

# MCRT® 48800V & 49800V ULTRA PRECISE SHAFT TORQUEMETERS

## Have Analog and Digital Outputs And The Highest Accuracy of Any Similar Torque Sensor, Transducer or Torquemeter

- Capacities from 25 to 375,000 lbf-in (2.8 to 42,400 N-m)
- Output Torque, Speed & Power in Analog & Digital Form
- 400% Overload and 300% Overrange
- 0.0006% Temperature Performance
- 0.02% Combined Nonlinearity and Hysteresis
- 0.01% 48 Hour Drift
- Accredited, NIST Traceable\* CW and CCW Cal
- Bipolar Rotor Shunt Cal - NIST Traceable\*
- Hardened to EMI From Adjustable Speed Drives
  - $\pm 5.000/\pm 10.000$ V Analogs of Torque, Speed & Power
  - Engineering Unit Digital Outputs of Torque, Speed & Power
  - 1 kHz Bandwidth; 13 Constant Delay Signal Filters
  - Select from 33 Units of Measure Without Re-calibration
  - Shaft Power Calculated 7800 Times/Second
  - 128  $\mu$ s Max/Min Data Acquisition
  - Plated Alloy Steel Shaft, Stainless Steel Housing

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



These strain gage Torquemeters measure and output *shaft torque in analog and digital form*. Option Z adds *speed and shaft power*. Their *outstanding performance* is due, in part, to *industries highest Overrange which avoids clipping real-world torque peaks and torsionals*. Without high Overrange, clipped peaks cause large errors; see AN 20805B.

Tight temperature compensation reduces drive heating and gradient effects. Also enhancing performance is elimination of pots subject to misadjustment under vibration and by unauthorized users. The Torquemeters are hardened against VFD and other noise sources. *Bipolar rotor shunt cal* verifies calibration of the entire data chain in CW and CCW modes. Included software displays, plots and stores real-time data on your PC. It also

*Displays and Stores Max/Min and Spread Data*. Choose RS232, RS422, RS485 or USB (option) communication. Input power is a single, unregulated voltage. Reverse polarity protection is provided. Password protection is supported.

Two Performance Grades are offered; Standard (Code N), and Enhanced (Code C). They are available with 200% (MCRT® 48800V Series) and 400% (MCRT® 49800V Series) overload ratings. Option Z adds *conditioned speed and power outputs*. All outputs are simultaneously available in both analog and digital form. Should the torque, speed\* or rotor temperature exceed the Torquemeters ratings, a warning flag(s) is generated.

\* Option Z is required to generate a Speed flag.

Table 1

Common Specifications	200% Overload MCRT® 48800V Series	400% Overload MCRT® 49800V Series
<b>Torque and Speed (Option) Scaling</b>	Factory Set @ Transducer Torque Capacity and Maximum Speed. Field Resettable to any lower value.	
<b>Power (Option) Range – See Note 1</b>	Scaling is Factory Set @ the Product of Full Scale Torque, Speed and a Constant. <b>It is user re-settable.</b>	
<b>Units of Measure</b>	Default units are lbf-in and, if Option Z is specified, rpm and hp. Any of 33 supported units may be specified or, user selected with a PC and furnished software. See listing on page 4.	
<b>Torque – Combined Nonlinearity<sup>2</sup> and Hysteresis<sup>2</sup> (% of F.S.)</b>	Code N (Standard Performance): $\leq \pm 0.04$ Code C (Enhanced Performance): $\leq \pm 0.02$ except $\leq \pm 0.1$ for 25 & 375,000 lbf-in ranges	Code N (Standard Performance): $\leq \pm 0.04$ Code C (Enhanced Performance): $\leq \pm 0.02$ except $\leq \pm 0.05$ for 50 lbf-in range
<b>Speed &amp; Power (Option Z) – Combined Nonlinearity<sup>2</sup> and Hysteresis<sup>2</sup> (% of F.S.)</b>		
<b>Nonrepeatability<sup>2</sup> (% of F.S.)</b>	Torque and Power: Code N $\leq \pm 0.02$ , Code C $\leq \pm 0.01$ ; Speed $\leq \pm 0.01$	
<b>Zero Drift (% of F.S./deg. F.)</b>	Torque and Power: Code N $\leq \pm 0.001$ , Code C $\leq \pm 0.0006$ ; Speed: none	
<b>Span Drift (% of Rdg./deg. F.)</b>	Torque and Power: $\leq \pm 0.002$ ; Speed: none	
<b>48 Hour Drift (% of F.S.)</b>	Code N: $\leq \pm 0.03$ , Code C $\leq \pm 0.02$	
<b>Temperature Ranges (deg. F.)</b>	Compensated: +75 to 175; Usable: -25 to +185; Storage: -65 to +225	
<b>Overrange, (% of F.S.)</b>	MCRT® 48800V: 150, MCRT® 49800V: 300 except $\pm 15V$ max. on the Analog Output of both grades	
<b>Signal Filter Cutoff Frequency<sup>4</sup>, Analog and Digital Data</b>	Field selectable from 0.1 to 1,000 Hz in thirteen 1-2-5 steps using furnished software. Torque, and Speed Filters are identical and their cutoff frequencies track. Units are set to 10 Hz (default) unless Purchase Order specifies another frequency.	
<b>Analog Output Signals, Auto Scaled</b>	Torque and when option Z is specified, Speed and Power. All are simultaneously available.	
<b>Full Scale Torque<sup>3</sup> and Power<sup>3</sup></b>	CW = +10V, CCW = -10V or, CW = +5V, CCW = -5V; field changeable (Default = $\pm 10V$ )	
<b>Full Scale Speed<sup>3</sup></b>	+10V or +5V for CW and CCW directions; field changeable (Default = +10V)	
<b>Resistive Load</b>	10,000 ohms, Minimum	
<b>Capacitive Load</b>	0.05 uF, Maximum	
<b>Output Noise (% rms of F.S.)</b>	MCRT® 48800V & MCRT® 49800V Series <0.02%	
<b>Minimum Resolution (% of F.S.)</b>	0.003 for both Analog and Digital Data.	
<b>Data Acquisition Time</b>	Torque: 128 $\mu$ s, Speed: >800 rpm $\leq 1.25$ ms, <800 rpm: 1000/rpm ms, Power: 128 $\mu$ s.	
<b>Duplex Serial Communications Port Selectable as RS232, RS422 or RS485</b>	Outputs Torque, Speed and Power (option Z) with units of measure. Inputs range selections, scaling and null values, cal info, units of measure, etc. and test parameters.	
<b>BAUD Rate</b>	115,200. Drivers are Short circuit (current limit) and $\pm 15kV$ ESD protected	
<b>120 <math>\Omega</math> Termination (RS422/485)</b>	Software selectable.	
<b>Maximum Cable Length</b>	4,000 feet for RS422 and RS485, 50 feet for RS232	
<b>Supply Voltage<sup>5</sup> and Power</b>	10 to 26 VDC at 2.7 watt, nominal. (Series 700 Instrument compatible.)	
<b>Connector Pinouts</b>	See Page 6 tabulation.	

- Torque and Speed (option Z) scaling may be re-set at any value  $\leq$  Transducer Full Scale Ratings.  
For example: If the set Torque range is 10,000 lbf-in, and the set Speed range is 5krpm then Power Range =  $10,000 * 5000 / 83025 = 793.34$  HP = 10V analog output.
- Assumes torque scale is set to the device torque rating.
- CW torque causes the shaft to turn CW when viewed from its driven end. CCW torque causes the opposite rotation. Power polarity tracks torque.
- Torque signal bandwidth upper limit is 1,000 Hz determined by integral Bessel response filters.
- Reverse polarity protected.
- "deg. F." denotes "degree Fahrenheit".
- Specifications are subject to change without notice.

Order No ▶	MCRT® 49804V	(5-3)	N	F	Z
	Model Number	Range	Performance Code: N or C	Foot Mount: N if none, F if yes	Speed/Power Option: Z if yes, N if no
	An MCRT® 49804V (5-3)NFZ is a 5,000 lbf-in Torquemeter with Standard Performance, 400% Overload, Foot Mount and Speed/Power option.				

Table 2

MCRT® Model	Torque Ratings				Speed Rating	Shaft Stiffness <sup>1</sup>		Rotating Inertia		Weight	
	Capacity		200% Overload								
	[lbf-in]	[N-m]	[lbf-in]	[N-m]							
48801V(25-0) <sup>2</sup>	25	2.82	50	5.65	0 to ±15,000	2,320	262	0.0147	0.000104	12.5	5.67
48801V(5-1)	50	5.65	100	11.3	0 to ±15,000	5,550	627	0.0147	0.000104	12.5	5.67
48801V(1-2)	100	11.3	200	22.6	0 to ±15,000	13,000	1,470	0.0148	0.000104	12.5	5.67
48801V(2-2)	200	22.6	400	45.2	0 to ±15,000	24,400	2,760	0.0149	0.000105	12.5	5.67
48802V(5-2)	500	56.5	1,000	113	0 to ±15,000	42,300	4,780	0.0168	0.000119	12.7	5.76
48802V(1-3)	1,000	113	2,000	226	0 to ±15,000	50,000	5,640	0.0170	0.000120	12.7	5.76
48803V(2-3)	2,000	226	4,000	452	0 to ±8,500	263,000	29,800	0.0900	0.000636	13.2	5.99
48804V(5-3)	5,000	565	10,000	1,130	0 to ±8,500	458,000	51,700	0.123	0.000873	15.8	7.17
48804V(1-4)	10,000	1,130	20,000	2,260	0 to ±8,500	620,000	70,100	0.128	0.000904	16.0	7.26
48806V(2-4)	20,000	2,260	40,000	4,520	0 to ±8,000	2,710,000	306,000	1.387	0.00979	70.7	32.1
48806V(4-4)	40,000	4,520	80,000	9,040	0 to ±8,000	3,800,000	430,000	1.417	0.00100	71.3	32.3
48807V(5-4)	50,000	5,650	100,000	11,300	0 to ±6,000	5,960,000	674,000	2.401	0.00170	81.7	37.1
48807V(1-5)	100,000	11,300	200,000	22,600	0 to ±6,000	7,320,000	827,000	2.462	0.00174	82.5	37.4
48808V(2-5)	200,000	22,600	400,000	45,200	0 to ±3,600	27,500,000	3,110,000	12.61	0.00890	170.4	77.3
48808V(375-3) <sup>2</sup>	375,000	42,400	750,000	84,700	0 to ±3,600	31,500,000	3,560,000	12.96	0.09150	172.2	78.1

1. Stiffness is conservatively rated and includes the torsion section and shaft-ends.

2. Enhanced Performance is not available on this model.

Table 3

MCRT® Model	Torque Ratings				Speed Rating	Shaft Stiffness¹		Rotating Inertia		Weight	
	Capacity		400% Overload								
	[lbf-in]	[N-m]	[lbf-in]	[N-m]							
49801V(5-1)	50	5.65	200	22.6	0 to ±15,000	13,000	1,470	0.0148	0.000104	12.5	5.67
49801V(1-2)	100	11.3	400	45.2	0 to ±15,000	24,400	2,760	0.0149	0.000105	12.5	5.67
49802V(25-1)	250	28.2	1,000	113	0 to ±15,000	42,300	4,780	0.0168	0.000119	12.7	5.76
49802V(5-2)	500	56.5	2,000	226	0 to ±15,000	50,000	5,640	0.0170	0.000120	12.7	5.76
49803V(1-3)	1,000	113	4,000	452	0 to ±10,000	263,000	29,800	0.0900	0.000636	13.2	5.99
49804V(25-2)	2,500	282	10,000	1,130	0 to ±10,000	458,000	51,700	0.123	0.000873	15.8	7.17
49804V(5-3)	5,000	565	20,000	2,260	0 to ±10,000	620,000	70,100	0.128	0.000904	16.0	7.26
49806V(1-4)	10,000	1,130	40,000	4,520	0 to ±8,000	2,710,000	306,000	1.387	0.00979	70.7	32.1
49806V(2-4)	20,000	2,260	80,000	9,040	0 to ±8,000	3,800,000	430,000	1.417	0.00100	71.3	32.3
49807V(25-3)	25,000	2,820	100,000	11,300	0 to ±6,000	5,960,000	674,000	2.401	0.00170	81.7	37.1
49807V(5-4)	50,000	5,650	200,000	22,600	0 to ±6,000	7,320,000	827,000	2.462	0.00174	82.5	37.4
49808V(1-5)	100,000	11,300	400,000	45,200	0 to ±3,600	27,500,000	3,110,000	12.61	0.00890	170.4	77.3
49808V(190-3)	190,000	21,500	750,000	84,700	0 to ±3,600	31,500,000	3,560,000	12.96	0.09150	172.2	78.1

1. Stiffness is conservatively rated and includes the torsion section and shaft-ends.

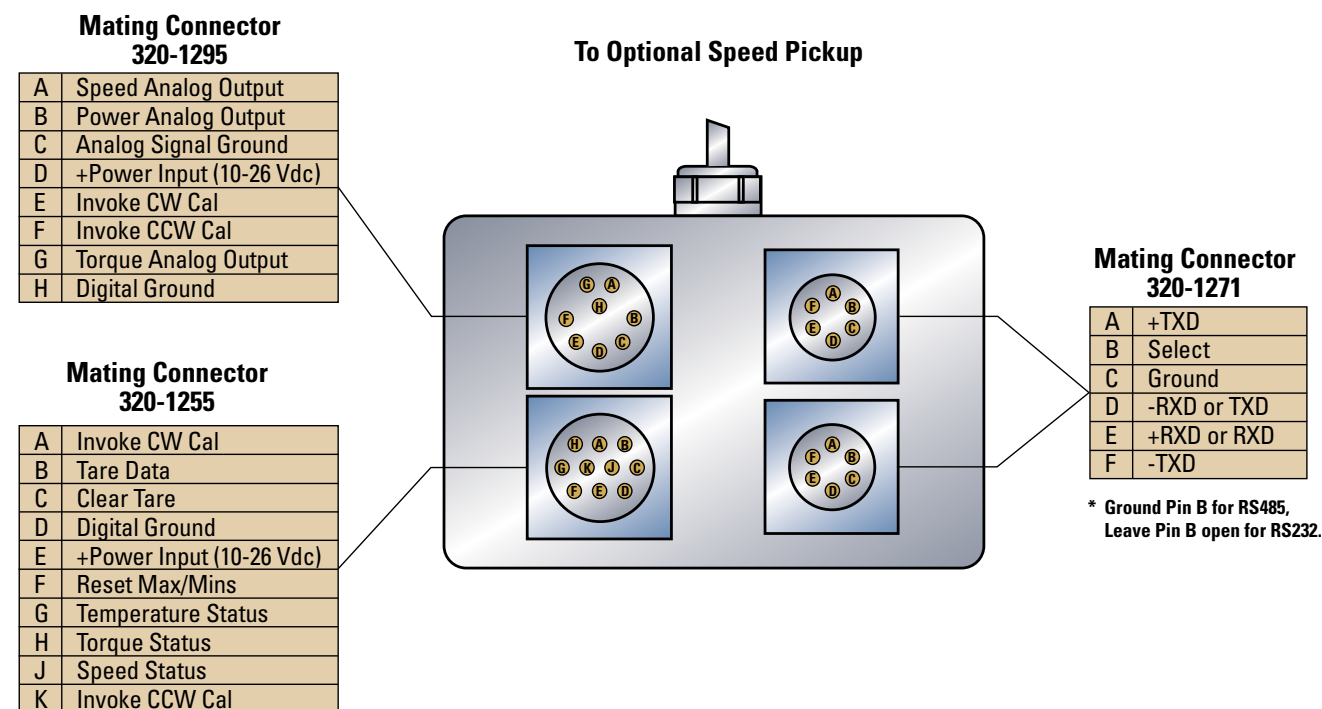
Table 4. Supported Units of Measure

Supported Units of Measure	
<b>Torque</b>	lbf-in, (default), lbf-ft, ozf-in, ozf-ft, N-m, kN-m, N-cm, kgf-m, kgf-cm, gf-cm
<b>Speed</b>	rpm (default), rps, rph, rad/s, rad/min, rad/h, degree/min, degree/s, degree/h, grad/s
<b>Power</b>	hp (default), hp (metric), kW, W, ft-lbf/min, ft-lbf/s, Btu/h, Btu/min, Btu/s, ton, cal/h, cal/min, cal/s

Table 5. Cables

Available Cables	Cable lengths (XX) are 20, 50 and 100 feet. RS232 cables are limited to 50 feet. When purchased without cables, mating connectors are supplied at no added cost.
<b>Torquemeter to Model 703</b> P/N 224-8722-XX	Powers Torquemeter, displays Torque, Implements Model 703 functions including Remote Cal, Tare, Analog Output, Zero, etc.
<b>Torquemeter to Model 733</b> P/N 224-8800-XX	Powers Torquemeter, displays Torque <b>and</b> Speed, Implements Model 733 functions including Remote Cal, Tare, Power Calculation, Analog Output, Zero, etc.
<b>Torquemeter to RS422/485 Host</b> P/N 224-8360-XX	Connects Torquemeter to host computer and implements all Torquemeter functions. Requires external power input (10-26 Vdc). It is unterminated at host end.
<b>RS485 Torquemeter to Torquemeter</b> P/N 224-8361-XX	Provides Torquemeter interconnect when using RS485 protocol to read and control multiple Torquemeters with a single host computer.
<b>Torquemeter to RS232 PC Port</b> P/N 224-8359-XX	Connects Torquemeter to RS232 host Port. Implements all Torquemeter functions. 50 feet maximum. Use RS422/485 connection in noisy environments or for long runs.

## Stator Connector Layout



## Outline Dimensions

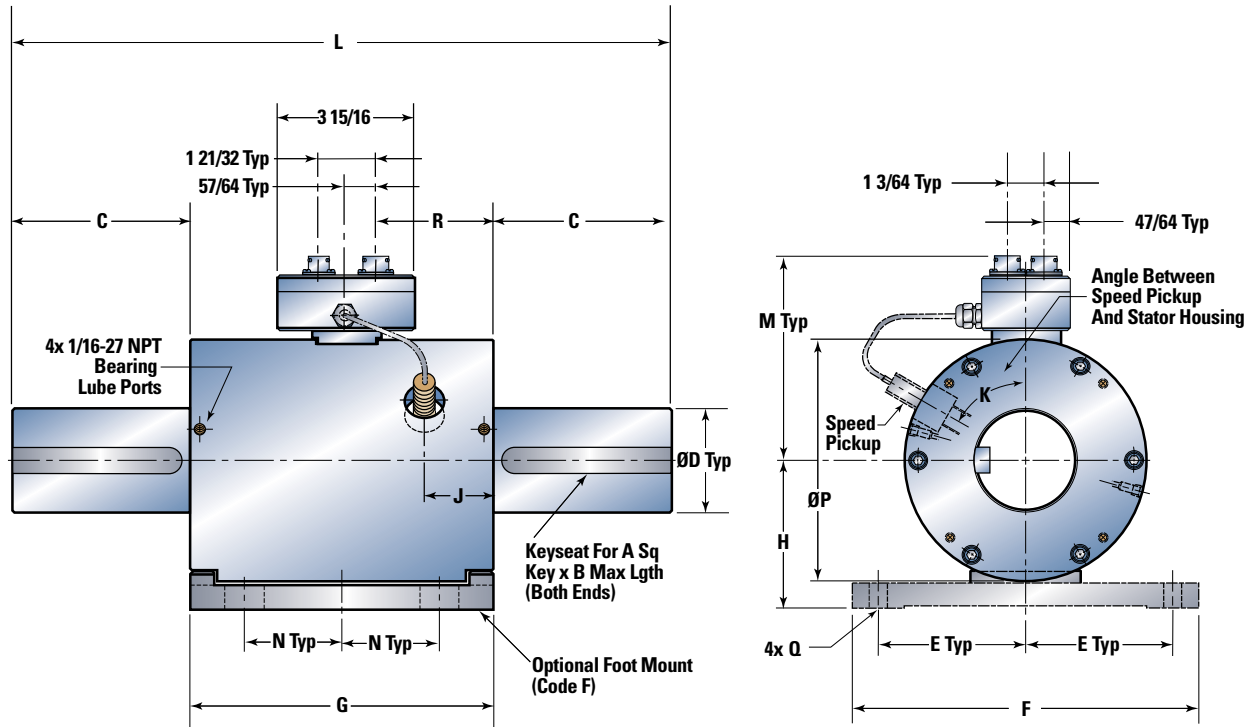


Table 6. Outline Dimensions [inch]

MCRT® Model	Outline Dimensions [inch]														
	A	B	C	D <sup>1</sup>	E	F	G	H	L	M	N	P	K	Q	R
48/9801V	0.187	1.125	1.50	0.625	2.250	5.50	5.50	2.250	8.50	3 55/64	1.50	3 15/32	90°	0.406	1 7/64
48/9802V	0.187	1.625	2.00	0.750	2.250	5.50	5.50	2.250	9.50	4 1/8	1.50	3 15/32	90°	0.406	1 7/64
48/9803V	0.250	1.719	2.22	1.000	2.625	6.25	5.65	2.500	10.00	4 3/32	1.50	3 31/32	60°	0.406	1 29/32
48/9804V	0.375	2.750	3.59	1.500	2.625	6.25	5.65	2.500	12.75	4 3/32	1.50	3 31/32	60°	0.406	1 29/32
48/9806V	0.625	3.500	4.13	2.500	4.250	10.00	8.75	4.250	17.00	5 5/8	2.81	6 15/16	60°	Note 2	2 23/64
48/9807V	0.750	4.500	5.13	3.000	4.250	10.00	8.75	4.250	19.00	5 7/8	2.81	6 15/16	60°	Note 2	2 23/64
48/9808V	1.000	6.500	7.56	4.500	4.250	10.00	8.50	5.000	23.03	6 19/64	2.81	8 3/16	60°	Note 2	2 1/64

1. Tolerance of D diameter is +0.0000/-0.0005 for D ≤ 2.5" and +0.000/-0.001" for D &gt; 2.5".

2. Slotted 0.531" wide by 1-1/8" long.

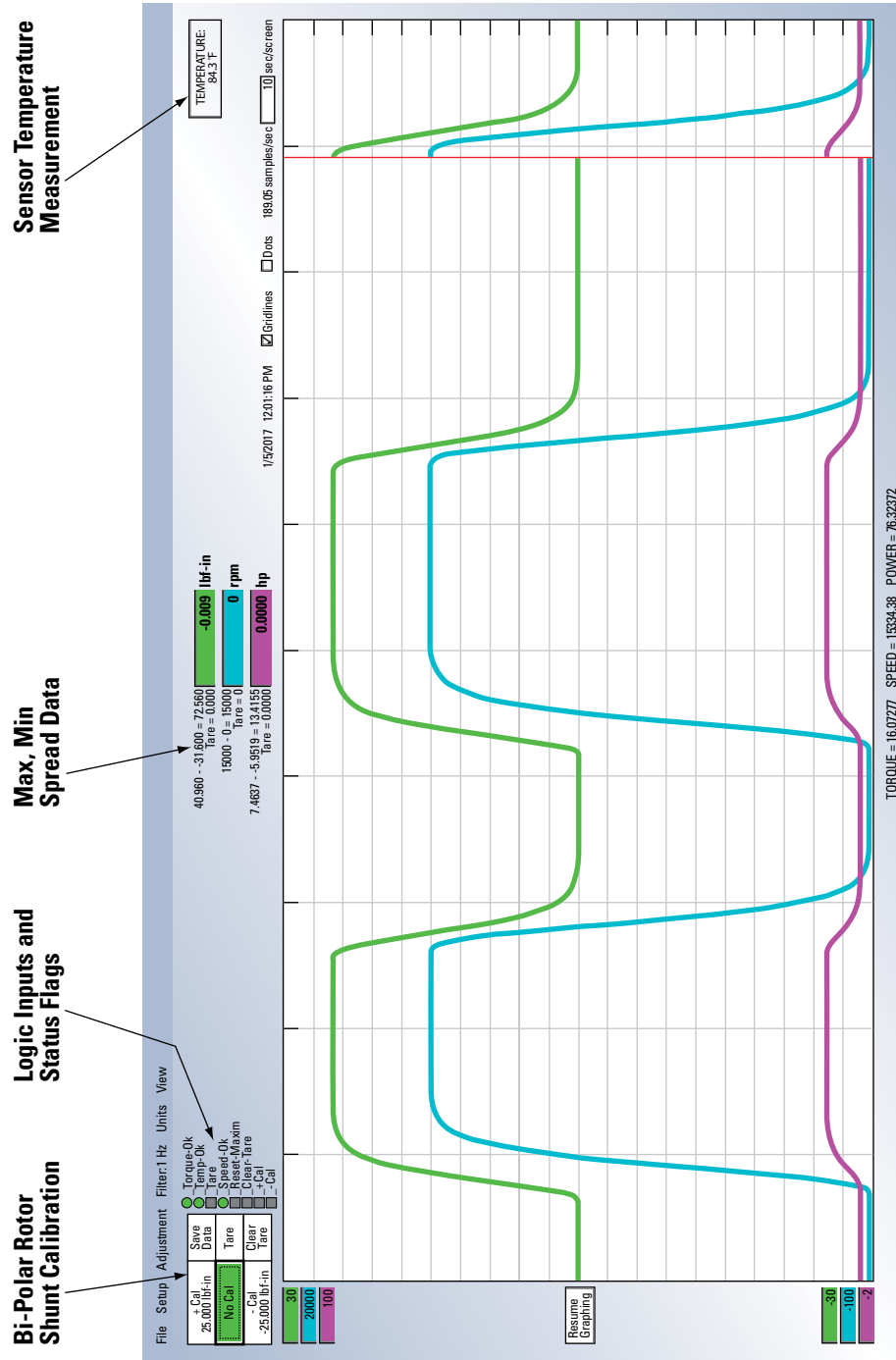
Table 7. Outline Dimensions [mm]

MCRT® Model	Outline Dimensions [mm]														
	A	B	C	D <sup>1</sup>	E	F	G	H	L	M	N	P	K	Q	R
48/9801V	4.75	28.6	38.1	15.9	57.2	139.7	139.7	57.2	215.9	98.0	38.1	88.1	90°	10.3	28.2
48/9802V	4.75	41.3	50.8	19.1	57.2	139.7	139.7	57.2	241.3	104.8	38.1	88.1	90°	10.3	28.2
48/9803V	6.35	43.7	56.4	25.4	66.7	158.8	143.5	63.5	254.0	104.0	38.1	100.8	60°	10.3	48.4
48/9804V	9.53	69.9	91.2	38.1	66.7	158.8	143.5	63.5	323.9	104.0	38.1	100.8	60°	10.3	48.4
48/9806V	15.88	88.9	104.8	63.5	108.0	254.0	222.3	108.0	431.8	142.9	71.4	176.2	60°	Note 2	59.9
48/9807V	19.05	114.3	130.2	76.2	108.0	254.0	222.3	108.0	482.6	149.2	71.4	176.2	60°	Note 2	59.9
48/9808V	25.40	165.1	192.0	114.3	108.0	254.0	215.9	127.0	585.0	159.9	71.4	208.0	60°	Note 2	51.2

1. Tolerance of D diameter is +0.0000/-0.0127 for D ≤ 63.5" and +0.000/-0.025 for D &gt; 63.5".

2. Slotted 13.5 wide by 28.6 long.

## Example of Software Display



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