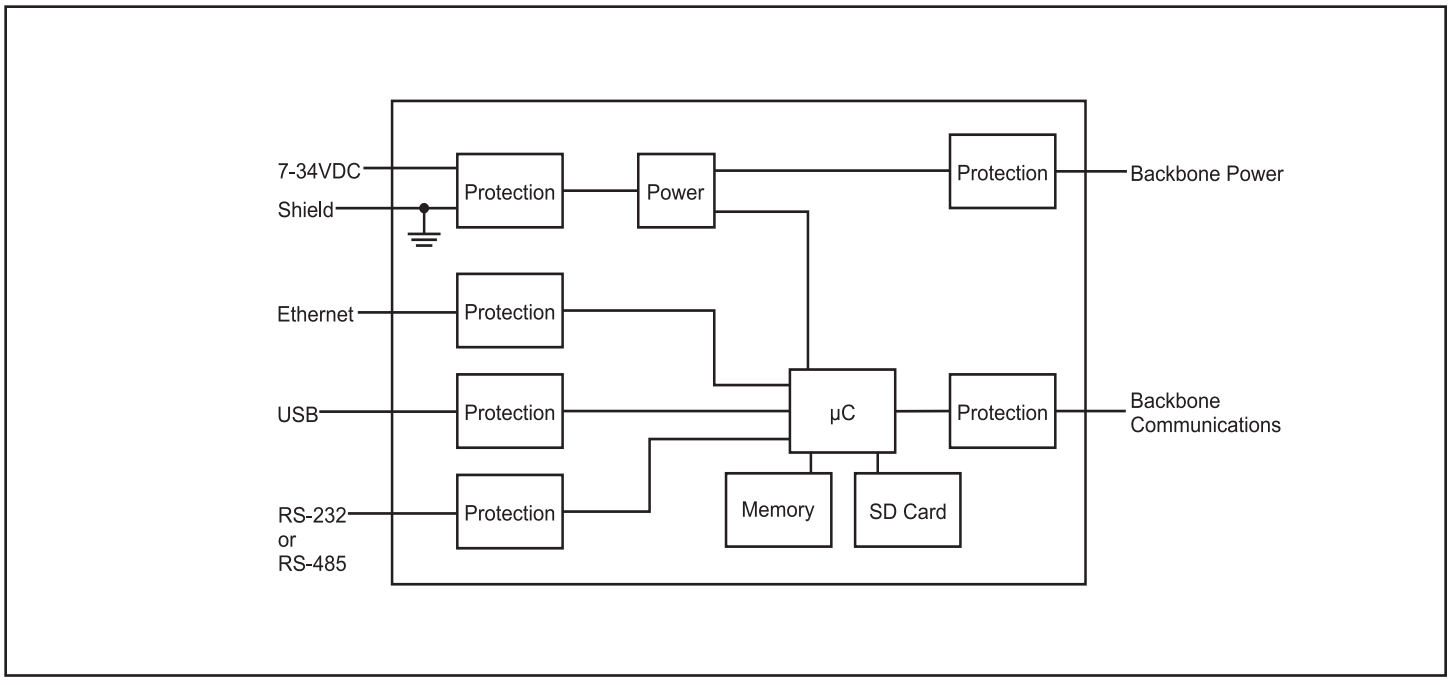


Figure 1: MAQ20 Communications Module Block Diagram

Specifications

Module	Description
MAQ20-COM4 MAQ20-COM2	Ethernet, USB, RS-485 Ethernet, USB, RS-232
Communications Ethernet USB RS-485 RS-232	 10/100 Base-T (1000 Base-T compatible) RJ-45, Modbus TCP USB 2.0, Type B, Proprietary Modbus over USB 2-wire or 4-wire, up to 921.6kbps, up to 4000 ft, RJ-45, Modbus RTU Up to 921.6kbps, RJ-45, Modbus RTU
CMV Power-to-Bus Communication Port-to-Bus Transient	 50VDC 50VDC ANSI/IEEE C37.90.1
Power Supply Input Power Power to Bus Power Conversion Efficiency Quiescent Current	 7-34VDC at 2A max 5VDC at 3A max 76% 100mA
Dimensions (h)(w)(d)	4.51" x 1.11" x 3.26" (114.6mm x 28.2mm x 82.8mm)
Environmental Operating Temperature Storage Temperature Relative Humidity Emissions, EN61000-6-4 Radiated, Conducted Immunity EN61000-6-2 RF ESD, EFT	 –40°C to +85°C –40°C to +85°C 0 to 95% Noncondensing ISM Group 1 Class A ISM Group 1 Performance A Performance B
Certifications	Heavy Industrial CE Compliant UL/CUL Listing Pending (Class I, Division 2, Groups A, B, C, D) ATEX Compliance Pending

Power Input Terminal Block Position (top to bottom)	Input Connections	
1	7 – 34 VDC	+
2	7 – 34 VDC	-
3		SHIELD

For full details on module operation, refer to MA1040 – MAQ20 Communications Module Hardware User Manual, available for download at: www.dataforth.com/maq20_download.aspx

Ordering Information

Model	Description
MAQ20-COM4 MAQ20-COM2	Ethernet, USB, RS-485 Ethernet, USB, RS-232

Figure 2: Communications Module

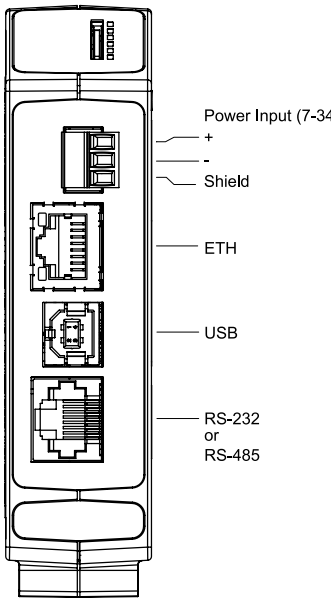


Figure 3: Communications Module Input Connections

Analog Input Modules: Process Voltage & Process Current

Interface to Volt, Millivolt, and Milliamp Sensors & Equipment

Description

MAQ20 voltage and current analog input modules interface to a wide range of volt, millivolt, and milliamp sensors and equipment used in industrial and test and measurement applications. They offer 8-channel differential input or 16-channel single-ended input for precise measurement of voltage and current signals. All channels are individually configurable for range, alarm limits, and averaging to match the most demanding applications. High, Low, High-High and Low-Low alarms provide essential monitoring and warning functions to ensure optimum process flow and fail-safe operation. Hardware low-pass filtering in each channel provides rejection of 50 and 60Hz line frequencies. Field I/O connections are made through a pluggable terminal block with four positions provided for the termination of wiring shields.

Input-to-bus isolation is a robust 1500Vrms and each individual channel is protected up to 240Vrms continuous overload in case of inadvertent wiring errors. Overloaded channels do not adversely affect other channels in the module, thereby preserving data integrity.

Channels in a module can be selectively enabled for scanning. All channels are enabled by default; however, non-used channels can be disabled to increase the sampling rate of enabled channels.

Input ranges are selectable on a per-channel basis. The MAQ20-MVDN, -VDN, and -VSN modules have five user selectable input ranges; the MAQ20-IDN and -ISN modules have two. Over-range and under-range up to 2% beyond the specified input values is allowed, and accuracy is guaranteed to ±f.s.

Features

- Interface to Volt, Millivolt, Milliamp Sensors and Equipment
- 8-Channel Differential or 16-Channel Single-Ended Input
- All Channels Individually Configurable for Range, Alarms, Averaging
- 1500Vrms Input-to-Bus Isolation
- Each Channel Protected up to 240Vrms Continuous Overload
- Selective Enabling of Module Channels for Scanning

Cables to interface 8B backpanels to the MAQ20-VSN module are available; the 8B modules and backpanel assembly provide 1500Vrms channel-to-channel isolation.

All MAQ20 modules are designed for installation in Class I, Division 2 hazardous locations and have a high level of immunity to environmental noise commonly present in heavy industrial environments.

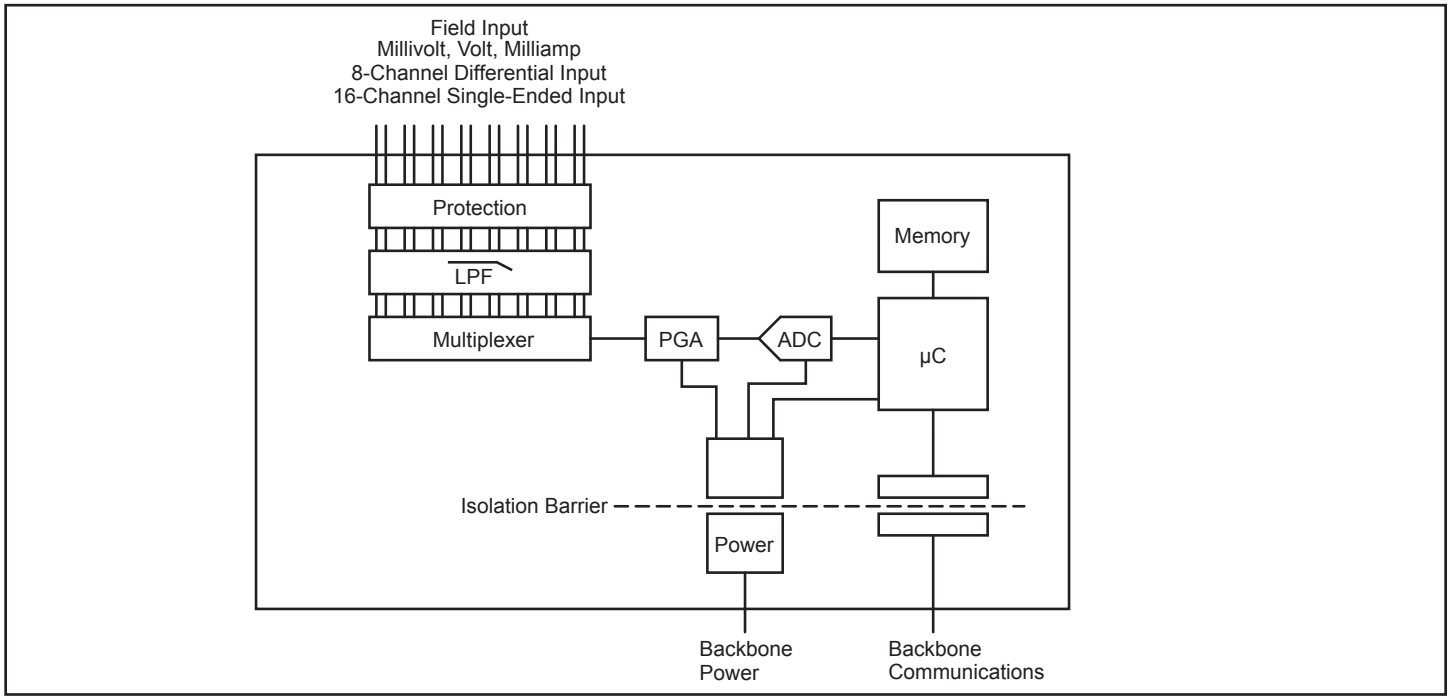


Figure 1: MAQ20 Voltage & Current Input Module Block Diagram

Specifications

Typical* at T_A =+25°C and +24VDC system power

Module	Description
MAQ20-MVDN	8-channel, milliVolt, Differential Input ±50mV, ±100mV, ±250mV, ±1.0V, ±2.0V (Default ±1.0V)
MAQ20-VDN	8-channel, Volt, Differential Input ±5V, ±10V, ±20V, ±40V, ±60V (Default ±5V)
MAQ20-VSN	16-channel, Volt, Single-Ended Input ±5V, ±10V, ±20V, ±40V, ±60V (Default ±5V)
MAQ20-IDN	8-channel, milliAmp, Differential Input 0-20mA, 4-20mA (Default 0-20mA)
MAQ20-ISN	16-channel, milliAmp, Single-Ended Input 0-20mA, 4-20mA (Default 0-20mA)
Per Channel Setup	Individually configurable for range, alarms, averaging
Input Protection	
Continuous	240Vrms max
Transient	ANSI/IEEE C37.90.1
CMV	
Channel-to-Bus	1500Vrms, 1 min
Channel-to-Channel	±28V peak (-VDN), ±3V peak (-MVDN, -IDN), 0V (-VSN, -ISN)
Transient	ANSI/IEEE C37.90.1
CMR	100dB at 50/60Hz
NMR	30dB at 50/60Hz
Accuracy(1)	±0.035% span
Linearity / Conformity	±0.02% span
Resolution	0.012% span
Stability	
Zero	±15ppm/°C
Span	±35ppm/°C
Bandwidth, –3dB	3Hz
Scan Rate	200 Ch/s
Alarms	High / High-High / Low / Low-Low
Power Supply Current	30mA
Dimensions (h)(w)(d)	4.51” x 0.60” x 3.26” (114.6mm x 15.3mm x 82.8mm)
Environmental	
Operating Temperature	–40°C to +85°C
Storage Temperature	–40°C to +85°C
Relative Humidity	0 to 95% Noncondensing
Emissions, EN61000-6-4	ISM Group 1
Radiated, Conducted	Class A
Immunity EN61000-6-2	ISM Group 1
RF	Performance A ±0.5% Span Error
ESD, EFT	Performance B
Certifications	Heavy Industrial CE Compliant UL/CUL Listing Pending (Class I, Division 2, Groups A, B, C, D) ATEX Compliance Pending

NOTES:
*Contact factory or your local Dataforth sales office for maximum values.
(1) Includes linearity, hysteresis and repeatability.

For input connections and full details on module operation, refer to MA1041 – MAQ20 mV-V-mA Input Module Hardware User Manual, available for download at: www.dataforth.com/maq20_download.aspx

Ordering Information

Model	Description
MAQ20-MVDN	Analog Input Module; mV, 8-ch, Differential
MAQ20-VSN	Analog Input Module; V, 16-ch, Single Ended
MAQ20-VDN	Analog Input Module; V, 8-ch, Differential
MAQ20-ISN	Analog Input Module; mA, 16-ch, Single Ended
MAQ20-IDN	Analog Input Module; mA, 8-ch, Differential

Cables to Interface 8B Backpanels to MAQ20-VSN Module

Model	Description
MAQ20-8B25-0.3	DB25-to-20 pos screw term Transition Cable, 0.3m long
MAQ20-8B25-0.6	DB25-to-20 pos screw term Transition Cable, 0.6m long
MAQ20-8B25-01	DB25-to-20 pos screw term Transition Cable, 1.0m long

Figure 2: 8B Backpanel Interface Cable

Terminal Block Position (top to bottom)	MAQ20 MVDN, MAQ20-VDN & MAQ20-IDN Input Connections	MAQ20-VSN & MAQ20-ISN Input Connections
1	CH0 +IN	CH0 +IN
2	CH0 -IN	CH1 +IN
3	SHIELD	CH0, CH1, CH2, CH3 -IN, SHIELD
4	CH1 +IN	CH2 +IN
5	CH1 -IN	CH3 +IN
6	CH2 +IN	CH4 +IN
7	CH2 -IN	CH5 +IN
8	SHIELD	CH4, CH5, CH6, CH7 -IN, SHIELD
9	CH3 +IN	CH6 +IN
10	CH3 -IN	CH7 +IN
11	CH4 +IN	CH8 +IN
12	CH4 -IN	CH9 +IN
13	SHIELD	CH8, CH9, CH10, CH11 -IN, SHIELD
14	CH5 +IN	CH10 +IN
15	CH5 -IN	CH11 +IN
16	CH6 +IN	CH12 +IN
17	CH6 -IN	CH13 +IN
18	SHIELD	CH12, CH13, CH14, CH15 -IN, SHIELD
19	CH7 +IN	CH14 +IN
20	CH7 -IN	CH15 +IN

Analog Input Modules: Process Voltage & Process Current◈

Isolated Channel-to-Channel, High Resolution Conversion, Wide Bandwidth

Description

The MAQ20-ISOMV and MAQ20-ISOV voltage input modules and MAQ20-ISOI current input module offer 8 isolated input channels with multiple signal ranges and high resolution conversion for precise measurement of a wide range of analog voltage and current signals. All channels are individually configurable for range, alarm limits, averaging, and high-speed burst scan to match the most demanding applications. High, Low, High-High and Low-Low alarms provide essential monitoring and warning functions to ensure optimum process flow and failsafe applications. Signal bandwidth is 5kHz for voltage input and 1.5kHz for current input. The burst scan mode allows up to 10kS/s per channel to be captured simultaneously. Field I/O connections are made through a pluggable terminal block with four positions provided for the termination of wiring shields.

Input-to-bus isolation is a robust 1500Vrms and each individual channel is protected up to 240Vrms continuous overload in case of inadvertent wiring errors. In addition, the MAQ20-ISOMV, -ISOV, and -ISOI modules have 300Vrms continuous channel-to-channel isolation. Overloaded channels do not adversely affect other channels in the module, thereby preserving data integrity.

Signal ranges for the voltage input modules are from ±100mV to ±10V, and for the current input module, 0 to 20mA.

All MAQ20 modules are designed for installation in Class I, Division 2 hazardous locations and have a high level of immunity to environmental noise commonly present in heavy industrial environments.

Features

- 8 Isolated Input Channels with Multiple Ranges and High Resolution Conversion
- Precise Measurement of Wide Range of Analog Voltage and Current Signals
- Channels Individually Configurable for Range, Alarm Limits, Averaging, and High-speed Burst Scan Mode
- 1500Vrms Input-to-Bus Isolation
- 300Vrms Channel-to-Channel Isolation
- Each Channel Protected up to 240Vrms Continuous Overload
- Overloaded Channels Do Not Adversely Affect Other Channels

◈Preliminary at date of printing. Contact factory for availability.

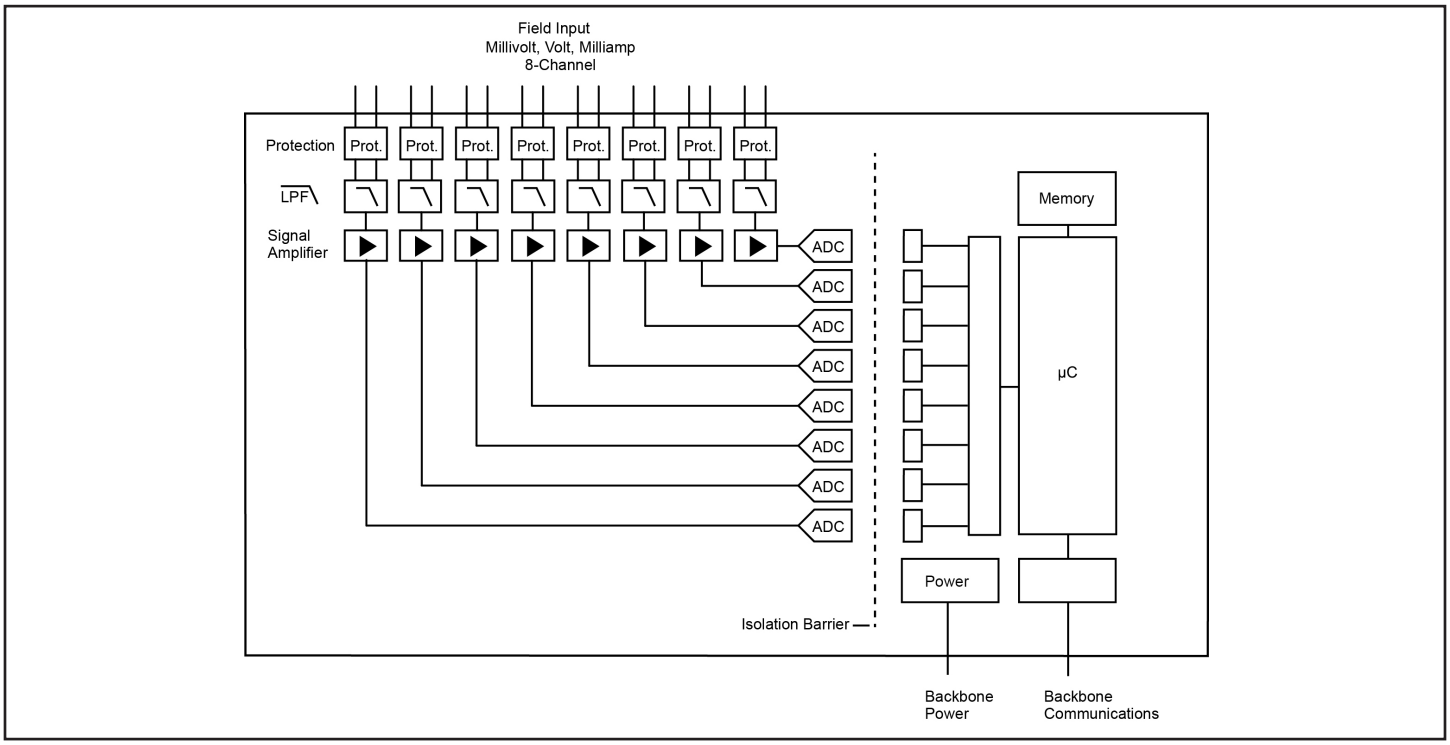


Figure 1: MAQ20-ISOMV/-ISOV/-ISOI Modules Block Diagram

Specifications

Typical* at T_A =+25°C and +24VDC system power

Module	Description
MAQ20-ISOMV1◇ MAQ20-ISOV1◇ MAQ20-ISOV2◇ MAQ20-ISOI1◇	0 to +100mV, ±100mV (default) 0 to +1V, ±1V (default) 0 to +10V, ±10V (default) 0-20mA (default), 4-20mA, ±20mA
Per Channel Setup Input Protection Continuous Transient CMV Channel-to-Bus Channel-to-Channel Transient CMR NMR	Individually configurable for range, alarms, averaging, burst scan 240Vrms max ANSI/IEEE C37.90.1 1500Vrms, 1 min 300Vrms, 425V peak ANSI/IEEE C37.90.1 100dB at 50/60Hz 20dB/decade
Accuracy(1) Linearity / Conformity Resolution Stability Zero Span	±0.035% span ±0.02% span 0.0015% span 15ppm/ºC 35ppm/ºC
Bandwidth Scan Rate Continuous Burst Alarms Open Input Response mV Input Detection Time Power Supply Current	5kHz Voltage Input, 1.5kHz Current Input 500 Ch/s net, 65 Ch/s at 8-Ch Simultaneous 10kS/s per channel High / High-High / Low / Low-Low Upscale <5s 270mA
Dimensions (h)(w)(d)	3.27” x 4.51” x 0.60” (83.1mm x 114.6mm x 15.3mm)
Environmental Operating Temperature Storage Temperature Relative Humidity Emissions, EN61000-6-4 Radiated, Conducted Immunity EN61000-6-2 RF ESD, EFT	 -40°C to +85°C -40°C to +85°C 0 to 95% Noncondensing ISM Group 1 Class A ISM Group 1 Performance A ±0.5% Span Error Performance B
Certifications	Heavy Industrial CE Compliant ATEX Compliance Pending UL/CUL Listing Pending (Class I, Division 2, Groups A, B, C, D)

NOTES:
*Contact factory or your local Dataforth sales office for maximum values.
◇Preliminary at date of printing. Contact factory for availability.
(1) Includes linearity/conformity, hysteresis and repeatability.

Ordering Information

Model	Description
MAQ20-ISOMV1◇	Isolated Analog Voltage Input Module; ±100mV
MAQ20-ISOV1◇	Isolated Analog Voltage Input Module; ±1V
MAQ20-ISOV2◇	Isolated Analog Voltage Input Module; ±10V
MAQ20-ISOI1◇	Isolated Analog Current Input Module; ±20mA

Terminal Block Position (Top to Bottom)	Input Connections
1	CH0 +IN
2	CH0 -IN
3	SHIELD
4	CH1 +IN
5	CH1 -IN
6	CH2 +IN
7	CH2 -IN
8	SHIELD
9	CH3 +IN
10	CH3 -IN
11	CH4 +IN
12	CH4 -IN
13	SHIELD
14	CH5 +IN
15	CH5 -IN
16	CH6 +IN
17	CH6 -IN
18	SHIELD
19	CH7 +IN
20	CH7 -IN

For input connections and full details on module operation, refer to MA1062 – MAQ20 Ch-Ch Isolated mV-V-mA Input Module Hardware User Manual, available for download at: www.dataforth.com/maq20_download.aspx

Analog Input Modules: Thermocouple

Interface to Types J, K, T, R and S Thermocouples

Description

The MAQ20 thermocouple analog input modules have 8 differential input channels. Separate models are offered for interfacing to Type J, Type K, Type T and Types R and S thermocouples. Cold Junction Compensation uses four internal sensors resulting in industry leading measurement accuracy in any system configuration and over the entire system operating temperature range. All channels are individually configurable for range, alarm limits, and averaging to match the most demanding applications. High, Low, High-High and Low-Low alarms provide essential monitoring and warning functions to ensure optimum process flow and fail-safe operation. Hardware low-pass filtering in each channel provides rejection of 50 and 60Hz line frequencies. Field I/O connections are made through spring cage terminal blocks with four positions provided for the termination of wiring shields.

Input-to-bus isolation is a robust 1500Vrms and each individual channel is protected up to 150Vrms continuous overload in case of inadvertent wiring errors. Overloaded channels do not adversely affect other channels in the module, thereby preserving data integrity.

Channels in a module can be selectively enabled for scanning. All channels are enabled by default; however, non-used channels can be disabled to increase the sampling rate of enabled channels.

Input ranges are selectable on a per-channel basis. The MAQ20-JTC, -KTC, -TTC and -RSTC modules have two to four user selectable input ranges, depending on the model. Over-range and under-range up to 2% beyond the specified input values is allowed. Sensor linearization is performed in the module, and accuracy is guaranteed to ±f.s.

Features

- 8 Differential Input Channels
- Interface to Types J, K, T , R and S Thermocouples
- All Channels Individually Configurable for Range, Alarms, Averaging
- 1500Vrms Input-to-Bus Isolation
- Each Channel Protected up to 150Vrms Continuous Overload
- Selective Enabling of Module Channels for Scanning

All MAQ20 modules are designed for installation in Class I, Division 2 hazardous locations and have a high level of immunity to environmental noise commonly present in heavy industrial environments.

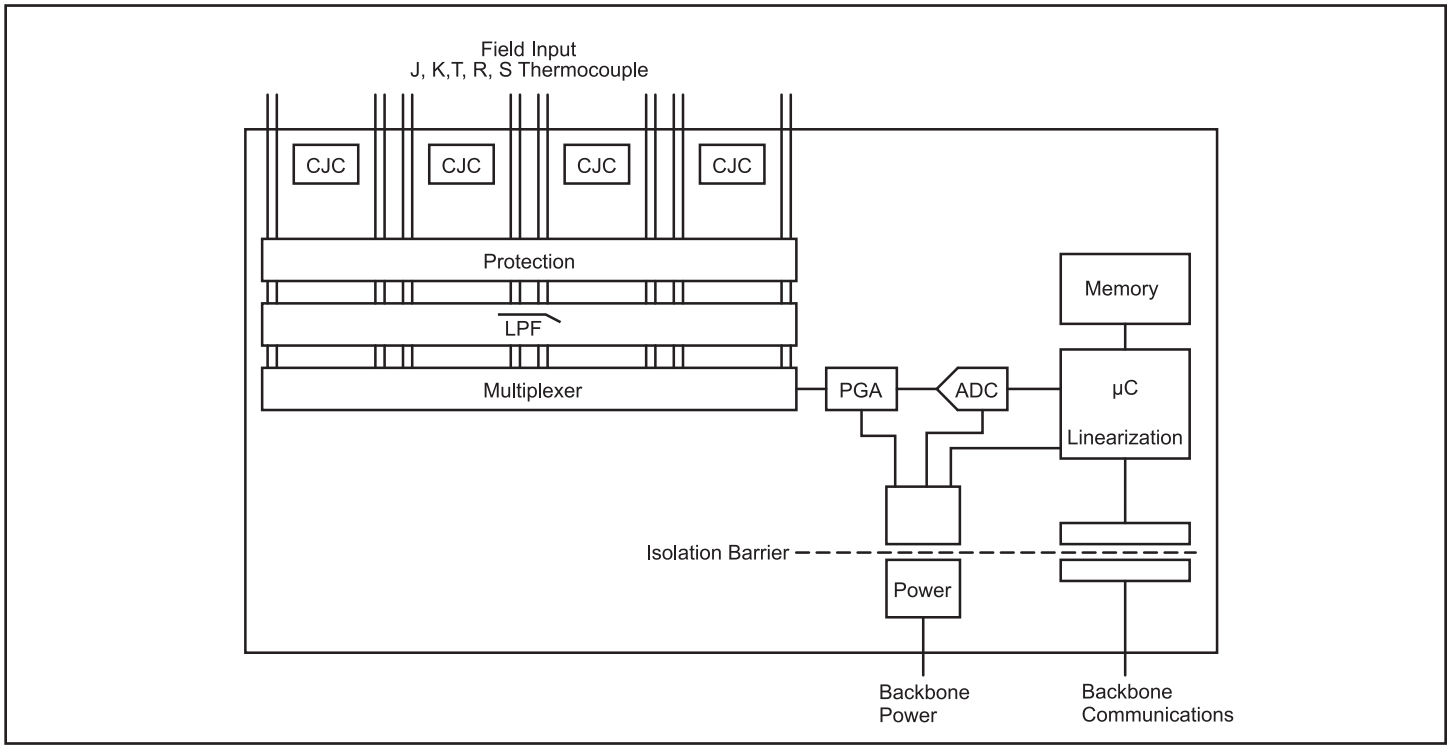


Figure 1: MAQ20 Thermocouple Input Module Block Diagram

Specifications

Typical* at T_A =+25°C and +24VDC system power

Module	Description
MAQ20-JTC	8-ch., Type JTC, Differential Input –100°C to +760°C (Default) –100°C to +393°C, –100°C to +199°C
MAQ20-KTC	8-ch., Type KTC, Differential Input –100°C to +1350°C (Default) –100°C to +651°C, –100°C to +332°C
MAQ20-TTC	8-channel, Type TTC, Differential Input –100°C to +400°C (Default), –100°C to +220°C
MAQ20-RSTC	8-channel, Type RTC and Type STC, Differential Input Type R: 0°C to +1750°C (Default), 0°C to +990°C Type S: 0°C to +1750°C, 0°C to +970°C
Per Channel Setup	Individually configurable for range, alarms, averaging
Input Protection	
Continuous	150Vrms max
Transient	ANSI/IEEE C37.90.1
CMV	
Channel-to-Bus	1500Vrms, 1 min
Channel-to-Channel	±3V peak
Transient	ANSI/IEEE C37.90.1
CMR	100dB at 50/60Hz
NMR	26dB at 50/60Hz
Accuracy(1)	±0.06% span
Conformity	±0.035% span
Cold Junction Compensation	±0.25°C at +25°C, ±1.0°C at –40°C to +85°C
Resolution	0.020% span
Stability	
Zero	±15ppm/°C
Span	±35ppm/°C
Bandwidth, –3dB	3Hz
Scan Rate	200 Ch/s
Alarms	High/ High-High / Low / Low-Low
Open Input Response	Downscale, <5s, Flag Set
Power Supply Current	30mA
Dimensions (h)(w)(d)	4.51" x 0.60" x 3.26" (114.6mm x 15.3mm x 82.8mm)
Environmental	
Operating Temperature	–40°C to +85°C
Storage Temperature	–40°C to +85°C
Relative Humidity	0 to 95% Noncondensing
Emissions, EN61000-6-4	ISM Group 1
Radiated, Conducted	Class A
Immunity EN61000-6-2	ISM Group 1
RF	Performance A ±0.5% Span Error
ESD, EFT	Performance B
Certifications	Heavy Industrial CE Compliant UL/CUL Listing Pending (Class I, Division 2, Groups A, B, C, D) ATEX Compliance Pending

NOTES:
*Contact factory or your local Dataforth sales office for maximum values.
(1) Includes conformity, hysteresis and repeatability. Does not include CJC accuracy.

For input connections and full details on module operation, refer to MA1047 – MAQ20 Thermocouple Input Module Hardware User Manual, available for download at: www.dataforth.com/maq20_download.aspx

Ordering Information

Model	Description
MAQ20-JTC	Analog Input Module; Type J Thermocouple, 8-ch
MAQ20-KTC	Analog Input Module; Type K Thermocouple, 8-ch
MAQ20-TTC	Analog Input Module; Type T Thermocouple, 8-ch
MAQ20-RSTC	Analog Input Module; Type R and Type S Thermocouple, 8-ch

Terminal Block Position (top to bottom)	MAQ20-xTC Input Connections
1	CH0 +IN
2	CH0 -IN
3	SHIELD
4	CH1 +IN
5	CH1 -IN
6	CH2 +IN
7	CH2 -IN
8	SHIELD
9	CH3 +IN
10	CH3 -IN
11	CH4 +IN
12	CH4 -IN
13	SHIELD
14	CH5 +IN
15	CH5 -IN
16	CH6 +IN
17	CH6 -IN
18	SHIELD
19	CH7 +IN
20	CH7 -IN

Analog Input Modules: RTD and Potentiometer

Interface to 2-Wire, 3-Wire, and 4-Wire Sensors

Description

Two MAQ20 resistance input modules are offered. One interfaces to 2-wire and 3-wire sensors and has 6 input channels; the other interfaces to 4-wire sensors and has 5 input channels. The 2-wire/3-wire module interfaces to 3 types of sensors: 100Ω Pt and 120Ω Ni RTDs, and potentiometers up to 5kΩ; the 4-wire module interfaces to 100Ω Pt and 120Ω Ni RTDs. Precision, low magnitude current sources are used to minimize sensor self-heating and cancel lead resistance errors when using 3-wire sensors. All channels are individually configurable for sensor, range, alarm limits, and averaging to match the most demanding applications. High, Low, High-High and Low-Low alarms provide essential monitoring and warning functions to ensure optimum process flow and fail-safe applications. Hardware low-pass filtering in each channel provides rejection of 50 and 60Hz line frequencies. Field I/O connections are made through a pluggable terminal block with positions designated for the termination of wiring shields.

Input-to-bus isolation is a robust 1500Vrms and each individual channel is protected up to 240Vrms continuous overload in case of inadvertent wiring errors. Overloaded channels do not adversely affect other channels in the module, which preserves data integrity.

Channels in a module can be selectively enabled for scanning. All channels are enabled by default; however, non-used channels can be disabled to increase the sampling rate of enabled channels.

Input sensors and input ranges are selectable on a per-channel basis. One to three ranges are available depending on the input sensor. Over-range and under-range up to 2% beyond the specified input values is allowed. Sensor linearization is performed in the module, and accuracy is guaranteed to ±f.s.

Features

- 6 Input Channels for 2-Wire or 3-Wire Sensors
- 5 Input Channels for 4-Wire Sensors
- Interface to Pt100, Ni120 RTDs, and Potentiometers up to 5kΩ
- All Channels Individually Configurable for Sensor, Range, Alarms, Averaging
- 1500Vrms Input-to-Bus Isolation
- Each Channel Protected up to 240Vrms Continuous Overload
- Selective Enabling of Module Channels for Scanning

All MAQ20 modules are designed for installation in Class I, Division 2 hazardous locations and have a high level of immunity to environmental noise commonly present in heavy industrial environments.

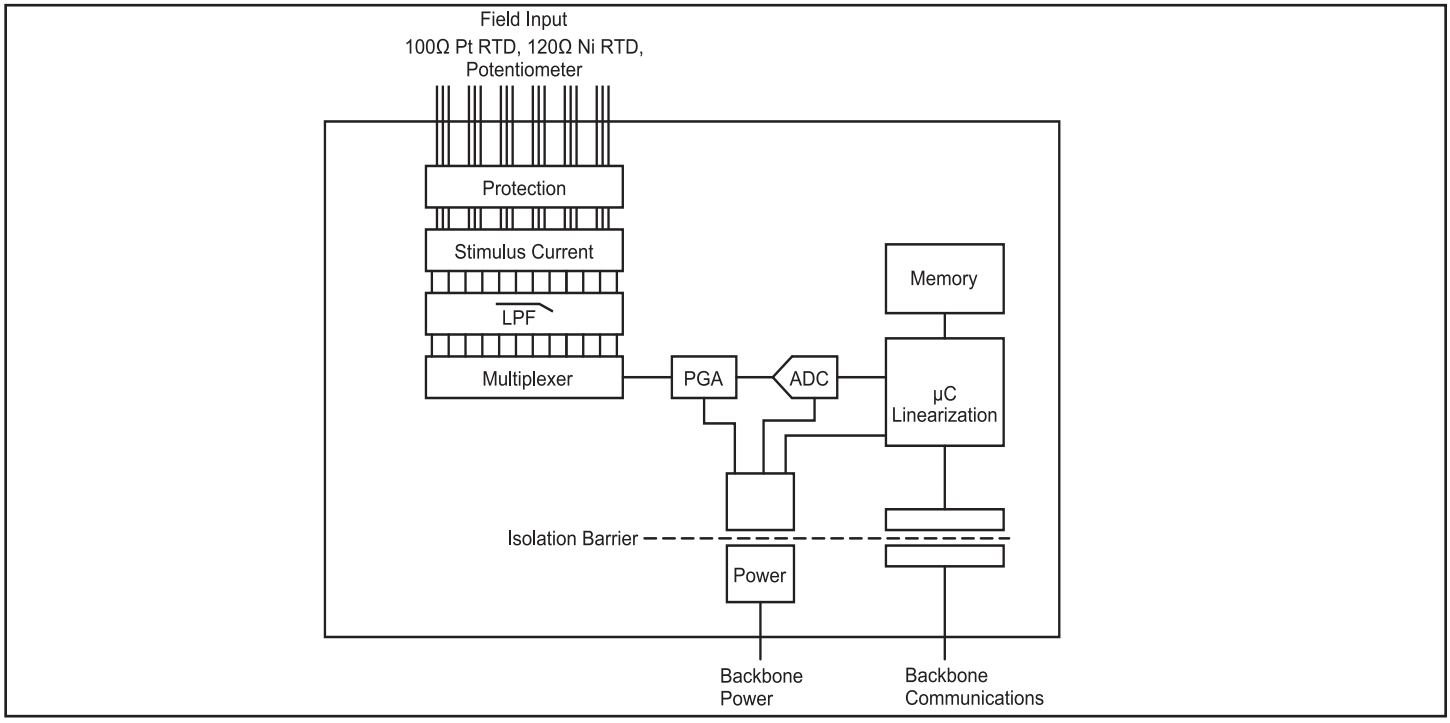


Figure 1: MAQ20-RTD31 RTD and Potentiometer Input Module Block Diagram

Specifications

Typical* at T_A =+25°C and +24VDC system power

Module	Description
MAQ20-RTD31	6-channel, 2-wire or 3-wire Pt100, Ni120, Potentiometer Input 100Ω Pt α = 0.00385; –200°C to +850°C (Default) 100Ω Pt100 α = 0.00385; –200°C to +200°C Pt100 α = 0.00385; –100°C to +100°C Ni120 α = 0.00672; –80°C to +300°C Potentiometer 0Ω to 5kΩ
MAQ20-RTD41	5-channel, 4-wire Pt100, Ni120 100Ω Pt α = 0.00385; –200°C to +850°C (Default) 100Ω Pt100 α = 0.00385; –200°C to +200°C Pt100 α = 0.00385; –100°C to +100°C Ni120 α = 0.00672; –80°C to +300°C
Per Channel Setup	Individually configurable for sensor, range, alarms, averaging
Input Protection	
Continuous	240Vrms max
Transient	ANSI/IEEE C37.90.1
CMV	
Channel-to-Bus	1500Vrms, 1 min
Channel-to-Channel	±3V peak
Transient	ANSI/IEEE C37.90.1
CMR	100dB at 50/60Hz
NMR	20dB at 50/60Hz
Accuracy(1)	±0.06% span
Conformity	±0.035% span
Resolution	0.012% span
Stability	
Zero	±50ppm/°C
Span	±35ppm/°C
Bandwidth, –3dB	3Hz
Scan Rate	200 Ch/s
Alarms	High / High-High / Low / Low-Low
Open Input Response	Upscale or Downscale, <5s, Flag Set
Power Supply Current	35mA
Dimensions (h)(w)(d)	4.51” x 0.60” x 3.26” (114.6mm x 15.3mm x 82.8mm)
Environmental	
Operating Temperature	–40°C to +85°C
Storage Temperature	–40°C to +85°C
Relative Humidity	0 to 95% Noncondensing
Emissions, EN61000-6-4	ISM Group 1
Radiated, Conducted	Class A
Immunity EN61000-6-2	ISM Group 1
RF	Performance A ±0.5% Span Error
ESD, EFT	Performance B
Certifications	Heavy Industrial CE Compliant UL/CUL Listing Pending (Class I, Division 2, Groups A, B, C, D) ATEX Compliance Pending

NOTES :
*Contact factory or your local Dataforth sales office for maximum values.
(1) Includes conformity, hysteresis and repeatability.

For input connections and full details on module operation, refer to MA1044 – MAQ20 RTD-Potentiometer Input Module Hardware User Manual, available for download at: www.dataforth.com/maq20_download.aspx

Ordering Information

Model	Description
MAQ20-RTD31	Analog Input Module; RTD/Potentiometer, 2-Wire or 3-Wire, Type Pt and Ni, 6-ch
MAQ20-RTD41	Analog Input Module; RTD, 4-Wire, Type Pt and Ni, 5-ch

Terminal Block Position (top to bottom)	MAQ20-RTD31 Input Connections
1	CH0 +EXC/SHIELD
2	CH0 +IN
3	CH0 -IN
4	CH1 +EXC/SHIELD
5	CH1 +IN
6	CH1 -IN
7	CH2 +EXC/SHIELD
8	CH2 +IN
9	CH2 -IN
10	NC
11	NC
12	CH3 +EXC/SHIELD
13	CH3 +IN
14	CH3 -IN
15	CH4 +EXC/SHIELD
16	CH4 +IN
17	CH4 -IN
18	CH5 +EXC/SHIELD
19	CH5 +IN
20	CH5 -IN

Analog Input Module: Strain Gage

Interface to Full, Half, and Quarter Bridge Sensors

Description

The MAQ20 strain gage input module offers 4 input channels and can interface to full, half, and quarter bridge sensors using 4-wire or 6-wire connections. All channels are individually configurable for range, alarm limits, and averaging to match the most demanding applications. In addition, sampling rate, resolution, bandwidth, excitation voltage, and choice of shunt calibration resistors are user settable parameters. Input signals are sampled simultaneously and burst mode can be used to capture fast events. High, Low, High-High and Low-Low alarms provide essential monitoring and warning functions to ensure optimum process flow and fail-safe applications. Hardware low-pass filtering in each channel provides rejection of unwanted frequencies. Field I/O connections are made through spring cage terminal blocks with positions designated for the termination of wiring shields.

Input-to-bus isolation is a robust 1500Vrms and each individual channel is protected up to 30Vrms continuous overload in case of inadvertent wiring errors. Overloaded channels do not adversely affect other channels in the module, which preserves data integrity.

Input ranges are selectable on a per-channel basis. Four ranges are available. Over-range and under-range up to 2% beyond the specified input values is allowed, and accuracy is guaranteed to ±fs.

All MAQ20 modules are designed for installation in Class I, Division 2 hazardous locations and have a high level of immunity to environmental noise commonly present in heavy industrial environments.

Features

- 4 Input Channels for 4-Wire or 6-Wire Sensors
- Bridge Resistance 100Ω to 1kΩ
- Interface to Full, Half and Quarter (with external bridge completion) Sensors
- All Channels Individually Configurable for Range, Alarms, Averaging
- 24-Bit Resolution
- Programmable Sampling Rate & Resolution
- Simultaneous Sampling of Input, Bandwidth Signals
- Burst Mode for Capturing Fast Events
- Programmable Excitation, Shunt Calibration, Remote Sense
- 1500Vrms Input-to-Bus Isolation
- Each Channel Protected up to 30Vrms Continuous Overload

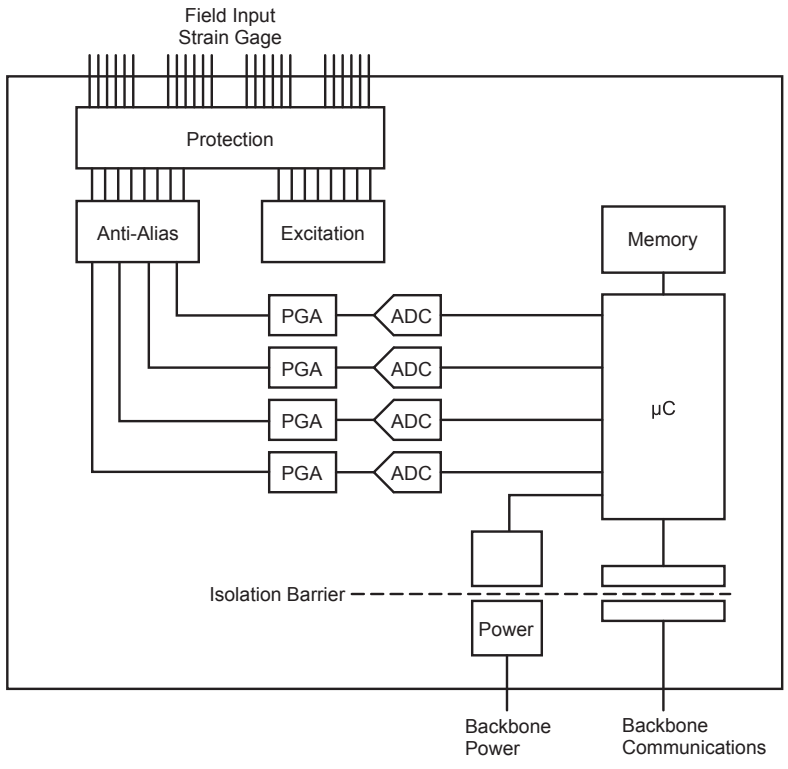


Figure 1: MAQ20 Strain Gage Input Module Block Diagram

Specifications

Typical* at T_A =+25°C and +24VDC system power

Module	Description
MAQ20-BRDG1	Full, Half, Quarter Bridge 4-wire or 6-wire connection
Number of Channels Per Channel Setup	4 Individually configurable for range, alarms, averaging
Input Range Input Protection Continuous Transient Excitation Voltage Bridge Resistance Shunt Calibration	±100mV, 0.8mV/V to 40mV/V Sensitivity 30Vrms max ANSI/IEEE C37.90.1 2.5V, 3.333V, 5.0V, 10.0V 100Ω to 1kΩ 60kΩ, 100kΩ, 200kΩ, External
Excitation Protection Continuous Transient CMV Channel-to-Bus Channel-to-Channel Transient CMR NMR	 30Vrms max ANSI/IEEE C37.90.1 1500Vrms, 1 min ±3V peak ANSI/IEEE C37.90.1 100dB at 50/60 Hz 60dB/decade
Accuracy(1) Linearity Resolution ADC Resolution Stability Zero Span	±0.03% span ±0.01% span 0.0005% to 0.005% span 24-bit 50ppm/C 75ppm/C
Bandwidth Scales with Sample Rate Sampling Rate, Simultaneous Alarms Power Supply Current	 Programmable to 17kHz 1kS/s to 32kS/s burst High / High-High / Low / Low-Low 400mA
Dimensions (h)(w)(d)	4.51" x 0.60" x 3.26" (114.6mm x 15.3mm x 82.8mm)
Environmental Operating Temperature Storage Temperature Relative Humidity Emissions, EN61000-6-4 Radiated, Conducted Immunity EN61000-6-2 RF ESD, EFT	 –40°C to +85°C –40°C to +85°C 0 to 95% Noncondensing ISM Group 1 Class A ISM Group 1 Performance A ±0.5% Span Error Performance B
Certifications	Heavy Industrial CE Compliant UL/CUL Listing Pending (Class I, Division 2, Groups A, B, C, D) ATEX Compliance Pending

NOTES :
*Contact factory or your local Dataforth sales office for maximum values.
(1) Includes linearity, hysteresis and repeatability.

Ordering Information

Model	Description
MAQ20-BRDG1	Analog Input Module; Bridge/Strain Gage, 4-ch

Sensor Connection	Terminal	Terminal	Sensor Connection
CH0			
+EXC	1	5	+REMOTE SENSE
-EXC	2	6	-REMOTE SENSE
SHIELD	S	S	SHIELD
+IN	3	7	+SHUNT CAL
-IN	4	8	-SHUNT CAL
CH1			
+EXC	1	5	+REMOTE SENSE
-EXC	2	6	-REMOTE SENSE
SHIELD	S	S	SHIELD
+IN	3	7	+SHUNT CAL
-IN	4	8	-SHUNT CAL
CH2			
+EXC	1	5	+REMOTE SENSE
-EXC	2	6	-REMOTE SENSE
SHIELD	S	S	SHIELD
+IN	3	7	+SHUNT CAL
-IN	4	8	-SHUNT CAL
CH3			
+EXC	1	5	+REMOTE SENSE
-EXC	2	6	-REMOTE SENSE
SHIELD	S	S	SHIELD
+IN	3	7	+SHUNT CAL
-IN	4	8	-SHUNT CAL

For input connections and full details on module operation, refer to MA1046 – MAQ20 Strain Gage Input Module Hardware User Manual, available for download at: www.dataforth.com/maq20_download.aspx

Analog Input Module: Frequency

Measure Frequencies to 1MHz

Description

The MAQ20 frequency input module offers 8 input channels for measuring frequencies up to 1MHz. All channels are individually configurable for range and alarm limits to match the most demanding applications. Four controllable outputs can be used for sensor excitation or as 5V logic compatible outputs. High, Low, High-High and Low-Low alarms provide essential monitoring and warning functions to ensure optimum process flow and fail-safe applications. Field I/O connections are made through a pluggable terminal block with positions designated for the termination of wiring shields.

Input-to-bus isolation is a robust 1500Vrms and each individual channel is protected up to 240Vrms continuous.

Channels in a module can be selectively enabled for scanning. All channels are enabled by default; however, non-used channels can be disabled to increase the system sampling rate of enabled channels.

All MAQ20 modules are designed for installation in Class I, Division 2 hazardous locations and have a high level of immunity to environmental noise commonly present in heavy industrial environments.

Features

- 8 Input Channels
- 50mV Sensitivity
- Frequency Range – 1Hz to 1MHz plus State Change
- Operating Range – DC + Signal ≤300Vrms
- All Channels Individually Configurable for Range and Alarms
- 4 Excitation Sources to Power Sensors or Provide 5V Logic Compatible Output
- 1500Vrms Input-to-Bus Isolation
- Each Channel Protected up to 240Vrms
- Selective Enabling of Module Channels for Scanning

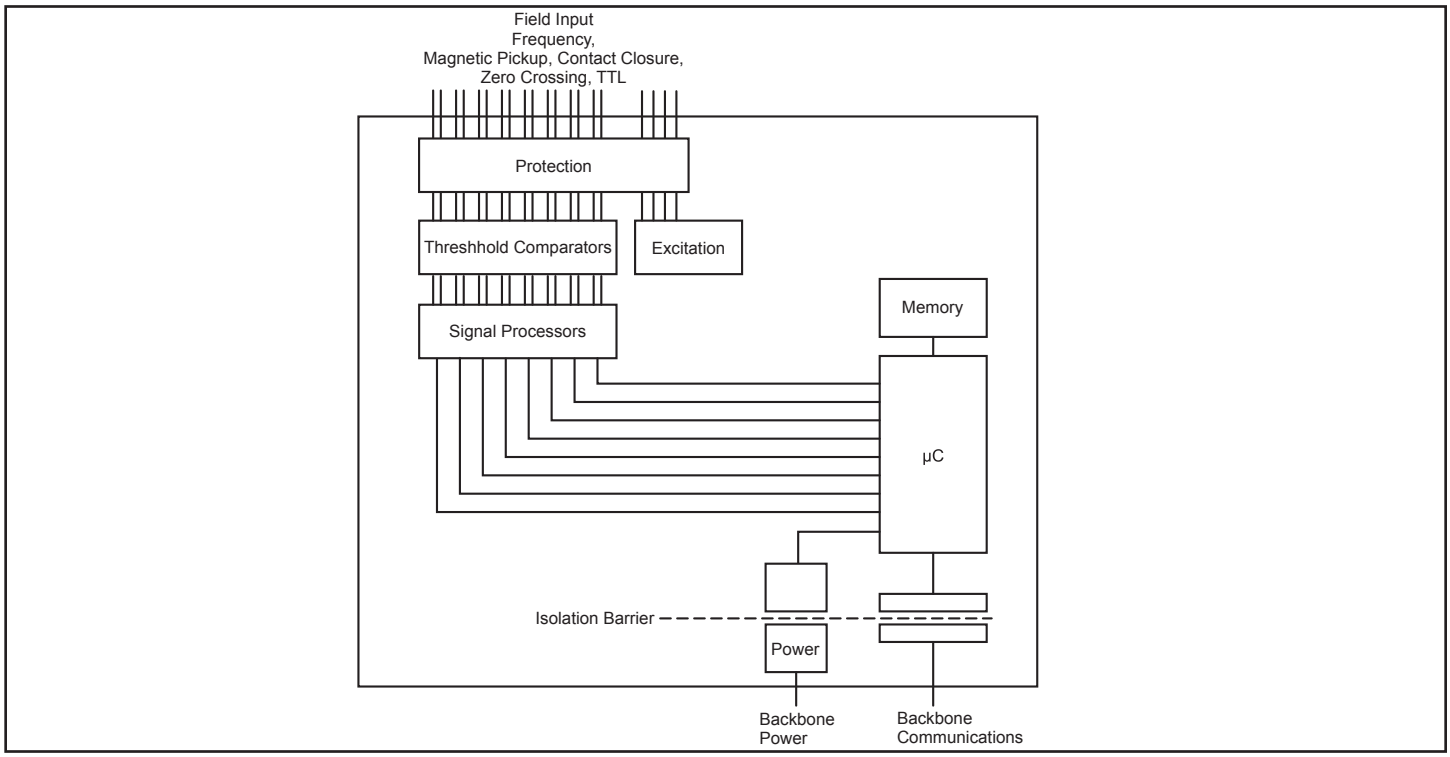


Figure 1: MAQ20 Frequency Input Module Block Diagram

Specifications

Typical* at T_A =+25°C and +24VDC system power

Module	Description
MAQ20-FREQ	8-channel, Frequency Input, 1Hz to 1MHz, plus state change detect
Input Signal	50mV Sensitivity Operating Range: DC + signal 300Vrms
Excitation	Four 5V sources at 8mA each Use for sensor excitation or 5V logic compatible output
Per Channel Setup	Individually configurable for range, alarms
Input Protection	
Continuous	240Vrms max
Transient	ANSI/IEEE C37.90.1
CMV	
Channel-to-Bus	1500Vrms, 1 min
Channel-to-Channel	0V
Transient	ANSI/IEEE C37.90.1
Resolution and Accuracy	32 bits
Clock Accuracy	±0.003%
Clock Accuracy Over Temp	±0.01%, –40°C to +85°C
Scan Rate	1000 Ch/s
Alarms	High / High-High / Low / Low-Low
Power Supply Current	400mA
Dimensions (h)(w)(d)	4.51" x 0.60" x 3.26" (114.6mm x 15.3mm x 82.8mm)
Environmental	
Operating Temperature	–40°C to +85°C
Storage Temperature	–40°C to +85°C
Relative Humidity	0 to 95% Noncondensing
Emissions, EN61000-6-4	ISM Group 1
Radiated, Conducted	Class A
Immunity EN61000-6-2	ISM Group 1
RF	Performance A ±0.5% Span Error
ESD, EFT	Performance B
Certifications	Heavy Industrial CE Compliant UL/CUL Listing Pending (Class I, Division 2, Groups A, B, C, D) ATEX Compliance Pending

NOTES :
*Contact factory or your local Dataforth sales office for maximum values.

Ordering Information

Model	Description
MAQ20-FREQ	Analog Input Module; Frequency, 8-ch

Terminal Block Position (top to bottom)	MAQ20-FREQ I/O Connections
1	CH0 +IN
2	CH0 -IN
3	CH1 +IN
4	CH1 -IN
5	EXC0 / OUT0
6	CH2 +IN
7	CH2 -IN
8	CH3 +IN
9	CH3 -IN
10	EXC1 / OUT1
11	CH4 +IN
12	CH4 -IN
13	CH5 +IN
14	CH5 -IN
15	EXC2 / OUT2
16	CH6 +IN
17	CH6 -IN
18	CH7 +IN
19	CH7 -IN
20	EXC3 / OUT3

For input connections and full details on module operation, refer to MA1048 – MAQ20 Frequency Input Module Hardware User Manual, available for download at: www.dataforth.com/maq20_download.aspx

Analog Output Modules: Process Voltage & Process Current

8 Isolated Voltage or Current Outputs

Description

The MAQ20 voltage output module and current output module offer 8 isolated voltage or current outputs. All channels are individually configurable for range and programmable output to match the most demanding applications. High-level per-channel isolation gives the module unmatched ruggedness and flexibility while default outputs provide essential functionality for fail-safe systems. User defined waveform outputs allow application-specific sophisticated, autonomous control. Field output connections are made through a pluggable terminal block which simplifies wiring during system setup and reconfiguration.

Input-to-bus isolation is a robust 1500Vrms and channel-to-channel isolation is 300Vrms. In addition, each channel is protected up to 40Vrms continuous overload in case of inadvertent wiring errors.

Channels in a module can be selectively enabled for output. All channels are enabled by default; however, non-used channels can be disabled to increase the refresh rate of enabled channels.

All MAQ20 modules are designed for installation in Class I, Division 2 hazardous locations and have a high level of immunity to environmental noise commonly present in heavy industrial environments.

Features

- 8 Isolated Output Channels
- Voltage or Current Output
- All Channels Individually Configurable for Range and Programmable Output
- User-Defined Default Output and Output Waveform
- 1500Vrms Input-to-Bus Isolation
- 300Vrms Channel-to-Channel Isolation
- Each Channel Protected up to 40Vrms Continuous Overload
- Selective Enabling of Module Channels for Refresh

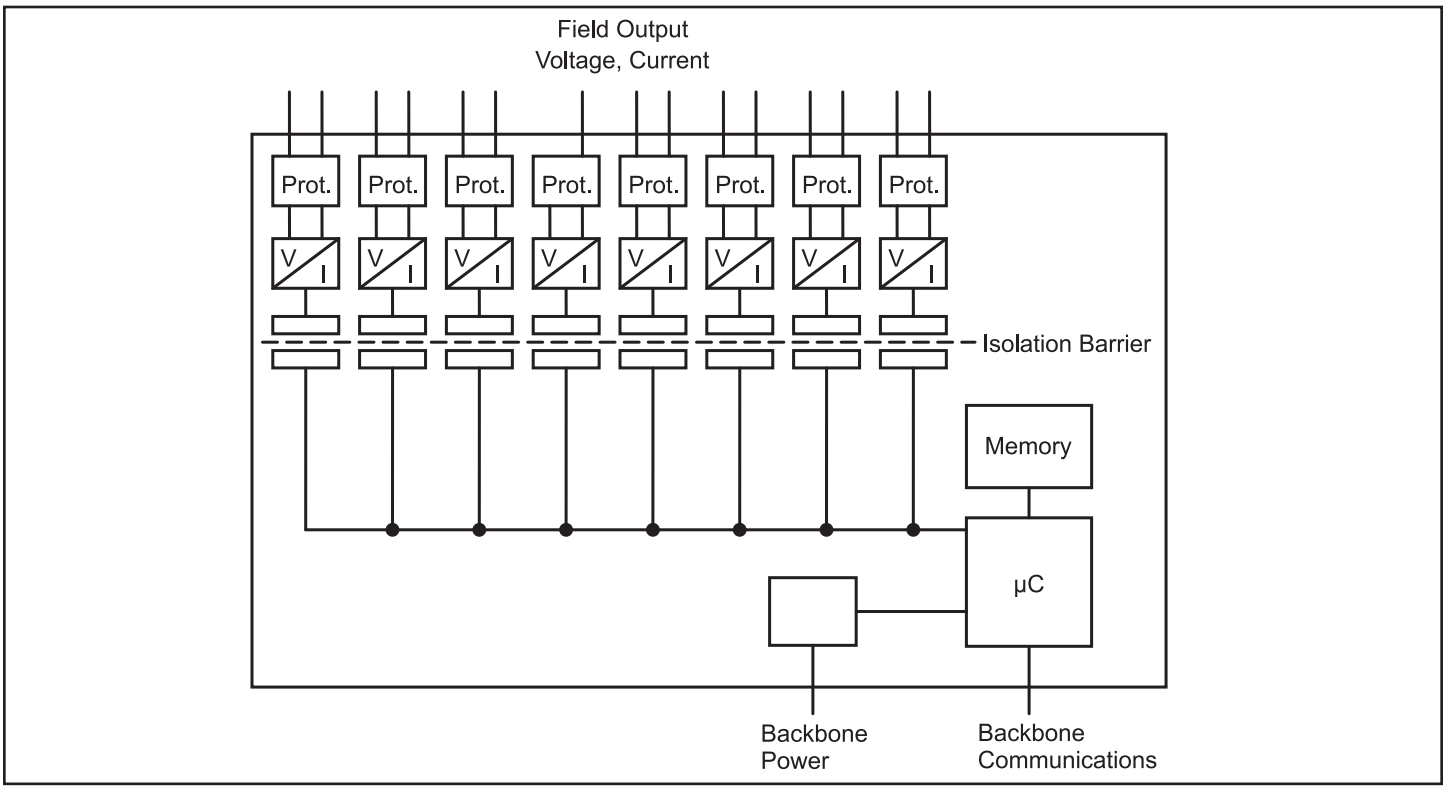


Figure 1: MAQ20 Voltage & Current Output Module Block Diagram

Specifications

Typical* at T_A =+25°C and +24VDC system power

Module	Description
MAQ20-VO	8 Isolated Channel Voltage Output 0-2.5V, 0-5V, 0-10V, ±2.5V, ±5V, ±10V (Default ±10V)
MAQ20-IO	8 Isolated Channel Current Output 0-20mA, 4-20mA (Default 0-20mA)
Per Channel Setup	Individually configurable for range, default output, waveform
MAQ20-VO	
Output Drive (Max Load)	10mA (1000Ω at 10V)
Over-range	10.5V
MAQ20-IO	
Compliance	15VDC
Load Range	0-600Ω
Over-range	21.5mA
Current Limit	26mA
Output Protection	
Continuous	40Vrms max
Transient	ANSI/IEEE C37.90.1
CMV	
Channel-to-Bus	1500Vrms, 1 min
Channel-to-Channel	300Vrms
Transient	ANSI/IEEE C37.90.1
CMR	75dB at 50/60Hz
Accuracy(1)	±0.040% span
Linearity / Conformity	±0.030% span
Resolution	0.024% span
Stability	
Zero	±25ppm/°C
Span	±35ppm/°C
Bandwidth, –3dB	100Hz
Update Rate	1600 Ch/s
Power Supply Current	
MAQ20-VO	270mA at no-load, 480mA at full-load
MAQ20-IO	210mA at no-load, 650mA at full-load
Dimensions (h)(w)(d)	4.51" x 0.60" x 3.26" (114.6mm x 15.3mm x 82.8mm)
Environmental	
Operating Temperature	–40°C to +85°C
Storage Temperature	–40°C to +85°C
Relative Humidity	0 to 95% Noncondensing
Emissions, EN61000-6-4	ISM Group 1
Radiated, Conducted	Class A
Immunity EN61000-6-2	ISM Group 1
RF	Performance A ±0.5% Span Error
ESD, EFT	Performance B
Certifications	Heavy Industrial CE Compliant UL/CUL Listing Pending (Class I, Division 2, Groups A, B, C, D) ATEX Compliance Pending

NOTES:
*Contact factory or your local Dataforth sales office for maximum values.
(1) Includes linearity, hysteresis and repeatability.

Ordering Information

Model	Description
MAQ20-VO	Analog Output Module; Voltage, 8-ch
MAQ20-IO	Analog Output Module; Current mA, 8-ch

Terminal Block Position (top to bottom)	MAQ20-VO & MAQ20-IO Output Connections
1	CH0 +OUT
2	CH0 -OUT
3	CH1 +OUT
4	CH1 -OUT
5	SHIELD
6	CH2 +OUT
7	CH2 -OUT
8	CH3 +OUT
9	CH3 -OUT
10	SHIELD
11	CH4 +OUT
12	CH4 -OUT
13	CH5 +OUT
14	CH5 -OUT
15	SHIELD
16	CH6 +OUT
17	CH6 -OUT
18	CH7 +OUT
19	CH7 -OUT
20	SHIELD

For output connections and full details on module operation, refer to MA1042 – MAQ20 Voltage and Current Output Module Hardware User Manual, available for download at: www.dataforth.com/maq20_download.aspx.

Discrete Input / Output Modules

5 Input Channels and 5 Output Channels (MAQ20-DIOL)
4 Input Channels and 4 Output Channels (MAQ20-DIOH)

Description

The MAQ20-DIOL discrete input/output module has 5 isolated discrete input channels and 5 isolated discrete output channels. Input channels accept 3-60VDC signals and output channels switch 3-60VDC signals at up to 3A load.

The MAQ20-DIOH discrete input/output module has 4 isolated discrete inputs and 4 isolated discrete outputs. Input channels accept 90-280VAC/VDC signals and output channels switch 24-280VAC signals at up to 3A AC load. NOTE: DIOH output channels switch AC loads only.

Discrete output channels have user configurable default output states which are set up on power up or module reset. In addition to performing standard discrete I/O, the channels can be configured to perform seven special functions: Pulse/Frequency Counter, Pulse/Frequency Counter with De-bounce, Waveform Measurement, Time Between Events, Frequency Generator, Pulse Width Modulation (PWM) Generator, and One-Shot Pulse Generator. Up to four special functions can run simultaneously. High, Low, High-High and Low-Low alarms provide essential monitoring and warning functions to ensure optimum process flow and fail-safe applications. Field I/O connections are made through a pluggable terminal block.

Input-to-bus isolation is a robust 1500Vrms and channel-to-channel isolation is 300Vrms. Each individual channel has continuous overload and reverse connection protection in case of inadvertent wiring errors.

Features

- Rugged Isolation and Protection for Industrial Control
- User-Defined Default Output and Output Waveform
- 7 High Performance Special Functions
- 1500Vrms Input-to-Bus Isolation
- 300Vrms Channel-to-Channel Isolation
- Continuous Overload and Reverse Protection

All MAQ20 modules are designed for installation in Class I, Division 2 hazardous locations and have a high level of immunity to environmental noise commonly present in heavy industrial environments.

IMPORTANT: The DIOH module can only switch AC loads, not DC. The output switch is AC only with zero-crossing detection.

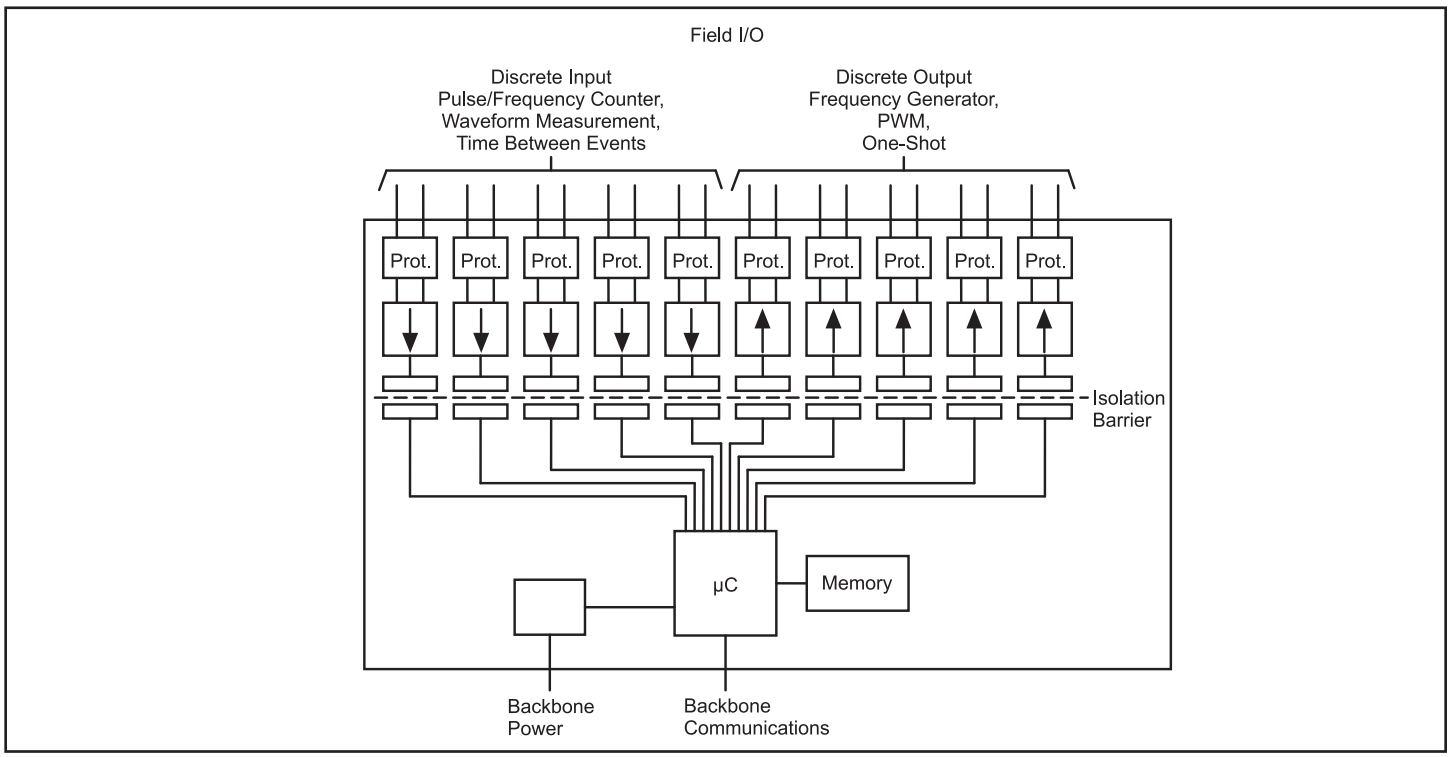


Figure 1: MAQ20-DIOL Discrete Input/Output Module Block Diagram

Specifications

Typical* at T_A =+25°C and +24VDC system power

Module	Description
MAQ20-DIOL	5 Isolated Channel Discrete Input, 3-60VDC 5 Isolated Channel Discrete Output, 3-60VDC
MAQ20-DIOH	4 Isolated Channel Discrete Input, 90-280VAC/VDC 4 Isolated Channel Discrete Output, 24-280VAC
Per Channel Setup	Individually configurable for default output, special function
Input Protection	
Continuous, -DIOL	70VDC max, Reverse Polarity Protected
Continuous, -DIOH	350VAC/VDC max
Transient	ANSI/IEEE C37.90.1
Output Protection	
Continuous, -DIOL	70VDC max, Reverse Polarity Protected
Continuous, -DIOH	350VAC/VDC max
Transient	ANSI/IEEE C37.90.1
CMV	
Channel-to-Bus	1500Vrms, 1 min
Channel-to-Channel	300Vrms, 425VDC
Transient	ANSI/IEEE C37.90.1
Output Load (Combined load, all channels)(1)	
MAQ20-DIOL	
Ta=25°C, Freq=0 to 1500Hz, Duty Cycle=5-100%	3A (2A if adjacent module Tcase>50°C)
Ta=85°C, Freq=0 to 500Hz, Duty Cycle=5-100%	2A (1A if adjacent module Tcase>50°C)
MAQ20-DIOH	
Ta=25°C, Freq=0 to 1500Hz	3Arms
Ta=85°C, Freq=0 to 500Hz	3Arms
Switching Characteristics	
MAQ20-DIOL	
Input Channel Turn-On/ Turn-Off Time	25µs / 55µs
Output Channel Turn-On/ Turn-Off Time	20µs / 40µs
MAQ20-DIOH	
Input Channel Turn-On/ Turn-Off Time	20ms / 30ms (VAC), 1ms / 1ms (VDC)
Output Channel Response Time	0.5 Cycle
I/O Special Functions (MAQ20-DIOL)	
Pulse/Frequency Counter	Freq to 10kHz, Count to 10M, RPM to 65k
Pulse/Frequency Counter w/De-bounce	Freq to 3kHz, Count to 10M
Waveform Measurement	Freq to 500Hz, # Periods, Pulse Width, Period, Duty Cycle
Time Between Events	Min, Max, Avg, Selectable Timebase
Frequency Generator	Up to 700Hz
PWM Generator	200µs min Period, Selectable Timebase
One-Shot Pulse Generator	100µs min, Programmable Pre- and Post-Delay
Scan/Update Rate	3500 Ch/s
Alarms (MAQ20-DIOL)	High / High-High / Low / Low-Low
Power Supply Current	30mA
Dimensions (h)(w)(d)	4.51" x 0.60" x 3.26" (114.6mm x 15.3mm x 82.8mm)

Ordering Information

Model	Description
MAQ20-DIOL	Digital Input/Output Module; 3 to 60VDC In, 3 to 60VDC Out, 5-ch In, 5-ch Out
MAQ20-DIOH	Digital Input/Output Module; 90 to 280VAC/VDC In, 24 to 280VAC Out, 4-ch In, 4-ch Out

Terminal Block Position (top to bottom)	MAQ20-DIOL Field Connections	MAQ20-DIOH Field Connections
1	DO CH0 +OUT	DO CH0 +OUT
2	DO CH0 -OUT	DO CH0 -OUT
3	DO CH1 +OUT	DO CH1 +OUT
4	DO CH1 -OUT	DO CH1 -OUT
5	DO CH2 +OUT	DO CH2 +OUT
6	DO CH2 -OUT	DO CH2 -OUT
7	DO CH3 +OUT	DO CH3 +OUT
8	DO CH3 -OUT	DO CH3 -OUT
9	DO CH4 +OUT	NC
10	DO CH4 -OUT	NC
11	DI CH0 +IN	NC
12	DI CH0 -IN	NC
13	DI CH1 +IN	DI CH0 +IN
14	DI CH1 -IN	DI CH0 -IN
15	DI CH2 +IN	DI CH1 +IN
16	DI CH2 -IN	DI CH1 -IN
17	DI CH3 +IN	DI CH2 +IN
18	DI CH3 -IN	DI CH2 -IN
19	DI CH4 +IN	DI CH3 +IN
20	DI CH4 -IN	DI CH3 -IN

Specifications (continued)

Module	Description
Environmental	
Operating Temperature	–40°C to +85°C
Storage Temperature	–40°C to +85°C
Relative Humidity	0 to 95% Noncondensing
Emissions, EN61000-6-4	ISM Group 1
Radiated, Conducted	Class A
Immunity EN61000-6-2	ISM Group 1
RF	Performance A ±0.5% Span Error
ESD, EFT	Performance B
Certifications	Heavy Industrial CE Compliant UL/CUL Listing Pending (Class I, Division 2, Groups A, B, C, D) ATEX Compliance Pending

NOTES:
*Contact factory or your local Dataforth sales office for maximum values.
(1) See manual for detailed calculations of load ratings based on ambient temperature, multiple channels, and adjacent modules.

For input and output connections and full details on module operation, refer to MA1043 – MAQ20 Discrete Input-Output Module Hardware User Manual, available for download at: www.dataforth.com/maq20_download.aspx.

Discrete Input Modules: High Density Voltage

20 Input Channels with or without Compliance Voltage

Description

The MAQ20-DIV20/-DIVC20 modules have 20 discrete input channels that interface to 10-32VDC signals. The MAQ20-DIVC20 model has a +24VDC compliance voltage source on each channel for interfacing to relay contacts, solid state switches, or other devices that require an excitation. Discrete input states can be read individually or as a block. Logic polarity can be user defined as standard or inverted. The field inputs are designed for harsh industrial environments and have fast switching times. Pulses as narrow as 200µs can be measured. Field input connections are made through high density spring cage terminal blocks.

Input-to-bus isolation is a robust 1500Vrms and each individual channel is protected up to 150Vrms continuous overload in case of inadvertent wiring errors.

The high channel count within the narrow module package gives exceptional functionality while preserving valuable mounting space. The high density minimizes cost per channel resulting in economical monitoring solutions.

All MAQ20 modules are designed for installation in Class I, Division 2 hazardous locations and have a high level of immunity to environmental noise commonly present in heavy industrial environments.

Features

- 20 Discrete Input Channels
- Interface to 10-32VDC Signals
- +24VDC Compliance Voltage for Interface to Relay Contacts, Solid State Switches & Other Devices Requiring Excitation (MAQ20-DIVC20)
- 1500Vrms Input-to-Bus Isolation
- Each Channel Protected up to 150Vrms Continuous Overload
- User Defined Logic Polarity
- Fast Switching Times
- Field Input Connections Use Spring Cage Terminal Blocks
- Low Cost per Channel

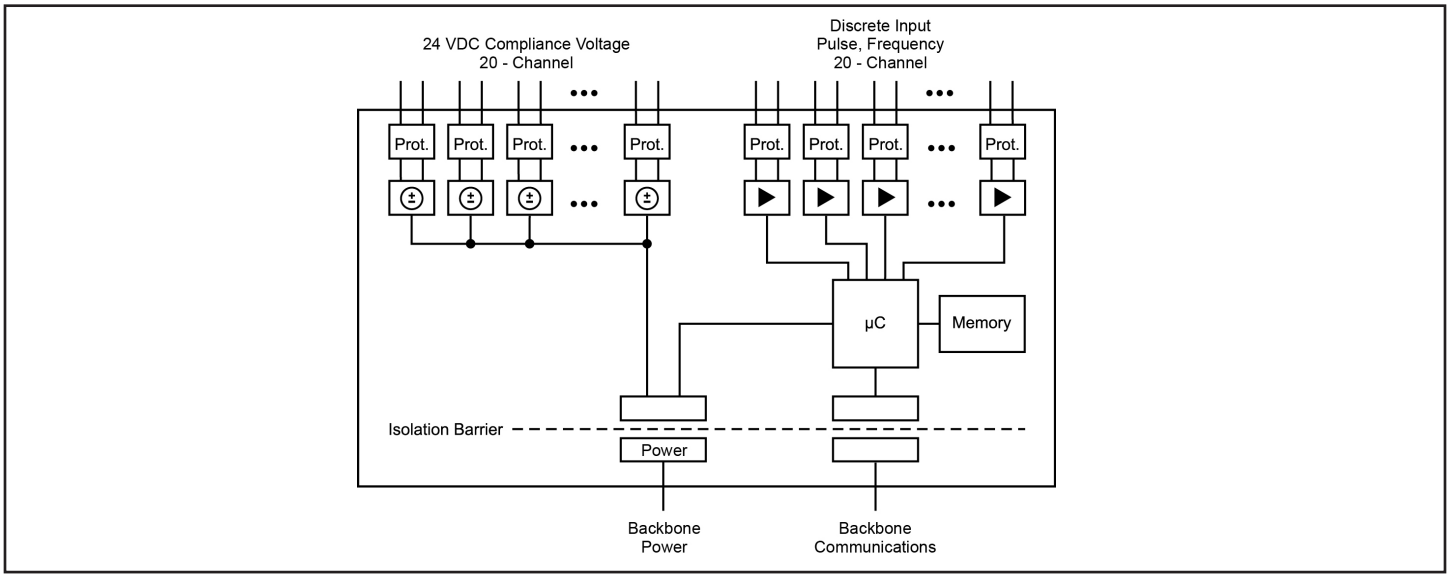


Figure 1: MAQ20-DIV20/-DIVC20 Discrete Input Voltage Modules Block Diagram

Specifications

Typical* at T_A =+25°C and +24VDC system power

Module	Description
MAQ20-DIV20 MAQ20-DIVC20	10 to 32VDC Input, 24VDC Nominal 10 to 24VDC Input, 24VDC Compliance Voltage per channel
Number of Channels Input Resistance	20 77kΩ
Switching Characteristics Turn-On/Turn-Off Time Switching Threshold, Turn-On/Turn-Off	 50µs / 50µs 9.0V / 5.5V
Input Protection Continuous Transient CMV Channel-to-Bus Channel-to-Channel Transient	 150Vrms max ANSI/IEEE C37.90.1 1500Vrms, 1 min 0V ANSI/IEEE C37.90.1
Input Functions Logic Selection Block Read	 Standard / Inverted 20 Channel
Scan/Update Rate Power Supply Current	1300 Ch/s net, 65 Ch/s at 20-Ch Simultaneous 50mA
Dimensions (h)(w)(d)	3.27" x 4.51" x 0.60" (83.1mm x 114.6mm x 15.3mm)
Environmental Operating Temperature Storage Temperature Relative Humidity Emissions, EN61000-6-4 Radiated, Conducted Immunity EN61000-6-2 RF ESD, EFT	 -40°C to +85°C -40°C to +85°C 0 to 95% Noncondensing ISM Group 1 Class A ISM Group 1 Performance A Performance B
Certifications	Heavy Industrial CE Compliant ATEX Compliance Pending UL/CUL Listing Pending (Class I, Division 2, Groups A, B, C, D)

NOTES:
*Contact factory or your local Dataforth sales office for maximum values.

Ordering Information

Model	Description
MAQ20-DIV20	Analog Input Module; Discrete Input Voltage, 20-ch
MAQ20-DIVC20	Analog Input Module; Discrete Input +24VDC Compliance Voltage, 20-ch

Field Connection (MAQ20-DIV20/ -DIVC20)	Terminal	Terminal	Field Connection (MAQ20-DIV20)	Field Connection (MAQ20-DIVC20)
CH0 +IN	1	2	CH0 -IN	CH0 VC*
CH1 +IN	3	4	CH1 -IN	CH1 VC*
CH2 +IN	5	6	CH2 -IN	CH2 VC*
CH3 +IN	7	8	CH3 -IN	CH3 VC*
CH4 +IN	9	10	CH4 -IN	CH4 VC*
CH5 +IN	11	12	CH5 -IN	CH5 VC*
CH6 +IN	13	14	CH6 -IN	CH6 VC*
CH7 +IN	15	16	CH7 -IN	CH7 VC*
CH8 +IN	17	18	CH8 -IN	CH8 VC*
CH9 +IN	19	20	CH9 -IN	CH9 VC*
CH10 +IN	21	22	CH10 -IN	CH10 VC*
CH11 +IN	23	24	CH11 -IN	CH11 VC*
CH12 +IN	25	26	CH12 -IN	CH12 VC*
CH13 +IN	27	28	CH13 -IN	CH13 VC*
CH14 +IN	29	30	CH14 -IN	CH14 VC*
CH15 +IN	31	32	CH15 -IN	CH15 VC*
CH16 +IN	33	34	CH16 -IN	CH16 VC*
CH17 +IN	35	36	CH17 -IN	CH17 VC*
CH18 +IN	37	38	CH18 -IN	CH18 VC*
CH19 +IN	39	40	CH19 -IN	CH19 VC*

NOTES: *VC = Vcompliance

For input connections and full details on module operation, refer to MA1059 – MAQ20-DIV20/-DIVC20 Discrete Input Module Hardware User Manual, available for download at: www.dataforth.com/maq20_download.aspx

Discrete Output Module: High Density Isolated

20 Output Channels with User Configurable Default Output States

Description

The MAQ20-DODC20SK module has 20 isolated discrete output channels that can switch up to 60VDC signals and sink up to 3A of current. Channels can be switched individually or in block format. User configurable default output states which are set upon power up or module reset ensure failsafe operation for critical applications. Logic polarity can be user defined as standard or inverted. The isolated field outputs are designed for harsh industrial environments and have fast switching times. Field output connections are made through high density spring cage terminal blocks.

Output-to-bus isolation is a robust 1500Vrms and each individual channel is protected up to 60VDC continuous overload in case of inadvertent wiring errors. 150Vrms channel-to-channel isolation gives the module the ability to control equipment with or without common signal grounds or different pieces of equipment with multiple reference potentials.

The high channel count within the narrow module package gives exceptional functionality while preserving valuable mounting space. The high density minimizes cost per channel resulting in economical control solutions.

All MAQ20 modules are designed for installation in Class I, Division 2 hazardous locations and have a high level of immunity to environmental noise commonly present in heavy industrial environments.

Features

- 20 Isolated Discrete Output Channels with User Configurable Default Output States
- Channels Switch up to 60VDC Signals and Sink up to 3A Current
- Channels Switched Individually or in Blocks
- 1500Vrms Output-to-Bus Isolation
- 150Vrms Channel-to-Channel Isolation
- Each Channel Protected up to 60VDC Continuous Overload
- User Defined Logic Polarity
- Fast Switching Times
- Field Output Connections Use Spring Cage Terminal Blocks
- Low Cost per Channel

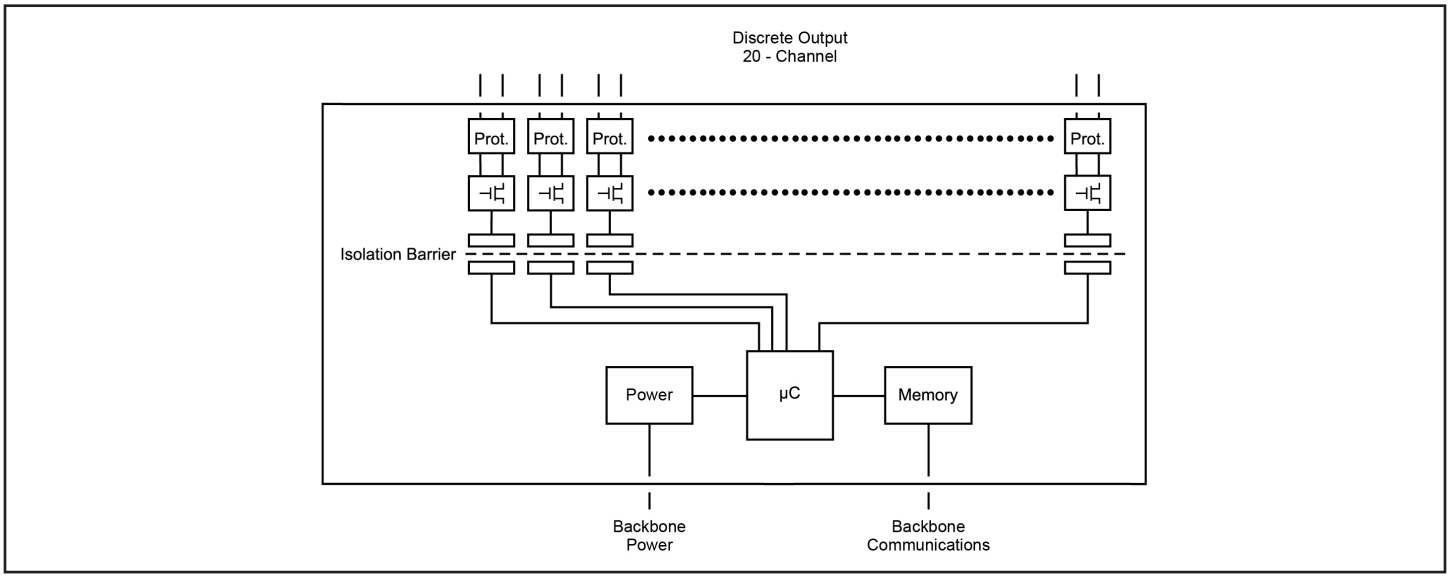


Figure 1: MAQ20-DODC20SK Discrete Output Voltage Module Block Diagram

Specifications

Typical* at T_A =+25°C and +24VDC system power

Module	Description
MAQ20-DODC20SK	10 to 60VDC Output at 3A max per channel
Number of Channels Output Configuration	20 Open Drain MOSFET
Switching Characteristics Turn-On/Turn-Off Time Output Load (Combined load, all channels) Ta = 25ºC Ta = 85ºC	 1ms / 1ms 30A 10A
Output Protection Continuous Transient CMV Channel-to-Bus Channel-to-Channel Transient	 60VDC max ANSI/IEEE C37.90.1 1500Vrms, 1 min 150Vrms, 212V peak ANSI/IEEE C37.90.1
Output Functions Logic Selection Block Write Default Relay State on Power Up/Reset	 Standard / Inverted 20 Channel User Configurable
Update Rate Power Supply Current	1300 Ch/s net, 65 Ch/s at 20-Ch Simultaneous 30mA
Dimensions (h)(w)(d)	3.27" x 4.51" x 0.60" (83.1mm x 114.6mm x 15.3mm)
Environmental Operating Temperature Storage Temperature Relative Humidity Emissions, EN61000-6-4 Radiated, Conducted Immunity EN61000-6-2 RF ESD, EFT	 -40°C to +85°C -40°C to +85°C 0 to 95% Noncondensing ISM Group 1 Class A ISM Group 1 Performance A Performance B
Certifications	Heavy Industrial CE Compliant ATEX Compliance Pending UL/CUL Listing Pending (Class I, Division 2, Groups A, B, C, D)

NOTES:
*Contact factory or your local Dataforth sales office for maximum values.

Ordering Information

Model	Description
MAQ20-DODC20SK	Discrete Output Module; Up to 60VDC Signals, 3A Current, 20-ch

Field Connection (MAQ20-DODC20SK)	Terminal	Terminal	Field Connection (MAQ20-DODC20SK)
CH0 +OUT	1	2	CH0 -OUT
CH1 +OUT	3	4	CH1 -OUT
CH2 +OUT	5	6	CH2 -OUT
CH3 +OUT	7	8	CH3 -OUT
CH4 +OUT	9	10	CH4 -OUT
CH5 +OUT	11	12	CH5 -OUT
CH6 +OUT	13	14	CH6 -OUT
CH7 +OUT	15	16	CH7 -OUT
CH8 +OUT	17	18	CH8 -OUT
CH9 +OUT	19	20	CH9 -OUT
CH10 +OUT	21	22	CH10 -OUT
CH11 +OUT	23	24	CH11 -OUT
CH12 +OUT	25	26	CH12 -OUT
CH13 +OUT	27	28	CH13 -OUT
CH14 +OUT	29	30	CH14 -OUT
CH15 +OUT	31	32	CH15 -OUT
CH16 +OUT	33	34	CH16 -OUT
CH17 +OUT	35	36	CH17 -OUT
CH18 +OUT	37	38	CH18 -OUT
CH19 +OUT	39	40	CH19 -OUT

For input connections and full details on module operation, refer to MA1061 – MAQ20-DODC20SK Discrete Output Module Hardware User Manual, available for download at: www.dataforth.com/maq20_download.aspx

Discrete Output Module: Relay◈

Isolated SPST Latching Relay Output Channels

Description

The MAQ20-DORLY20 module has 20 isolated SPST latching relay output channels that can switch between 2A at 30V and 0.4A at 150V. Each channel has contact state readback to verify the physical output state. Relays can be controlled individually or in blocks and have user configurable default output states which are set upon power up, power loss, and module reset to ensure failsafe operation for critical applications. Relay state control can be user defined as standard or inverted logic. The isolated field outputs are designed for harsh industrial environments and have fast switching times. Advanced output functions SPDT, DPDT, 4x5 Crosspoint Matrix, 8-Channel Differential Multiplexer, 20:1 Multiplexer and Null Mode are configured with external field terminal block wiring and controlled by module commands. Field output connections are made through high density spring cage terminal blocks. Reserve power is stored and used for predictable shutdown to user-defined relay states upon loss of module power.

Output-to-bus isolation is a robust 1500Vrms and each individual channel is protected up to 150Vrms continuous overload in case of inadvertent wiring errors. 150Vrms channel-to-channel isolation gives the module the ability to control equipment with or without common signal grounds or different pieces of equipment with multiple reference potentials.

The high channel count within the narrow module package gives exceptional functionality while preserving valuable mounting space. The high density minimizes cost per channel resulting in economical control solutions.

All MAQ20 modules are designed for installation in Class I, Division 2 hazardous locations and have a high level of immunity to environmental noise commonly present in heavy industrial environments.

◈Preliminary at date of printing. Contact factory for availability.

Features

- 20 Isolated SPST Latching Relay Output Channels
- Channels Switch Between 2A at 30V and 0.4A at 150V
- Contact State Readback on Each Channel
- Relays Controlled Individually or in Blocks
- User Configurable Default States
- 1500Vrms Channel-to-Bus Isolation
- 150Vrms Channel-to-Channel Isolation
- Advanced Output Functions
- User Defined Logic Polarity
- Fast Switching Times
- Field Output Connections Use Spring Cage Terminal Blocks

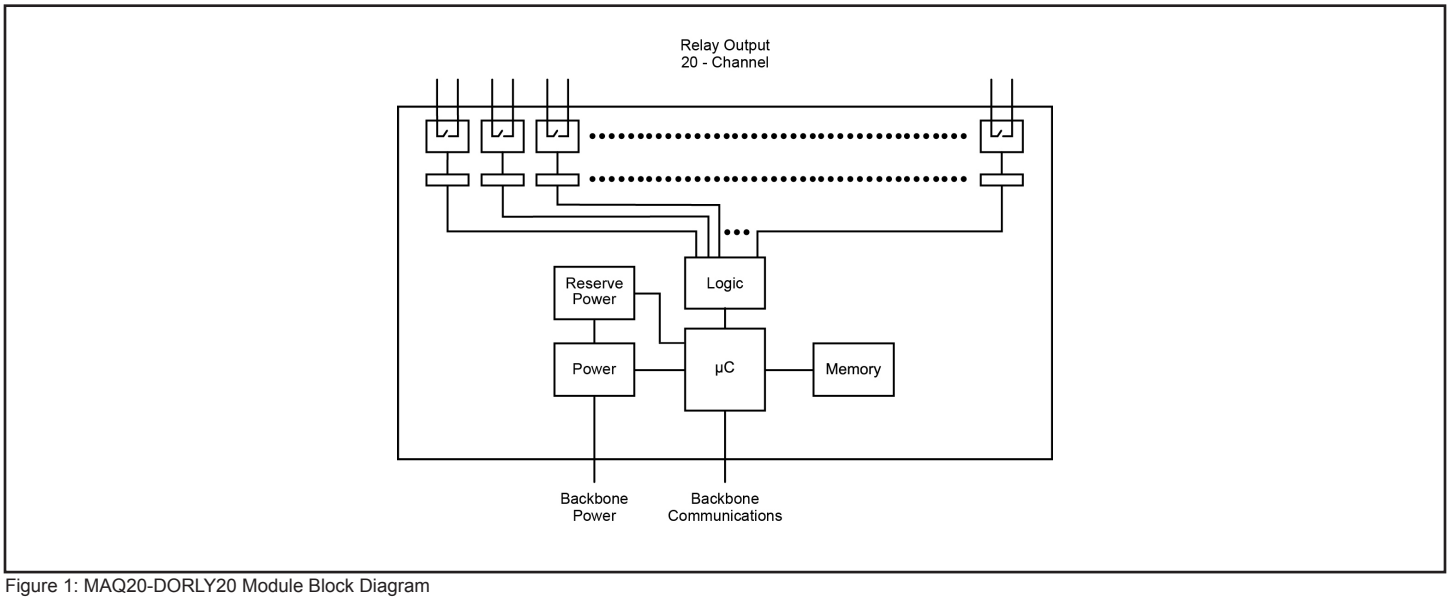


Figure 1: MAQ20-DORLY20 Module Block Diagram

Specifications

Typical* at T_A =+25°C and +24VDC system power

Module	Description
MAQ20-DORLY20◇	60W per channel (2A at 30V to 0.4A at 150V)
Number of Channels Output Configuration	20 SPST Latching Relay with Contact State Readback
Switching Characteristics Turn-On/Turn-Off Time Output Load Ta = 25ºC Ta = 85ºC	 1ms / 1ms 60W per channel max (2A at 30V to 0.4A at 150V) 40W per channel max (1.3A at 30V to 0.27A at 150V)
Output Protection Continuous Transient CMV Channel-to-Bus Channel-to-Channel Transient	 ±150V peak max ANSI/IEEE C37.90.1 1500Vrms, 1 min 150Vrms, 212V peak ANSI/IEEE C37.90.1
Standard Output Functions Logic Selection Block Write Default Relay State on Power Up Default Relay State on Power Loss Default Relay State on Reset Advanced Output Functions Configure with External Wiring	 Standard / Inverted 20 Channel User Configurable User Configurable User Configurable SPDT, DPDT, 4x5 Crosspoint Matrix, 8-Channel Differential Multiplexer, 20:1 Multiplexer, Null Mode
Update Rate Power Supply Current	1300 Ch/s net, 65 Ch/s at 20-Ch Simultaneous 30mA
Dimensions (h)(w)(d)	3.27" x 4.51" x 0.60" (83.1mm x 114.6mm x 15.3mm)
Environmental Operating Temperature Storage Temperature Relative Humidity Emissions, EN61000-6-4 Radiated, Conducted Immunity EN61000-6-2 RF ESD, EFT	 -40°C to +85°C -40°C to +85°C 0 to 95% Noncondensing ISM Group 1 Class A ISM Group 1 Performance A ±0.5% Span Error Performance B
Certifications	Heavy Industrial CE Compliant ATEX Compliance Pending UL/CUL Listing Pending (Class I, Division 2, Groups A, B, C, D)

NOTES:
*Contact factory or your local Dataforth sales office for maximum values.
◇Preliminary at date of printing. Contact factory for availability.

Ordering Information

Model	Description
MAQ20-DORLY20◇	Discrete Output Module; Isolated SPST Latching Relay Channels

Field Connection	Terminal	Terminal	Field Connection
CH0 POLE	1	2	CH0 THROW
CH1 POLE	3	4	CH1 THROW
CH2 POLE	5	6	CH2 THROW
CH3 POLE	7	8	CH3 THROW
CH4 POLE	9	10	CH4 THROW
CH5 POLE	11	12	CH5 THROW
CH6 POLE	13	14	CH6 THROW
CH7 POLE	15	16	CH7 THROW
CH8 POLE	17	18	CH8 THROW
CH9 POLE	19	20	CH9 THROW
CH10 POLE	21	22	CH10 THROW
CH11 POLE	23	24	CH11 THROW
CH12 POLE	25	26	CH12 THROW
CH13 POLE	27	28	CH13 THROW
CH14 POLE	29	30	CH14 THROW
CH15 POLE	31	32	CH15 THROW
CH16 POLE	33	34	CH16 THROW
CH17 POLE	35	36	CH17 THROW
CH18 POLE	37	38	CH18 THROW
CH19 POLE	39	40	CH19 THROW

For input connections and full details on module operation, refer to MA1063 – MAQ20-DORLY20 Discrete Relay Output Module Hardware User Manual, available for download at: www.dataforth.com/maq20_download.aspx

System Backbones

Distribute Power and Communications

Description

The MAQ20 system backbone resides within the DIN rail used for module mounting and provides power to and interface between the communications module and the I/O modules. Standard backbones provide for one communication module and 4, 8, 16, or 24 I/O modules. The longest backbone, which accommodates 24 I/O modules, fits in an industry standard 19" rack. Each backbone utilizes a pluggable connector system on each end such that varying system channel counts can be configured using the standard backbones. As a result of this pluggable system, the main part of a system, including the communications module, can be installed in one location while other sets of I/O modules installed in remote locations connect to the main system through a wire harness.

Modules mount on industry standard 35x7.5mm gull-wing DIN rails.

Once a system is established with a system backbone and a communications module, system configuration is accomplished by applying power and installing the I/O modules. These are hot swappable and true 'plug and run'. When an I/O module is plugged into any backbone position, the communications module automatically recognizes that it has been added to the system, registers it in the system configuration record, and makes it immediately available in the host software for use in data acquisition and control and test and measurement applications. Similarly, when a module is removed from any backbone position, the communications module recognizes that it has been unplugged, removes it from the system configuration, and disables it in the software.

Features

- Compact Mounting in DIN Rail Channel
- Distribute Power and Communications
- 4, 8, 16, and 24 Position Models
- Simplify System Wiring
- Expandable for Local or Distributed Installation
- Prevent Reverse Installation
- Long-Life, Durable, Vibration Resistant Contacts

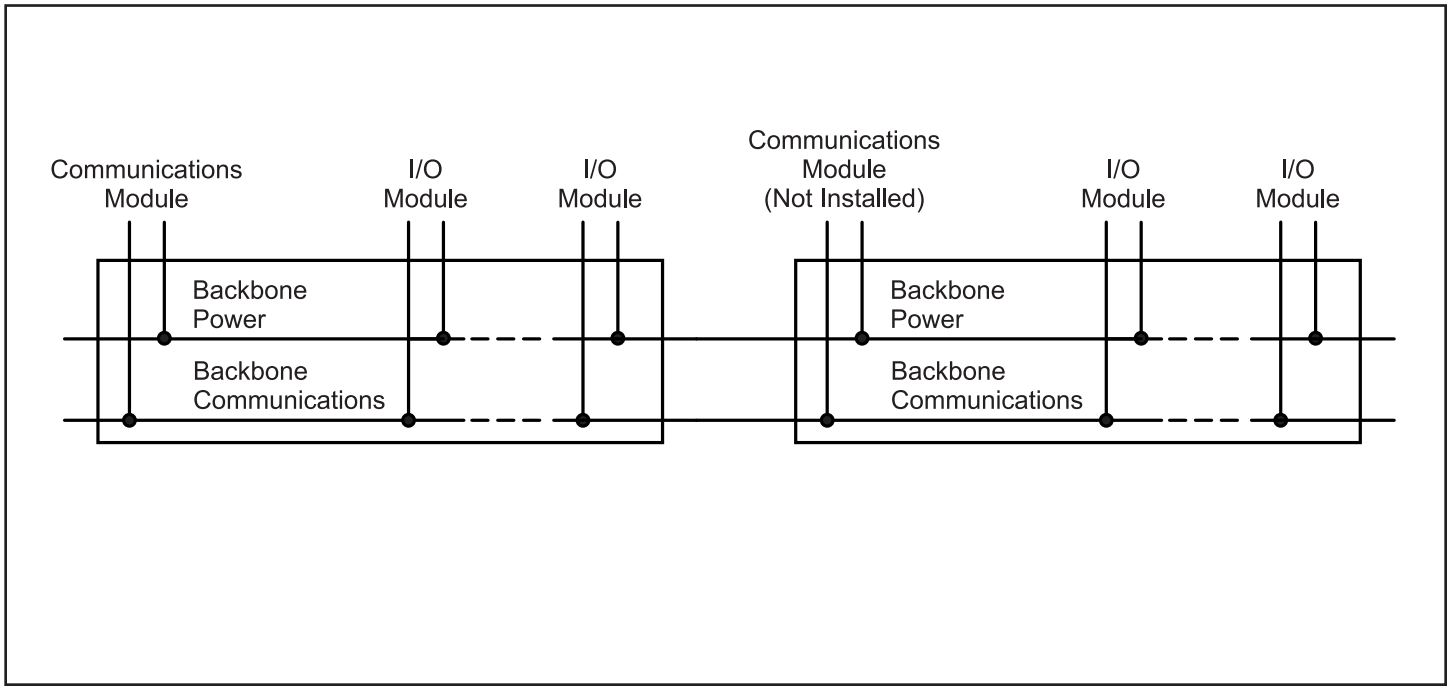


Figure 1: MAQ20 Backbone Block Diagram

Specifications

Module	Description
MAQ20-BKPL4 MAQ20-BKPL8 MAQ20-BKPL16 MAQ20-BKPL24	1 COM Module plus 4 I/O Modules 1 COM Module plus 8 I/O Modules 1 COM Module plus 16 I/O Modules 1 COM Module plus 24 I/O Modules
Expansion & Distributed Installation	
Mechanical	Male/Female pluggable terminal blocks at each end of the backbone allow direct interconnection or remote installation using the accessory expansion cable.
Expansion Distance	100ft (30m) max
Mounting	
Physical	Spring clips hold the backbone in the DIN rail. When modules are installed, the backbone is secured to the DIN rail.
Reverse Protection	Mechanical interface prevents reverse module installation.
Electrical	
Circuitry	Passive
Inter-Module Communications	RS-485
Dimensions (h)(w)(d)	
MAQ20-BKPL4	5.05” x 0.94” (127.1mm x 3.9mm)
MAQ20-BKPL8	7.53” x 0.94” (191.1mm x 3.9mm)
MAQ20-BKPL16	12.63” x 0.94” (320.9mm x 3.9mm)
MAQ20-BKPL24	17.41” x 0.94” (442.1mm x 3.9mm)
Environmental	
Operating Temperature	–40°C to +85°C
Storage Temperature	–40°C to +85°C
Relative Humidity	0 to 95% Noncondensing
Certifications	Heavy Industrial CE Compliant UL/CUL Listing Pending (Class I, Division 2, Groups A, B, C, D) ATEX Compliance Pending

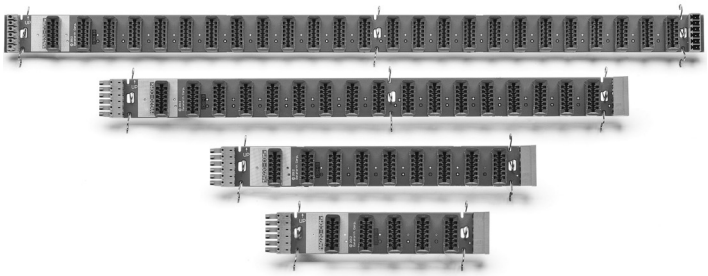


Figure 2: MAQ20 Backbones for 4, 8, 16, and 24 I/O Modules

Ordering Information

Model	Description
MAQ20-BKPL4	DIN Rail Backbone; 1 COM Module plus 4 I/O Modules
MAQ20-BKPL8	DIN Rail Backbone; 1 COM Module plus 8 I/O Modules
MAQ20-BKPL16	DIN Rail Backbone; 1 COM Module plus 16 I/O Modules
MAQ20-BKPL24	DIN Rail Backbone; 1 COM Module plus 24 I/O Modules

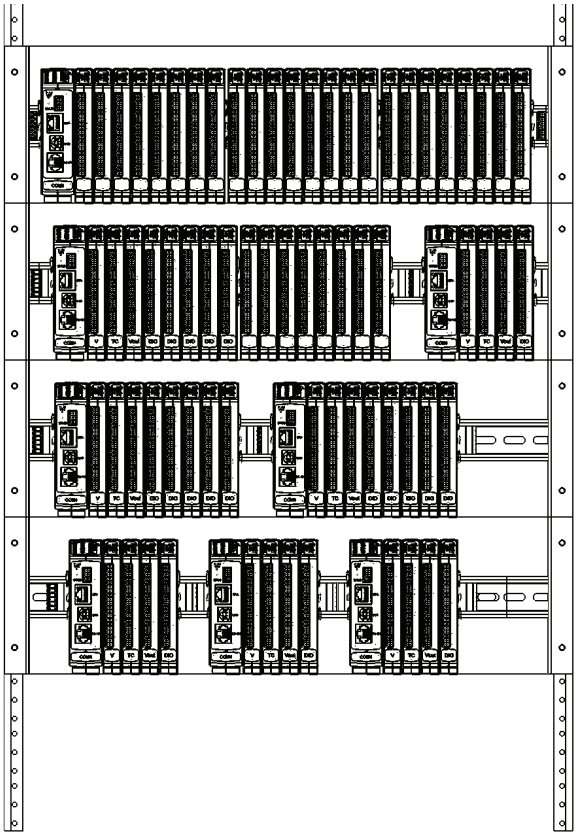


Figure 3: Flexible Backbone System Allows Configuration with Communications Module and 4, 8, 16, or 24 I/O Modules in 19” Rack Space

For connections and full details on system operation, refer to MA1040 – MAQ20 Communications Module Hardware User Manual, available for download at: www.dataforth.com/maq20_download.aspx.

MAQ20-940/-941/-945

ReDAQ® Shape and Configuration Software for MAQ20

Description

Dataforth offers ReDAQ Shape software for MAQ20 as an easy and efficient development tool for use with the MAQ20 Industrial Data Acquisition and Control System. This software enables users to create, save, and open graphical user interface projects for test, process, data collection and data analysis applications. Built-in functions in the Acquire and Analyze panels are pre-configured and can be used as is. Just three easy steps are required to create data acquisition and control projects in the Presentation panel using 65 high quality tools and powerful MAQ20 functions.

ReDAQ Shape for MAQ20 is ideal for data acquisition, monitoring and control applications. It enables users to easily interact with the Dataforth PID loop controller, which an engineer or operator accesses through faceplates within the software.

The ReDAQ Shape software also provides an effective way to configure and customize MAQ20 functions for specific application requirements. The toolbox tools are easily moved, re-sized, cut, copied, pasted, and deleted. The main screen of ReDAQ Shape shows a representation of the system inclusive of the communications module and any installed I/O modules. This graphic is updated as I/O modules are added to or removed from the system. Modules can be given unique identifiers, and I/O module channels can be assigned tag names to represent process variables they control.

Based on programming tools incorporated from Microsoft Visual Studio® and National Instruments Measurement Studio™, ReDAQ Shape software for MAQ20 has a very short user-learning curve and offers integrated, across-the-board applicability for data acquisition and control applications. It requires only a one-time low-cost license fee.

Features

- 3 Easy Steps to Create Customized Applications
- No Setup or Configuration Required to Acquire and Analyze Data
- Faceplates for PID Loop Control
- 65 Toolbox Tools Simplify Project Creation
- Supports Any Graphical File Format
- Integrated, Across-the-Board Applicability
- Most Efficient Way to Configure and Run MAQ20 Systems
  - Continuous acquisition and burst scan modes
  - Automatically scales data from counts to engineering units
  - Discrete I/O offers 7 special functions: Pulse/Frequency Counter, Pulse/Frequency Counter with De-bounce, Waveform Measurement, Time Between Events, Frequency Generator, PWM Generator, One-Shot Pulse Generator
  - Assign tag names for any input and output
  - Configure control loops and alarm outputs
  - Three function timer (count-down, 24hr/day, day/time) with 10 programmable events

Configure

Display

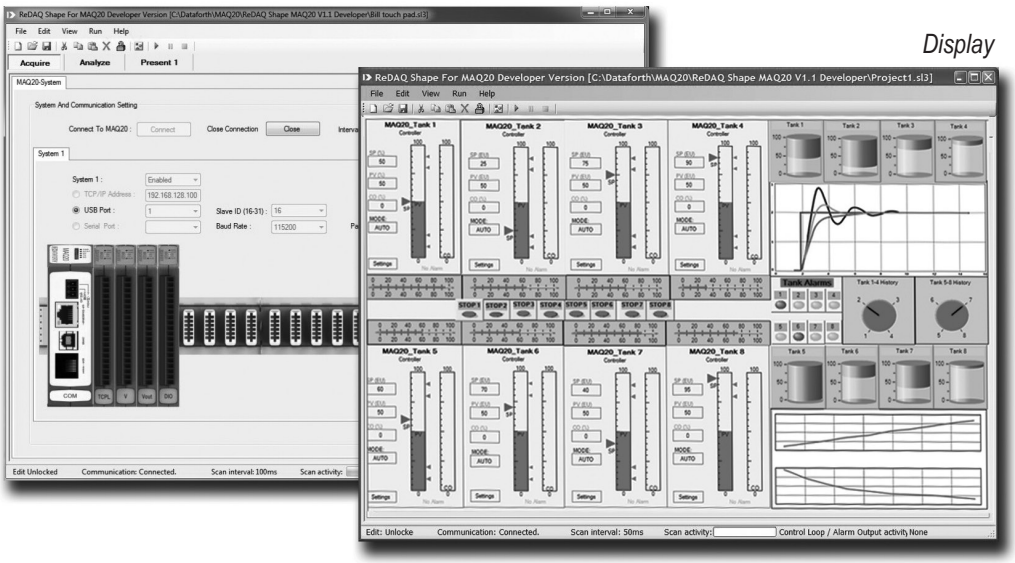


Figure 1: ReDAQ Shape Software Screen Shots

PID Control Using MAQ20-COMx Modules and ReDAQ Shape for MAQ20 Software

Description

The powerful Dataforth MAQ20 communications module is capable of autonomously running up to 32 PID control loops; faceplates within ReDAQ Shape software enable an engineer or operator to configure the many features of loop control and monitor processes.

With proportional and derivative modes that can act on error or a process variable, the controller can eliminate process bumps from set point changes. Gap control provides improved loop stability near the set point while retaining high response speed. The ability to change tuning settings without disturbing the process when the controller is in automatic mode and the option to track the set points of process variables during manual operation are both key features that enable smooth operation in both manual and automatic modes.

To ensure sensitive equipment is well protected, the controller's output range can be limited. The anti-reset windup feature both minimizes overshoot and improves stability after output saturation conditions.

The integrated Auto-Tuner simplifies the complex task of control loop tuning with separate methods for integrating and self-regulating loops.

Typical PID Control Applications

- Steam, water, and chemical flow control
- Tank level control
- Heat-exchanger / reactor temperature control
- Pressure control

Many types of processes in a wide variety of applications can be managed using the Dataforth PID controller in the MAQ20 system. Its high level of performance and broad range of features are paralleled only by much larger state-of-the-art distributed control systems.

Features

- Separate Panels for Setting Basic, Advanced, and Alarm Items
- Noninteracting and Parallel PID Control Algorithms
- Up to 32 Loops of PID Control
- Controller Runs in Real Time
- Controller Accessed through Faceplates
- Proportional and Derivative Modes can Act on Error or Process Variable
- Gap Control
- Built-in Process Variable Filtering
- Bumpless Manual to Automatic Control Mode Transfer
- Change Tuning Settings Easily in Automatic Mode
- Optional Process Variable Set Point Tracking in Manual Mode
- Limit Controller Output Range
- Anti-Reset Windup
- Four Process Alarms
- Full-Featured Faceplate for Numeric and Visual Feedback
- Integrated Auto-Tuner

Ordering Information

Model	Description
MAQ20-940	ReDAQ Shape Software for MAQ20 Developer Version
MAQ20-941	ReDAQ Shape Software for MAQ20 User Version
MAQ20-945	MAQ20 Configuration Software Tool

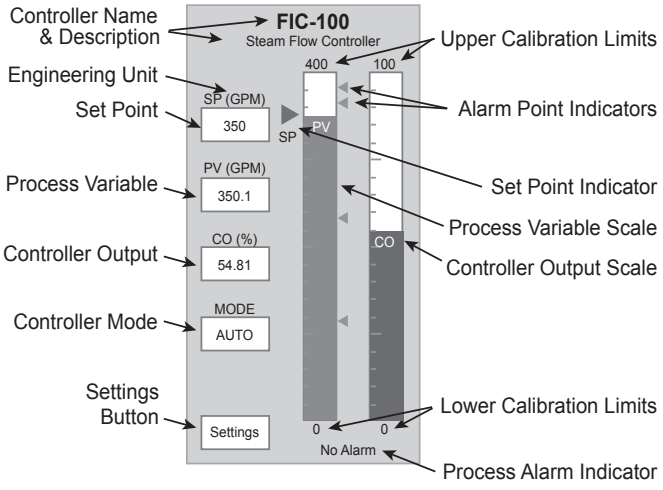


Figure 2: PID Faceplate in ReDAQ Shape Software

MAQ20-951/-952

IPEmotion Software for MAQ20

Description

Representing the next step in test and measurement, IPEmotion is a very advanced, intuitive, versatile, and high performance data acquisition / test and measurement software designed specifically for industrial and R&D applications. Now available with an interface to the MAQ20, this powerful new generation software provides synchronized data acquisition and is easily adaptable to all customer specific requirements.

These requirements can include device configuration, data acquisition measurement, visualization, and analysis; to meet them, IPEmotion provides automatic recognition of connected devices, automatic configuration of all channels, automatic start of measuring, and instant visualization of all measurement values.

MAQ20 and IPEmotion measurements include temperature, current and voltage, strain, pressure, frequencies and rotational speeds, and logging and diagnostic data.

To enhance ease of use and increase productivity, the versatile IPEmotion software is available in seven languages: English, German, French, Italian, Chinese (traditional and simplified), Korean, and Japanese.

PID loop control is an integral part of IPEmotion. It runs in Windows and an unlimited number of loops are possible; the only limiting factor is the processing power of the PC.

IPEmotion communicates with the MAQ20 via a Plug-In driver. The software enables many functions to be integrated by linking external .dll and Visual Basic Script (.VBS) files to the application. Script is a powerful tool which enables users to automate the measurement process and to change menus, settings, analyzing procedures, and other aspects of the software.

Well designed for long-term measurements, IPEmotion allows measurement analysis and verification during data acquisition. Storage can be on a local hard drive or a remote drive, including a mapped Internet or network drive.

Features

- Live Data Display, Recording, Online and Offline Math and Logic Functions
- One-Click Acquisition
  - Direct hardware detection, data display and recording
- Live Adjustment
  - Analyze and verify measurements during active data acquisition
  - GUI adaptation during active measurement and storage
- Data Analysis
- PID Loop Control
- Post Processing and Report Generation
- Easy Drag and Drop HMI Creation
- High Speed Recording to 1000 Samples/s
- Plug-In Synchronization
- Import and Export Recorded Data Using Standard File Formats
- Scripting Option with VB or Python Software
- Configurable Gauges for Wide Ranging Applications
- Multilingual

Control *Recording*

Figure 1: IPEmotion Software Screen Shots

PID Control Using IPEmotion Software with MAQ20 Plug-In

Description

PID loop control is extensive and highly functional in the IPEmotion software. An unlimited number of loops can be run; the only limiting factor is the processing power of the PC.

A maximum calculation cycle time update rate of 1kHz allows the software to control processes with fast reacting elements.

Typical PID Applications

- Steam, water, and chemical flow control
- Tank level control
- Heat-exchanger / reactor temperature control
- Pressure control

Ordering Information

Model	Description
MAQ20-951	IPEmotion Software for MAQ20 (1 COM module and 1 to 4 I/O modules)
MAQ20-952	IPEmotion Software for MAQ20 (Each additional 4 I/O modules)

Features

- Control Module Includes PID, State Machine, Function Generator, Math Functions
- Unlimited PID Control Loops Possible
- PID Controller Runs in Windows
- Start, Stop, Hold Trigger for All Control Functions
- Designed for Test Sequencing and Test Bench Control Operations
- 1kHz Maximum Calculation Cycle Time Update Rate
- Easily Configured Test Sequences using VB or Python Scripts
- Configure with Point and Click Functions on IPEmotion GUI
- Software Usable as Virtual PLC

Accessories

Expansion Cables and Load Share Power Supply Module

Description

Accessories for the MAQ20 Industrial Data Acquisition and Control System include backbone expansion cables and a load share power supply module for systems that have power supply requirements greater than those the communications module provides.

Also available are cables to interface 8B backpanels to the MAQ20-VSN module, and USB and Ethernet cables and adapters.

A MAQ20 Demonstration Suitcase with process simulator is offered to sales channels.

The five PWR-PS5RxW power supplies used by the MAQ20 are the same as those used by DSCA signal conditioners.

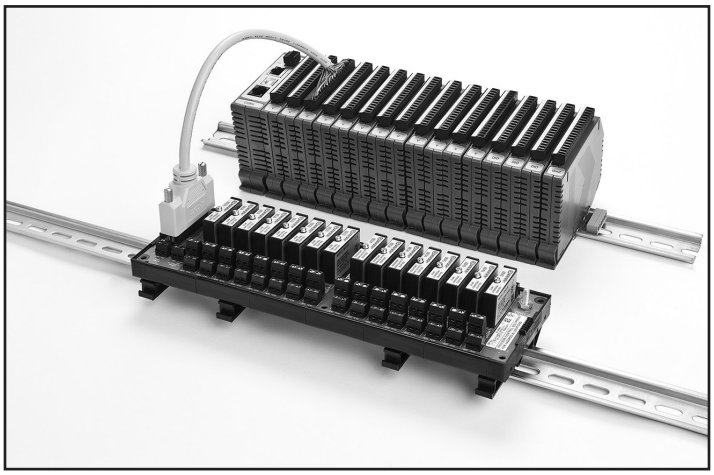


Figure 1: Cable Interfacing 8B Backpanel to MAQ20-VSN Module

Ordering Information

Backbone Expansion Cables

Model	Description
MAQ20-XCA-01	Backbone Expansion Cable; 1 meter
MAQ20-XCA-02	Backbone Expansion Cable; 2 meter

Load Share Power Supply Module

Model	Description
MAQ20-PWR3	Load Share Power Supply Module

Cables to Interface 8B Backpanels to MAQ20-VSN Module

Model	Description
MAQ20-8B25-0.3	DB25-to-20 pos screw term Transition Cable, 0.3m long
MAQ20-8B25-0.6	DB25-to-20 pos screw term Transition Cable, 0.6m long
MAQ20-8B25-01	DB25-to-20 pos screw term Transition Cable, 1.0m long

USB and Ethernet Cables and Adapters

Model	Description
SLX147-01, -02, -05	USB Cable, Type A to Type B; 1m, 2m, 5m
SLX141-01, -02, -07	Ethernet Cable, 1m, 2m, 7m
SLX141-X01, -X02, -X07	Ethernet Crossover Cable, 1m, 2m, 7m
SLX146-02, -07	Null Modem Serial Cable, Female DB-9 to Female DB-9; 2m, 7m
SLX142, 143	RJ45 to DB9 Adapters
SLX144	RJ45 RS-485 Multidrop Adapter

MAQ20 Demonstration Suitcase

Model	Description
MAQ20DEMO-B	MAQ20 Demonstration Suitcase with Process Simulator for Sales Channels

PWR-PS5RxW Power Supplies

Model	PWR-PS5R7W	PWR-PS5R15W	PWR-PS5R30W	PWR-PS5R60W	PWR-PS5R120W
Input	100 to 240VAC nominal; 85 to 264VAC, 100 to 370VDC compatible				
Output Voltage & Current Ratings	24V, 0.3A	24V, 0.65A	24V, 1.3A	24V, 2.5A	24V, 5.0A
Power	7.5W	15W	30W	60W	120W
Dimensions (h)(w)(d)	2.95" x1.77" x 2.76") (75mm x 45mm x 70mm)	3.54" x 0.89" x 3.74" (90mm x 22.5mm x 95mm)	3.54" x 0.89" x 3.74" (90mm x 22.5mm x 95mm)	3.74" x 1.42" x 4.25" (95mm x 36mm x 108mm)	4.53" x 1.81" x 4.76" (115mm x 46mm x 121mm)

NOTE:
For complete PWR-PS5RxW Power Supplies specifications, see page 232 in 2017 Full-Line Catalog.

DATAFORTH WARRANTY

Applying to Products Sold by Dataforth Corporation

a. **General.** Dataforth Corporation ("Dataforth") warrants that its products furnished under this Agreement will, at the time of delivery, be free from defects in material and workmanship and will conform to Dataforth's applicable specifications or, if appropriate, to buyer's specifications accepted in writing by Dataforth. DATAFORTH'S OBLIGATION OR LIABILITY TO BUYER FOR PRODUCTS WHICH DO NOT CONFORM TO THE ABOVE STATED WARRANTY SHALL BE LIMITED TO DATAFORTH, AT DATAFORTH'S SOLE DISCRETION, EITHER REPAIRING, REPLACING, OR REFUNDING THE PURCHASE PRICE OF THE DEFECTIVE PRODUCT(S) PROVIDED THAT WRITTEN NOTICE OF SAID DEFECT IS RECEIVED BY DATAFORTH WITHIN THE TIME PERIODS SET FORTH BELOW:

i. for all software products including licensed programs, thirty (30) days from date of initial delivery;

ii. for all hardware products including complete systems, three (3) years from date of initial delivery;

iii. for all special products, sixty (60) days from date of initial delivery; and

further, all products warranted hereunder for which Dataforth has received timely notice of nonconformance must be returned FOB to Dataforth's plant in Tucson, Arizona USA within thirty (30) days after the expiration of the warranty periods set forth above.

The foregoing warranties shall not apply to any products which Dataforth determines have, by buyer or otherwise, been subjected to operating and/or environmental conditions in excess of the maximum value established therefor in the applicable specifications, or any products that have been the subject of mishandling, misuse, misapplication, neglect, improper testing, repair, alteration or damage. THE PROVISIONS OF THE FOREGOING WARRANTIES EXTEND TO BUYER ONLY AND NOT TO BUYER'S CUSTOMERS OR USERS OF BUYER'S PRODUCTS. THE DATAFORTH STANDARD WARRANTY IS IN LIEU OF ALL WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE OR USE AND ALL OTHER WARRANTIES WHETHER EXPRESS, IMPLIED OR STATUTORY, EXCEPT AS TO TITLE. THE DATAFORTH STANDARD WARRANTY MAY BE CHANGED BY DATAFORTH WITHOUT NOTICE.

b. **Buyer Indemnity**. Buyer agrees to indemnify and hold Dataforth harmless from and against any and all claims, damages and liabilities whatsoever asserted by any person, entity, industry organization, government, or governmental agency of any country resulting directly or indirectly (i) from any acts not authorized by Dataforth in writing or any statements regarding the products inconsistent with Dataforth's product documentation or standard warranty, or (ii) from any breach or threatened breach by buyer, or by any of its employees or agents, of any term, condition or provision of this Warranty or (iii) from any warranty, representation, covenant or obligation given by buyer to any third party and not expressly provided for in this Warranty or (iv) for any non-compliance (in any form) of the products with any necessary or mandatory applicable laws, regulations, procedures, government or industry policies or requirements related to the use, sale or importation of the products. Such indemnification shall include the payment of all reasonable attorneys' fees and other costs incurred by Dataforth in defending such claim.

c. **Limitation on Damages.**

(1) IN NO EVENT SHALL DATAFORTH, ITS SUPPLIERS, LICENSORS, SERVICE PROVIDERS, EMPLOYEES, AGENTS, OFFICERS, AND DIRECTORS BE LIABLE FOR INDIRECT, SPECIAL, INCIDENTAL, COVER, ECONOMIC, PUNITIVE, ACTUAL, EXEMPLARY, CONSEQUENTIAL OR OTHER DAMAGES OF ANY NATURE INCLUDING, WITHOUT LIMITATION, LOST PROFITS OR REVENUES, COSTS OF REPLACEMENT PRODUCTS, LOSS OR DAMAGE TO DATA ARISING OUT OF THE USE OR INABILITY TO USE ANY DATAFORTH PRODUCT.

(2) IN NO EVENT SHALL DATAFORTH BE LIABLE FOR DIRECT, SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY NATURE RESULTING FROM BUYER'S NONCOMPLIANCE (IN ANY FORM) WITH ALL NECESSARY OR MANDATORY APPLICABLE LAWS, REGULATIONS, PROCEDURES, GOVERNMENT POLICIES OR REQUIREMENTS RELATED TO THE USE, SALE OR IMPORTATION OF PRODUCTS.

(3) IN NO EVENT WILL THE COLLECTIVE LIABILITY OF DATAFORTH AND ITS SUPPLIERS, LICENSORS, SERVICE PROVIDERS, EMPLOYEES, AGENTS, OFFICERS, AND DIRECTORS TO ANY PARTY (REGARDLESS OF THE FORM OF ACTION, WHETHER BASED UPON WARRANTY, CONTRACT, TORT, OR OTHERWISE) EXCEED THE GREATER OF EITHER US$1000.00 (ONE THOUSAND DOLLARS U.S.A. CURRENCY) OR THE AMOUNT PAID TO DATAFORTH FOR THE APPLICABLE PRODUCT OR SERVICE OUT OF WHICH LIABILITY AROSE.

(4) DATAFORTH'S LIABILITY ARISING OUT OF THE PRODUCTION, SALE OR SUPPLY OF PRODUCTS OR THEIR USE OR DISPOSITION, WHETHER BASED UPON WARRANTY, CONTRACT, TORT OR OTHERWISE, SHALL NOT EXCEED THE GREATER OF EITHER US$1000.00 (ONE THOUSAND DOLLARS U.S.A. CURRENCY) OR THE ACTUAL PURCHASE PRICE PAID BY BUYER FOR DATAFORTH'S PRODUCTS. DATAFORTH'S LIABILITY FOR ANY CLAIM OF ANY KIND SHALL IN NO CASE EXCEED THE OBLIGATION OR LIABILITY SPECIFIED IN THIS WARRANTY.

d. **Technical Assistance.** Dataforth's Warranty as hereinabove set forth shall not be enlarged, diminished or affected by, and no obligation or liability shall arise or grow out of, Dataforth's rendering of technical advice, facilities or service in connection with buyer's order of the products furnished hereunder.

e. **Warranty Procedures.** Buyer shall notify Dataforth of any products which it believes to be defective during the applicable warranty period and which are covered by the Warranty set forth above. Buyer shall not return any products for any reason without the prior authorization of Dataforth and issuance of a Return Material Authorization ("RMA") number. After issuance of a RMA number, such products shall be promptly returned by buyer (and in no event later than thirty (30) days after the Warranty expiration date), transportation and insurance prepaid, to Dataforth's designated facility for examination and testing. Dataforth shall either repair or replace any such products found to be so defective and promptly return such products to buyer, transportation and insurance prepaid. Should Dataforth's examination and testing not disclose any defect covered by the foregoing Warranty, Dataforth shall so advise buyer and dispose of or return the products in accordance with buyer's instructions and at buyer's sole expense, and buyer shall reimburse Dataforth for testing expenses incurred at Dataforth's then current repair rates.

f. **Repair Warranty.** Dataforth warrants its repair work and/or replacement parts for a period of ninety (90) days from receipt by buyer of the repaired or replaced products or for the remainder of the warranty period for the initial delivery of such order as set forth in paragraph a above, whichever is greater.

g. **Critical Applications.** Certain applications using Dataforth's products may involve potential risks of death, personal injury, or severe property or environmental damage ("Critical Applications"). DATAFORTH'S PRODUCTS ARE NOT DESIGNED, INTENDED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT DEVICES OR SYSTEMS, SAFETY EQUIPMENT, NUCLEAR FACILITY APPLICATIONS OR OTHER CRITICAL APPLICATIONS WHERE MALFUNCTION OF THE PRODUCT CAN BE EXPECTED TO RESULT IN PERSONAL INJURY, DEATH OR SEVERE PROPERTY DAMAGE. BUYER USES OR SELLS SUCH PRODUCTS FOR USE IN SUCH CRITICAL APPLICATIONS AT BUYER'S OWN RISK AND AGREES TO DEFEND, INDEMNIFY AND HOLD HARMLESS DATAFORTH FROM ANY AND ALL DAMAGES, CLAIMS, PROCEEDINGS, SUITS OR EXPENSE RESULTING FROM SUCH USE.

h. **Static Sensitive.** Dataforth ships all product in anti-static packages. Dataforth's Warranty as hereinabove set forth shall not cover warranty repair, replacement, or refund on product or devices damaged by static due to buyer's failure to properly ground.

Application Support

Dataforth provides timely, high-quality product support. Call **1-800-444-7644 TOLL-FREE**

Returns/Repair Policy

All warranty and repair requests should be directed to the Dataforth Customer Service Department at (520) 741-1404. If a product return is required, request a Return Material Authorization (RMA) number. You should be ready to provide the following information:

1. Complete product model number.
2. Product serial number.
3. Name, address, and telephone number of person returning product.
4. Special repair instructions.
5. Purchase order number for out-of-warranty repairs.

The product should be carefully packaged, making sure the RMA number appears on the outside of the package, and shipped prepaid to:

Dataforth Corporation
6230 S. Country Club
Tucson, AZ 85706 USA

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WORLD HEADQUARTERS

Dataforth Corporation
3331 E. Hemisphere Loop
Tucson, AZ 85706 USA
Toll Free: 800-444-7644
Tel: 520-741-1404
Fax: 520-741-0762
Email: sales@dataforth.com
www.dataforth.com

Dataforth Europe
Tel: +44 (0) 1785 472 727
Email: customerservice@dataforth.eu
www.dataforth.eu

Asia/Pacific Customer Assistance
Tel: +1 800-444-7644
Email: sales@dataforth.com
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