

# MCRT<sup>®</sup> 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
  - ±5.000/±10.000V 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 µs 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<sup>®</sup> 48800V Series) and 400% (MCRT<sup>®</sup> 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 [rpm]	Shaft Stiffness <sup>1</sup>		Rotating Inertia		Weight	
	Capacity		200% Overload			[lbf-in/rad]	[N-m/rad]	[ozf-in s <sup>2</sup> ]	[kg-m <sup>2</sup> ]	[lb]	[kg]
	[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 [rpm]	Shaft Stiffness <sup>1</sup>		Rotating Inertia		Weight	
	Capacity		400% Overload			[lbf-in/rad]	[N-m/rad]	[ozf-in s <sup>2</sup> ]	[kg-m <sup>2</sup> ]	[lb]	[kg]
	[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 P/N 224-8722-XX</b>	Powers Torquemeter, displays Torque, Implements Model 703 functions including Remote Cal, Tare, Analog Output, Zero, etc.
<b>Torquemeter to Model 733 P/N 224-8800-XX</b>	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 P/N 224-8360-XX</b>	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 P/N 224-8361-XX</b>	Provides Torquemeter interconnect when using RS485 protocol to read and control multiple Torquemeters with a single host computer.
<b>Torquemeter to RS232 PC Port P/N 224-8359-XX</b>	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**

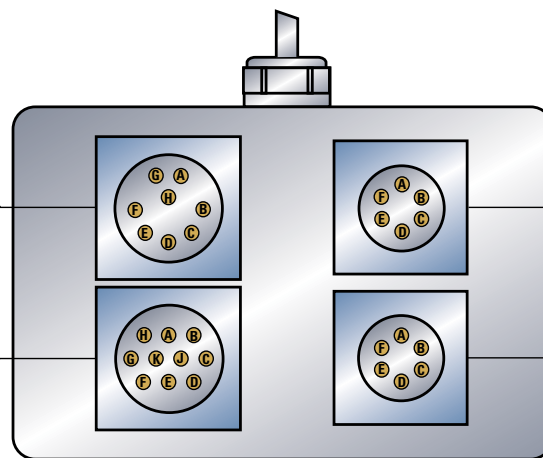
**Mating Connector  
320-1295**

A	Speed Analog Output
B	Power Analog Output
C	Analog Signal Ground
D	+Power Input (10-26 Vdc)
E	Invoke CW Cal
F	Invoke CCW Cal
G	Torque Analog Output
H	Digital Ground

**Mating Connector  
320-1255**

A	Invoke CW Cal
B	Tare Data
C	Clear Tare
D	Digital Ground
E	+Power Input (10-26 Vdc)
F	Reset Max/Mins
G	Temperature Status
H	Torque Status
J	Speed Status
K	Invoke CCW Cal

**To Optional Speed Pickup**



**Mating Connector  
320-1271**

A	+TXD
B	Select
C	Ground
D	-RXD or TXD
E	+RXD or RXD
F	-TXD

\* Ground Pin B for RS485, Leave Pin B open for RS232.

### Outline Dimensions

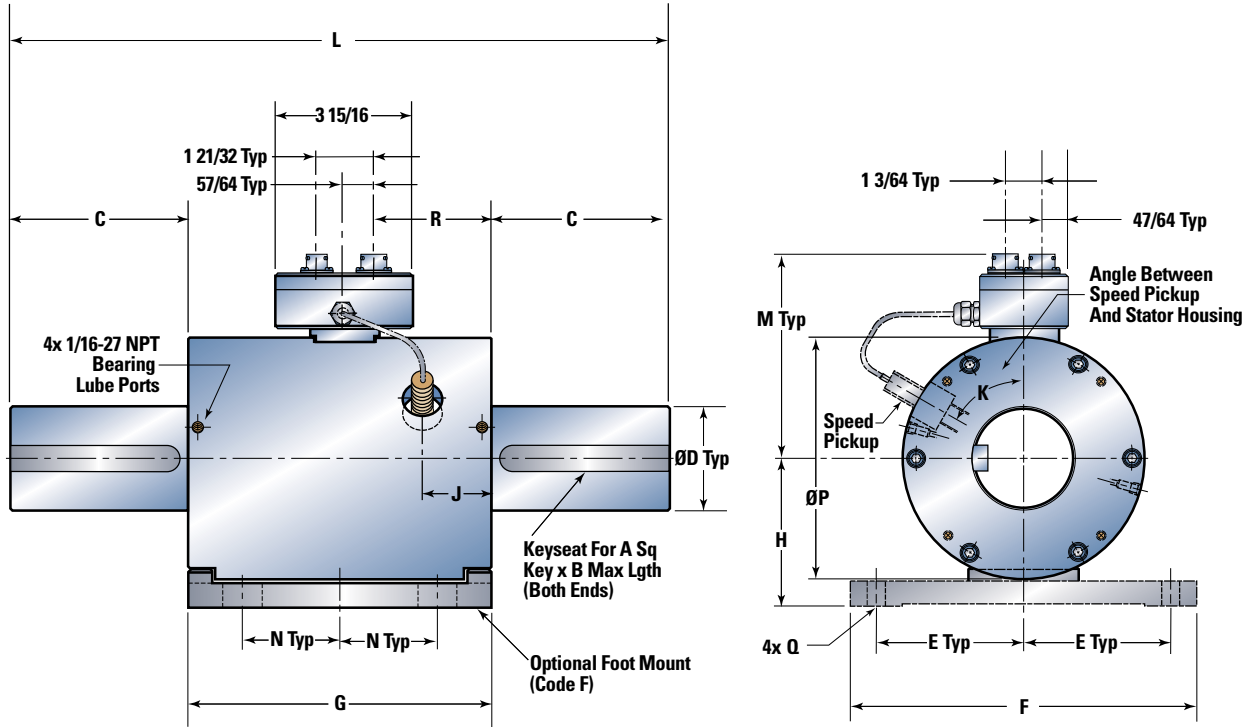


Table 6. Outline Dimensions [inch]

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

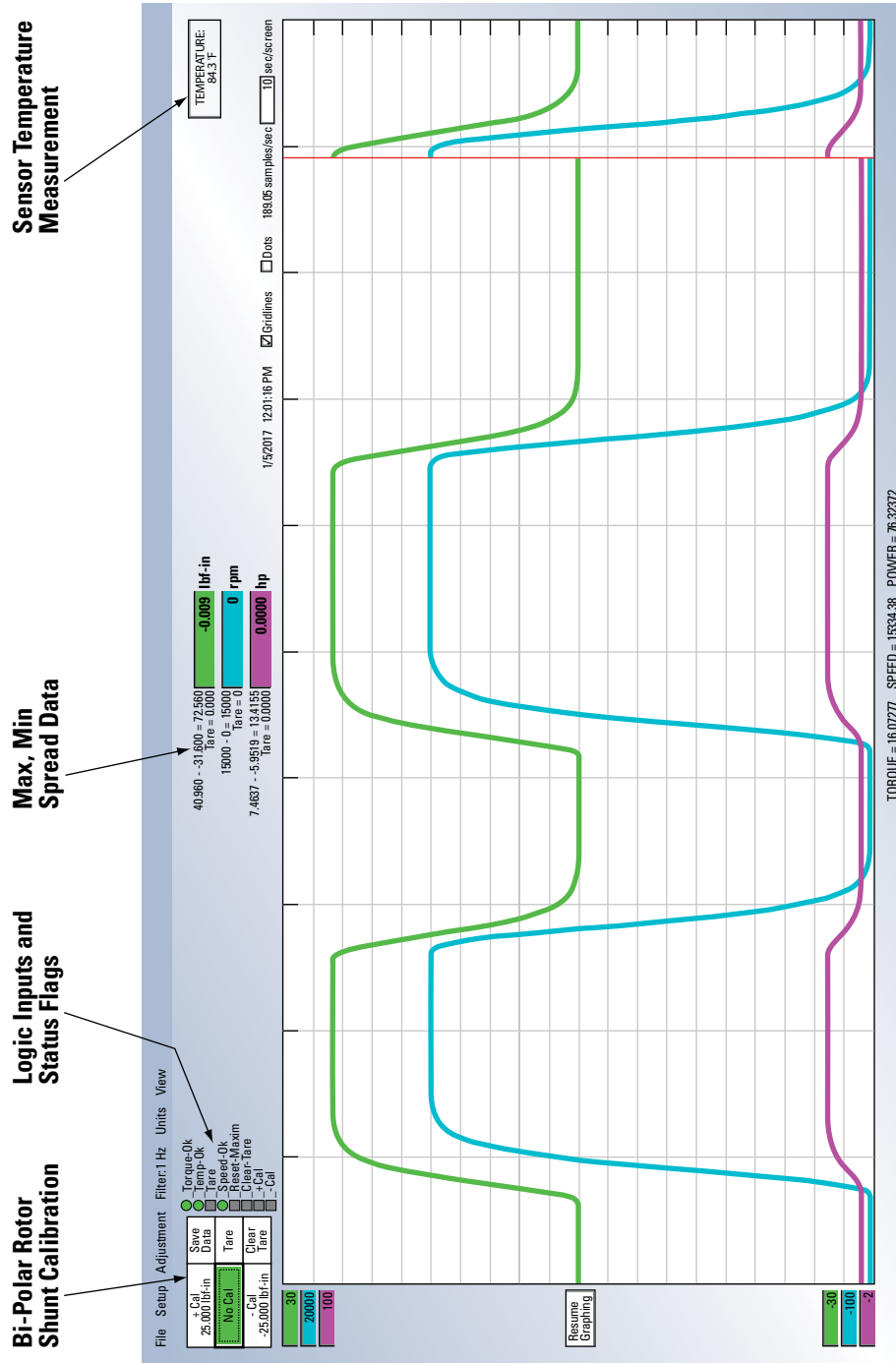
1. Tolerance of D diameter is +0.0000/-0.0005 for D ≤ 2.5" and +0.000/-0.001" for D > 2.5".  
 2. Slotted 0.531" wide by 1-1/8" long.

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 > 63.5".  
 2. Slotted 13.5 wide by 28.6 long.

Example of Software Display



S. Himmelstein and Company

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2490 Pembroke Avenue, Hoffman Estates, IL 60169 USA

• Tel: 847-843-3300 • Fax: 847-843-8488

• www.himmelstein.com