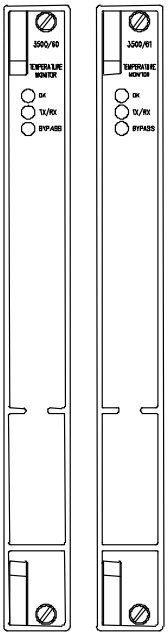
3500/60 & /61 Temperature Monitors

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

Greater than 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).

Type J: 0 °C to +760 °C,

(+32 °F to +1400 °F).

Type K: 0 °C to +1370 °C,

(+32 °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 +850 °C

(-122 °F to +1562 °F).

120Ω 3-wire & 4-wire nickel RTD:

-80 °C to +260 °C

(-112 °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 +850 °C

(-122 °F to +1562 °F).

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

***** Lower OK limit with external barriers is -50°C.

I/O Modules

Isolated TC I/O modules have 250 Vdc of isolation between channels.

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).

CE Mark Directives

Declaration of Conformity

134036

EMC Directives

IEC/EN61000-6-4

Radiated Emissions

EN 55011, Class A

Conducted Emissions

EN 55011, Class A

IEC/EN61000-6-2

Electrostatic Discharge

EN 61000-4-2, Criteria B

Radiated Susceptibility

EN61000-4-3, Criteria A

Conducted Susceptibility

EN61000-4-6, Criteria A

Radiated Susceptibility

ENV 50140, Criteria A

Conducted Susceptibility

ENV 50141, Criteria A

Electrical Fast Transient

EN 61000-4-4, Criteria B

Surge Capability

EN 61000-4-5, Criteria B

Magnetic Field

EN 61000-4-8, Criteria A

Power Supply Dip

EN 61000-4-11, Criteria B

Radio Telephone

ENV 50204, Criteria B

Low Voltage Directives

IEC/EN61010-1

Safety Requirements

Hazardous Area Approvals

CSA/NRTL/C

Approval Option (01)

Class I, Div 2

Groups A, B, C, D

T4 @ Ta = -30 °C to +65 °C

(-22 °F to +150 °F)

Certification number

150268-1002151 (LR 26744)

Approval Option (02)

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

A/Ex nC[L] IIC

Class I, Zone 2

Class I, Div 2, Groups A,B,C,D

T4 @ Ta = -20 °C to +65 °C

(-4 °F to +150 °F)

Certification Number

CSA 1389797 (LR 26744-211)

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

A/Ex nC[ia] IIC

Class I, Zone 2/(0)

Class I, Div I, Groups A,B,C,D

T4 @ Ta = -20 °C to +65 °C

(-4 °F to +150 °F)

Certification Number

CSA 1389797 (LR 26744-211)

ATEX

Approval Option (02)

For Selected Ordering Options with ATEX/CSA agency approvals:

 II 3/(3) G

Ex nCAL[L] IIC

T4 @ Ta = -20 °C to +65 °C

(-4 °F to +150 °F)

Certification number

LCIE 04 ATEX 6161X

Note: When used with Internal Barrier I/O Module, refer to specification sheet 141495-01 for approvals information.

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

No Recorder Outputs

3500/60-AXX-BXX

A: I/O Module Type

- **0 1** RTD/TC Non-isolated with Internal Terminations
- **0 2** RTD/TC Non-isolated with External Terminations
- **0 3** TC Isolated with Internal Terminations
- **0 4** TC Isolated with External Terminations
- **0 5** RTD/TC Non-isolated with Internal Barriers and Internal Terminations

B: Agency Approval Option

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

Note: Agency Approval Option B 02 is only available with Ordering Option A 05.

Recorder Outputs

3500/61-AXX-BXX

A: I/O Module Type

- **0 1** RTD/TC Non-isolated with Internal Terminations
- **0 2** RTD/TC Non-isolated with External Terminations
- **0 3** TC Isolated with Internal Terminations

0 4 TC Isolated with External Terminations
0 5 RTD/TC Non-isolated with Internal Barriers and Internal Terminations

B: Agency Approval Option
0 0 None
0 1 CSA/NRTL/C (Class 1, Div 2)
0 2 ATEX/CSA (Class 1, Zone 2)
Note: Agency Approval Option B 02 is only available with Ordering Options A 01, A 03, and A 05.

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
0 1 Not assembled
0 2 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

Spares

Shared components

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.

04425545

Grounding Wrist Strap (single use).

04400037

IC Removal Tool.

134542-01

3500/60 & 3500/61 Manual.

3500/60-Specific

133811-01

3500/60 Monitor (Replaced by PN 163179-01).

135344-01

Firmware IC.

133819-01

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

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

133811-02

3500/61 Monitor (Replaced by PN 163179-02).

135343-01

Firmware IC

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).

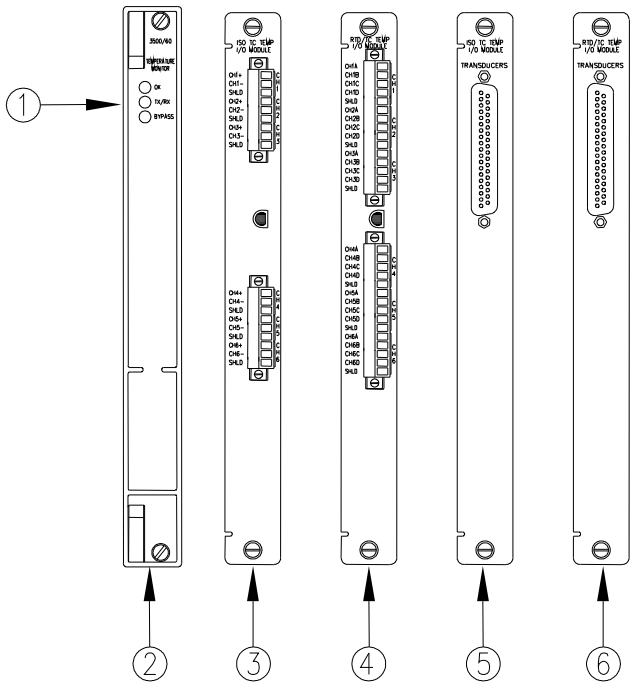
133900-01

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

136711-02

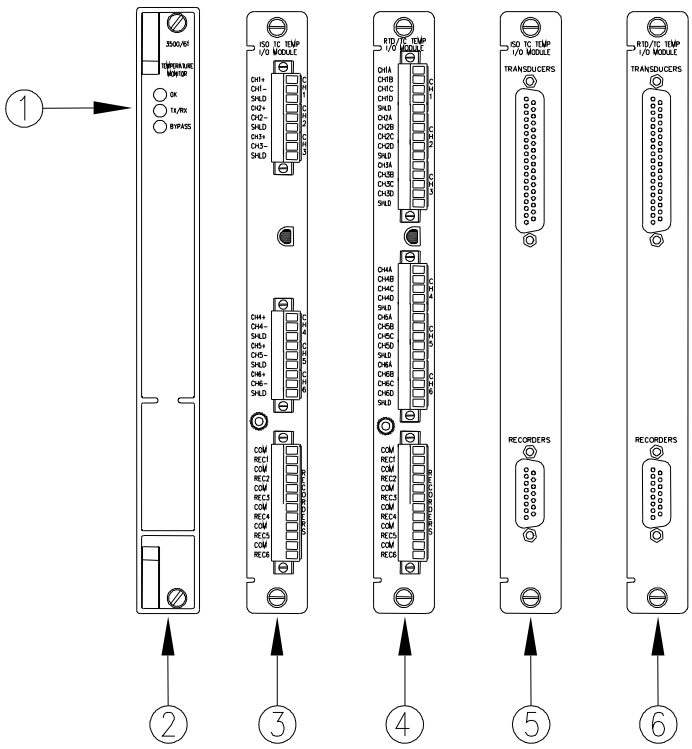
3500/61 RTD/TC I/O Module with Internal Barriers and Internal Terminations. (Not-Isolated)

Figures and Tables



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