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TRACO POWER

DC/DC Railway Converter

TEN 20WIRH Series, 20 Watt

- **Fully encapsulated 1”x1.6” package**
- **3000 VAC I/O isolation (reinforced)**
- **4:1 input voltage range: 36 – 160 VDC**
- **EN 50155 and EN 61373 certified**
- **Internal class A EMI filter**
- **-40°C up to +75°C without derating**
- **EN 45545-2 fire behavior**
- **Remote on/off function**
- **Undervoltage lockout (UVLO), short-circuit protection (SCP), overtemperature protection (OTP), and overvoltage protection (OVP)**
- **3-year product warranty**



UL 62368-1 IEC 62368-1

The TEN 20WIRH is a series of 20 watt railway-certified DC/DC converters with reinforced I/O isolation for highest reliability in harsh environments. The proven and certified design guarantees highest resistance against thermal shocks, moisture, mechanical shocks, and vibration. The TEN 20WIRH comes with additional EN 62368-1 safety approvals for IT equipment and EN 45545-2 certification for fire behavior. Thanks to its favorable operating temperature range of -40°C to +75°C without derating (depending on the model), the TEN 20WIRH presents a first choice for demanding applications.

Models

Order Code	Input Voltage Range	Output 1		Output 2		Efficiency
		Vnom	Imax	Vnom	Imax	typ.
TEN 20-11011WIRH	36 - 160 VDC (110 VDC nom.)	5.1 VDC	4'000 mA			91 %
TEN 20-11012WIRH		12 VDC	1'670 mA			89 %
TEN 20-11013WIRH		15 VDC	1'330 mA			90 %
TEN 20-11015WIRH		24 VDC	833 mA			89 %
TEN 20-11021WIRH		+5 VDC	2'000 mA	–5 VDC	2'000 mA	86 %
TEN 20-11022WIRH		+12 VDC	833 mA	–12 VDC	833 mA	89 %
TEN 20-11023WIRH		+15 VDC	667 mA	–15 VDC	667 mA	90 %

Options

on demand (backorder with MOQ non stocking item)	- Optional models with inverse remote on/off function (passiv = off)

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Input Specifications

Input Current	- At no load		10 mA typ.
Surge Voltage			200 VDC max. (1 s max.)
Input Inrush Current			50 A typ.
Under Voltage Lockout			32 VDC min. / 34 VDC typ. / 35.8 VDC max.
Recommended Input Fuse			1'000 mA (slow blow) (The need of an external fuse has to be assessed in the final application.)
Input Filter			Internal Pi-Type

Output Specifications

Output Voltage Adjustment			±10% (5.1, 12 Vout single models) -10% to +20% (15, 24 Vout single models) (By external trim resistor) See application note: www.tracopower.com/overview/ten20wirh Output power must not exceed rated power!
Voltage Set Accuracy			±1% max.
Regulation	- Input Variation (Vmin - Vmax)	single output models:	0.2% max.
		dual output models:	0.2% max.
	- Load Variation (0 - 100%)	single output models:	0.5% max.
		dual output models:	1% max. (Output 1) 1% max. (Output 2)
	- Voltage Balance (symmetrical load)	dual output models:	2% max.
	- Cross Regulation (25% / 100% asym. load)	dual output models:	5% max.
Ripple and Noise (20 MHz Bandwidth)	- single output	5.1 Vout models:	75 mVp-p typ. (w/ 1 µF, 50 V, X7R)
		12 Vout models:	100 mVp-p typ. (w/ 1 µF, 50 V, X7R)
		15 Vout models:	100 mVp-p typ. (w/ 1 µF, 50 V, X7R)
		24 Vout models:	150 mVp-p typ. (w/ 1 µF, 50 V, X7R)
	- dual output	5 / -5 Vout models:	75 / 75 mVp-p typ. (w/ 1 µF, 50 V, X7R)
		12 / -12 Vout models:	100 / 100 mVp-p typ. (w/ 1 µF, 50 V, X7R)
		15 / -15 Vout models:	100 / 100 mVp-p typ. (w/ 1 µF, 50 V, X7R)
Capacitive Load	- single output	5.1 Vout models:	5'000 µF max.
		12 Vout models:	850 µF max.
		15 Vout models:	700 µF max.
		24 Vout models:	220 µF max.
	- dual output	5 / -5 Vout models:	2'500 / 2'500 µF max.
		12 / -12 Vout models:	500 / 500 µF max.
		15 / -15 Vout models:	350 / 350 µF max.
Minimum Load			Not required
Temperature Coefficient			±0.02 %/K max.
Start-up Time			30 ms typ. / 60 ms max.
Short Circuit Protection			Continuous, Automatic recovery
Output Current Limitation			150% typ. of Iout max.
Overvoltage Protection			126% typ. of Vout nom. (depending on model) 6.2 VDC typ. (5.1 Vout model) 15 VDC typ. (12 Vout model) 20 VDC typ. (15 Vout model) 30 VDC typ. (24 Vout model) (by Zener diode)
Transient Response	- Peak Variation		320 mV typ. / 400 mV max. (75% to 100% Load Step)
	- Response Time		250 µs typ. / 300 µs max. (75% to 100% Load Step)

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

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Safety Specifications

Safety Standards	- IT / Multimedia Equipment	EN 62368-1 IEC 62368-1 UL 62368-1
	- Railway Applications	EN 50155
	- Certification Documents	www.tracopower.com/overview/ten20wirh
Pollution Degree		PD 2
Over Voltage Category		OVC II

EMC Specifications

EMI Emissions			EN 50121-3-2 (EMC for Rolling Stock)
	- Conducted Emissions		EN 55032 class A (internal filter)
			EN 55032 class B (with external filter)
	- Radiated Emissions		EN 55032 class A (internal filter)
			EN 55032 class B (with external filter)
		External filter proposal:	www.tracopower.com/overview/ten20wirh
EMS Immunity			EN 50155 (Railway Applications)
			EN 50121-3-2 (EMC for Rolling Stock)
			EN 55024 (IT Equipment)
			EN 55035 (Multimedia)
	- Electrostatic Discharge	Air:	EN 61000-4-2, ±8 kV, perf. criteria A
		Contact:	EN 61000-4-2, ±6 kV, perf. criteria A
	- RF Electromagnetic Field		EN 61000-4-3, 20 V/m, perf. criteria A
	- EFT (Burst) / Surge		EN 61000-4-4, ±2 kV, perf. criteria A
			EN 61000-4-5, ±2 kV, perf. criteria A
		Ext. input component:	2x 220 µF, 200 V, KXJ || SMDJ170A
	- Conducted RF Disturbances		EN 61000-4-6, 10 Vrms, perf. criteria A
	- PF Magnetic Field	Continuous:	EN 61000-4-8, 100 A/m, perf. criteria A
		1 s:	EN 61000-4-8, 1000 A/m, perf. criteria A

General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature	–40°C to +85°C
	- Case Temperature	+105°C max.
	- Storage Temperature	–55°C to +125°C
Power Derating	- High Temperature	Depending on model
	See application note:	www.tracopower.com/overview/ten20wirh
Over Temperature Protection Switch Off	- Protection Mode	115°C typ. (Automatic recovery)
	- Measurement Point	Case
Cooling System		Natural convection (20 LFM)
Remote Control	- Voltage Controlled Remote	On: 3.0 to 12 VDC or open circuit Off: 0 to 1.2 VDC or short circuit Refers to 'Remote' and '-Vin' Pin
	- Off Idle Input Current	3 mA typ. / 3.5 mA max. (Optional models with inverse logic (passiv = off) available)
Altitude During Operation		5'000 m max.
Switching Frequency		250 - 310 kHz (PWM) 275 kHz typ. (PWM)
Insulation System		Reinforced Insulation
Working Voltage (rated)		182 VAC
Isolation Test Voltage	- Input to Output, 60 s	3'000 VAC
	- Input to Case, 60 s	3'000 VAC
	- Output to Case, 60 s	2'000 VAC
Creepage	- Input to Output	4.5 mm min.
Clearance	- Input to Output	4.5 mm min.

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Isolation Resistance	- Input to Output, 500 VDC	1'000 MΩ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	650 pF typ. 1'000 pF max.
Reliability	- Calculated MTBF	1'558'000 h (MIL-HDBK-217F, ground benign)
Washing Process		According to Cleaning Guideline www.tracopower.com/info/cleaning.pdf
Environment	- Vibration	MIL-STD-810F EN 61373
	- Mechanical Shock	MIL-STD-810F EN 61373
	- Thermal Shock	MIL-STD-810F EN 50155
Housing Material		Non-conductive Plastic (UL 94 V-0 rated)
Base Material		Non-conductive Plastic (UL 94 V-0 rated)
Potting Material		Silicone (UL 94 V-0 rated)
Pin Material		Tinned Copper
Pin Foundation Plating		Nickel (2 - 3 µm)
Pin Surface Plating		Tin (3 - 5 µm), matte
Housing Type		Plastic Case
Mounting Type		PCB Mount
Connection Type		THD (Through-Hole Device)
Footprint Type		1.6" x 1"
Soldering Profile		Wave Soldering 260°C / 6 s max.
Weight		24 g
Thermal Impedance	- Case to Ambient	11.5 K/W typ.
Environmental Compliance	- REACH Declaration	www.tracopower.com/info/reach-declaration.pdf REACH SVHC list compliant REACH Annex XVII compliant
	- RoHS Declaration	www.tracopower.com/info/rohs-declaration.pdf Exemptions: 7a, 7c-I (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule). The SCIP number is provided on request.)
	- Flammability (EN 45545-2)	www.tracopower.com/info/en45545-declaration.pdf

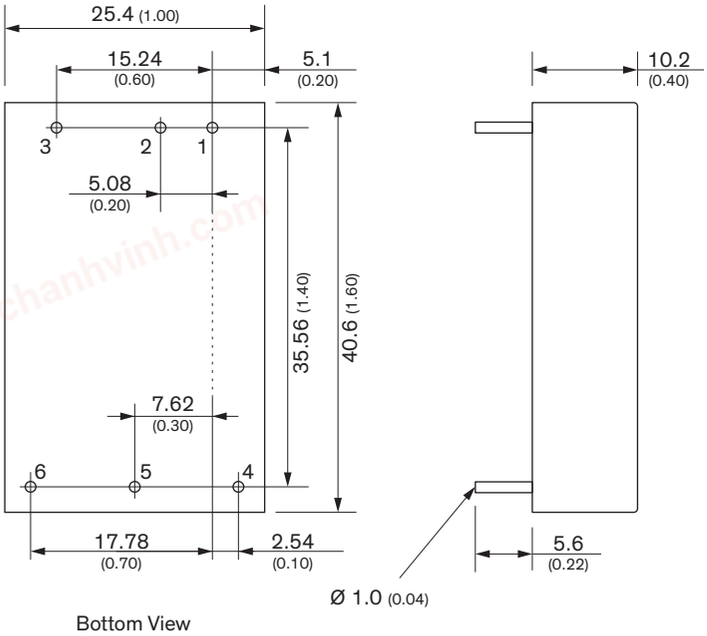
Supporting Documents

Overview Link (for additional Documents)	www.tracopower.com/overview/ten20wirh

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Outline Dimensions



Bottom View

All dimension in mm (inch)
Tolerance: X.X ±0.5 (X.XX ±0.02)
X.XX ±0.25 (X.XXX ±0.010)
Pin dimension tolerance ±0.10 (±0.004)

Pinout		
Pin	**Single**	**Dual**
1	+Vin	
2	–Vin	
3	Remote On/Off	
4	+Vout	
5	–Vout	Common
6	Trim	–Vout

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