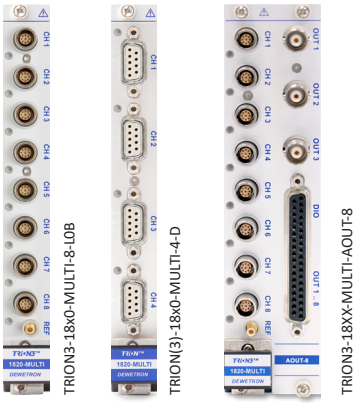
TRION(3)-18xx-MULTI

DEWETRON

- Universal input module
- Sampling: 5 MS/s per channel
- Input types: Voltage, bridge, resistance, RTD, IEPE® current and counter
- Isolated
- CAN: High-speed CAN2.0 port
- Bandwidth: 2 MHz
- TRION3-18xx-MULTI-AOUT-8: Isolated ±5 V, ±10 V or ±30 mA output



Module specifications

General specifications

TRION(3)-18xx-MULTI specifications			
		Ranges	**Supported sensors**
Input types	Voltage	±2 mV to ±100 V freely programmable	-
	IEPE	±100 mV to ±10 V freely programmable	IEPE® sensors
	Bridge	±1 to 1000 mV/V	4-, 5-, 6-wire full bridge 3-, 4-, 5-wire ½ bridge 2-, 3-, 4-wire ¼ bridge 120/350/1000 Ω internal ¼ bridge completion
	Resistance	10 Ω to 30 kΩ	Potentiometer, resistance temperature detection: Pt100, Pt200, Pt300, Pt500, Pt2000 (2-, 3-, 4-wire)
	Current	±30 mA	4 to 20 mA sensors; loop-powered sensors
	MSI	MSI2-CH-x: 500 to 50000 pC MSI2-TH-x: various TC ranges MSI2-LVDT MSI2-V-600	LVDT, RVDT, charge output and thermocouple sensors
Input channels / connectors	TRION-1820-MULTI-4-D	4 channels D-SUB	
	TRION3-1820-MULTI-8-L0B	8 channels 0B LEMO	
	TRION3-1820-MULTI-4-D	4 channels D-SUB	
	TRION3-18xx-MULTI-AOUT-8[1)]	3 channels BNC, 1 D-SUB-37	
		8 channels 0B LEMO	
	TRION3-1850-MULTI-8-L0B	8 channels 0B LEMO	
	TRION3-1850-MULTI-4-D	4 channels D-SUB	

Tab. 15: General specifications

TRION(3)-18xx-MULTI specifications			
Sampling rate / resolution	TRION-1820-MULTI TRION3-1820-MULTI	100 S/s to 2 MS/s	24-bit
	TRION3-1850-MULTI	100 S/s to 2 MS/s >2 MS/s to 5 MS/s	24-bit 18-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}	
Isolation voltage (channel-to-channel and channel-to-chassis)		±350 V_{DC}	
REF connector		SMB connector to apply external calibration signal (LEMO version only)	
Input connector		9-pin LEMO EPG.0B.309 (TRION3-18xx-MULTI-8-L0B) 9-pin D-SUB connector (TRION(3)-18xx-MULTI-4-D)	
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)	TRION3-1820-MULTI-4-D	196 187 hours	
	TRION3-1850-MULTI-8-L0B	93 843 hours	
Power consumption	TRION(3)-1820-MULTI-4-D	Typ. 10 W, max. 14 W	
	TRION3-1850-MULTI-8-L0B	Typ. 18 W, max. 25 W	
		Voltage mode, no excitation	15 W
		IEPE® mode (4 mA / 20 mA)	15 W / 19 W
		Loop powered sensor (24 V, 20 mA)	20 W
		350 Ω full bridge (5 V / 10 V)	18 W / 21 W
		PT100, PT1000	15 W
	TRION3-18xx-MULTI-AOUT-8	Typ. 32 W, max. 50 W	

Tab. 15: General specifications

1) Occupies 2 module slots.

2) Mean time between failures

Input amplifier

Input amplifier				
Voltage input accuracy[1) 2)]	≤10 V	DC 0.1 Hz to 10 kHz 10 kHz to 100 kHz	±0.02 % of reading ±0.02 % of range ±20 µV ±0.02 % of reading ±0.02 % of range ±20 µV ±(0.005 % * f) of reading ±0.02 % of range ±20 µV	 f: frequency in kHz
	>10 V input divider on	DC 0.1 Hz to 5 kHz 5 kHz to 100 kHz	±0.02 % of reading ±0.02 % of range ±0.02 % of reading ±0.02 % of range ±(0.015 % * f) of reading ±0.02 % of range	 f: frequency in kHz
Amplifier drift		Gain drift Offset drift	Typical 10 ppm/°C max. 20 ppm/°C Typical 0.3 µV/°C + 10 ppm of range/°C, max 2 µV/°C + 20 ppm of range/°C	
Linearity			Typical <25 ppm	
Current input accuracy[1) 2)]			Direct input	0.1 % of reading ±10 µA
			Loop-powered sensor	0.1 % of reading ±30 µA

Tab. 16: Input amplifier

Input amplifier																
Current input impedance					Direct input (IN- to GNDi)				75 Ω ±25 Ω							
					Loop-powered sensor				120 Ω ±1 Ω							
Input impedance					**Differential**				**Input (single-ended)**							
	≤100 mV range				20 MΩ or 1 MΩ (prog.) // 35 pF				10 MΩ or 1 MΩ (prog.) // 130 pF							
	>100 mV to 10 V range				200 MΩ or 1 MΩ (prog.) // 35 pF				100 MΩ or 1 MΩ (prog.) // 120 pF							
	>10 V to 100 V				2 MΩ // 20 pF				1 MΩ // 90 pF							
Input configuration					Single-ended or differential (programmable)											
Input coupling					2^{nd} order Bessel filter:				DC … 100 Hz freely programmable							
					0.15 Hz:				Analog highpass filter							
					0.16…100 Hz:				Digital highpass filter, freely programmable							
Common mode voltage to $GND_{isolated}$	0 to 10 V range				±10 V_{DC}											
	>10 to 100 V range				±100 V_{DC}											
Overvoltage protection	0 to 10 V range				±50 V_{DC}, 100 V_{PEAK} (1 min)											
	>10 to 100 V range				±200 V_{DC}											
Low pass filter (-3 dB, digital)					1 Hz to 1.5 MHz freely programmable or OFF											
– Characteristic					Bessel or Butterworth											
– Filter order					2^{nd}, 4^{th}, 6^{th}, 8^{th}, 10^{th}											
– Filter setting AUTO					30 % of sample rate with 10^{th} order Bessel											
Analog anti-aliasing filter					2^{nd} order Bessel, automatically selected											
					100 kHz, 500 kHz, 2 MHz, (≤1 V range bandwidth is limited to 1.8 MHz)											
Typ. channel-to-channel phase mismatch					<10 ns between channels using the same range											
Typ. CMRR					135 dB @ 50 Hz; 110 dB @ 1 kHz; 90 dB @ 10 kHz; 90 dB @ 100 kHz											
Typical crosstalk					-134 dB (10 V range; 0 to 100 kHz)											
Input noise (100 mV range)		0 to 10 Hz			0.3 μV_{PP}											
		Noise density			6.9 nV/SQRT(Hz)											
Typical THD		10 V range			-108 dB				for 1 kHz fundamental frequency							
		1 V range			-102 dB											
Typ. signal to noise ratio; Spurious free SNR;	**100 mV range**				**1 V range**				**10 V range**				**100 V range**			
Effective number of Bits[3]; noise V_{PP}	SNR	SFDR[4]	ENOB[5]	Noise	SNR	SFDR[4]	ENOB[5]	Noise	SNR	SFDR[4]	ENOB[5]	Noise	SNR	SFDR[4]	ENOB[5]	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	113.5	130	18.6	0.001	112.4	135	18.4	0.010	127.2	140	20.8	0.018	120.1	140	19.7	0.400
10 kS/s	103.0	130	16.8	0.003	109.0	135	17.8	0.017	119.5	140	19.6	0.055	114.7	140	18.8	0.950
100 kS/s	94.7	130	15.4	0.011	103.9	130	17.0	0.038	109.8	140	17.9	0.190	106.6	140	17.4	2.700
200 kS/s	91.4	130	14.9	0.016	101.4	130	16.6	0.051	107.4	140	17.6	0.260	104.1	140	17.0	3.800
1000 kS/s	84.7	125	13.8	0.038	95.0	130	15.5	0.116	99.8	139	16.3	0.650	97.7	135	15.9	8.300
2000 kS/s	81.4	120	13.2	0.058	91.0	128	14.8	0.170	95.4	132	15.6	1.100	94.1	132	15.3	14.000
5000 kS/s	78.7	110	12.8	0.080	88.7	125	14.4	0.270	93.1	130	15.2	1.600	91.4	130	14.9	19.000
Filter = OFF	76.2	105	12.4	0.110	86.5	120	14.1	0.330	90.5	130	14.7	2.000	89.0	130	14.5	23.000

Tab. 16: Input amplifier

1) 1 year accuracy 23 °C ±5 °C.

2) Add 0.02 % of reading with filter settings OFF.

3) LP Filter in auto mode.

4) SFDR excluding harmonics.

5) ENOB calculated from SNR.

Excitation

Excitation			
Excitation voltage	0 to 24 V_{DC}; freely programmable separately for each channel, 1 mV resolution, balanced around GNDi, remote sense support		
	1 year accuracy (23 °C ±5 °C)	±0.03 % ±1.5 mV	
	Drift	±10 ppm/°C ±50 µV/°C	
	Current limit	0.1 to 5 V:	100 mA
		>5 V to <24 V:	limited to 0.6 W
		24 V:	limited to 1 W; >0.6 W accuracy: ±5 %
	Protection	Continuous short	
	Load and line regulation error	±0.002 % with sense line connected	
	Voltage regulation reserve	0.1 to 10 V:	>2 V
		>10 to 24 V:	>1 V
Excitation current	0.1 to 60 mADC (programmable, 16-bit DAC) 1 µA; balanced around GNDi		
	1 year accuracy (23 °C ±5 °C)	0.1 to 5 mA:	0.05 % ±2 µA
		>5 to 60 mA:	0.5 % ±5 µA
	Drift	15 ppm/°C	
	Compliance voltage	0.1 to 20 mA	24 V
		>20 mA	10 V
	Output impedance	>10 MΩ	
	Load regulation bandwidth	100 kHz	
IEPE® excitation		2 to 20 mA; 10 %; >21 V compliance voltage	

Tab. 17: Excitation

Bridge functions

Bridge functions			
Supported bridge types	Full bridge	4-, 5- or 6-wire full bridge	
		4-wire full bridge with constant current excitation (piezoresistive bridge sensors), potentiometer	
	Half bridge	3-, 4- or 5-wire ½ bridge with internal completion (software programmable)	
	Quarter bridge	2-, 3- or 4-wire ¼ bridge with internal completion resistor for 120 Ω, 350 Ω and 1000 Ω (software programmable)	
		2-wire ¼ with constant current excitation for dynamic measurement (AC coupled)	
Internal quarter bridge completion		120 Ω, 350 Ω, 1000 Ω	±0.05 %
Bridge resistance	80 Ω to 10 kΩ @ ≤ 5 V_{DC} excitation		the lower limit is caused by the maximum power supply
Bridge excitation voltage	Max. 10 V		
Shunt calibration	4000 steps programmable shunt; shunt target can be programmed in mV/V or in Engineering Unit (programming in Engineering Unit requires OXYGEN R7.4 or higher)		
Completion resistor accuracy	0.05 % ±15 ppm/K		
Automatic bridge balance	±400 % of range		
Bridge features	Bridge balance, line-resistance compensation		

Tab. 18: Bridge functions

CAN functions

CAN functions	
CAN specification	CAN 2.0
CAN physical layer	High-speed
CAN termination	Programmable: high impedance or 120 Ω
Bus pin fault protection	±36 V_{DC}

Tab. 19: CAN functions

Counter functions

Counter functions	
Counter	2x counter channels linked to the last two analog channels; trigger level is adjustable within the input range
Counter modes*)	Simple event counting, period measurement, pulse width measurement, frequency, duty cycle
Timebase / resolution	5 MHz (200 ns)
Filter	0.1 µs to 100 µs

Tab. 20: 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	
Output range		±5 V, 0 to 5 V, ±10 V, 0 to 10 V, ±30 mA; 0 to 30 mA	
Load current		±30 mA max.	
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	
Function generator		Sine, triangular, square or custom waveforms	
Analog output accuracy		See *Tab. 22*.	
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	

Tab. 21: AOUT functions

AOUT functions[1]		
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
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 / 200 ns[3]	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 8 channels, additionally 3x BNC sockets for CH1 to CH3	
BNC connector	Analog out	AO1, AO2, AO3
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. 21: AOUT functions

1) TRION3-18x0-MULTI-AOUT-8 only

2) Analog output channels can be assigned variably (e.g. AO1 = CH4; AO2 = CH2 + CH7)

3) TRION3-1850 MULTI-AOUT at 5 MS/s

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. 22: Output accuracy

[1)] f: frequency in kHz