

MCRT[®] 81708V 10 to 25 kN·m Bearingless Dual Range Digital Torquemeters

**BEST* REAL WORLD ACCURACY OF ANY SIMILAR TORQUEMETER,
TORQUE SENSOR OR TORQUE TRANSDUCER**

**WIDE INSTALLED MEASUREMENT BANDWIDTH AND FAST INSTALLED RESPONSE
SIMPLE TO INSTALL, TOLERANT OF ROTOR-STATOR MISALIGNMENT
HAS METRIC PILOTS, BOLT CIRCLES AND FASTENERS
HIGH OVERRANGE AND HIGH OVERLOAD
0.03% COMBINED NONLINEARITY & HYSTERESIS
NOISE TOLERANT CARRIER AMPLIFICATION
BI-DIRECTIONAL ROTOR SHUNT CALIBRATION
NO HOOP OR CALIPER ANTENNAE**

- Digital Output of Torque & Temperature
- Analog and FM Outputs
- 3 kHz Signal Bandwidth
- Max/Min's Updated @ 20 kHz
- 200% & 1,000% Overload, 150% & 300% Overrange
- 0.00072%/°C Compensation
- Optional Zero Velocity Speed Pickup
- 13 Selectable Bessel Data Filters
- Interface Software Furnished
- Select from 10 Units of Measure Without Recalibration



*NIST traceable calibration performed in our accredited laboratory (NVLAP Lab Code 200487-0). For details visit www.himmelstein.com or follow the accreditation link at www.nist.gov.

MCRT[®]81708V Dual Range Torquemeters measure high and low torques without the cost and inconvenience of swapping two conventional sensors. They also correctly measure torques with high peak to average ratios. Each range is calibrated to its' full scale with 8 to 10 (17 to 21 total) CW and CCW steps and documented by a NVLAP approved Certificate certifying NIST traceability and that our lab and its' management meet ISO/IEC 17025:2017.

Carrier amplifiers immune to dc and low frequency noise, handle the strain gage output. Industries highest Overrange avoids errors¹ from clipped torque peaks. Hardening against interference (EMI) from VFD's and other sources further enhances performance.

Bi-directional rotor shunt cal verifies calibration and

1. See Application Note 221101D 2. See Application Note 20805B

operation of the entire data chain in **both CW and CCW modes**. It is invoked via stator switches, I/O line or from your computer. Multiple bridges and elegant design provide **exceptional immunity to clamping and other extraneous loads**. These devices have high stiffness, low deflection and provide superlative static and dynamic system response². The Torquemeter is installed without an additional coupling resulting in a *torsionally stiff driveline*, with low overhung moment and a short overall length.

The torque signal is digitized on the rotor and sent to the stator where analog, frequency and Com Port outputs are created. Choose RS232/RS422/RS485 or USB (option) communication. Included software interfaces with your Windows-based PC. It displays Real-time, Max/Min and Spread Torque, Rotor Temperature, does limit checks, torque versus time plots and stores test results. Password protection may be invoked.

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Designing and Making the World's Best Torque Instruments Since 1960

Exceptional Immunity To Noise And Interference From ISM Transmitters

All bearingless Torquemeters necessarily use unshielded antennae. As a result, any device (including a like Torquemeter) operating at or near their carrier frequency, can cause interference. FCC rules allow Industrial, Scientific and Medical (ISM) devices to generate unlimited energy. Such ISM devices are commonly used for inventory control, parts tracking, controlling personnel access, induction heating, etc. Most Bearingless Torquemeters use an ISM frequency for data transfer. As a

result, they are susceptible to interference from other ISM devices. Since FCC rules only allow narrow band (typically ± 7 kHz) transmission for unlicensed use, wideband ISM frequency Torquemeters risk violation of FCC regulations. Himmelstein Bearingless Torquemeters use non-ISM frequencies for power and data, have field strengths within FCC rules, powerful 12 pole signal filters and near field (not radiated field) signal transfer.

Common Specifications*		Performance Grade	
		Code N	Code C
Torque Range⁴		Factory Set @ Transducer Full Scale Torque; see Note 1.	
Torque Units of Measure		Select N-m, kN-m, N-cm, kgf-m, kgf-cm, gf-cm, lbf-in, lbf-ft, ozf-in, ozf-ft without re-calibration	
Temperature Units of Measure		Select °C or °F without re-calibration.	
Combined Nonlinearity, Hysteresis & Non-Return to Zero: <small>(0 to $\pm 100\%$ of range) (Best Fit Line Basis - see Tech Memo 230104)</small>	High Range	$\leq \pm 0.1\%$	$\leq \pm 0.05\%$
	Low Range	$\leq \pm 0.1\%$	$\leq \pm 0.07\%$
Overrange² (% of Range)	High Range	150. Applies to all outputs. Combined Error is $< 0.1\%$ in Overrange.	
	Low Range	300. Applies to all outputs.	
Repeatability	High Range	$\leq \pm 0.01\%$ of Range	
	Low Range	$\leq \pm 0.02\%$ of Range	
Accuracy Class³	High Range	$\leq \pm 0.1\%$	$\leq \pm 0.05\%$
	Low Range	$\leq \pm 0.1\%$	$\leq \pm 0.07\%$
Calibration Signal⁴		100.00% of full scale for clockwise and counterclockwise directions	
Zero Drift (% of Range per °C/per °F)	High Range	$\leq \pm 0.00072/0.0004$	
	Low Range	$\leq \pm 0.00364/0.002$	
Span Drift (% of Reading per °C/per deg °F)		$\leq \pm 0.0036/0.002$	
48 Hour Drift <small>(% of Range - applies to all outputs)</small>	High Range	$\leq \pm 0.02$	
	Low Range	$\leq \pm 0.05$	
Temperature Ranges (°C/°F)		Compensated Range: +24 to +79.4/+75 to +175; Usable Range: -32 to +85/-25 to +185 Storage Range: -54 to +107/-65 to +225	
Rotor to Stator Maximum Misalignment <small>(mm/inches)</small>		Axial: $\pm 5/\pm 0.2$, Radial: 5/0.2 without Speed Pickup Option If Speed Pickup Option (Code Z) is installed, then both maximums become 1.5/0.06	
Analog Output Signals⁵, Auto-Scaled		Allowable Load: 10k resistive, minimum; 0.05 μ F capacitive, maximum.	
Full Scale Torque		$\pm 10V$ with $\pm 15V$ overrange. User may select $\pm 5V$ with $\pm 7.5V$ overrange.	
Signal Filter Cutoff Frequency⁶		From 0.1 Hz to 1 kHz in thirteen 1-2-5 steps plus 3 kHz. Selected from a remote PC using furnished software. Filters have Bessel Response; and are free from delay distortion and overshoot errors.	
Frequency Modulated Output⁵		Frequency: $10 \pm 5/20 \pm 10/40 \pm 20$ kHz; field changeable (Default = 10 ± 5 kHz); TTL square wave	
Peak-Peak Digital Output⁵ Noise vs Filter Cutoff Frequency (% of Range)		< 0.001 @ 0.1Hz, 0.002 @ 1 Hz, 0.004 @ 10 Hz, 0.01 @ 100 Hz, 0.0372 @ 1 kHz, 0.06 @ 3 kHz	
Peak-Peak Analog Output^{5,7} Noise vs Filter Cutoff Frequency (millivolt)		On 10V Setting: 6 @ 0.1 to 100 Hz, 8 @ 1 kHz and 12 @ 3 kHz. On 5V Setting: 6 @ 0.1 to 100 Hz, 7 @ 1 kHz and 8 @ 3 kHz.	
Torque Sampling Rate and Bandwidth		Sampled @ 20 kHz. Torque 3 dB bandwidth is 3 kHz reducible by filters (see Note 6)	
Rotor-to-Stator Transfer Rate		1.25 Mbaud	
RS232/RS422/RS485/USB Communication⁸		Com port outputs Torque and Temperature with units of measure. Inputs torque range if other than sensor full scale, selects units of measure, selects filter cutoff, etc. and permits remote computer control of the test. For USB interface specify Option U.	
Baud Rate		115,200; Drivers are protected for short circuit (current limit) and ± 15 kV ESD protected.	
Maximum Cable Length		RS232 = 50 feet, RS422/485 = 4,000 feet; access 120 Ω termination via Com Port.	
Interface Software With Torque Limits		Provided to interface with Windows-based PC. Includes 20 foot interconnect cable ⁷ for a PC. Flags on PC screen classify user-set High and Low Limits for Current, or Max/Min or Spread (Max - Min) Torque data.	
I/O Lines and FM Output⁵		Input lines are +Cal, -Cal, Tare, Clear Tare, Toggle Range. Output lines are Data OK & FM Out. Output	
Status LED's (on Stator Keypad)		Power (Yellow = Power-up, Green = OK, Red = Fault); Data (Green = OK, Red = Error); Rotor Temperature (Green = In Operating Range, Red = Out of Operating Range).	
Keypad Control Switches		+ CAL invokes CW Rotor Shunt Cal, -CAL invokes CCW Rotor Shunt Cal, Both held simultaneously for 5 seconds invokes Tare.	
Rotor Temperature		Rotor Temperature is output via Com Port. Range is 0 to 85 °C.; Accuracy is ± 1 °C.	
Optional Zero Velocity Speed Pickup		Code Z Optional Speed Pickup outputs 120 pulses/revolution.	
Supply Voltage/Power⁹		10 to 26 VDC @ 6 to 11 watt nominal, varies with rotor misalignment.	

Specification Notes:

- Outputs may be set at any value equal to or less than the Torquemeter Rating(s). For example: If the High Range Rating is 15 kN·m, the user may re-scale to 10 kN·m. Then the analog output would be 5 or 10 volt at 10 kN·m and the digital output, at the Com Port, would be 10 kN·m. However, the above specification still defines measurement accuracy. In other words, you can use this capability to change the scaling but it will not change measurement accuracy; see Application Note 20804 for further details on Torquemeters operated with extended measuring range.
 - In the Overrange region** all outputs are guaranteed to have combined nonlinearity and hysteresis lower than 0.1% of full scale. This avoids large average and peak torque errors that driveline resonance and pulsating driver and load devices can cause near the high end of the sensor range. See Application Note 20805B for more complete information. Torquemeters have infinite fatigue life for full reversals up to half their overload rating. Above that, you risk a fatigue failure. An MCRT® 81708V will provide accurate data, without yielding, when torque peaks are 150% of its full scale rating. It will not yield if torque peaks are $\leq 200\%$ of its full scale rating, however, its fatigue life will be reduced and, therefore, **it should not be used continuously or for long periods above half its overload rating.** Additionally, if you are using the analog output, it is linear up to 15 volt. That corresponds to 150% of full scale on the 10 volt output setting and 300% on the 5 volt output setting. Accordingly, if you expect torque peaks greater than 150% of full scale, you should switch to the 5 volt setting.
 - The greatest of Combined Error, Repeatability, Zero Drift and Span Drift over 18°F(10°C). It is expressed as a percent of full scale.
 - CW torque causes CW rotation if viewed from the driving end. CCW torque causes the opposite rotation.
 - Power Input and all outputs are protected. Digital inputs are reverse polarity and overvoltage protected.
 - Torque signal bandwidth upper limit is 3 kHz determined by the integral anti-aliasing filter. Realizable, installed measurement bandwidth is limited by driveline components. A Torquemeters' principal contribution is determined by its torsional stiffness; see Application Note 221101D for further information.
 - Analog noise is measured by an Agilent U1520A Scope with bandwidth set to 10 kHz.
 - A 20 foot long Torquemeter to RS422/485 PC port cable is shipped with each Torquemeter. That communication protocol provides for long, robust connection in a noisy industrial environment, and permits connection of multiple Torquemeters to a single, host computer. An optional USB to RS422/485 adapter is available, if needed; specify option U.
 - Fused and reverse polarity protected
- * Specifications are subject to change without notice.

MCRT® Model	High Range			Low Range			Both Ranges
	Full Scale Torque		Max. Deflection	Full Scale Torque		Max. Deflection	Max. Speed
	(N·m)	(lbf·in)	(Degree)	(N·m)	(lbf·in)	(Degree)	(rpm)
	Torque Overload Rating is 2 Times the High Range Full Scale Torque for All Models.						
81708V(1-4 Nm)	10,000	88,510	0.069	2,000	17,700	0.018	0 to ±8,500 Suffix H or 0 to ±6,000 Suffix B
81708V(15-3 Nm)	15,000	132,760	0.070	3,000	26,550	0.014	
81708V(2-4 Nm)	20,000	177,000	0.071	4,000	35,400	0.014	
81708V(25-3 Nm)	25,000	221,300	0.072	5,000	44,260	0.014	

MCRT® Model	Torsional Stiffness	Rotating Inertia	Maximum Extraneous Loads ¹			Max Rotor Wt.
			Thrust	Bending	Shear	
SI Units	(N·m/rad)	(kg·m ²)	(N)	(N·m)	(N)	(kg)
81708V(1-4 Nm)	8,260,000	0.326	78,740	3,330	39,370	27.6
81708V(15-3 Nm)	12,230,000	0.327	118,110	5,000	59,060	27.8
81708V(2-4 Nm)	16,090,000	0.327	157,480	6,670	78,740	28.0
81708V(25-3 Nm)	19,870,000	0.328	196,850	8,330	98,430	28.1
English Units	(lbf·in/rad)	(ozf·in s ²)	(lbf)	(lbf·in)	(lbf)	(lb)
81708V(1-4 Nm)	73,100,000	46.20	17,700	29,500	8,850	60.8
81708V(15-3 Nm)	108,300,000	46.30	26,550	44,250	13,280	61.3
81708V(2-4 Nm)	142,400,000	46.30	35,400	59,000	17,700	61.7
81708V(25-3 Nm)	175,800,000	46.40	44,250	73,730	22,130	61.9

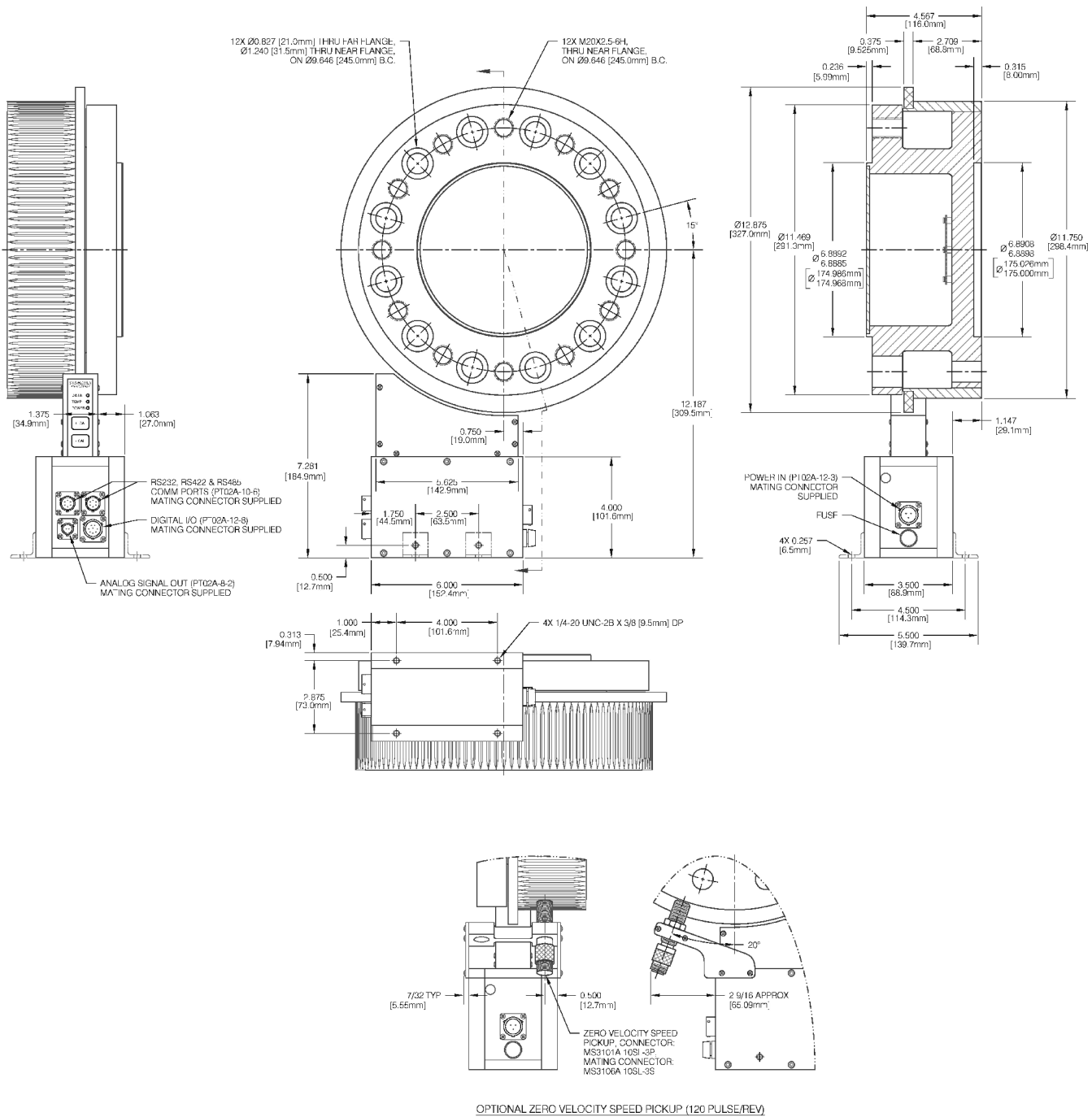
Notes: 1. Maximum extraneous loads and rated torque may be applied simultaneously without damage

ORDER NUMBER FORMAT MCRT® A B C D E F

- A = Model Number from table: 81708V.
- B = Range from table: (1-4 Nm), (15-3 Nm), (2-4 Nm) or (25-3 Nm).
- C = Performance Code: N for Standard, C for Enhanced.
- D = Optional Zero Velocity Speed Pickup: N for None, Z for Magnetic Type.
- E = Speed Rating Suffix: H designates 8,500 rpm rating, B designates 6,000 rpm rating.
- F = USB Interface: U when RS422/485 adapter is furnished, N when omitted.

ORDER NUMBER EXAMPLE  MCRT® 81708V(25-3 Nm)CZHU specifies a Bearingless Torquemeter with a 25 kN·m (221,200 lbf·in) High Torque Rating, a 5 kN·m Low Torque Range, a 50 kN·m Torque Overload Rating, Enhanced Performance, an Optional Speed Pickup, a 8,500 rpm Speed Rating, and a USB Adapter.

Please note, dimensions subject to change without notice. Contact factory for certified drawings.



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