3500/60 & /61 Temperature Monitors

Product Datasheet

Bently Nevada* Asset Condition Monitoring

Description

The 3500/60 & 61 modules provide six channels of temperature monitoring and accept both Resistance Temperature Detector (RTD) and Thermocouple (TC) temperature inputs. The modules condition these inputs and compare them against user-programmable alarm setpoints. The 3500/60 and 3500/61 provide identical functionality except that the 3500/61 provides recorder outputs for each of its six channels while the 3500/60 does not.

The user programs the modules to perform either RTD or TC temperature measurements using the 3500 Rack Configuration Software. Different I/O modules are available in RTD/TC non-isolated or TC isolated versions. The user can configure the RTD/TC non-isolated version to accept either TC or RTD, or a mixture of TC and RTD inputs. The TC isolated version provides 250 Vdc of channel-to-channel isolation to protect against external interference.

When used in a Triple Modular Redundant (TMR) configuration, temperature monitors must be installed adjacent to each other in groups of three. When used in this configuration, the system employs two types of voting to ensure accurate operation and to avoid single-point failures.

Specifications

Inputs

Signal

Accepts from 1 to 6 RTD or TC transducer signals.

Input Impedance

10 MΩ for each lead input.

Power Consumption

3500/60: Nominal consumption of 7 watts.

3500/61: Nominal consumption of 9 watts.

Tranducers

TCs

Type E: -100 °C to +1000 °C,

(-148 °F to +1832 °F).

Note: When using any of the isolated thermocouple I/O modules (-03 or -04 I/O ordering option) with Type E thermocouples, the available full-scale range will be reduced if the 3500 system is operated in an ambient temperature above +35C. The reduced range will be -60C to +1000C (-76F to +1832F). Rack configuration software will allow the user to configure a channel down to -100C but the system will not function properly in this scenario and therefore should not be configured to operate with these settings.

Type J: -18 °C to +760 °C,

(+0 °F to +1400 °F).

Type K: -18 °C to +1370 °C,

(+0 °F to +2498 °F).

Type T: -160 °C to +400 °C,

(-256 °F to +752 °F).

RTDs

100Ω 3-wire & 4-wire platinum RTD (alpha = 0.00385):

-200° C to +850° C

(-328 °F to +1562 °F).

With external barriers:

-50 °C to +850 °C

(-122 °F to +1562 °F).

100Ω 3-wire & 4-wire platinum RTD (alpha = 0.00392):

-200 °C to +700 °C

(-328 °F to +1292 °F).

With external barriers:

-50 °C to +260 °C

(-122 °F to + 1292 °F).

120Ω 3-wire & 4-wire nickel RTD:

-80 °C to +260 °C

(-112 °F to +500 °F).

With external barriers:

-50 °C to +260 °C

(-122 °F to + 500 °F).

10Ω 3-wire & 4-wire copper RTD:

-100 °C to +260 °C,

(-148 °F to +500 °F).

With external barriers:

-50 °C to +260 °C

(-122 °F to +500 °F).

Note: Platinum RTD's with 0.00385 alphas are the worldwide industrial standard and are recommended for all applications.

I/O Modules

Isolated I/O Module

System Isolation: 500Vdc
Channel to Channel Isolation: 250 Vdc

Isolation is only required for fault scenarios and these voltages will not be present on the I/O module inputs when a wiring or field fault occurs.

Outputs

Front Panel LEDs

OK LED

Indicates when the Temperature Monitor is operating properly.

TX/RX LED

Indicates then the Temperature Monitor is communicating with other modules in the 3500 rack.

Bypass LED

Indicates when the Temperature Monitor is in Bypass Mode.

RTD Current Source Value

925 ±15 µA @ 25° C per transducer (single supply for the 4-wire RTD and two supplies for the 3-wire).

Recorder

+4 to +20 mA. Values are proportional to monitor full-scale. Individual recorder values are provided for each channel. Monitor operation is unaffected by short circuits on recorder outputs.

Voltage Compliance (current output)

0 to +12 Vdc range across load. Load resistance is 0 to 600 Ω.

Resolution

0.3662 µA per bit ±0.15% error at room temperature ±0.4% error over temperature range.

Signal Conditioning

Note: Specified at +25 °C (+77 °F) unless otherwise noted.

Full-scale range for each channel is set in the field via 3500 Configuration Software. No calibration is required.

RTDs and TCs (except for 10Ω Copper RTDs)

Resolution

1 °C or 1 °F

Accuracy

Internal Termination Non-Isolated

Bulkhead Rack ±3 °C at 25 °C (±5.4 °F at 77 °F).

Standard Rack: ±3 °C at 25 °C (±5.4 °F at 77 °F).

External Termination Non-Isolated:

Bulkhead Rack: ±3 °C at 25 °C (±5.4 °F at 77 °F).

Standard Rack: ±1 °C at 25 °C (±1.8 °F at 77 °F).

Internal Termination Isolated:

Bulkhead Rack: ±2 °C at 25 °C (±3.6 °F at 77 °F).

Standard Rack: ±3 °C at 25 °C ±5.4 °F at 77 °F).

External Termination Isolated:

Bulkhead Rack: ±1 °C at 25 °C (±1.8 °F at 77 °F).

Standard Rack: ±1 °C at 25 °C (±1.8 °F at 77 °F).

10Ω Copper RTDs

Resolution

1°C or 1 °F

Accuracy

±3 °C at 25 °C (±5.4 °F at 77 °F).

Cold Junction Compensation Sensor (used for TC measurements)

Accuracy

±1° C at 25 °C (±1.8 °F at 77 °F).

Alarms

Alarm Setpoints

The user can set Alert and Danger setpoints for the value measured by the monitor using software configuration. Alarms are adjustable from 0 to 100% of full-scale for each measured value. The exception is when the full-scale range exceeds the range of the sensor. In this case, the range of the sensor will limit the setpoint. Accuracy of alarms are to within 0.13% of the desired value. The Temperature Monitors have both under and over alarm setpoints.

Alarm Time Delays

The user can program alarm delays using software as follows:

Alert

From 1 to 60 seconds in 1 second intervals.

Danger

From 1 to 60 seconds in 0.5 second intervals or can be set to the minimum alarm delay.

Number of actual channel(s)	Minimum time delay (mS)
1	225
2	300
3	375
4	450
5	525
6	600

Note: 225 ms alarm time delays will not be available for all channels. As more channels are used the alarm time delay increases. The configuration software will indicate the minimum alarm time delay based on the channel loading.

Proportional Values

Proportional values are temperature measurements used to monitor the machine. The Temperature Monitors return temperature proportional values.

Environmental Limits

Operating Temperature

-30 °C to +65 °C (-22 °F to +150 °F) when used with Internal/External Termination I/O Modules

0 °C to +65 °C (32 °F to +150 °F) when used with Internal Barrier I/O Modules (Internal Termination).

Storage Temperature

-40 °C to +85 °C (-40 °F to +185 °F).

Compliance and Certifications

EMC

European Community Directives:

EMC Directive 2014/35/EU

Standards:

EN 61000-6-2 Immunity for Industrial Environments

EN 61000-6-4 Emissions for Industrial Environments

Electrical Safety

European Community Directives:

LV Directive 2014/35/EU

Standards:

EN 61010-1

Hazardous Area Approvals

For the detailed listing of country and product specific approvals, refer to the **Approvals Quick Reference Guide**, document 108M1756, at **www.GEmeasurement.com**.

North American

Approval Option (01)

When used with I/O module ordering options with internal barriers:

Ex nC [ia] IIC T4 Gc

Class I, Zone 2, AEx nC [ia] IIC T4 Gc

Class I, Division 1, Groups A, B, C, and D

T4 @ Ta = -20 °C ≤ Ta ≤ +65 °C

(-4 °F ≤ Ta ≤ +149 °F)

per control drawing 138547

When used with I/O module ordering options without internal barriers:

Ex nC [L] IIC T4 Gc

Class I, Zone 2, AEx nC IIC T4 Gc

Class I, Division 2, Groups A, B, C, and D

T4 @ -20 °C ≤ Ta ≤ +65 °C

(-4 °F ≤ Ta ≤ +149 °F)

per control drawing 149243

ATEX/IECEx

Approval Option (02)

For Selected Ordering Options with ATEX/IECEx agency approvals:

For ATEX/IECEx agency approval ordering options with internal barriers:

II 3 (1) G

Ex nA nC ic [ia Ga] IIC T4 Gc

T4 @ Ta = -20°C≤ Ta ≤ +65 °C

(-4°F to +149°F)

per control drawing 138547

For ATEX/IECEx agency approval ordering options without internal barriers:

II 3 G

Ex nA nC ic IIC T4 Gc

T4 @ -20°C ≤ Ta ≤ +65°C

(-4°F ≤ Ta ≤ +149°F)

Physical

Monitor Module

Dimensions (Height x Width x Depth)

241.3 mm x 24.4 mm x 241.8 mm

(9.50 in x 0.96 in x 9.52 in).

Weight

0.91 kg (2.0 lbs.).

I/O Modules

Dimensions (Height x Width x Depth)

241.3 mm x 24.4 mm x 99.1 mm

(9.50 in x 0.96 in x 3.90 in).

Weight

0.45 kg (1.0 lbs.).

Internal Barrier I/O Module

Dimensions (Height x Width x Depth)

241.3 mm x 24.4 mm x 163.1 mm

(9.50 in x 0.96 in x 6.42 in).

Weight

0.46 kg (1.01 lbs.).

Rack Space Requirements

Monitor Module

1 full-height front slot.

I/O Modules

1 full-height rear slot.

Ordering Considerations

General

If the 3500/60 or 3500/61 is added to an existing 3500 System the following firmware and software versions (or later) are required:

3500/20 Module Firmware – Revision G

3500/01 Software – Version 2.00

3500/02 Software – Version 2.00

3500/03 Software – Version 1.10

Note: External Termination Blocks cannot be used with Internal Termination I/O modules.

When ordering I/O Modules with External Terminations the External Termination Blocks and Cables must be ordered separately.

Internal Barrier I/O Module

Consult the 3500 Internal Barrier specification sheet (part number 141495-01) if the Internal Barrier Option is selected.

Ordering Information

For the detailed listing of country and product specific approvals, refer to the **Approvals Quick Reference Guide**, document 108M1756, at **www.GEmeasurement.com**.

No Recorder Outputs

3500/60-AXX-BXX

A: I/O Module Type

0 1	RTD/TC Non-isolated I/O Module Internal Terminations
0 2	RTD/TC Non-isolated I/O Module External Terminations
0 3	TC Isolated I/O Module Internal Terminations
0 4	TC Isolated I/O Module External Terminations
0 5	RTD/TC Non-isolated I/O Module with Internal Barriers

B: Agency Approval Option

0 0	None
0 1	CSA/NRTL/C (Class 1, Div 2)
0 2	ATEX/ IECEx/ CSA (Class 1, Zone 2)

Recorder Outputs

3500/61-AXX-BXX

A: I/O Module Type

0 1	RTD/TC Non-isolated I/O Module Internal Terminations
0 2	RTD/TC Non-isolated I/O Module External Terminations
0 3	TC Isolated I/O Module Internal Terminations
0 4	TC Isolated I/O Module External Terminations
0 5	RTD/TC Non-isolated I/O Module with Internal Barriers

B: Agency Approval Option

0 0	None
0 1	CSA/NRTL/C (Class 1, Div 2)
0 2	ATEX/ IECEx/ CSA (Class 1, Zone 2)

External Termination Blocks

133908-01

RTD/TC Non-Isolated External Termination Block (Terminal Strip connectors).

133916-01

RTD/TC Non-Isolated External Termination Block (Euro Style connectors).

133924-01

TC Isolated External Termination Block (Terminal Strip connectors).

133932-01

TC Isolated External Termination Block (Euro Style connectors).

133892-01

3300/61 Recorder Output External Termination Block (Terminal Strip connectors).

133900-01

3300/61 Recorder Output External Termination Block (Euro Style connectors).

Cables

3500/60 and 3500/61 Transducer (XDCR) Signal to External Termination (ET) Block Cable

134544-AXXXX-BXX

A: Cable Length

0 0 0 5	5 feet (1.5 metres)
0 0 0 7	7 feet (2.1 metres)
0 0 1 0	10 feet (3.0 metres)
0 0 2 5	25 feet (7.5 metres)
0 0 5 0	50 feet (15 metres)
0 1 0 0	100 feet (30.5 metres)

B: Assembly Instructions

01	Not assembled
02	Assembled

3500/61 Recorder Output to External Termination (ET) Block Cable

134543- AXX – BXX

A: Cable Length

0 0 0 5 5 feet (1.5 metres)
0 0 0 7 7 feet (2.1 metres)
0 0 1 0 10 feet (3.0 metres)
0 0 2 5 25 feet (7.5 metres)
0 0 5 0 50 feet (15 metres)
0 1 0 0 100 feet (30.5 metres)

B: Assembly Instructions

0 1 Not assembled
0 2 Assembled

Note: Recorder cables are not used with /60 or /62 monitors

Spares

Shared components for /60 and /61

133908-01

RTD/TC Non-Isolated External Termination Block (Terminal Strip connectors).

133916-01

RTD/TC Non-Isolated External Termination Block (Euro Style connectors).

133924-01

TC Isolated External Termination Block (Terminal Strip connectors).

133932-01

TC Isolated External Termination Block (Euro Style connectors).

00580442

Connector Header, Internal Termination, 9-position, Green.

00580443

Connector Header, Internal Termination, 12-position, Green.

00502133

Connector Header, Internal Termination, 12-position, Blue.

00580444

Connector Header, Internal Termination, 15-position, Green.

134542-01

3500/60 & 3500/61 Manual.

3500/60-Specific

163179-01

3500/60 Temperature Monitor (without recorders)

133827-01

3500/60 RTD/TC Non-Isolated I/O Module External Terminations.

133835-01

3500/60 TC Isolated I/O Module Internal Terminations.

133843-01

3500/60 TC Isolated I/O Module External Terminations.

136711-01

3500/60 RTD/TC I/O Module with Internal Barriers and Internal Terminations. (Not-Isolated)

3500/61-Specific

163179-02

3500/61 Temperature Monitor (with recorders)

133819-02

3500/61 RTD/TC Non-Isolated I/O Module Internal Terminations.

133827-02

3500/61 RTD/TC Non-Isolated I/O Module External Terminations.

133835-02

3500/61 TC Isolated I/O Module Internal Terminations.

133843-02

3500/61 TC Isolated I/O Module External Terminations.

133892-01

3500/61 Recorder Output External Termination Block (Terminal Strip connectors).

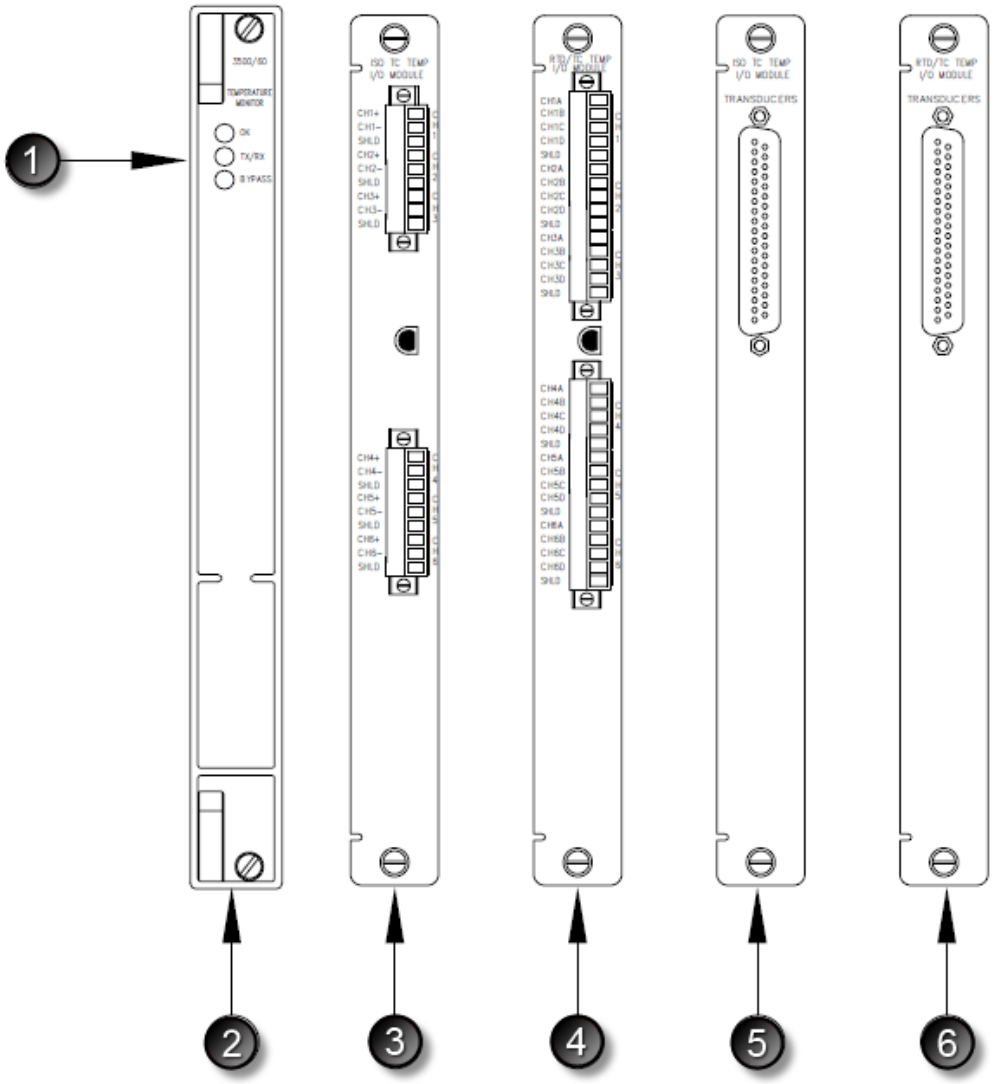
133900-01

3500/61 Recorder Output External Termination Block (Euro Style connectors).

136711-02

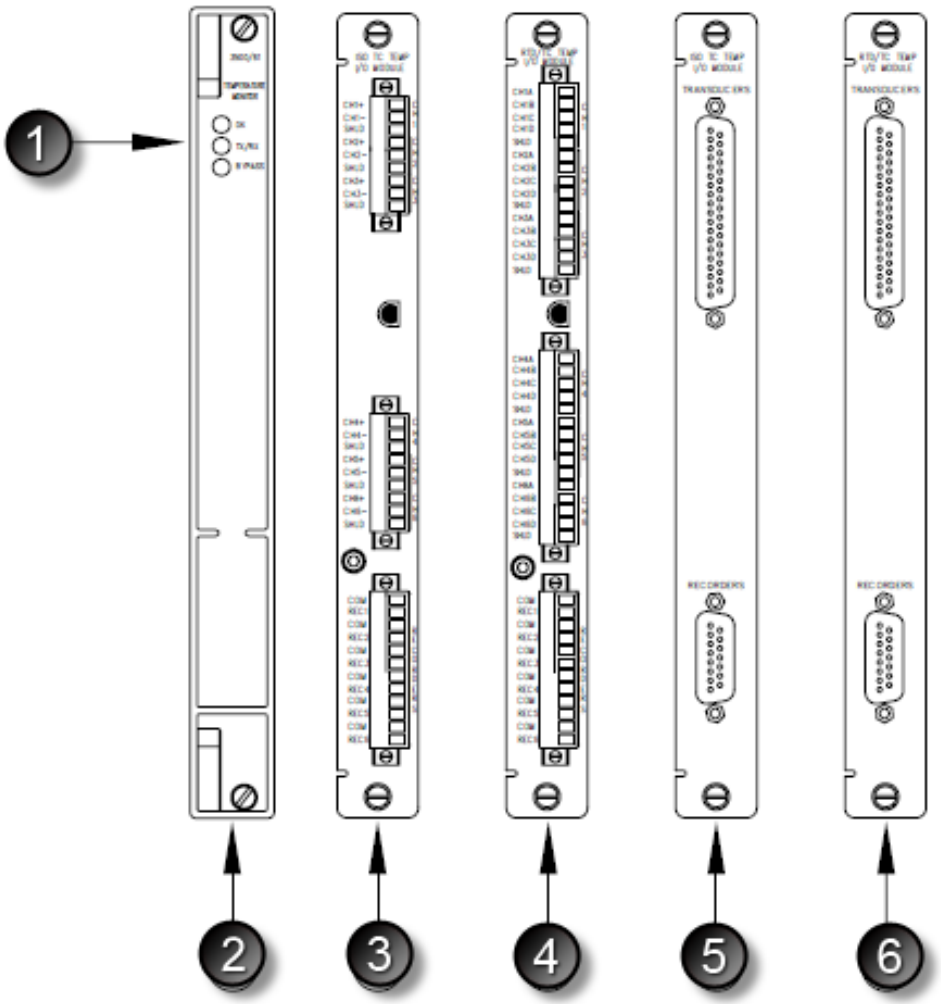
3500/61 RTD/TC I/O Module with Internal Barriers and Internal Terminations. (Not-Isolated)

Graphs and Figures...



1) Status LEDs
2) 3500/60 Main Module Front View
3) ISO TC Temp I/O Module (Internal Terminations)
4) RTD/TC Temp I/O Module (Internal Terminations)
5) ISO TC Temp I/O Module (External Terminations)
6) RTD/TC Temp I/O Module (External Terminations)
   (No Recorder Outputs)

Figure 1: Front and Rear Views of the 3500/60 Temperature Monitor



1) Status LEDs
2) 3500/61 Main Module Front View
3) ISO TC Temp I/O Module (Internal Terminations)
4) RTD/TC Temp I/O Module (Internal Terminations)
5) ISO TC Temp I/O Module (External Terminations)
6) RTD/TC Temp I/O Module (External Terminations)
(Recorder Outputs)

Figure 2: Front and Rear Views of the 3500/61 Temperature Monitor

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