MCRT®49000V ***Non-Contact***
DC OPERATED TORQUEMETERS

See Bulletin 7590 For 10X Overload and Bulletin 7401C For 2X Overload DC Operated MCRT® Torquemeters

- ***4X Overload Rating***
- ***Hardened to EMI From Adjustable Speed Drives***
- *Dual ±5 Volt Outputs*
- *Single Supply Operation (includes 12 Volt Battery)*
- *NIST Traceable Remote Calibration*
- *Ferrite-free Rotary Transformer Coupling*
- *Calibration & Balance Free of Cable Effects*
- *Unexcelled Immunity To Machinery Magnetic Fields*
- *15-5 PH Stainless Steel Shaft, Splashproof & Corrosion Resistant*





Torque Ranges: 25 to 2,000,000 lb-in (2.8 to 226,000 n-m)

Interface Directly To PC and PLC Controllers and Data Acquisition Systems

S. HIMMELSTEIN AND COMPANY

Measurement and Control Products Since 1960

Features

High Accuracy With 400% Overload
Hardened to EMI From Adjustable Speed Drives
Infinite Fatigue Life
Full Bi-directional Operation
Dual ±5 Volt Outputs
Single DC Supply, Reverse Polarity Protected
NIST Traceable Remote Calibration
Static and Dynamic Response
Long, Maintenance-Free Life
Immune to Vibration, Lubricants and Machinery Magnetic Fields
One Piece 15-5PH Stainless Steel Shaft
Splashproof, Corrosion Resistant Construction
Rotary Transformer Coupled Foil Strain Gage Torque Sensing
Calibration & Balance Free of Cable Effects
No Slip Rings, Brushes, LVDT's, Optical Paths, Ferrites, or Radio Transmitters
Provides Direct Interface To PC and PLC Controllers and Data Acquisition Systems

Applications

Control, Monitoring and Testing Of:

Electric, Air and Hydraulic Motors
Gasoline, Diesel and Turbine Engines
Pumps, Fans, Blowers, Compressors
Gear, Belt, and Fluid Transmissions
Chassis and Engine Dynamometers
Machine Tools, Vehicle and Marine Drives
Mixers, Extruders, Fluid Viscosity
Clarifier Drives, Emulsifiers, Reactors
Crushers, Pelletizers, Conveyers
Rolling and Grain Mills, Grinders
Winders, Paper Machines, Drill Rigs
Or Virtually any Rotating Machinery

Benefits

MCRT® devices provide the fastest, easiest, most dependable way to measure torque. *The use of actual rather than inferred torque, power and energy makes possible otherwise unusable* control strategies. Very fast measurement response enhances those capabilities.

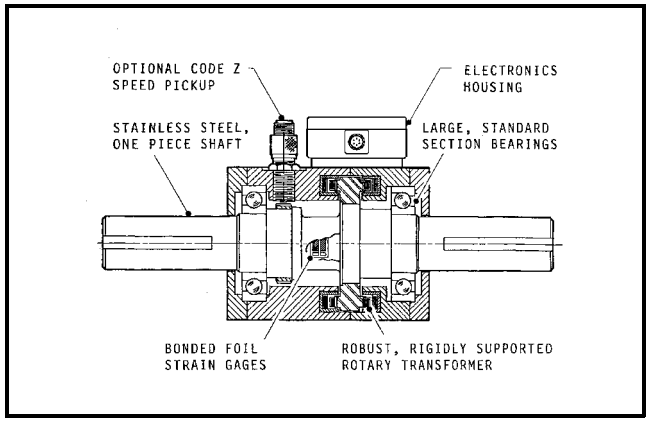
Control and verification of machine performance, efficiency, load, and load sharing are common uses. Early detection of dangerous and wasteful conditions are valuable benefits. Examples are process and machine degradation, overload, load loss, and destructive torsionals.

MCRT® sensors are well known for their tolerance of machine fields and noise. MCRT® 49000V s incorporate new advances that *harden them to the intense electromagnnetic interference generated by IGBT-based adjustable speed drives.*

Torquemeter Description

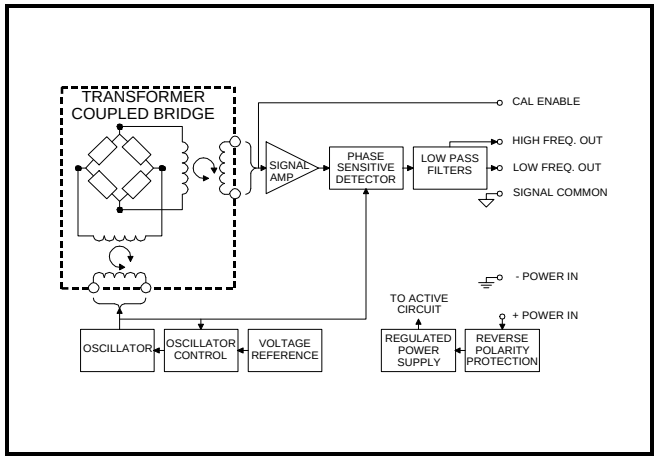
When installed between a driver and its load, MCRT® 49000V dc operated torquemeters *measure bidirectional static (stall) and dynamic shaft torque and speed* (an option). These devices use patented Himmelstein technology field-proven in more than three decades of use. A one piece stainless shaft carries bonded, foil strain gages. They measure torque and, in combination with element design, cancel bending and thrust loads.

Rotary transformers connect the rotating gages to stationary, dc-to-dc torquemeter circuitry. They provide high quality non-contact signal coupling to the rotating gages. Rotary transformers don't generate noise or wear. They are immune to ambient noise, vibration, lubricants and other hostile environments.



DC Operated Torquemeter Construction

RFI shielded circuitry and the 5 volt output, provide high noise immunity. Simple cabling yields *calibration and balance truly free of cable effects* There are no slip rings, brushes, radio transmitters and other limited-life, noise-generating elements. Their elimination further increases performance and reliability. Moreover, the *robust, non-ferrite design* suits these torquemeters for diesel and other hostile environments.

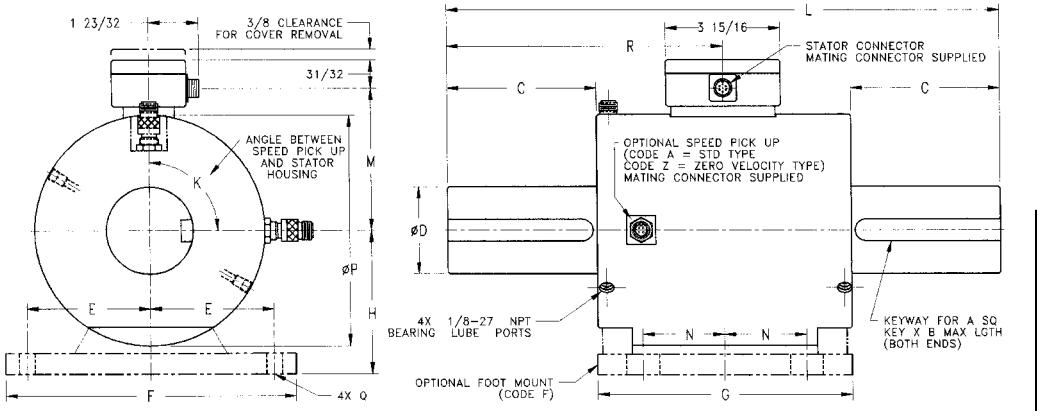


Simplified Block Diagram

Standard Ratings, Shaft End Models

MCRT® MODEL	TORQUE RANGE		TORQUE OVERLOAD		SPEED RATING	SHAFT STIFFNESS*	ROTATING INERTIA	MAX WT.
	[lb-in]	[n-m]	[lb-in]	[n-m]	[rpm]	[lb-in/rad]	[oz-in sec^2]	[lbs]
49001V(25-0)	25	2.82	100	11.3	0 to ±15,000	5,590	0.035	11
49001V(5-1)	50	5.65	200	22.6	0 to ±15,000	11,700	0.035	11
49001V(1-2)	100	11.3	400	45.2	0 to ±15,000	21,400	0.035	11
49002V(25-1)	250	28.2	1,000	113	0 to ±15,000	50,200	0.036	12
49002V(5-2)	500	56.5	2,000	226	0 to ±15,000	56,000	0.036	12
49003V(5-2)	500	56.5	2,000	226	0 to ±10,000	154,000	0.11	23
49003V(1-3)	1,000	113	4,000	452	0 to ±10,000	214,000	0.11	23
49004V(2-3)	2,000	226	8,000	904	0 to ±10,000	421,000	0.16	26
49004V(5-3)	5,000	565	20,000	2,260	0 to ±10,000	593,000	0.16	26
49006V(1-4)	10,000	1,130	40,000	4,520	0 to ±8,000	1,800,000	2.3	105
49006V(2-4)	20,000	2,260	80,000	9,040	0 to ±8,000	2,700,000	2.4	105
49007V(25-3)	25,000	2,820	100,000	11,300	0 to ±6,000	5,700,000	2.8	115
49007V(5-4)	50,000	5,650	200,000	22,600	0 to ±6,000	7,100,000	3.0	115
49008V(1-5)	100,000	11,300	400,000	45,200	0 to ±3,600	29,000,000	11.0	150
49008V(25-4)	250,000	28,200	750,000	84,700	0 to ±3,600	36,000,000	11.7	150
49009V(5-5)	500,000	56,500	2,000,000	226,000	0 to ± 1,800	125,000,000	207	780
49009V(1-6)	1,000,000	113,000	4,000,000	452,000	0 to ± 1,800	142,000,000	218	800
49010V(15-5)	1,500,000	170,000	6,000,000	678,000	0 to ± 1,200	221,000,000	567	1455
49010V(2-6)	2,000,000	226,000	7,350,000	830,000	0 to ± 1,200	227,000,000	582	1475

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



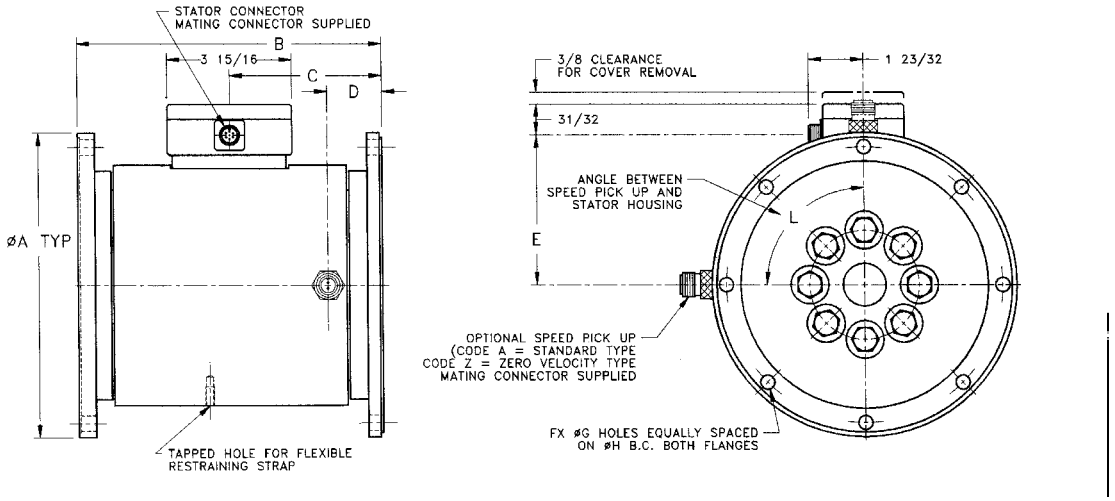
MCRT® MODEL	DIMENSIONS [inches]														
	A	B	C	D[1]	E	F	G	H	L	M	N	P	K	Q	R
49001V	0.187	1.125	1.50	0.625	2.25	5.50	5.50	2.250	8.50	2 9/16	1 1/2	3 15/32	90°	0.406D	4 1/4
49002V	0.187	1.625	2.00	0.750	2.25	5.50	5.50	2.250	9.50	2 9/16	1 1/2	3 15/32	90°	0.406D	4 3/4
49003V	0.250	1.750	2.00	1.000	2.625	6.25	7.00	2.500	10.00	2 31/32	1 1/2	4 7/32	90°	0.406D	5
49004V	0.375	2.750	3.38	1.500	2.625	6.25	7.00	2.500	12.75	2 31/32	1 1/2	4 7/32	90°	0.406D	6 3/8
49006V	0.625	3.500	4.13	2.500	4.25	10.00	8.75	5.000	17.00	4 7/8	2 13/16	7 15/16	0°	Note 2	9 1/2
49007V	0.750	4.500	5.13	3.000	4.25	10.00	8.75	5.000	19.00	4 7/8	2 13/16	7 15/16	0°	Note 2	9 1/2
49008V	1.000	6.500	7.56	4.500	4.25	10.00	7.75	5.000	23.00	5 1/8	2 13/16	8 1/2	0°	Note 2	12 27/32
49009V	Note 3	8.000	9.00	7.750	7.00	15.50	18.00	8.000	36.00	7 7/8	7 7/8	13 7/8	0°	Note 2	18
49010V	Note 4	12	13.50	9.375	8.50	18.50	20.00	9.750	47.00	9 1/2	8 7/8	17	0°	Note 2	23 1/2

1. Tolerance on D diameter is +0.0000/-0.0005 for diameters = < 2.5" and +0.000/-0.001 for diameters > 2.5". 2. Slotted 0.531 wide by 1-1/8 long.
3. Dual rectangular keyways at each end are 2" wide by 1.50" high. 4. Dual rectangular keyways at each end are 2.50" wide by 1.75" high.

Standard Ratings, Compact Flanged Models

MCRT® MODEL	TORQUE RANGE		TORQUE OVERLOAD		SPEED RATING	SHAFT STIFFNESS*	ROTATING INERTIA	MAX WT.
	[lb-in]	[n-m]	[lb-in]	[n-m]	[rpm]	[lb-in/rad]	[oz-in sec^2]	[lbs]
49060V(5-2)	500	56.5	2000	226	0 to ±8,000	602,000	0.6	12½
49060V(1-3)	1,000	113	4000	452	0 to ±8,000	1,375,000	0.6	12½
49060V(2-3)	2,000	226	8000	904	0 to ±8,000	2,640,000	0.6	12½
49061V(3-3)	3,000	339	12,000	1,360	0 to ±8,000	2,430,000	0.9	15½
49061V(5-3)	5,000	565	20,000	2,260	0 to ±8,000	2,930,000	0.9	15½
49061V(12-3)	12,000	1,360	36,000	4,070	0 to ±8,000	3,530,000	0.9	15½
49070V(12-3)	12,000	1,360	48,000	5,420	0 to ±5,500	6,800,000	8.24	51
49070V(24-3)	24,000	2,710	96,000	10,850	0 to ±5,500	12,200,000	8.27	51½
49070V(48-3)	48,000	5,420	192,000	21,700	0 to ±5,500	17,900,000	8.33	52
49080V(1-5)	100,000	11,300	400,000	45,200	0 to ±3,600	39,200,000	54.5	153
49080V(25-4)	250,000	28,200	750,000	84,800	0 to ±3,600	53,100,000	54.9	155
49090V(5-5)	500,000	56,500	2,000,000	226,000	0 to ±1,800	152,000,000	482	979
49090V(1-6)	1,000,000	113,000	4,000,000	452,000	0 to ±1,800	177,000,000	493	998
49091V(15-5)	1,500,000	170,000	6,000,000	678,000	0 to ±1,200	282,000,000	1,838	1,502
49091V(2-6)	2,000,000	226,000	7,350,000	830,000	0 to ±1,200	292,000,000	1,852	1,516

**Stiffness is conservatively rated from flange face-to-flange face.*



MCRT® MODEL	DIMENSIONS [inches]								
	A	B	C	D	E	F	G	H	L
49060V	4.250 ±0.001 *(Flange faces are pilotless)*	5 3/16	2 19/32	1 3/32	2 27/32	8	3/8-24UNF-2B	3.625	90^N
49061V	4.250 ±0.001*(Flange faces are pilotless)*	5 15/16	2 31/32	1 15/32	2 27/32	8	3/8-24UNF-2B	3.625	90^N
49070V	8 *(Flange faces have male and female pilots*)*	8	4 1/32	1 7/16	4 1/16	8	0.377 +0.002/-0.000	7.250	0^N
49080V	12 *(Flange faces have female pilots*)*	15 1/4	8 13/16	5 5/8	5 5/32	16	0.630 +0.002/-0.000	10.375	0^N
49090V	23 *(Flange faces have female pilots*)*	31	15 1/2	7 1/8	7 7/8	32	0.755 +0.002/-0.000	20.625	0^N
49091V	30 *(Flange faces have female pilots*)*	37	18 1/2	9 1/8	9 1/2	32	1.005 +0.002/-0.000	27	0^N

**Contact the factory for a print of flange details.*

Shaft End and Flanged Models

Shaft end torquemeters are the choice for most applications. They cost less than flanged models and, they can either be floated or foot mounted. Flanged torquemeters are much shorter than the shaft end types. Therefore, flanged models are often used when axial space is insufficient to accommodate a longer, shaft end model or, when the highest shaft stiffness is needed.

Flanged models handle large* axial or thrust loads *without special mounting considerations or hardware*. As a result, they are frequently used in marine or vehicular drives, to support the weight and thrust of a mixers' impeller, and in other similar circumstances. *A flanged torquemeter must be installed as a floating shaft.*

* generally a thrust in pounds equal to the torquemeters' full scale rating in pound-inches.

General Specifications

	Code N Standard Performance	Code C Enhanced Performance
Non-linearity (end point method, % of F.S.):	≤ ±0.15	≤ ±0.07
Hysteresis (% of F.S.):	≤ ±0.15	≤ ±0.07
Non-repeatability (% of F.S.):	≤ ±0.07	≤ ±0.03
Combined Error (guaranteed combined non-linearity, hysteresis and non-repeatability, % of F.S.):	≤ ±0.20	≤ ±0.10
Rotational Effect on Zero (% of F.S.):	≤ ±0.10	≤ ±0.03
Remote[1] Calibration Error (% of F.S. @ 75 deg. F., traceable to NIST):	≤ ±0.05	≤ ±0.02
Output Tracking (difference between dual outputs, % of F.S.):	≤ ±0.10	≤ ±0.05
Temperature Effects:		
Zero (% of F.S./deg. F.):	≤ ±0.003	≤ ±0.0015
Span (% of Rdg./deg. F.):	≤ ±0.003	≤ ±0.0015
Compensated Range:	+75 to +175 deg. F.	
Minimum Usable Range:	-25 to +185 deg. F.	
Storage Range:	-65 to +225 deg. F.	
Outputs: Fully bi-directional, dual outputs with common characteristics, as follows		
Clockwise (CW) Torque[2]:	+5 Volts[3]	
Counterclockwise (CCW) Torque[2]:	-5 Volts[3]	
Minimum Resistive Load:	10 kΩ	
Maximum Capacitive Load:	0.05 uF	
Source Impedance:	< 1Ω	
Overrange[3] (% of F.S.):	±33	
Measurement Bandwidth[4]:	High Frequency Output ☞ dc to 500 Hz and, Low Frequency Output ☞ dc to 1Hz. Both outputs are present simultaneously.	
Output Noise (rms, % of F.S.):	0.10 at 500 Hz output, 0.01 at 1 Hz output	
Zero Control Range:	±5% of F.S., nominal	
Span Control Range:	±5% of F.S., nominal	
Supply Voltage[5]:	10.5 to 24 Volts dc	
Supply Current[5]:	85 mA, nominal	
Power Supply Effect:	<0.01% of F.S. per volt	

Notes

1. Calibration enabled by grounding CAL terminal or asserting logic 0.
2. CW torque causes the torquemeter shaft to turn CW when viewed from its driven end. CCW torque causes the opposite rotation.
3. Electrical outputs remain *linear* to *the overrange* level. A torquemeter will not *yield* below its *rated overload torque. The region between rated and overload torques should be reserved for unexpected loads.*
4. Bandwidth upper limit is determined by integral Bessel response filter. The torquemeters' self resonant frequency is > 1 kHz.
5. Fused and reverse polarity protected.
6. "F.S." denotes "Full Scale". "Rdg." denotes "Reading".
7. "deg. F." denotes "degree Fahrenheit".
8. Speed ratings are for continuous, bi-directional operation.
9. These torquemeters will operate in a condensing atmosphere, and if wetted with non-corrosive fluids and mud. When operated continuously, clean regularly or cover to deflect contaminants. They are not submersible.
10. Specifications are subject to change without notice. . . . .

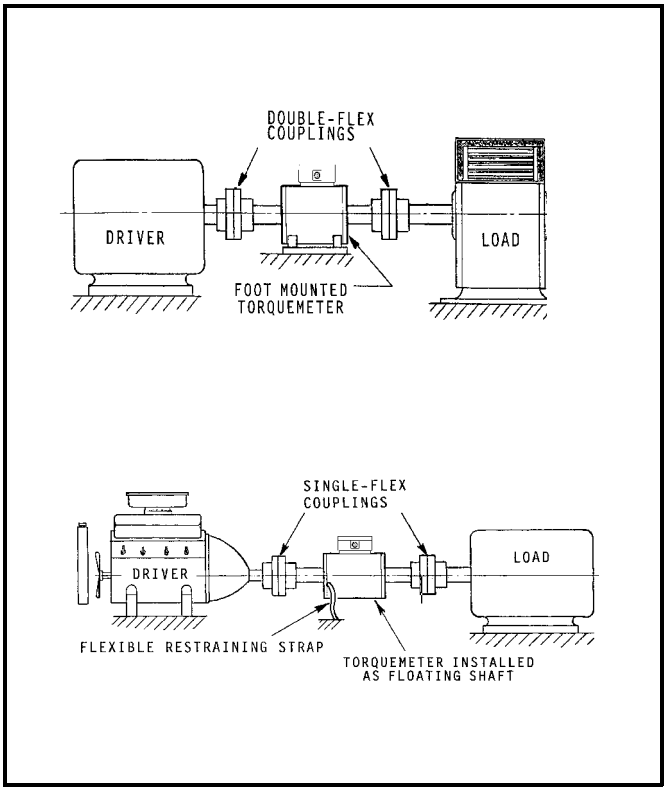
Patent Notice

Himmelstein torque measurement products are manufactured under one or more of the following U.S. Patents:

RE26,501 3,441,886 3,531,748 3,531,749 3,717,029 3,800,591 3,961,526 4,412,198 4,555,956 4,563,905 4,616,512 4,651,573 4,790,175

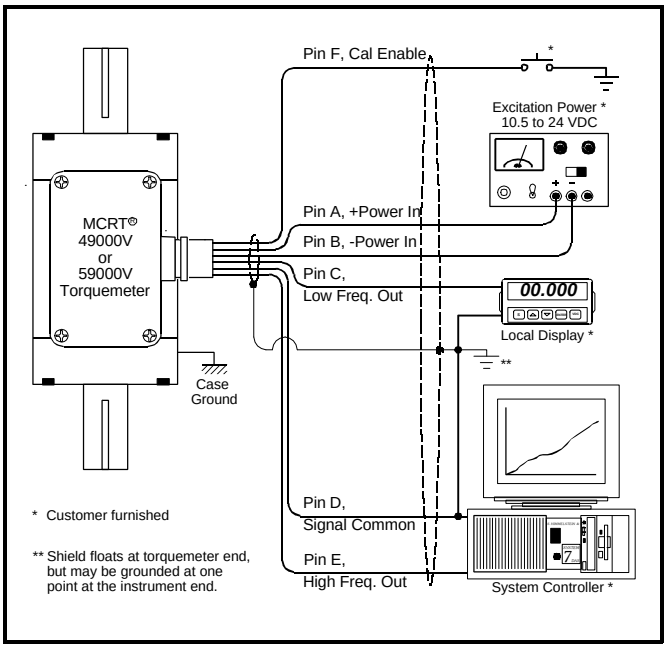
Installation

When it's installed between a driver and its load, a torquemeter measures shaft torque. A shaft end torquemeter may be floated or, foot mounted as shown in the upper sketch. Both shaft end and flanged end types may be operated as floating shafts; see the lower illustration. A floating torquemeter handles the greatest axial loads, a foot mounted torquemeter operates at the highest speeds.



Mechanical Installation

Just connect a single excitation supply as shown. A voltage between 10.5 and 24 volts dc is required. Thus, these devices can be operated from vehicle battery power. Both high (dc to 500 hertz) and low frequency (dc to 1 hertz) outputs are simultaneously available. The 1 hertz cutoff is useful for eliminating vibratory signals, if present. The 500 hertz output may be used to drive a fast controller or for wideband data acquisition. NIST traceable, remotely operable calibration circuitry verifies torquemeter operation and simplifies scaling of the customers' recording/control system.



Electrical Connections

Available Options: Available options are listed. Consult the factory should you have special requirements.

Enhanced Performance - Code C, or N if Standard

This option reduces measurement errors by a factor of two. See specifications for full details.

Foot Mount - Code F, or N if None

Foot mounts provide a rigid stator mounting. They are only available on shaft end torquemeters. Refer to outline drawing for dimensions.

Zero Velocity Speed Pick-up - Code Z, or N if None

Outputs 60 voltage pulses/revolution, not *±5 volts*. Its amplitude is constant with speed. It requires 5 to 15V dc power. Output pulse amplitude is approximately the input supply voltage less 0.5 volts.

Standard Speed Pick-up - Code A, or N if None

Outputs 60 voltage pulses/revolution, not *±5 volts*. *Its amplitude is proportional to speed.* ***Use Code Z pick-ups for speeds below 100 rpm.***

Order Number: MCRT® 49061V (5-3) - C - N - Z - 8000

- *Model No. and Range Performance*
- *Maximum RPM*
- *Speed Pick-up*
- *Foot Mount*

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