PXIe-4353

NI PXIe-4353 Specifications

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This document lists specifications for the NI PXIe-4353 module. These specifications are typical for the range of 0 °C to 55 °C unless otherwise stated. The system must be allowed to warm up for 15 minutes to achieve the rated accuracy. All specifications are subject to change without notice. Visit ni.com/manuals for the most current specifications and product documentation.

Note Keep the filler panels on all unused slots in your chassis to maintain forced air cooling.

Thermocouple Measurement Accuracy

Type	-100 °C to 0 °C*	0 °C to 300 °C*	300 °C to 900 °C*	900 °C to 1400 °C*
J/N	0.47 °C	0.35 °C	0.47 °C	0.56 °C
K	0.44 °C	0.38 °C	0.58 °C	0.88 °C
T/E	0.48 °C	0.32 °C	0.48 °C	—
R/S	—	0.81 °C	0.60 °C	0.70 °C
B	—	—	1.00 °C	0.49 °C

* The values in this table are typical for 23 °C ±5 °C when using the module with a TB-4353 in the High-Resolution ADC-timing mode. For detailed accuracy tables, including maximum specifications, refer to the *Temperature Measurement Accuracy* section.

Input Characteristics

Number of channels .... 32 thermocouple channels, 2 autozero channels, 8 cold-junction compensation channels

ADC resolution .... 24 bits

Type of ADC.. Delta-Sigma

Sampling mode .... Scanned

Maximum sample rate .... 90 S/s
(Refer to the *Timing* section for more details.)

Voltage measurement range.............................. ±80 mV

Temperature measurement range .... Full NIST temperature range (J, K, T, E, N, B, R, S thermocouple types)

50/60 Hz noise rejection (High resolution mode) .... 70 dB

Differential input impedance .... 20 MΩ

DC linearity .... 20 ppm typical, 60 ppm max

Open Thermocouple Detection (OTD)

Selection .... On/off, software-selectable per module

Detection .... Per channel

Input current

- OTD enabled .... 17 nA
- OTD disabled .... 400 pA

Common Mode Voltage Range

Channel-to-COM, channel-to-channel .... ±10 V

COM-to-earth ground .... ±300 V

Common Mode Rejection Ratio (CMRR)

Channel-to-COM at DC .... 100 dB

COM-to-earth ground at DC, 50/60 Hz, Timing Mode 1 .... >170 dB

COM-to-earth ground at DC, 50/60 Hz, Timing Mode 7 .... 155 dB

ADC Timing Modes*	**CMRR (50/60 Hz) Channel-to-COM**
1 (High Resolution)	110 dB
2	85 dB
3	75 dB
4	70 dB
5	70 dB
6	70 dB
7 (High Speed)	70 dB

* Refer to the *Timing* section for more information about ADC timing modes.

Input Bandwidth (-3 dB)

ADC Timing Modes*	Input Bandwidth
1 (High Resolution)	14 Hz
2	17 Hz
3	32 Hz
4	57 Hz
5	61 Hz
6	67 Hz
7 (High Speed)	67 Hz

* Refer to the *Timing* section for more information about ADC timing modes.

Overvoltage Protection

Between any CJC pin,
TC input pin, and COM .... ±60 V

Between RSVD lines and COM .... ±24 V

Voltage Measurement Accuracy

ADC Timing Modes[*]	Offset Error with Open Thermocouple Detection Disabled[†]				Gain Error (% of Reading) 23 °C ±5 °C	
	Typical (23 °C ±5 °C)		Maximum (23 °C ±5 °C)			
	Autozero Enabled	Autozero Disabled	Autozero Enabled	Autozero Disabled	Typical	Maximum
1 (High Resolution)	1.0 μV	3.5 μV	2.0 μV	9.5 μV	0.03%	0.04%
2	1.0 μV	3.5 μV	2.0 μV	9.5 μV	0.03%	0.04%
3	1.0 μV	3.5 μV	2.0 μV	9.5 μV	0.03%	0.04%
4	2.0 μV	4.5 μV	3.0 μV	10.5 μV	0.03%	0.04%
5	3.0 μV	7.0 μV	5.0 μV	13.0 μV	0.04%	0.05%
6	4.5 μV	8.5 μV	6.5 μV	14.5 μV	0.04%	0.05%
7 (High Speed)	5.0 μV	9.0 μV	7.5 μV	15.5 μV	0.04%	0.05%

[*] Refer to the *Timing* section for more information about ADC timing modes.

[†] If open thermocouple detection is enabled, there is additional offset due to input current. To determine the additional offset, refer to the *Input current* specification and multiply by the lead-wire resistance, which is the sum of the resistance of both thermocouple leads. All offsets assume the lead-wire resistance is ≤50 Ω when open thermocouple detection is disabled.

Input Noise

ADC Timing Modes[*]	Input Noise[†]	
1 (High Resolution)	200 nV_{rms}	1.34 $\mu V_{pk\text{-}pk}$
2	200 nV_{rms}	1.34 $\mu V_{pk\text{-}pk}$
3	280 nV_{rms}	1.84 $\mu V_{pk\text{-}pk}$
4	370 nV_{rms}	2.6 $\mu V_{pk\text{-}pk}$
5	750 nV_{rms}	6.3 $\mu V_{pk\text{-}pk}$
6	1.05 μV_{rms}	8.3 $\mu V_{pk\text{-}pk}$
7 (High Speed)	2.0 μV_{rms}	24 $\mu V_{pk\text{-}pk}$

[*] Refer to the *Timing* section for more information about ADC timing modes.

[†] Multiply noise by $\sqrt{2}$ if using the autozero channel for each sample.

Measurement Sensitivity[1]

ADC Timing Modes*	Type J, K, T, E	Type N	Type B	Type R, S
1 (High Resolution)	≤0.01 °C	<0.02 °C	<0.10 °C	<0.08 °C
2	≤0.01 °C	<0.02 °C	<0.10 °C	<0.08 °C
3	<0.02 °C	<0.02 °C	≤0.13 °C	≤0.11 °C
4	<0.02 °C	<0.03 °C	<0.18 °C	≤0.14 °C
5	<0.04 °C	<0.06 °C	<0.35 °C	<0.29 °C
6	<0.06 °C	<0.08 °C	<0.49 °C	<0.40 °C
7 (High Speed)	<0.11 °C	<0.14 °C	<0.93 °C	<0.77 °C

* Refer to the *Timing* section for more information about ADC timing modes.

Input Stability

	Typical	Max
Offset stability with autozero enabled	10 nV/°C	50 nV/°C
Offset stability with autozero disabled	0.3 µV/°C	0.9 µV/°C
Gain stability	4 ppm/°C	15 ppm/°C

[1] Measurement sensitivity represents the smallest change in temperature that the module can detect. It is a function of input noise. The values assume the full measurement range of the standard thermocouple sensor according to NIST Monograph 175.

Cold-Junction Compensation Accuracy

Configuration	Typical[1]		Maximum[1]	
	23 °C ±5 °C	0 °C to 55 °C	23 °C ±5 °C	0 °C to 55 °C
PXIe-4353 CJC channel accuracy	0.02 °C	0.03 °C	0.03 °C	0.05 °C
Total CJC accuracy using a TB-4353[5, 7]	0.22 °C	0.38 °C	0.33 °C	0.50 °C
Total CJC accuracy using a TC-4353, Configuration A[2, 6, 8]	0.20 °C	0.28 °C	0.28 °C	0.42 °C
Total CJC accuracy using a TC-4353, Configuration B[3, 6, 8]	—	—	0.49 °C	0.56 °C
Total CJC accuracy using a TC-4353, Configuration C[4, 6, 8]	—	—	1.93 °C	2.07 °C

[1] For graphs that combine CJC Accuracy with Voltage Measurement Accuracy to derive overall thermocouple measurement accuracy, go to `ni.com/info` and use Info Code: `PXIE4353CALCULATOR`.

[2] Configuration A represents a TC-4353 deployed into a thermally isolated setup.

[3] Configuration B represents a TC-4353 that is mounted below any heat sources in the rack and is protected from airflow by a physical barrier.

[4] Configuration C represents a TC-4353 that has not been protected from heat sources.

Note: For example configurations go to `ni.com/info` and use Info Code: `TC4353CONFIGURATIONS`.

[5] This represents performance for wire gauges of 24 AWG and smaller.

[6] This represents performance for wire gauges of 20 AWG and smaller.

[7] Includes thermistor and isothermal errors and assumes that the module and terminal block are maintained at a stable ambient temperature. Refer to the *NI PXIe-4353 and TB-4353 Terminal Block Installation Guide and Specifications* document for proper set up instructions.

[8] Includes thermistor and isothermal errors and assumes that the module and terminal block are maintained at a stable ambient temperature. Refer to the *NI PXIe-4353 and TC-4353 Terminal Block Installation Guide and Specifications* document for proper set up instructions.

Temperature Measurement Accuracy

The following thermocouple measurement tables show the results of calculating the accuracy of each standard thermocouple type using the specifications for the PXIe-4353 and the TB-4353. These tables assume the following conditions:

- The module is connected to a terminal block of CJC accuracy equal to a TB-4353.
- Autozero is enabled.
- Open thermocouple detection is disabled.[1]
- 0 V common mode voltage.
- Built-in CJC is enabled.

The tables include all measurement errors of the module and the terminal block. The tables do not include the accuracy of the thermocouple itself.

For some example calculations that transform the device specifications into temperature error, refer to the *Thermocouple Accuracy Example Calculations* section.

Thermocouple Type J/N Measurement Accuracy (°C)

		-100 °C	0 °C	100 °C	300 °C	500 °C	700 °C	900 °C	1100 °C	1400 °C
High Resolution	Typical 23 °C ±5 °C	0.47	0.35	0.31	0.33	0.38	0.41	0.47	0.56	—
	Max 23 °C ±5 °C	0.83	0.63	0.55	0.54	0.60	0.65	0.73	0.84	—
	Max 0 °C to 55 °C	1.26	0.94	0.78	0.84	0.99	1.09	1.27	1.52	—
High Speed	Typical 23 °C ±5 °C	0.80	0.61	0.53	0.52	0.56	0.64	0.72	0.82	—
	Max 23 °C ±5 °C	1.22	0.95	0.83	0.79	0.83	0.92	1.02	1.15	—
	Max 0 °C to 55 °C	1.66	1.26	1.06	1.07	1.18	1.36	1.56	1.80	—

[1] For more information, refer to the *Additional Maximum Error When Open Thermocouple Detection Is Enabled (°C)* table.

Thermocouple Type K Measurement Accuracy (°C)

		-100 °C	0 °C	100 °C	300 °C	500 °C	700 °C	900 °C	1100 °C	1400 °C
High Resolution	Typical 23 °C ±5 °C	0.44	0.31	0.28	0.38	0.37	0.46	0.58	0.66	0.88
	Max 23 °C ±5 °C	0.74	0.53	0.49	0.62	0.62	0.74	0.89	1.00	1.30
	Max 0 °C to 55 °C	1.15	0.80	0.71	0.93	1.02	1.24	1.51	1.76	2.29
High Speed	Typical 23 °C ±5 °C	0.67	0.47	0.44	0.57	0.57	0.69	0.83	0.95	1.24
	Max 23 °C ±5 °C	1.02	0.73	0.70	0.86	0.86	1.00	1.18	1.33	1.70
	Max 0 °C to 55 °C	1.43	1.00	0.91	1.14	1.25	1.49	1.80	2.09	2.68

Thermocouple Type T/E Measurement Accuracy (°C)

		-100 °C	0 °C	100 °C	300 °C	500 °C	700 °C	900 °C	1100 °C	1400 °C
High Resolution	Typical 23 °C ±5 °C	0.48	0.32	0.28	0.28	0.33	0.40	0.48	—	—
	Max 23 °C ±5 °C	0.80	0.55	0.47	0.45	0.51	0.61	0.71	—	—
	Max 0 °C to 55 °C	1.27	0.86	0.69	0.72	0.86	1.06	1.28	—	—
High Speed	Typical 23 °C ±5 °C	0.72	0.49	0.43	0.41	0.45	0.55	0.66	—	—
	Max 23 °C ±5 °C	1.10	0.76	0.65	0.61	0.65	0.77	0.90	—	—
	Max 0 °C to 55 °C	1.58	1.07	0.87	0.87	1.00	1.22	1.47	—	—

Thermocouple Type R/S Measurement Accuracy (°C)

		-100 °C	0 °C	100 °C	300 °C	500 °C	700 °C	900 °C	1100 °C	1400 °C
High Resolution	Typical 23 °C ±5 °C	—	0.81	0.59	0.53	0.55	0.58	0.60	0.63	0.70
	Max 23 °C ±5 °C	—	1.73	1.26	1.09	1.08	1.10	1.11	1.13	1.22
	Max 0 °C to 55 °C	—	2.34	1.67	1.50	1.56	1.64	1.71	1.79	2.01
High Speed	Typical 23 °C ±5 °C	—	2.04	1.49	1.27	1.25	1.26	1.26	1.27	1.36
	Max 23 °C ±5 °C	—	3.23	2.36	1.99	1.93	1.92	1.90	1.90	2.00
	Max 0 °C to 55 °C	—	3.84	2.76	2.41	2.41	2.46	2.50	2.56	2.79

Thermocouple Type B Measurement Accuracy (°C)

		-100 °C	0 °C	100 °C	300 °C	500 °C	700 °C	900 °C	1100 °C	1400 °C
High Resolution	Typical 23 °C ±5 °C	—	—	—	1.00	0.66	0.55	0.49	0.47	0.49
	Max 23 °C ±5 °C	—	—	—	2.39	1.52	1.20	1.04	0.96	0.95
	Max 0 °C to 55 °C	—	—	—	3.04	1.99	1.63	1.48	1.43	1.49
High Speed	Typical 23 °C ±5 °C	—	—	—	3.15	1.98	1.54	1.32	1.20	1.15
	Max 23 °C ±5 °C	—	—	—	5.01	3.13	2.41	2.04	1.85	1.74
	Max 0 °C to 55 °C	—	—	—	5.66	3.60	2.85	2.48	2.31	2.28

Additional Maximum Error When Open Thermocouple Detection Is Enabled (°C)[1]

Type	-100 °C	0 °C	100 °C	300 °C	500 °C	700 °C	900 °C	1100 °C	1400 °C
J/N	0.05	0.04	0.03	0.03	0.02	0.02	0.02	0.03	—
K	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03
T/E	0.03	0.02	0.02	0.02	0.01	0.01	0.01	—	—
R/S	—	0.18	0.13	0.10	0.10	0.09	0.08	0.08	0.08
B	—	—	—	0.31	0.19	0.14	0.11	0.10	0.08

Thermocouple Accuracy Example Calculations

The following thermocouple accuracy examples are based on the *Voltage Measurement Accuracy* and *Cold-Junction Compensation Accuracy* tables.

The thermocouple equations used in the following examples are nonlinear relations between the thermocouple voltage V_X (where X is the thermocouple type) and the thermocouple temperature T_X when the cold junction is kept at 0 °C. The voltage is expressed as a polynomial function $V_X(T_X)$ whose coefficient values depend upon a thermocouple type X. For the coefficient values for a given thermocouple type, visit `ni.com/info` and enter the Info Code `tcpolynomials`. The inverse function $T_X(V_X)$ is a polynomial function that gives the temperature as a function of V_X.

Example 1

For a type K thermocouple with a high-speed timing mode, a measurement temperature of 100 °C, an ambient temperature of 23 °C ±5 °C, an accuracy type of maximum, and autozero enabled, the device specifications are as follows:

$$\text{Offset} = 7.5\ \mu V$$

$$\text{Gain Stability} = 15\ \text{ppm/°C}$$

$$\text{Gain Error} = 0.05\%$$

$$\text{Noise} = 2.0\ \mu V \cdot \sqrt{2} = 2.828\ \mu V$$

$$T_{CJ\_error} = 0.33\ °C$$

$$V_{INL\_max} = 60\ \text{ppm} \cdot 80\ \text{mV} = 4.8\ \mu V$$

[1] Per 50 Ω of lead-wire resistance, which is the sum of the resistance of both thermocouple leads. Add the values in the table to the accuracy numbers shown in the *Thermocouple Measurement Accuracy* tables to get the total error when open thermocouple detection is enabled.

The ambient temperature of 23 °C ±5 °C can range from 18 °C to 28 °C. But the cold junctions may extend beyond the ambient temperature by a small amount. For the range of 23 °C ±5 °C, an additional 5 °C is allowed. The range for cold junctions temperatures is as follows:

$T_{cold\_junction\_min}$ = 13 °C

$T_{cold\_junction\_max}$ = 33 °C

The voltage measured at the thermocouple terminals when the hot junction is at 100 °C and the cold junction is at 13 °C ($T_{cold\_junction\_min}$) is as follows:

$V_{meas} = V_K$ (100 °C) - V_K (13 °C) = 3.579 µV

The error in this equation caused by offset/gain errors, noise, and integral nonlinearity (INL) is as follows:

V_{meas_err} = Offset + |V_{meas} | · Gain Error + Noise + V_{INL_max} = 16.918 µV

The equation to calculate the hot junction thermocouple temperature from the measured thermocouple voltage is as follows:

$T_{hot\_junction} = T_X (V_{meas\,+}\ V_X (T_{cold\_junction}))$

where T_X() and V_X() are the polynomial functions explained above.

Both V_{meas} and $T_{cold\_junction}$ have uncertainties associated with their measurements that introduce an inaccuracy when calculating $T_{hot\_junction}$. The error in this measurement is as follows:

$T_{error} = T_K$ (V_{meas} + V_{meas_error} + V_K (13 °C + $T_{cold\_junction\_error}$)) - 100 °C = 0.70 °C

Next, repeat this calculation when the cold junction is at 33 °C ($T_{cold\_junction\_max}$), and take the greater result as the accuracy specification.

$V_{meas} = V_K$ (100 °C) - V_K (33 °C) = 2.771 mV

The error in this measurement caused by offset/gain errors, noise, and INL is as follows:

V_{meas_error} = Offset + |V_{meas} | · Gain Error + Noise + V_{INL_max} = 16.514 µV

$T_{error} = T_K$ (V_{meas} + V_{meas_error} + V_K (33 °C + $T_{cold\_junction\_error}$)) - 100 °C = 0.69 °C

The maximum accuracy at an operating temperature of 23 °C ±5 °C for a type K thermocouple measuring 100 °C in high-speed timing mode is 0.70 °C.

Example 2

For a type B thermocouple with a high-resolution timing mode, a measurement temperature of 500 °C, an ambient temperature of 0 °C to 55 °C, an accuracy type of maximum, and autozero enabled, based on the *Voltage Measurement Accuracy* and *Cold-Junction Compensation Accuracy* tables, the device specifications are as follows:

Offset Stability = 50 nV/°C

Offset = 2.0 µV + Offset Stability · (55 °C - 23 °C) = 3.6 µV

Gain Stability = 15 ppm/°C

Gain Error = 0.04% + Gain Stability · (55 °C - 23 °C) = 0.088%

Noise = 200 nV · $\sqrt{2}$ = 0.283 µV

T_{CJ_error} = 0.50 °C

V_{INL_max} = 60 ppm · 80 mV = 4.8 µV

The ambient temperature is 0 °C to 55 °C. But the cold junctions may extend beyond the ambient temperature by a small amount. For the range of 0 °C to 55 °C, an additional 10 °C is allowed in the hotter direction. The range for cold junctions temperatures is as follows:

$T_{cold\_junction\_min}$ = 0 °C

$T_{cold\_junction\_max}$ = 65 °C

The voltage measured at the thermocouple terminals when the hot junction is at 500 °C and the cold junction is at 0 °C ($T_{cold\_junction\_min}$ = 0°C) is as follows:

V_{meas} = V_B (500 °C) - V_B (0 °C) = 1.242 µV

The error in this equation caused by offset/gain errors, noise, and INL is as follows:

V_{meas_err} = Offset + |V_{meas} | · Gain Error + Noise + V_{INL_max} = 9.776 µV

T_{error} = T_B (V_{meas} + V_{meas_error} + V_B (0 °C + $T_{cold\_junction\_error}$)) - 500 °C = 1.917 °C

Next, repeat this calculation when the cold junction is at 65 °C ($T_{cold\_junction\_max}$), and take the greater result as the accuracy specification.

V_{meas} = V_B (500 °C) - V_B (65 °C) = 1.233 mV

The error in this measurement caused by offset/gain errors, noise, and INL is as follows:

V_{meas_error} = Offset + |V_{meas} | · Gain Error + Noise + V_{INL_max} = 9.768 µV

T_{error} = T_B (V_{meas} + V_{meas_error} + V_B (65 °C + $T_{cold\_junction\_error}$)) - 500 °C = 1.99 °C

The maximum accuracy at an operating temperature of 0 °C to 55 °C for a type B thermocouple measuring 500 °C in high-resolution timing mode is 1.99 °C.

Example 3

For a type T thermocouple with a high-resolution timing mode, a measurement temperature of -100 °C, an temperature of 23 °C ±5 °C typical, and autozero enabled, based on the *Voltage Measurement Accuracy* and *Cold-Junction Compensation Accuracy* tables, the device specifications are as follows:

Offset = 1 µV

Gain Error = 0.03%

Noise = 200 nV · $\sqrt{2}$ = 0.283 µV

T_{CJ_error} = 0.22 °C

V_{INL_typ} = 20 ppm · 80 mV = 1.6 µV

The ambient temperature of 23 °C ±5 °C can range from 18 °C to 28 °C. But the cold junctions may extend beyond the ambient temperature by a small amount. For the range of 23 °C ±5 °C, an additional 5 °C is allowed.The range for cold junctions temperatures is as follows:

$T_{cold\_junction\_min}$ = 13 °C

$T_{cold\_junction\_max}$ = 33 °C

The voltage measured at the thermocouple terminals when the hot junction is at -100 °C and the cold junction is at 13 °C ($T_{cold\_junction\_min}$) is as follows:

V_{meas} = V_T (-100 °C) - V_T (13 °C) = -3.888 µV

The error in this equation caused by offset/gain errors, noise, and INL is as follows:

V_{meas_err} = Offset + |V_{meas} | · Gain Error + Noise + V_{INL_typ} = 4.049 µV

T_{error} = T_T (V_{meas} + V_{meas_error} + V_T (13 °C + $T_{cold\_junction\_error}$)) - (-100 °C) = 0.45 °C

Next, repeat this calculation for 33 °C ($T_{cold\_junction\_max}$), and take the greater result as the accuracy specification.

V_{meas} = V_T (-100 °C) - V_T (33 °C) = -4.699 mV

The error in this measurement caused by offset/gain errors, noise, and INL is as follows:

V_{meas_error} = Offset + |V_{meas} | · Gain Error + Noise + V_{INL_typ} = 4.292 µV

T_{error} = T_T (V_{meas} + V_{meas_error} + V_T (33 °C + $T_{cold\_junction\_error}$)) - (-100 °C) = 0.48 °C

The typical accuracy at an operating temperature of 23 °C ±5 °C for a type T thermocouple measuring -100 °C in high-resolution timing mode is 0.48 °C.

Timing

Note To maintain the specified accuracy, the maximum allowable sample rate is 90 S/s.

ADC Timing Modes[*]	ADC Conversion Rate	Max Sample Rate[†] (32 Channels)
1 (High Resolution)[‡]	17 Hz	1 S/s
2	34 Hz	2 S/s
3	68 Hz	4 S/s
4	136 Hz	8 S/s
5	272 Hz	16 S/s
6	544 Hz	32 S/s
7 (High Speed)	1530 Hz	90 S/s

[*] Refer to the *NI PXIe-4353 User Manual* for more information about ADC timing modes.

[†] With autozero enabled.

[‡] ADC Timing Mode 1 is the default setting for the On Demand timing mode when sample rate is not explicitly selected.

Digital Triggers

Source .... PXI_TRIG <0..7>, PXI_STAR, PXIe_DSTAR <A..B>

Purpose........................ Start Trigger, Reference Trigger, Pause Trigger

Polarity........................ Software-selectable

Debounce filter settings .... Disable, 90 ns, 5.12 µs, 2.56 ms, custom interval

Clocking

Source .... Onboard Clock, PXI_Trig <0..7>, PXI_STAR, PXIe_DSTAR <A..B>, PXIe_Clk100 (RefClk only)

Destination .... Sample Clock, Sample Clock Timebase, Reference Clock

Polarity........................ Software-selectable (except Reference Clock)

Debounce filter settings (Sample clock only) .... Disable, 90 ns, 5.12 µs, 2.56 ms, Custom interval

Reference clock locking frequencies

Reference Signal	Locking Input Frequency (MHz)		
	10	20	100
PXIe_DSTAR <A..B>	✓	✓	✓
PXI_STAR	✓	✓	—
PXIe_CLK100	—	—	✓
PXI_TRIG <0..7>	✓	✓	—

Note National Instruments does not recommend locking to non-selected frequencies.

Output Timing Signals

Source .... Start Trigger, Reference Trigger, Pause Trigger, Sample Clock, various derived timebases and clocks

Destination .... PXI_Trig <0..7>, PXIe_DSTAR C

Polarity .... Software-selectable

Bus Interface

Form factor .... x1 PXI Express peripheral module, Specification v1.0 compliant

Slot compatibility .... x1 and x4 PXI Express or PXI Express hybrid slots

DMA channels .... 1, analog input

Calibration

You can obtain the calibration certificate and information about calibration services for the NI PXIe-4353 at `ni.com/calibration`.

Recommended warm-up time .... 15 minutes

Calibration interval .... 1 year

Power Requirements

+3.3 V .... 570 mA

+12 V .... 200 mA

Physical Requirements

Dimensions .... Standard 3U PXIe, 16 × 10 cm (6.3 × 3.9 in.)

Weight .... 139 g (4.9 oz)

I/O connector .... 96-pin male DIN 41612/IEC 60603-2 connector

Environmental Specifications

Maximum altitude .... 2,000 m (800 mbar)

Pollution Degree 2

Indoor use only

Operating Environment

Ambient temperature range .... 0 °C to 55 °C
(Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2. Meets MIL-PRF-28800F Class 3 low temperature limit and MIL-PRF-28800F Class 2 high temperature limit.)

Relative humidity range .... 10% to 90%, noncondensing
(Tested in accordance with IEC-60068-2-56.)

Storage Environment

Ambient temperature range .... -40 °C to 71 °C
(Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2. Meets MIL-PRF-28800F Class 3 limits.)

Relative humidity range .... 5% to 95%, noncondensing
(Tested in accordance with IEC-60068-2-56.)

Shock and Vibration

Operating shock .... 30 g peak, half-sine, 11 ms pulse
(Tested in accordance with IEC-60068-2-27. Meets MIL-PRF-28800F Class 2 limits.)

Random vibration operating .... 5 Hz to 500 Hz, 0.3 g_{rms}

Nonoperating .... 5 Hz to 500 Hz, 2.4 g_{rms}
(Tested in accordance with IEC-60068-2-64. Nonoperating test profile exceeds the requirements of MIL-PRF-28800F, Class 3.)

Safety Voltages

Connect only voltages that are within the following limits.

Between any TC+ and TC- .... ±80 mV

Between any
TC terminal and COM .... ±10 V

Between CJC+ and CJC- .... ±1.024 V

Isolation

Channel-to-channel .... None

Channel-to-earth ground

Continuous .... 300 V_{rms}, Measurement Category II

Withstand .... 2,300 V_{rms}, verified by a 5 s dielectric withstand test

Measurement Category II is for measurements performed on circuits directly connected to the electrical distribution system.

This category refers to local-level electrical distribution, such as that provided by a standard wall outlet, for example, 115 V for U.S. or 230 V for Europe.

Caution Do *not* connect the NI PXIe-4353 to signals or use for measurements within Measurement Categories III or IV.

Caution The protection provided by the PXIe-4353 can be impaired if it is used in a manner not described in this document.

Safety

This product meets the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA 61010-1

Note For UL and other safety certifications, refer to the product label or the *Online Product Certification* section.

Electromagnetic Compatibility

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 61326-1 (IEC 61326-1): Class A emissions; Basic immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- AS/NZS CISPR 11: Group 1, Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions

Note In the United States (per FCC 47 CFR), Class A equipment is intended for use in commercial, light-industrial, and heavy-industrial locations. In Europe, Canada, Australia and New Zealand (per CISPR 11) Class A equipment is intended for use only in heavy-industrial locations.

Note Group 1 equipment (per CISPR 11) is any industrial, scientific, or medical equipment that does not intentionally generates radio frequency energy for the treatment of material or inspection/analysis purposes.

Note For EMC declarations and certifications, refer to the *Online Product Certification* section.

CE Compliance

This product meets the essential requirements of applicable European Directives as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

Online Product Certification

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for this product, visit `ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.

Environmental Management

NI is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial to the environment and to NI customers.

For additional environmental information, refer to the *Minimize Our Environmental Impact* web page at `ni.com/environment`. This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

Waste Electrical and Electronic Equipment (WEEE)

EU Customers At the end of the product life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers, National Instruments WEEE initiatives, and compliance with WEEE Directive 2002/96/EC on Waste and Electronic Equipment, visit ni.com/environment/weee.

电子信息产品污染控制管理办法 （中国 RoHS）

中国客户 National Instruments 符合中国电子信息产品中限制使用某些有害物质指令 (RoHS)。关于 National Instruments 中国 RoHS 合规性信息，请登录 ni.com/environment/rohs_china。 (For information about China RoHS compliance, go to ni.com/environment/rohs_china.)

Where to Go for Support

The National Instruments Web site is your complete resource for technical support.At ni.com/support you have access to everything from troubleshooting and application development self-help resources to email and phone assistance from NI Application Engineers.

A Declaration of Conformity (DoC) is our claim of compliance with the Council of the European Communities using the manufacturer's declaration of conformity. This system affords the user protection for electromagnetic compatibility (EMC) and product safety. You can obtain the DoC for your product by visiting ni.com/certification. If your product supports calibration, you can obtain the calibration certificate for your product at ni.com/calibration.

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