



MCRT® 81708V Bearingless Dual Range Digital Torquemeters

Torque Ranges: 10 to 25 kN-m

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

**Widest Installed Measurement Bandwidth
And Fastest Installed Response**

**Simple To Install, Tolerant Of
Wide Rotor-Stator Misalignment**

Has Metric Pilots, Bolt Circles And Fasteners

High Overrange And High Overload

0.05% 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/Mins 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.

M CRT® 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 VFDs and other sources further enhances performance.

Bi-directional rotor shunt cal verifies calibration and 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.

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

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* | Standard, Code N Performance | | Enhanced, Code C Performance | |
|---|--|------------------------------|---|------------------------------|
| | High Range | Low Range | High Range | Low Range |
| Torque Range¹ | Factory Set @ Transducer Full Scale Torque; see Note 1. | | | |
| Torque Units of Measure (without re-calibration) | Select N-m, kN-m, N-cm, kgf-m, kgf-cm, gf-cm, lbf-in, lbf-ft, ozf-in, ozf-ft | | | |
| Temperature Units of Measure | Select °C or °F without re-calibration. | | | |
| Combined Nonlinearity & Hysteresis & Non-Return to Zero (% of Range, Best Fit Line Basis – see Tech Memo 230104) | $\leq \pm 0.1\%$ | $\leq \pm 0.1\%$ | $\leq \pm 0.05\%$ | $\leq \pm 0.07\%$ |
| Overrange² (% of Range) | 150. Applies to all outputs. Combined Error is < 0.1% in Overrange. | 300. Applies to all outputs. | 150. Applies to all outputs. Combined Error is < 0.1% in Overrange. | 300. Applies to all outputs. |
| Repeatability (% of Range) | $\leq \pm 0.01\%$ of Range | $\leq \pm 0.02\%$ of Range | $\leq \pm 0.01\%$ of Range | $\leq \pm 0.02\%$ of Range |
| Accuracy Class³ | $\leq \pm 0.1\%$ | $\leq \pm 0.1\%$ | $\leq \pm 0.05\%$ | $\leq \pm 0.07\%$ |
| Calibration Signal⁴ | 100.00% of full scale for clockwise and counterclockwise directions | | | |
| Zero Drift (% of Range per °C/ per °F) | $\leq \pm 0.00072/0.0004$ | $\leq \pm 0.00364/0.002$ | $\leq \pm 0.00072/0.0004$ | $\leq \pm 0.00364/0.002$ |
| Span Drift (% of Reading per °C/ per °F) | $\leq \pm 0.0036/0.002$ | | | |
| 48 Hour Drift (% of Range - applies to all outputs) | $\leq \pm 0.02$ | $\leq \pm 0.10$ | $\leq \pm 0.02$ | $\leq \pm 0.10$ |
| 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 (mm/inches) | 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; 0.05µF 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 Output⁶ | Frequency: 10±5/20±10/40±20 kHz; field changeable (Default = 10±5 kHz); TTL square wave | | | |
| Peak-Peak Digital Output⁶ 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^{6,7} 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 Communications⁸ | 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 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. | | | |
| Status LEDs (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 Full Scale Rating. *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 ≤ 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 input, 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 Torquemeter's principle 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 (P/N 330-0003) is available if your PC has only USB ports. Should you prefer to use the RS232 interface and your computer has an integral RS232 port, you may order a Torquemeter to PC cable; P/N 224-8359-20 is 20 feet long, P/N 224-8359-50 is 50 feet long.
 - Fused and reverse polarity protected.
- *Specifications are subject to change without notice.*

| MCRT® Model | High Range | | | | Low Range | | | Both Ranges Maximum Speed [rpm] |
|-----------------|-------------------|----------|--|-----------------------------|-------------------|----------|-----------------------------|--|
| | Full Scale Torque | | Torque Overload Rating | Maximum Deflection [degree] | Full Scale Torque | | Maximum Deflection [degree] | |
| | [N-m] | [lbf-in] | | | [N-m] | [lbf-in] | | |
| 81708V(1-4 Nm) | 10,000 | 88,510 | 2X the high range full scale torque for all models | 0.069 | 2,000 | 17,700 | 0.014 | 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 | |

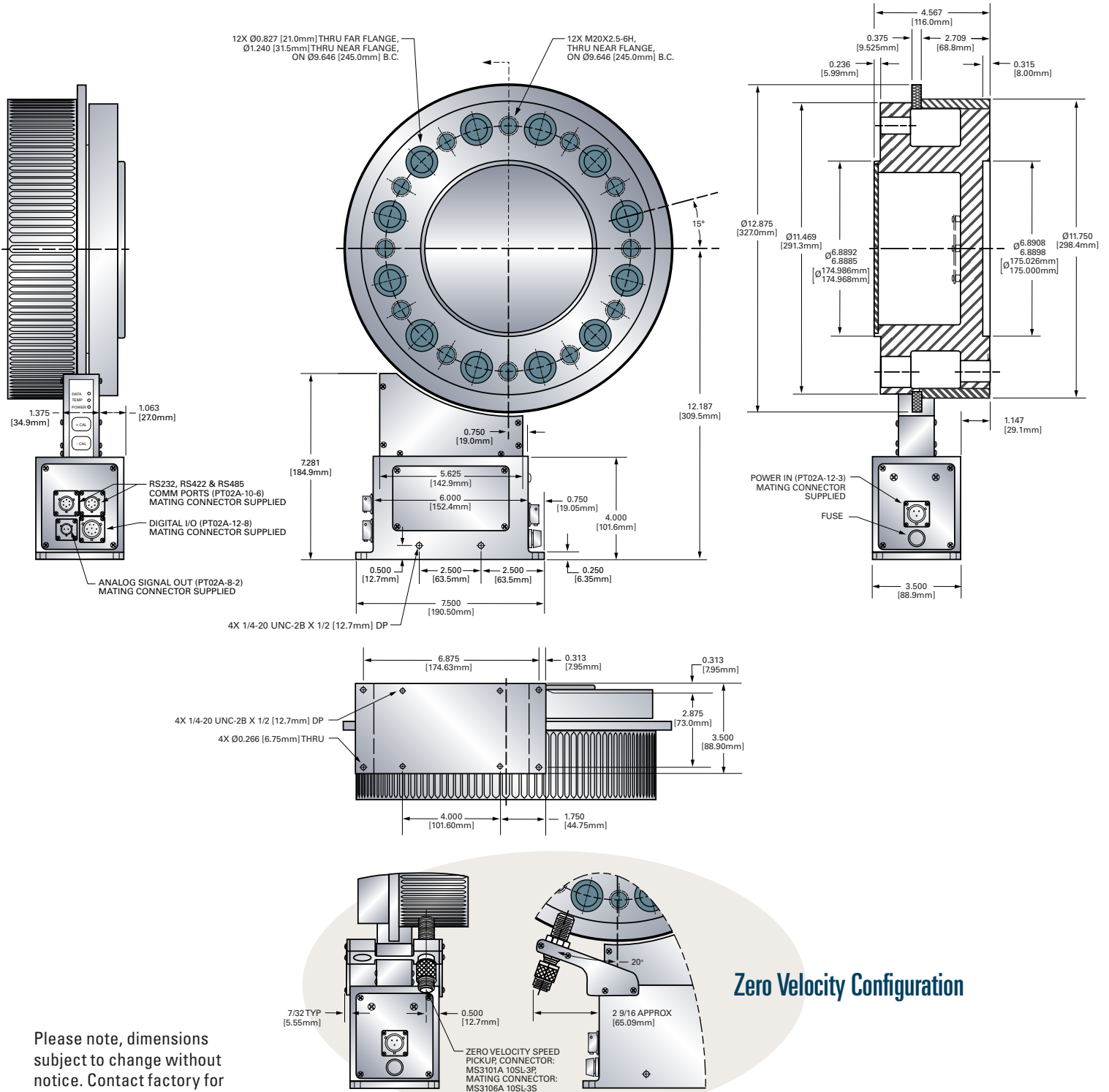
| MCRT® Model | Torsional Stiffness | Rotating Inertia | Maximum Extraneous Loads ¹ | | | Rotor Weight |
|------------------------|---------------------|--------------------------|---------------------------------------|----------|--------|--------------|
| | | | Thrust | Bending | Shear | |
| SI Units ➔ | [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 |

Note: 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 or 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)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.

S. Himmelstein and Company

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