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 \( T_a = +25^\circ \text{C} \) and +24VDC system power

<table>
<thead>
<tr>
<th>Module</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>MAQ20-JTC</td>
<td>8-ch., Type JTC, Differential Input (-100^\circ \text{C} ) to (+760^\circ \text{C} ) (Default)</td>
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<tr>
<td>MAQ20-KTC</td>
<td>8-ch., Type KTC, Differential Input (-100^\circ \text{C} ) to (+998^\circ \text{C} )</td>
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<tr>
<td>MAQ20-TTC</td>
<td>8-channel, Type TTC, Differential Input (-100^\circ \text{C} ) to (+400^\circ \text{C} ) (Default), (-100^\circ \text{C} ) to (+220^\circ \text{C} )</td>
</tr>
<tr>
<td>MAQ20-RSTC</td>
<td>8-channel, Type RTC and Type STC, Differential Input Type R: ( 0^\circ \text{C} ) to (+1750^\circ \text{C} ) (Default), Type S: ( 0^\circ \text{C} ) to (+990^\circ \text{C} )</td>
</tr>
</tbody>
</table>

Per Channel Setup Input Protection
- Continuous
- Transient
CV:
- Channel-to-Bus
- Channel-to-Channel
- Transient

CMR:
- 100dB at 50/60Hz
- 26dB at 50/60Hz

Accuracy\(^{(1)}\)
- \( \pm 0.06\% \) span
- \( \pm 0.035\% \) span

Cold Junction Compensation
- \( \pm 0.25^\circ \text{C} \) at \(+25^\circ \text{C} \), \( \pm 1.0^\circ \text{C} \) at \(-40^\circ \text{C} \) to \(+85^\circ \text{C} \)
- \( 0.020\% \) span

Stability
- \( \pm 15\text{ppm/}^\circ \text{C} \)
- \( \pm 35\text{ppm/}^\circ \text{C} \)

Bandwidth, \(-3\text{dB}\)
- 3Hz
- 200 Ch/s
- High/High-High / Low / Low-Low
- Downscales, \( \leq 5 \) s, 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
  - \(-40^\circ \text{C} \) to \(+85^\circ \text{C} \)
- \(-40^\circ \text{C} \) to \(+85^\circ \text{C} \)
- 0 to 95% Noncondensing
- ISM Group 1
- Class A
- ISM Group 1
- Performance A \( \pm 0.5\% \) Span Error
- Performance B

Certifications
- Heavy Industrial CE Compliant
- UL/CSA Listing Pending
- (Class I, Division 2, Groups A, B, C, D)
- ATEX Compliance Pending

**Ordering Information**

**Model**
- MAQ20-JTC
- MAQ20-KTC
- MAQ20-TTC
- MAQ20-RSTC

**Description**
- Analog Input Module; Type J Thermocouple, 8-ch
- Analog Input Module; Type K Thermocouple, 8-ch
- Analog Input Module; Type T Thermocouple, 8-ch
- Analog Input Module; Type R and Type S Thermocouple, 8-ch

**Terminal Block Position (top to bottom)**

<table>
<thead>
<tr>
<th>Terminal Block Position</th>
<th>MAQ20-xTC Input Connections</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>CH0</td>
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<td>CH0</td>
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<td>CH7</td>
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<td></td>
<td>CH8</td>
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**NOTES:**
- \(^{(1)}\) Contact factory or your local Dataforth sales office for maximum values.
- Does not include CJC accuracy.

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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