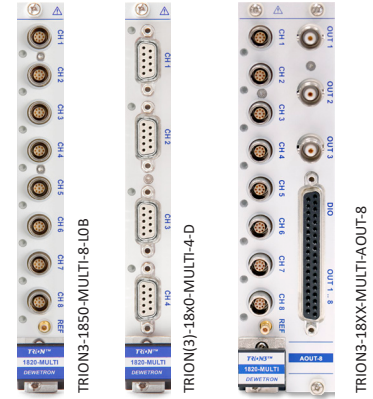


# TRION(3)-18xx-MULTI









## TRION(3)-18xx-MULTI

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



## Module specifications

### General specifications

TRION(3)-18xx-MULTI specifications				
Input types	Voltage  IEPE  Bridge  Resistance  Current  MSI 	Ranges	Supported sensors	
			$\pm 2$ mV to $\pm 100$ V freely programmable	-
			$\pm 100$ mV to $\pm 10$ V freely programmable	IEPE <sup>®</sup> sensors
			$\pm 1$ to 1000 mV/V	4-, 5-, 6-wire full bridge 3-, 4-, 5-wire $\frac{1}{2}$ bridge 2-, 3-, 4-wire $\frac{1}{4}$ bridge 120/350/1000 $\Omega$ internal $\frac{1}{4}$ bridge completion
			10 $\Omega$ to 30 k $\Omega$	Potentiometer, resistance temperature detection: Pt100, Pt200, Pt300, Pt500, Pt2000 (2-, 3-, 4-wire)
			$\pm 30$ mA	4 to 20 mA sensors; loop-powered sensors
			MSI2-CH-x: 500 to 50000 pC MSI2-TH-x: various TC ranges MSI2-LVDT	LVDT, RVDT, charge output and thermocouple sensors
Sampling rate / resolution	TRION-1820-MULTI	100 S/s to 2 MS/s	24-bit	
	TRION3-1820-MULTI	100 S/s to 2 MS/s	24-bit	
	TRION3-1850-MULTI	>2 MS/s to 5 MS/s	18-bit	

Tab. 17: General specifications

# TRION(3)-18xx-MULTI



TRION(3)-18xx-MULTI specifications				
Input channels / connectors	TRION-1820-MULTI-4-D	4 channels D-SUB		
	<b>TRION3</b> -1820-MULTI-8-LOB	8 channels 0B LEMO		
	<b>TRION3</b> -1820-MULTI-4-D	4 channels D-SUB		
	<b>TRION3</b> -18xx-MULTI-AOUT-8 <sup>1)</sup>	3 channels BNC, 1 D-SUB-37		
		8 channels 0B LEMO		
	<b>TRION3</b> -1850-MULTI-8-LOB	8 channels 0B LEMO		
	<b>TRION3</b> -1850-MULTI-4-D	4 channels D-SUB		
Onboard data buffer		512 MB		
Rated input voltage to earth according to EN 61010-2-30		33 V <sub>RMS</sub> <sup>2)</sup> , 46.7 V <sub>PEAK</sub> <sup>2)</sup> , 70 V <sub>DC</sub>		
Isolation voltage (channel-to-channel and channel-to-chassis)		±350 V <sub>DC</sub>		
REF connector		SMB connector to apply external calibration signal (LEMO version only)		
Input connector		9-pin LEMO EPG.0B.309 (TRION3-18xx-MULTI-8-LOB) 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 <sup>2)</sup> (MIL HDBK 217 F, GB)	<b>TRION3</b> -1820-MULTI-4-D	196 187 hours		
	<b>TRION3</b> -1850-MULTI-8-LOB	93 843 hours		
Power consumption	TRION(3)-1820-MULTI-4-D	Typ. 10 W, max. 14 W		
		Typ. 18 W, max. 25 W		
	<b>TRION3</b> -1850-MULTI-8-LOB	Voltage mode, no excitation	15 W	
		IEPE <sup>®</sup> 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	
<b>TRION3</b> -18xx-MULTI-AOUT-8	Typ. 32 W, max. 50 W			

Tab. 17: General specifications

1) Occupies 2 module slots.

2) Mean time between failures

# TRION(3)-18xx-MULTI



## Input amplifier

Input amplifier			
Voltage input accuracy <sup>1) 2)</sup>	≤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 <sup>1) 2)</sup>		0.1 % of reading ±10 μA	
Current input impedance		Direct input (IN- to GNDi) Loop-powered sensor	75 Ω ±25 Ω 120 Ω ±1 Ω
Input impedance	0 to 10 V range >10 to 100 V range	<b>Differential</b>	<b>Input (single-ended)</b>
		100 MΩ or 1 MΩ (programmable) / 15 pF 2 MΩ // 35 pF	50 MΩ // 28 pF 1 MΩ // 65 pF
Input configuration		Single-ended or differential (programmable)	
Input coupling		DC / AC (highpass filter 0.16 Hz to 100 Hz freely programmable)	
Common mode voltage to GND <sub>isolated</sub>	0 to 10 V range	±10 V <sub>DC</sub>	
	>10 to 100 V range	±100 V <sub>DC</sub>	
Overvoltage protection	0 to 10 V range	±50 V <sub>DC</sub> , 100 V <sub>PEAK</sub> (1 min)	
	>10 to 100 V range	±200 V <sub>DC</sub>	
Low pass filter (-3 dB, digital)		1 Hz to 1.5 MHz freely programmable or OFF	
– Characteristic		Bessel or Butterworth	
– Filter order		2 <sup>nd</sup> , 4 <sup>th</sup> , 6 <sup>th</sup> , 8 <sup>th</sup> , 10 <sup>th</sup>	
– Filter setting AUTO		30 % of sample rate with 10 <sup>th</sup> order Bessel	
Analog anti-aliasing filter		2 <sup>nd</sup> order Bessel, automatically selected 100 kHz, 500 kHz, 2 MHz, (≤1 V range bandwidth is limited to 1.8 MHz)	
Channel-to-channel phase mismatch		<10 ns between channels using the same range	
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 <sub>pp</sub>	
	Noise density	6.9 nV/SQRT(Hz)	
Typical THD	10 V range	-108 dB	for 1 kHz fundamental frequency
	1 V range	-102 dB	

Tab. 18: Input amplifier

# TRION(3)-18xx-MULTI



Input amplifier																
Signal to noise ratio; Spurious free SNR; Effective number of Bits <sup>3)</sup> ; noise $V_{pp}$	100 mV range				1 V range				10 V range				100 V range			
	SNR	SFDR <sup>4)</sup>	ENOB <sup>5)</sup>	Noise	SNR	SFDR <sup>4)</sup>	ENOB <sup>5)</sup>	Noise	SNR	SFDR <sup>4)</sup>	ENOB <sup>5)</sup>	Noise	SNR	SFDR <sup>4)</sup>	ENOB <sup>5)</sup>	Noise
Sample rate	[dB]	[dB]	[Bit]	[mV <sub>pp</sub> ]	[dB]	[dB]	[Bit]	[mV <sub>pp</sub> ]	[dB]	[dB]	[Bit]	[mV <sub>pp</sub> ]	[dB]	[dB]	[Bit]	[mV <sub>pp</sub> ]
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. 18: Input amplifier

1) 1 year accuracy 23 °C ±5 °C.

4) SFDR excluding harmonics.

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

5) ENOB calculated from SNR.

3) LP Filter in auto mode.

## Excitation

Excitation			
Excitation voltage	0 to 24 V <sub>DC</sub> ; 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. 19: Excitation

# TRION(3)-18xx-MULTI



## 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 <sub>DC</sub> 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	
Completion resistor accuracy	0.05 % ±15 ppm/K	
Automatic bridge balance	±400 % of range	
Bridge features	Bridge balance, line-resistance compensation	

Tab. 20: Bridge functions

## CAN functions

CAN functions	
CAN specification	CAN 2.0
CAN physical layer	Highspeed
CAN termination	Programmable: high impedance or 120 Ω
Bus pin fault protection	±36 V <sub>DC</sub>

Tab. 21: 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. 22: Counter functions

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

# TRION(3)-18xx-MULTI



## AOUT functions

AOUT functions <sup>1)</sup>			
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 <sup>2)</sup>	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 <sub>PEAK</sub> or 0–30 mA <sub>PEAK</sub>
		Offset	-10 to 10 V or -30 to 30 mA
		Phase	-180 to 180°
		Symmetry (triangle)/duty cycle (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. 24.		
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	<b>High-speed mode</b>	<b>High-resolution mode</b>	
Update rate	2.5 MS/s	500 kS/s	
DAC resolution	16-bit	32 bit	
Bandwidth	600 kHz, 4 <sup>th</sup> order Bessel characteristic	70 kHz, 6 <sup>th</sup> order Bessel characteristic	
Latency	<5 μs	<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 <sub>PP</sub> / 0.3 mV <sub>RMS</sub>	2 mV <sub>PP</sub> / 0.3 mV <sub>RMS</sub>	
Output noise on 1 kHz signal	11 mV <sub>PP</sub> / 0.7 mV <sub>RMS</sub>	3 mV <sub>PP</sub> / 0.3 mV <sub>RMS</sub>	
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)		

Tab. 23: AOUT functions

# TRION(3)-18xx-MULTI



AOUT functions <sup>1)</sup>	
Non isolated digital I/O	
– Compatibility (input)	CMOS/TTL, 100 kΩ pullup
– Compatibility (output)	TTL, 20 mA
– Overvoltage protection	±30 V <sub>DC</sub> , 50 V <sub>PEAK</sub> (100 ms)
Isolated digital input	
– Compatibility (input)	
– Overvoltage protection	
– Bandwidth	CMOS Low: <1.5 V High: >3.2 V
– Pulse width distortion	±35 V <sub>DC</sub> , 65 V <sub>PEAK</sub> (100 ms)
– Input high current @ 5V UIN	50 kHz
– Input high current @ 35V UIN	2.3 μs
	<3 mA
	<5 mA
Isolated digital output	
– Compatibility (output)	Open collector
– Max. collector voltage	±30 V <sub>DC</sub>
– 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. 23: AOUT functions

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

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

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

Tab. 24: Output accuracy