

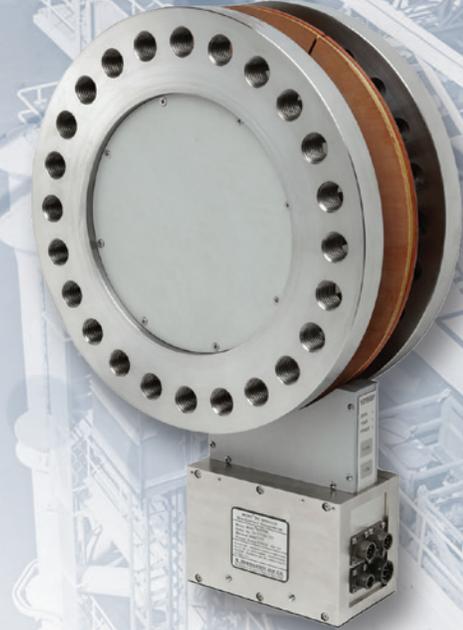
# MCRT® 86100V 30 to 452 kNm Capacity Bearingless Digital Torque Sensors

## Best Performance Under Real-World Conditions

**23 standard ranges with accredited\*  
calibration per ISO 17025,  
no need to compromise**

High Overage and Overload  
Strain Gage Carrier Amplification  
Great Immunity to External Noise  
Very High Stiffness and Low Deflection  
Bipolar Rotor Shunt Cal  
Accredited\*, CW and CCW ISO 17025 Calibration  
Simple, Non-critical Installation

- 0.05% Combined Error\*, 21,000 Samples/Sec
- 200% Overload
- 300% Overage
- 0.001%/°C Compensation
- 3 kHz Data Bandwidth
- Analog and FM Outputs
- Digital Output with Temperature
- 10 Units of Measure
- 14 Bessel Data Filters
- 48 µS Max/Min Update
- Interface Software Furnished
- Zero Velocity Speed Pickup Options



\*NIST traceable CW & CCW, full load calibration performed in our accredited laboratory (NVLAP Lab Code 200487-0). Details at our website or the accreditation link at [www.nist.gov](http://www.nist.gov).

**M**CRT® 86100V Metric Range Torquemeters have **high accuracy in real-world applications, not just in the cal lab**. That's due, in part, to **industries highest Overage**. High Overage avoids clipping real-world torque peaks and driveline torsionals. **Without high Overage, clipped peaks produce large measurement errors<sup>1</sup>**.

World class temperature performance greatly reduces drive heating and gradient errors. Also enhancing real world performance is noise hardening against electromagnetic interference (EMI) from Variable Frequency Drives, ISM devices and

other industrial noise sources - see overleaf.

Bi-directional rotor shunt cal verifies calibration and operation of the entire data chain **in CW and CCW modes**. It is invoked via stator switches, I/O line or from your computer. Multiple bridges provide immunity to extraneous loads. The short torque path yields high stiffness, low deflection and provides excellent *static and dynamic system response*. The Torquemeter is installed without an additional coupling resulting in a torsionally stiff driveline, with low overhung moment and a short overall length.

The sensors' output is digitized on the rotor and sent to the stator where analog, frequency and Com

1. See Application Note 20805B.

Port outputs are created. Choose RS232, RS422, RS485 or USB communications. Included software interfaces with your Windows-based PC. It displays Real-time, Max Min and Spread Torque, does limit checks, torque versus time plots and stores test results. Password protection may be invoked when needed.

**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 operating at or near their operating frequency, can cause interference.

**Specifications**

Common Specifications*	Code N Performance	Code C Performance
<b>Torque Range</b>	Factory Set @ Transducer Full Scale Torque; see Note 1.	
<b>Torque Overload</b> (% of Range)	200, all models.	
<b>Units of Measure</b>	User may select from kNm, Nm, lbf-in, lbf-ft, ozf-in, ozf-ft, N-cm, kgf-m, kgf-cm, gf-cm without re-calibration.	
<b>Combined Error</b> (% of Range, includes effects of non-linearity, hysteresis and non-return to the first data point)	≤ ±0.1	≤ ±0.05
<b>Bipolar Shunt Calibration Enable</b>	From Stator Switches (one CW, one CCW), via TTL I/O, or PC Com Port using furnished software.	
<b>Zero Drift</b> (% of Range/deg. C.)	≤ ±0.0018	≤ ±0.001
<b>Span Drift</b> (% of Reading/deg. C.)	≤ ±0.0036	≤ ±0.0036
<b>Temperature Ranges</b> (deg. C.)	Compensated Range: +24 to +79.4; Usable Range: -32 to +85; Storage Range: -54 to +107	
<b>Rotor to Stator Maximum Misalignment</b> (mm)	For MCRT® 86108V Series: ±6.35 Axial, 7.6 Radial. For MCRT® 86109V & 86110V Series: ±5 Axial, 5 Radial. If Magnetic (Code Z) Speed Pickup Option is installed then maximums are reduced - see below.	
<b>Analog Output Signals<sup>6</sup>, Auto-Scaled</b>	Allowable Load: 10k resistive, minimum; 0.05 µF capacitive, maximum.	
<b>All Models</b>	Default is ±10 V with ±15 V overrange. User may select ± 5V with ±7.5 V overrange. Caution: see note 7.	
<b>Signal Filter Cutoff Frequency<sup>4</sup></b>	Field selectable 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; they are free of delay distortion and overshoot errors.	
<b>Frequency Modulated Output, Auto-Scaled</b>	Frequency: 10±5 kHz or 20±10kHz or 40±20 kHz; field changeable (Default = 10±5 kHz); TTL square wave output.	
<b>Overrange</b> (% of Range; see Application Note 20805)	150 to 300; user selection dependent - see above. Applies to analog, Digital and FM (except for CCW side) Outputs.	
<b>System Resolution<sup>2</sup></b> (% of Range)	0.01	
<b>Output Noise, All Outputs</b> (% of Range)	<0.01 at 1 Hz, <0.01 at 10 Hz, <0.015 at 100 Hz, <0.015 at 1 kHz and <0.041 at 3 kHz.	
<b>Torque Sampling Rate and Bandwidth</b>	Torque is sampled @ 21 kHz. Its 3dB bandwidth is 3kHz but can be reduced by filters (see above).	
<b>Rotor-to-Stator Data Transfer Rate</b>	1.25 MBaud	
<b>RS232, RS422, RS485 Communications Port</b>	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.	
<b>BAUD Rate</b>	115,200; Drivers are protected for short circuit (current limit) and ±15 kV ESD protected.	
<b>Maximum Cable Length</b>	RS232 = 50 feet, RS422/485 = 4,000 feet; 120 ohm termination may be accessed via software.	
<b>Interface Software with Torque Limits</b>	Provided to interface with Windows-based PC. Includes 20 foot RS232 interconnect cable for PC. Flags on PC screen classify user-set High and Low Limits for Current, or Max/Min or Spread (Max - Min) Torque data.	
<b>I/O Lines and FM Output</b>	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.	
<b>Status LEDs</b> (on Stator Keypad)	Three Color Coded LEDs: <b>Power</b> (Yellow = Power-up, Green = OK, Red = Fault); <b>Data</b> (Green = OK, Red = Data Error); <b>Rotor Temperature</b> (Green = In Operating Range, Red = Out of Operating Range).	
<b>Keypad Control Switches</b>	+CAL invokes CW Rotor Shunt Cal, -CAL invokes CCW Rotor Shunt Cal, Both held simultaneously for 5 seconds invokes TARE.	
<b>Rotor Temperature, Auxiliary Measurement</b>	Rotor temperature is output via Com Port. Range is 0 to 85 deg. C.; Accuracy is ±1 degrees, nominal. See above for status LEDs.	
<b>Optional Zero Velocity Speed Pickups</b>	Optical (Code O) and Magnetic (Code Z) pickups output 30 ppr. Magnetic type restricts radial alignment to 1 mm.	
<b>Supply Voltage/Power<sup>5</sup></b>	10 to 26 VDC @ 9 watts with Antenna aligned to 12 watts with maximum specified misalignments.	

**Notes:**

- Outputs may be set at any value ≤ 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. Do not knowingly operate in this region.

\* Specifications are subject to change without notice.

FCC rules allow Industrial, Scientific and Medical (ISM) devices to generate unlimited energy. High-power ISM devices are commonplace and are used for inventory control, parts tracking, controlling personnel access, etc.

Most bearingless Torquemeters use an ISM frequency and are susceptible to Interference from other ISM devices.

Those Torquemeters risk violation of FCC regulations since unlicensed use is only allowed in a narrow band.

Himmelstein Bearingless Torquemeters use non-ISM frequencies and have field strengths within FCC rules. If interference is encountered, they can automatically switch to a clear channel.

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

**A** = Model Number from tables; either 86108V or 86109V or 86110V.

**B** = Range from tables above; (3-4 Nm), or (4-4 Nm), etc.

**C** = Performance Code; N for Standard Performance or C for Enhanced Performance.

**D** = Optional Zero Velocity Speed Pickup; N for None, Z for Magnetic Type, O for Optical Type.

**ORDER NUMBER EXAMPLE** ➔ **MCRT® 86108V(85-3)CO** specifies a Bearingless Torquemeter with a 85 kNm Torque Rating, a 200% Torque Overload Rating, Enhanced Performance and an Optical Speed Pickup.

**MCRT® 86100V Bearingless Torquemeters With 200% Overload**

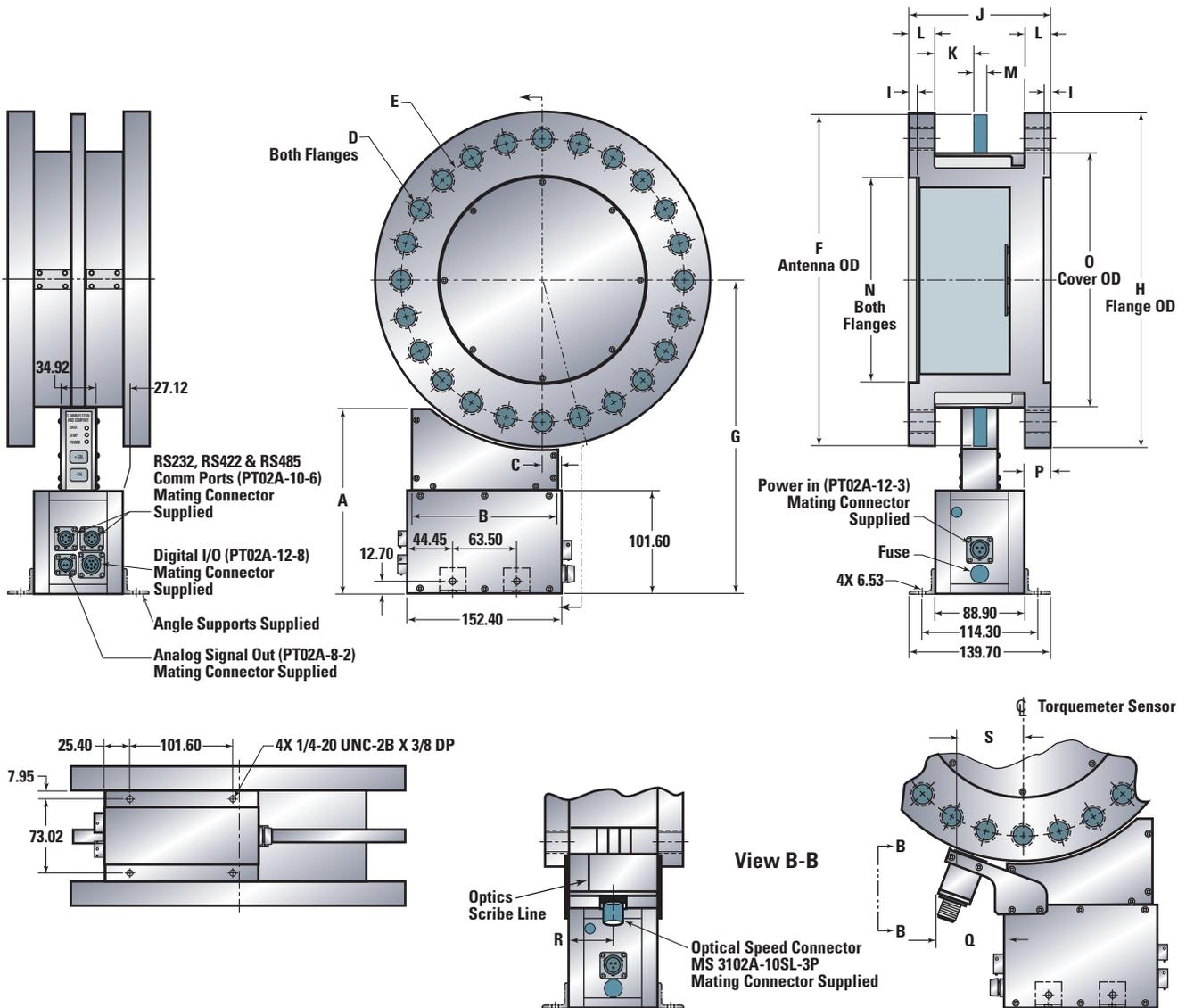
MCRT® Model	Torque Ratings		Speed Rating	Torsional Stiffness	Maximum Angular Deflection	Rotating Inertia	Maximum Extraneous Loads <sup>2</sup>			Max Rotor Wt.
	Capacity	Overload					Thrust	Bending	Shear	
	[kNm] <sup>1</sup>		[rpm]	[kNm/rad]	[degree]	[kg-m <sup>2</sup> ]	[kN]	[kNm]	[kN]	[kg]
86108V(3-4 Nm)	30	60	0 to ±5,000	59,890	0.029	0.45	66.7	11.0	66.7	35
86108V(4-4 Nm)	40	80			0.038					
86108V(5-4 Nm)	50	100		81,070	0.035	0.46	111	16.9	111	36
86108V(6-4 Nm)	60	120			0.042					
86108V(7-4 Nm)	70	140			0.049					
86108V(8-4 Nm)	80	160		98,570	0.046	0.47	169	28.2	169	37
86108V(85-3 Nm)	85	170			0.049					
86108V(9-4 Nm)	90	180		0 to ±3,000	189,930	0.052	4.38	890	16.9	222
86109V(11-4 Nm)	110	220	0.035							
86109V(12-4 Nm)	120	240	0.038							
86109V(15-4 Nm)	150	300	284,950		0.045	4.52	1,560	29.7	387	125
86109V(2-5 Nm)	200	400			0.040					
86109V(22-4 Nm)	220	440	376,920		0.045	4.67	2,220	42.4	556	127
86109V(25-4 Nm)	250	500			0.050					
86109V(28-4 Nm)	280	560			0.043					
86109V(3-5 Nm)	300	600			0.046					
86109V(31-4 Nm)	310	620	0 to ±2,200		529,110	0.048	9.44	2,890	55.0	712
86109V(33-4 Nm)	330	660		0.050						
86110V(37-4 Nm)	370	740		652,710	0.040	9.71	3,560	67.8	890	200
86110V(38-4 Nm)	380	760			0.042					
86110V(4-5 Nm)	400	800			0.035					
86110V(42-4 Nm)	420	840			0.037					
86110V(45-4 Nm)	450	900	0.040							

**Notes:** 1. To convert kNm to klbf-ft multiply by 0.7375  
 2. Maximum extraneous loads and rated torque may be applied simultaneously without damage.

## Dimensions

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

MCRT	"A"	"B"	"C"	"D"	"E"	"F"	"G"	"H"	"I"	"J"	"K"	"L"	"M"	"N"	"O"	"P"	"Q"	R
86108V	184.94	152.4	19.05	24 X 7/8-9UNC-2B	279.4	327.02	309.55	330.20	6.35	139.70	36.51	25.40	12.70	∅ 203.246 203.200	250.82	25.40	67.47 ± 3.97	44.45
86109V	179.6	152.4	15.88	24 X 1-1/4-7UNC-2B	469.90	533.4	402.90	533.40	9.52	203.20	0.000	38.10	25.40	∅ 298.501 298.450	436.60	13.59	73.02 ± 3.97	44.45
86110V	179.6	152.4	15.88	20 X 1-1/2-6UNC-2B	546.10	609.60	459.00	609.80	10.31	228.60	0.000	47.62	25.40	∅ 336.606 336.550	485.14	23.11	75.41 ± 3.97	44.45



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