

MCRT[®] 86000V & MCRT[®] 87000V

Bearingless Digital Torquemeters

Torque Ranges: 500 to 100,000 lbf-in (56.5 N-m to 11,300 N-m)

HIGHEST OVERLOAD AND OVERRANGE - Assures safety and best accuracy despite high peak to average torque ratios.
GREATEST NOISE IMMUNITY - Use with variable frequency drives. Immune to EMI, ISM emitters and nearby torquemeters.
BEST DYNAMIC RESPONSE - Highest stiffness and lowest deflection assures the greatest installed system response.
NON-CRITICAL INSTALLATION - Handles 1" axial, 0.3" radial misalignment with mating metal parts as close as 0.1 inch.
BI-DIRECTIONAL ROTOR CALIBRATION - Rotor bridge shunt verifies calibration/operation for CW and CCW torques.

- 0.05% Accuracy*
- 200% & 400% Overload
- No Hoops or Calipers
- Insensitive to Nearby Metal
- No Manual Adjustments
- 3 kHz Data Bandwidth
- Analog Output
- Digital Output with Temperature
- FM Output
- 10 Units of Measure
- 11 Bessel Data Filters
- Max/Min's Updated @ 20 kHz
- Interface Software Furnished
- Zero Velocity Speed Pickup Option



*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[®]86000V and 87000V Torquemeters output shaft torque with 0.01% resolution. Digital, Analog and FM formats are simultaneously available. Industries highest overload and overrange ratings assure safety and accuracy even when the driveline has high peak to average torque ratios. Features include non-critical installation, temperature data, very fast max/min capture and absence of manual adjustments.

Range, scaling, calibration and setup data are stored in the rotor memory and transferred to the stator during startup. That assures accuracy, without re-calibration, if rotors and stators are replaced or intermixed. Bi-polar, rotor shunt cal can be enabled with stator switches, logic I/O or, via the Com Port. Choose from ten units of measure without re-calibrating. When you re-calibrate, earlier calibrations are archived. Eleven selectable Bessel data filters avoid overshoot errors and delay distortion.

Multiple bridges sense torque and provide immunity to extraneous loads. The radial torque path yields short length, unsurpassed torsional stiffness and deflection resulting in the **highest installed system response**. The torquemeter is installed without an additional coupling. The result is low overhung moment and short length. Those features, combined with the ability to operate with metal driveline parts as close as 0.1 inch, results in **the most compact assembly possible**. Himmelstein has made wheel, pulley and chassis roll *radial path* sensors for decades.

The sensors' output is digitized and then sent to the stator where analog, frequency and Com Port outputs are created. Choose RS232, RS422, or RS485 communications. Included software interfaces with your Windows-based PC. It displays real time, Max/Min and Spread Torque, does limit checks, real time plots and stores test results. Password protection may be invoked.

S. HIMMELSTEIN AND COMPANY

Designing and Making the Worlds Best Torque Instruments Since 1960

Exceptional Immunity To Noise And Interference From ISM Transmitters

To achieve short length, high stiffness and wide signal bandwidth, bearingless sensors use unshielded antennae. As a result, any device (including a like torquemeter) operating at or near its carrier frequency, can cause interference and data errors.

Of special concern are Industrial, Scientific and Medical (ISM) devices. Under FCC rules, they can generate unlimited energy and field strength. High power ISM devices are commonplace in industrial environments. Furthermore, billions of RFID tags also operate at ISM frequencies. These ubiquitous products are used for inventory control, parts tracking, controlling personnel access, etc.

Most Bearingless Torquemeters use a single ISM frequency for power and data; usually 6.78 or 13.56 MHz. As a result, they are susceptible to interference from ISM Transmitters. Furthermore, FCC rules permit high power/fields only within a narrow band;

± 7 kHz for a 13.56 MHz device. For unlicensed use outside that band, field strength must be low; $\leq 25 \mu\text{V/m}$ at 300 meters for a 13.56 MHz carrier. Because real-time data transmissions are several MHz wide, these devices risk violation of FCC regulations.

Himmelstein Bearingless Torquemeters use separate 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. **Should interference occur, the system automatically shifts to a clear channel. An important benefit of this feature is the ability to install torquemeters very close to each other. Equally important is the Torquemeters' ability to operate as close as 0.1 inch to metal components.** These characteristics can make possible otherwise impractical installations and can yield significant space and cost savings.

Common Specifications*	Code N Performance	Code C Performance
Torque Range	Factory Set @ Transducer Full Scale Torque; see Note 1.	
Units of Measure	User may select from lbf-in, lbf-ft, ozf-in, ozf-ft, N-m, kN-m, N-cm, kgf-m, kgf-cm, gf-cm without re-calibration	
Accuracy ² (nonlinearity, hysteresis & repeatability)	$\leq \pm 0.1$ (End Point, % of Range)	$\leq \pm 0.05$ (End Point, % of Range)
Bi-polar Shunt Calibration Enable	From Stator Switches (one CW, one CCW), via TTL I/O, or PC Com Port using furnished software.	
Zero Drift (% of Range/deg. F.)	$\leq \pm 0.002$	$\leq \pm 0.001$
Span Drift (% of Reading/deg. F.)	$\leq \pm 0.002$	$\leq \pm 0.001$
Temperature Ranges (deg. F.)	Compensated Range: +75 to +175; Usable Range: -25 to +185; Storage Range: -65 to +225	
Rotor to Stator Maximum Misalignment (inches)	Axial: ± 0.5 , Radial: 0.3; If Speed Pickup Option is installed then maximums may be reduced - call factory.	
Rotational Effects (% of Range)	$\leq \pm 0.01$	
Analog Output Signals³, Auto-Scaled		
MCRT[®] 86000V Full Scale Torque³	Default is $\pm 10\text{V}$ with $\pm 15\text{V}$ overrange. User may select $\pm 5\text{V}$ with $\pm 7.5\text{V}$ overrange. Caution: see Note 7.	
MCRT[®] 87000V Full Scale Torque³	Default is $\pm 5\text{V}$ with $\pm 15\text{V}$ overrange. User may select $\pm 10\text{V}$ with $\pm 15\text{V}$ overrange. Caution: see Note 7.	
Signal Filter Cutoff Frequency⁴	Field selectable from 1 Hz to 1 kHz in ten 1-2-5 steps plus 3 kHz selected from a remote PC using furnished software. Filters have Bessel Response; no delay distortion or overshoot errors.	
Frequency Modulated Output, Auto-Scaled	Frequency: 10 ± 5 kHz or 20 ± 10 kHz or 40 ± 20 kHz; field changeable (Default = 10 ± 5 kHz); TTL square wave output.	
Overrange (% of Range, see Application Note 20805)	150 to 300; model/user selection dependent - see above. Applies to analog, Digital and FM (except for negative side) Outputs.	
System Resolution (% of Range)	0.01	
Output Noise, All Outputs (% of Range)	< 0.01 at 1Hz, < 0.01 at 10 Hz, < 0.015 at 100 Hz, < 0.028 at 1 kHz and < 0.041 at 3 kHz.	
Torque Sampling Rate and Bandwidth	Torque is sampled @ 20 kHz. Its' 3 db bandwidth is 3 kHz but can be reduced by filters (see above)	
Rotor-to-Stator Transfer Rate	1.25 MBaud	
RS232, RS422, RS485 Communications Port	Com port outputs Torque and Temperature with units of measure. Inputs torque range if other than sensor full scale, selects units of measure, selects BAUD Rate, and permits remote computer control of the test.	
BAUD Rate	115,200; Drivers are protected for short circuit (current limit) and $\pm 15\text{kV}$ ESD protected	
Maximum Cable Length	RS232 = 50 feet, RS422/485 = 4,000 feet; 120 Ohm termination may be accessed via software.	
Interface Software	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	5 input and 2 output lines. Input lines are +CAL, -CAL, TARE, CLEAR TARE, and RESET MAX/MIN. Output lines are Data OK and FM Torque Signal.	
Status LED's (on Stator Keypad)	Three Color Coded LED's: Power (Yellow = Power-up, Green = OK, Red = Fault); Data (Green = OK, Red = Data 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, Auxiliary Measurement	Rotor temperature is output via Com Port. Range is 0 to 185 degrees F.; Accuracy is ± 2 degrees. See above for status LED's.	
Option Code Z	30 to 180 pulses/revolution (model dependent) Zero Velocity Speed Pickup.	
Supply Voltage/Power⁵	10 to 26 VDC @ 6 Watts with Antenna aligned to 9 Watts with maximum specified misalignments.	

Notes:

- Outputs may be set at any value \leq Torquemeter Full Scale Rating. *For example:* If the Full Scale Rating is 10,000 lbf-in, the user may re-scale to 5,000 lbf-in. Then the analog output would be 5 or 10 Volts at 5,000 lbf-in and the digital output, at the Com Port, would be 5,000. However, the specification still defines measurement accuracy, i.e., 0.1% (for code N) or 0.05% (for code C) of the sensor full scale range - a possible error of 10 lbf-in (code N) or 5 lbf-in (code C). 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.
 - Assumes torque range is set to the device full scale torque rating.
 - CW torque causes CW rotation if viewed from its driven end. CCW torque causes the opposite rotation.
 - Torque signal bandwidth upper limit is 3 kHz determined by the integral anti-aliasing filter. Realizable measurement bandwidth is limited by driveline components; see Technical Memorandum 8150.
 - Fused and reverse polarity protected.
 - All outputs are fused. Digital inputs are reverse polarity and overvoltage protected.
 - Torquemeters have infinite fatigue life for full reversals up to half their overload rating. Above that, you risk a fatigue failure. Outputs are linear to the overrange rating which, for the 87000V, exceeds the infinite fatigue life threshold (50% of the overload rating). Do not knowingly operate in this region.
- * Specifications are subject to change without notice.

**Standard Ratings,
MCRT® 8600V Bearingless Torquemeters With 200% Overload (Call for Higher Capacities)**

MCRT® Model	Torque Rating		Speed Rating	Torsional Stiffness	Maximum Angular Deflection	Rotating Inertia	Maximum Extraneous Loads			Max Rotor Wt.
	Range	Overload					Thrust	Bending	Shear	
	[lbf-in]*						[rpm]	[lbf-in/rad]	[degree]	
86002V(5-2)	500	1,000	0 to ±15,000	2.77 X 10 ⁶	0.010	0.67	500	250	125	6
86002V(1-3)	1,000	2,000	0 to ±15,000	2.77 X 10 ⁶	0.021	0.67	1,000	500	250	6
86004V(2-3)	2,000	4,000	0 to ±13,500	1.61 X 10 ⁷	0.007	7.2	2,000	1,000	400	28
86004V(5-3)	5,000	10,000	0 to ±13,500	2.04 X 10 ⁷	0.014	7.2	4,000	2,000	800	28
86004V(1-4)	10,000	20,000	0 to ±13,500	2.73 X 10 ⁷	0.021	7.2	7,000	3,500	1,000	28
86007V(2-4)	20,000	40,000	0 to ±10,000	2.87 X 10 ⁸	0.004	59	10,000	5,000	2,000	94
86007V(5-4)	50,000	100,000	0 to ±10,000	3.09 X 10 ⁸	0.009	59	20,000	10,000	4,000	94
86007V(1-5)	100,000	200,000	0 to ±10,000	3.20 X 10 ⁸	0.018	59	30,000	15,000	5,000	94

* To convert lbf-in to N-m multiply by 0.112985.


**Standard Ratings,
MCRT® 8700V Bearingless Torquemeters With 400% Overload (Call for Higher Capacities)**

MCRT® Model	Torque Rating		Speed Rating	Torsional Stiffness	Maximum Angular Deflection	Rotating Inertia	Maximum Extraneous Loads			Max Rotor Wt.
	Range	Overload					Thrust	Bending	Shear	
	[lbf-in]*						[rpm]	[lbf-in/rad]	[degree]	
87002V(5-2)	500	2,000	0 to ±15,000	2.77 X 10 ⁶	0.010	0.67	1,000	500	250	6
87004V(1-3)	1,000	4,000	0 to ±13,500	1.61 X 10 ⁷	0.003	7.2	2,000	1,000	400	28
87004(25-2)	2,500	10,000	0 to ±13,500	2.04 X 10 ⁷	0.007	7.2	4,000	2,000	800	28
87004V(5-3)	5,000	20,000	0 to ±13,500	2.73 X 10 ⁷	0.010	7.2	7,000	3,500	1,000	28
87007V(1-4)	10,000	40,000	0 to ±10,000	2.87 X 10 ⁸	0.002	59	10,000	5,000	2,000	94
87007V(25-3)	25,000	100,000	0 to ±10,000	3.09 X 10 ⁸	0.005	59	20,000	10,000	4,000	94
87007V(5-4)	50,000	200,000	0 to ±10,000	3.20 X 10 ⁸	0.009	59	30,000	15,000	5,000	94

* To convert lbf-in to N-m multiply by 0.112985.

ORDER NUMBER FORMAT  **MCRT® A B C D**

- A = Model Number from tables above; either 8600_V or 8700_V where _ is 2, 4 or 7 from tables
- B = Range from tables above
- C = Performance Code; N for Standard Performance or C for Enhanced Performance
- D = Optional Zero Velocity Speed Pickup; N for None, Z for Optional Pickup

ORDER NUMBER EXAMPLE  **MCRT® 86007V(5-4)CN** specifies a Bearingless Torquemeter with a 50,000 lbf-in Torque Rating, a 200% Torque Overload rating, Enhanced Performance and No Speed Pickup.

