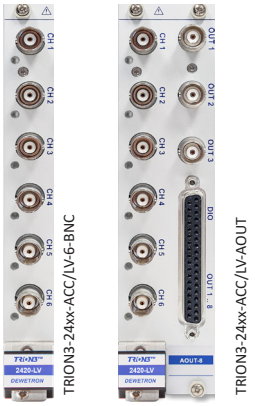
TRION3-24xx-ACC/LV

DEWETRON

- Sampling: 2 MS/s 24 bit per channel
- Isolated input
- IEPE: 20 mA excitation, sensor fault detection
- TRION3-2420-ACC/LV-AOUT: isolated output
- Ultra steep anti aliasing filter



Module specifications

General specifications

TRION3-24xx-ACC/LV specifications			
Variants	TRION3-2402-LV-6-BNC	voltage input; 200 kS/s	
	TRION3-2420-LV-6-BNC	voltage input; 2 MS/s	
	TRION3-2420-LV-AOUT	voltage input; 2 MS/s; analog output	
	TRION3-2402-ACC-6-BNC	voltage input; IEPE input; 200 kS/s	
	TRION3-2420-ACC-6-BNC	voltage input; IEPE input; 2 MS/s	
	TRION3-2420-ACC-AOUT	voltage input; IEPE input; 2 MS/s; analog output	
Input types		**Ranges**	**Supported sensors**
	Voltage	±2 mV to ±100 V freely programmable	-
	IEPE	±100 mV to ±10 V freely programmable	IEPE® sensors
Sampling rate/ resolution	TRION3-2402 series	200 kS/s 24 bit	
	TRION3-2420 series	2 MS/s 24 bit	
Data rate DMA transfer		6 analog channels: max. 36 MB/s; 1x counter: max. 16 MB/s	
ADC type		2 MS/s 24 bit	
Onboard data buffer		512 MB	
Rated input voltage to earth according to EN 61010-2-30		33 V_{RMS}, 46.7 V_{PEAK}, 70 V_{DC}	
Overvoltage protection		±300 V_{DC}	
Isolation voltage (channel-to-channel and channel-to-chassis)		1500 V_{PEAK}	
Input connector		BNC	
Environmental specifications	Operating temperature	0 to +45 °C (32 to 113 °F)	
	Storage temperature	-20 to +70 °C (-4 to 158 °F)	
	Humidity	10 to 80 % non cond., 5 to 95 % rel. humidity	
MTBF[2] (MIL HDBK 217 F, GB)		182 068 hours	

Tab. 31: General specifications

TRION3-24xx-ACC/LV specifications			
Power consumption	Voltage mode	10 W	
	IEPE mode 4 mA	10 W	
	IEPE mode 20 mA	12 W	
	TRION3-2420-LV/ACC-AOUT	Typ. 25 W	Max. 36 W

Tab. 31: General specifications

1) Occupies 2 module slots.

2) Mean time between failures

Input amplifier

Input amplifier				
Voltage input accuracy [1]	≤10 V	DC to 1 kHz 1 kHz to 10 kHz 10 kHz to 100 kHz	±0.02 % of reading ± 0.02 % of range ±20 µV ±0.1 % of reading ± 0.02 % of range ±20 µV ±(0.015 % * f) of reading ± 0.02 % of range ±20 µV	f: frequency in kHz
	>10 V input divider on	DC to 1 kHz 1 kHz to 5 kHz 5 kHz to 100 kHz	±0.02 % of reading ± 0.02 % of range ±0.15 % of reading ± 0.02 % of range ±(0.05 % * f) of reading ± 0.02 % of range	f: frequency in kHz
Amplifier drift		Gain drift Offset drift	Typ. 10 ppm/°C max. 20 ppm/°C Typ. 0.3 µV/°C + 10 ppm of range, max 2 µV/°C + 20 ppm of range/°C	
Linearity			Typ. <50 ppm	
Input impedance			1MΩ // 90 pF	
Input bias current			<1 nA	
Input configuration			Isolated	
IEPE® excitation			2 to 20 mA; 10 %; >24 V compliance voltage	
Input coupling			DC / AC (high pass flter 0.16 Hz to 100 Hz freely programable)	
Advanced anti-aliasing filter			Ultra steep anti-aliasing filter for Sigma-Delta style filtering; FIR type automatic filter delay compensation (see also *Tab. 37*)	
Low pass filter (-3 dB, digital) – Characteristic – Filter order – Filter setting AUTO			1 Hz to 600 kHz freely programmable or OFF (1 Mhz analog Filter) Bessel or Butterworth 2nd , 4th, 6th, 8th, 10th 30 % of sample rate with 8th order Bessel	
Analog anti-aliasing filter			2^{nd} order Bessel, automatically selected 100 kHz, 333 kHz, 1 MHz	
Typ. channel-to-channel phase mismatch			<10 ns between channels using the same range and filter setting	
Typ. CMRR		0 to ≤10 V range	135 dB @ 50 Hz; 110 dB @ 1 kHz; 100 dB @ 10 kHz	
		>10 to 100 V range	87 dB @ 50 Hz; 63 dB @ 1 kHz; 48 dB @ 10kHz	
Typ. input noise (100 mV range)		0 to 10 Hz	0.5 μV_{PP}	
		Noise density	7.5 nV/SQRT(Hz) @ 1 kHz Bandwidth	
Typical THD		100 mV range	-109 dB	for 1 kHz fundamental frequency

Tab. 32: Input amplifier

Input amplifier																
Typ. signal to noise ratio; Spurious free SNR; Effective number of Bits[2]; filter = AUTO	200 mV range				1 V range				10 V range				100 V range			
	SNR	SFDR[3]	ENOB[4]	Noise	SNR	SFDR[3]	ENOB[4]	Noise	SNR	SFDR[3]	ENOB[4]	Noise	SNR	SFDR[3]	ENOB[4]	Noise
Sample rate	[dB]	[dB]	[Bit]	[mV_{PP}]	[dB]	[dB]	[Bit]	[mV_{PP}]	[dB]	[dB]	[Bit]	[mV_{PP}]	[dB]	[dB]	[Bit]	[mV_{PP}]
1 kS/s	119.5	140	19.6	1.0	127.2	150	20.8	2.0	129.0	160	21.1	15	126.6	150	20.7	240
10 kS/s	111.0	140	18.1	3.2	123.5	150	20.2	3.5	127.7	160	20.9	22	124.3	150	20.4	380
100 kS/s	100.1	138	16.3	11	114.1	149	18.7	14	119.1	153	19.5	70	111.7	145	18.3	1800
200 kS/s	97.0	132	15.8	16	111.0	145	18.1	19	116.2	150	19.0	110	110.1	140	18.0	2200
1000 kS/s	89.5	125	14.6	40	103.5	137	16.9	48	108.2	145	17.7	280	104.7	134	17.1	4200
2000 kS/s	86.4	115	14.1	60	100.3	130	16.4	70	105.2	135	17.2	390	103.9	132	17.0	5000
Filter = OFF	85.1	110	13.8	80	97.9	127	16.0	90	102.8	135	16.8	550	101.7	132	16.6	6000

Tab. 32: Input amplifier

1) 1 year accuracy 23 °C ±5 °C.

2) LP Filter in auto mode.

3) SFDR excluding harmonics.

4) ENOB calculated from SNR.

Counter functions

Counter functions	
Counter	1 x counter channels linked to CH1; trigger level is 70 % of range
Counter modes*)	Event counting, frequency, pulsewidth
Timebase / resolution	100 MHz

Tab. 33: Counter functions

*) The available counter functions depend on the application software used and may differ from this list.

AOUT functions

AOUT functions[1]			
Analog outputs		8 isolated channels, independently programmable	
Modes[2]	Constant output	-10 to +10 V or -30 to +30 mA	
	Function generator	Waveform	Sine, square, triangle, custom
		Frequency	0.001 Hz to 1 MHz
		Amplitude	0–10 V_{PEAK} or 0–30 mA_{PEAK}
		Offset	-10 to 10 V or -30 to 30 mA
		Phase	-180 to 180°
		Symmetry (triangle)/ dutycycle (square)	0.01 to 100 %
		Custom waveforms	Up to 4 custom waveforms Max. 16384 samples per waveform
	Stream output	Output signal	-10 to +10 V or -30 to +30 mA
		Optional factor and offset	
	Math output	A*B; A+B; A-B	
	Monitor output	Direct conditioned signal output: -10 to +10 V or -30 to +30 mA	
Output range		±5 V, 0 to 5 V, ±10 V, 0 to 10 V, ±30 mA; 0 to 30 mA	

Tab. 34: AOUT functions

AOUT functions[1)]		
Load current	±30 mA max.	
Function generator	Sine, triangular, square or custom waveforms	
Analog output accuracy	See *Tab. 35.*	
Temperature drift	±25 ppm/K	
Linearity	<100 ppm	
Output impedance	<1 Ω at D- SUB connector, 50 Ω at BNC	
Output protection	Continuous short to ground	
DAC mode	**High-speed mode**	**High-resolution mode**
Update rate	2.5 MS/s	500 kS/s
DAC resolution	16-bit	32 bit
Bandwidth	600 kHz, 4th order Bessel characteristic	70 kHz, 6th order Bessel characteristic
Latency	<5µs	<100 µs
LSB	305 µV	1 µV
Linearity	50 ppm	10 ppm
THD	90 dB	100 dB
Noise floor	100 dB	115 dB
Output noise static	2 mV_{PP} / 0.3 mV_{RMS}	2 mV_{PP} / 0.3 mV_{RMS}
Output noise on 1 kHz signal	11 mV_{PP} / 0.7 mV_{RMS}	3 mV_{PP} / 0.3 mV_{RMS}
Rise/fall time	400 ns	4 µs
Latency (filter=off)	4 µs	15 µs
Input to output Jitter	400 ns	3.5 µs
Number of DIO	6 DI + 3 DI (isolated) + 4 DO + 1 DO (isolated)	
Non isolated digital I/O		
– Compatibility (input)	CMOS/TTL, 100 kΩ pullup	
– Compatibility (output)	TTL, 20 mA	
– Overvoltage protection	±30 V_{DC}, 50 V_{PEAK} (100 ms)	
Isolated digital input		
– Compatibility (input)	CMOS	Low: <1.5 V / High: >3.2 V
– Overvoltage protection	±35 V_{DC}, 65 V_{PEAK} (100 ms)	
– Bandwidth	50 kHz	
– Pulse width distortion	2.3 µs	
– Input high current @ 5V UIN	<3 mA	
– Input high current @ 35V UIN	<5 mA	
Isolated digital output		
– Compatibility (output)	Open collector	
– Max. collector voltage	±30 V_{DC}	
– Collector current	5 mA	
Connector	D-SUB-37 socket for all 6 channels, additionally 3x BNC sockets for CH1 to CH3	
BNC connector	Analog out	AO1, AO2, AO3

Tab. 34: AOUT functions

AOUT functions[1)]		
D-SUB-37 connector	Analog out	AO1 to AO8
	Digital in	DI3 to DI8
	Digital in (isolated)	DI1, DI2, DI11
	Digital out	DO1 to DO4
	Digital out (isolated)	DO5
Auxiliary power supply	+5 V, 20 mA	

Tab. 34: AOUT functions

1) TRION3-2420-ACC/LV-AOUT only 2) Analog output channels can be assigned variably (e.g. AO1 = CH4; AO2 = CH2 + CH7)

Output 1 year accuracy (23 °C ±5 °C)					
		High-speed mode		**High-resolution mode**	
Voltage output (+10 V; 0 to 10 V; ±5 V; 0 to 5 V)	DC	±0.02 % of reading	±1 mV	±0.02 % of reading	±1 mV
	0.1 to 1 kHz	±0.02 % of reading	±1 mV	±0.02 % of reading	±1 mV
	0.1 to 10 kHz	±0.02 % of reading	±1 mV	-	
	10 to 100 kHz	±(0.015 % * f) of reading	±1 mV	-	
Current output (±30 mA; 0 to 30 mA)	DC	±0.03 % of reading	±3 µA	±0.02 % of reading	±3 µA
	0.1 to 1 kHz	±0.3 % of reading	±3 µA	±0.3 % of reading	±3 µA
	0.1 to 10 kHz	±0.3 % of reading	±3 µA	-	
	10 to 100 kHz	±(0.03 % * f)[1)] of reading	±3 µA	-	

Tab. 35: Output accuracy

[1)] f: frequency in kHz