



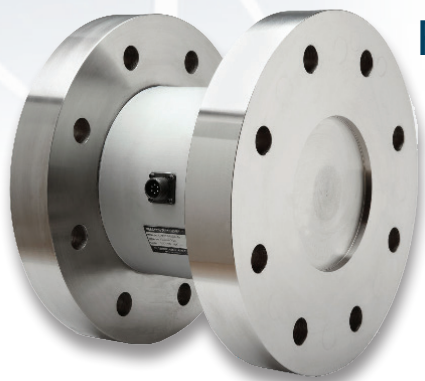
RTM 2000 Series & 2200M Series PRECISION HOLLOW AND SOLID FLANGED REACTION TORQUEMETERS

Capacities from
60 to 2,400,000 lbf-in (6.78 to 271,000 Nm) – Hollow
10 ozf-in to 750,000 lbf-in (0.07 to 84,735 Nm) – Solid

200% Overload
mV/V Outputs
0.1% Combined Nonlinearity and Hysteresis
Accredited ISO 17025:2017 CW and CCW Cal
High Torsional Stiffness
Compact Mechanical Package



RTM 2020



RTM 2206



RTM 2200M

Use Model 708+ or 788+ to display one or two channels of torque, respectively. See Bulletin 379.



*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.

S. Himmelstein and Company offers two basic types of reaction torque meters, i.e. Solid Flanged Torque meters and Hollow Flanged Torque meters. All use temperature compensated full foil gage torque bridge sensors that provide inherent cancellation of bending and thrust signals. The RTM hollow reaction series utilizes a double wall construction (except Model 2050) that economically provides unusual isolation and high torsional stiffness in a compact mechanical package. This is done without the use of multiple bridges, which have reduced

reliability because of the increased number of bridge connections and wiring complexities.

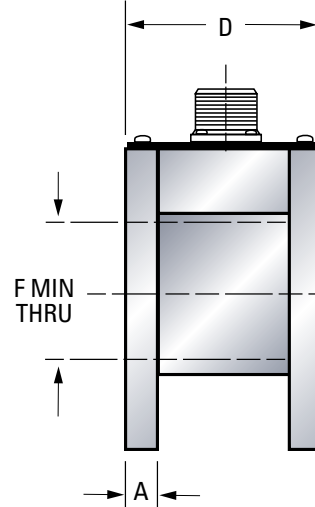
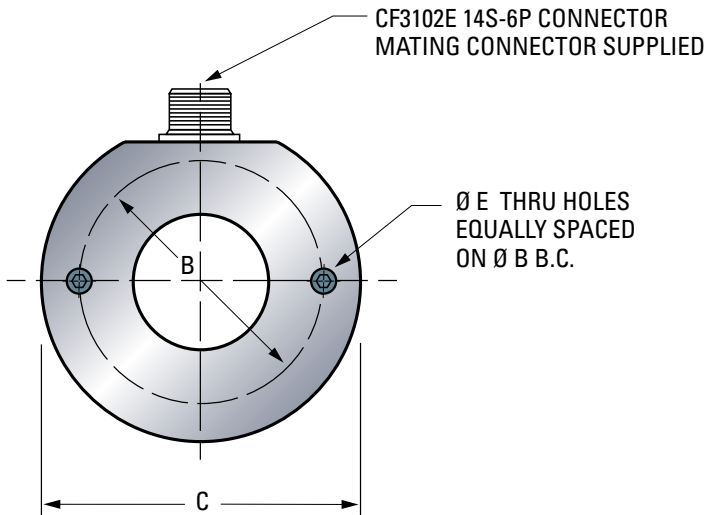
Low capacity units have aluminum alloy torsion elements. Larger units are constructed of 15-5 PH, a precipitation hardened stainless steel with exceptional fatigue properties. In that connection, transducers subjected to full scale reversals have essentially infinite fatigue life. All models are furnished with a mating connector and precision shunt calibration resistor referenced to an NIST traceable dead weight calibration.

Standard Ratings, Series RTM 2000 Precision, Hollow Flanged Reaction Torquemeters

Model Number	Range (lbf-in)	Torsional Stiffness (lbf-in/rad)	Maximum Extraneous Loads		Dimensions (Inches)					
			Thrust F (lbs)	Bending Moment W x D (lb-in)	A	B	C	D	E	F
2010(6-1)	60	98,500	100	50	5/16	2	2 1/2	2 1/8	2, 0.203D	7/8
2010(12-1)	120	98,500	120	60	5/16	2	2 1/2	2 1/8	2, 0.203D	7/8
2020(24-1)	240	171,400	240	120	5/16	2	2 1/2	2 1/8	2, 0.203D	7/8
2030(6-2)	600	712,000	600	300	5/16	2 1/2	3 1/4	2 1/8	2, 0.390D	1 3/8
2030(12-2)	1,200	1,420,000	1,200	600	5/16	2 1/2	3 1/4	2 1/8	2, 0.390D	1 3/8
2050(3-3)	3,000	3,340,000	3,000	1,500	5/16	3 3/8	4	2 1/8	4, 0.406D	2 3/8
2050(6-3)	6,000	7,970,000	6,000	3,000	5/16	3 3/8	4	2 1/8	4, 0.406D	2 3/8
2060(1-4)	10,000	8,380,000	2,500	2,250	5/8	4 3/8	5	3 1/2	6, 3/8 24 UNF	3 3/8
2060(2-4)	20,000	14,300,000	5,000	4,500	5/8	4 3/8	5	3 1/2	6, 3/8 24 UNF	3 3/8
2070(5-4)	50,000	36,800,000	10,000	10,000	5/8	7	8 1/2	3 1/2	8, 0.630D	3 3/8
2070(1-5)	100,000	51,200,000	20,000	20,000	5/8	7	8 1/2	3 1/2	8, 0.630D	3 3/8
2080(3-5)	300,000	925,000,000	120,000	120,000	0.650	17.00	18.25	6.110	20, 0.65625D	12.83
2092(12-5) ⁴	1,200,000	3,500,000,000	480,000	480,000	3/4	19.00	21.00	5	32, 0.765D	14.50
2092(18-5) ⁴	1,800,000	3,900,000,000	600,000	600,000						
2092(24-5) ⁴	2,400,000	4,300,000,000	720,000	720,000						

NOTES:

- Torsional stiffness value includes shaft extensions, where they exist.
- All units are stainless steel except Model 2010, which is aluminum.
- See Page 4 for a definition of extraneous loads.
- Torquemeter has connector on 18" pigtail, see Bulletin 779.



General Specifications

- Nominal Output 1.5 mV/V except 1 mV/V for Models 2030 and 2050
- Maximum Excitation 10V ac or dc
- Bridge Resistance 350 ohms
- Combined Error ≤±0.1% for Code C (Only Models 2010, 2020, 2060 & 2070),
≤±0.2% for Code N Models
Includes effects of Nonlinearity, Hysteresis and non-return to zero load
- Nonrepeatability ±0.03% of full scale
- Torque Overload Capacity 2 times full scale rating
- Temperature Effects Zero ≤±0.002% of full scale per degree F
Span ≤±0.002% of reading per degree F
- Compensated Range +75 to +175 degrees F
- Usable Range -65 to +225 degrees F

Electrical Connections	
PIN	FUNCTION
A	+ Excitation
B	+ Excitation Sense
C	- Excitation Sense
D	- Excitation
E	- Signal
F	+ Signal

Complete Systems

When supplied with precision reaction torque-meters, Himmelstein systems include solid state readout, interconnecting cable, system checkout and NIST traceable dead weight calibration. You receive an operating system with guaranteed system performance, single source system responsibility and a full one year system warranty.

Signal Polarity

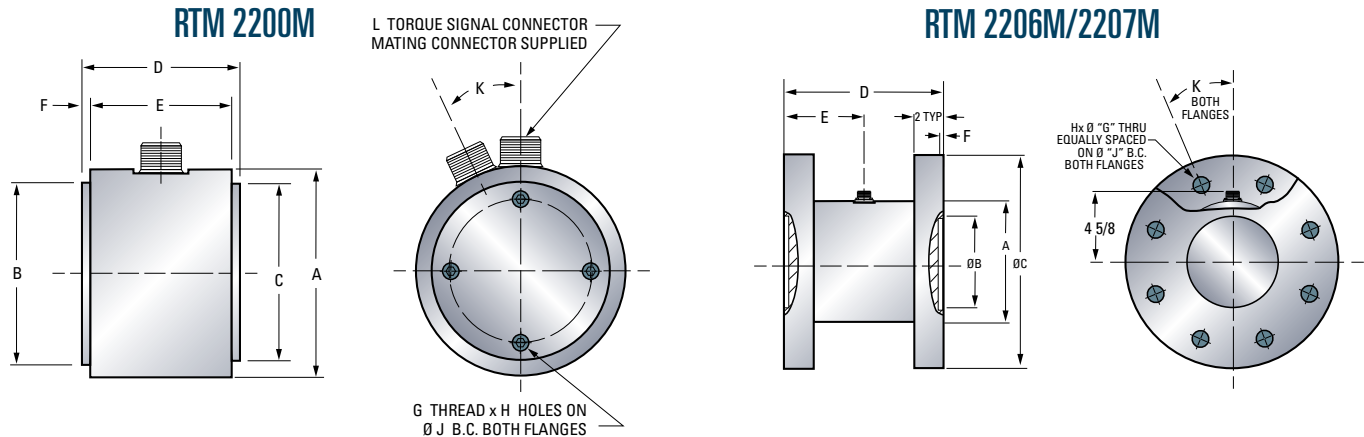
Hollow Type: Positive for CCW torque through the torquemeter.

All Other Types: Positive for CW torque through the torquemeter.

Standard Ratings, Series RTM 2200M Precision, Solid Flanged Reaction Torquemeters

Model Number ¹	Range		Torque Overload		Torsional Stiffness (From Flange Face-To-Face)		Weight (lb)	Maximum Extraneous Loads		
	(lbf-in)	(N-m)	(lbf-in)	(N-m)	(lbf-in/rad)	(N-m/rad)		Thrust (F) (lbf)	Bending (lbf-in)	Shear (lbf)
2200M(1-1)	0.625 = 10 ozf-in	0.071	1.25 = 20 ozf-in	0.141	560 ozf-in	3.95	0.2	200 ozf	50 ozf-in	25 ozf
2200M(2-1)	1.25 = 20 ozf-in	0.141	2.5 = 40 ozf-in	0.283	880 ozf-in	6.21		320 ozf	80 ozf-in	40 ozf
2200M(5-1)	3.125 = 50 ozf-in	0.353	6.25 = 100 ozf-in	0.706	3,200 ozf-in	22.6		600 ozf	150 ozf-in	75 ozf
2200M(1-2)	6.25 = 100 ozf-in	0.706	12.5 = 200 ozf-in	1.41	9,600 ozf-in	67.8		800 ozf	200 ozf-in	100 ozf
2200M(2-2)	12.5 = 200 ozf-in	1.412	25 = 400 ozf-in	2.83	27,200 ozf-in	192.0		800 ozf	200 ozf-in	200 ozf
2201M(1-1)	10	1.13	20	2.26	650	73.5	.5	40	10	10
2201M(2-1)	20	2.26	40	4.52	1,800	203		80	20	20
2201M(5-1)	50	5.65	100	11.3	7,400	836		200	50	50
2202M(1-2)	100	11.3	200	22.6	13,400	1,510	1.2	100	50	50
2202M(2-2)	200	22.6	400	45.2	37,500	4,240		200	100	100
2202M(5-2)	500	56.5	1,000	113	145,000	16,400		500	250	250
2203M(1-3)	1,000	113	2,000	226	270,000	30,500	8	1,000	500	500
2203M(2-3)	2,000	226	4,000	452	775,000	87,600		2,000	1,000	1,000
2203M(5-3)	5,000	565	10,000	1,130	3,000,000	339,000		5,000	2,500	2,500
2204M(1-4)	10,000	1,130	20,000	2,260	2,000,000	226,000	20	10,000	5,000	5,000
2204M(2-4)	20,000	2,260	40,000	4,520	5,000,000	565,000		20,000	10,000	10,000
2205M(5-4)	50,000	5,650	100,000	11,300	13,000,000	1,470,000	41	50,000	25,000	25,000
2205M(1-5)	100,000	11,300	200,000	22,600	33,000,000	3,730,000	42	100,000	50,000	50,000
2206M(3-5)	300,000	33,900	600,000	67,800	103,000,000	11,600,000	215	55,000	120,000	120,000
2206M(5-5)	500,000	56,500	1,000,000	113,000	139,000,000	15,700,000		80,000	200,000	200,000
2207M(6-5)	600,000	67,800	1,200,000	136,000	189,000,000	21,400,000	252	90,000	240,000	240,000
2207M(75-4)	750,000	84,750	1,500,000	170,000	209,000,000	23,600,000		105,000	300,000	300,000

Note: See Page 4 for definition of extraneous loads.



Model 2200 Series in English Units										
Model	A	B	C	D	E	F	G Thread	H	J	K
2200M	1-1/2	1.000	0.875	1-1/2	1-3/8	1/16	#4-40 UNC-2B	2	0.563	0°
2201M	2	1.375	1.250	2-1/8	1-7/8	1/8	#10-32 UNF-2B	2	0.750	0°
2202M	2-3/4	2.000	1.875	2-3/4	2-3/8	2-3/8	1/4-20 UNC-2B	4	1.250	0°
2203M	4-1/2	3.875	3.750	3-1/2	3	3	3/8-24 UNF-2B	4	2.750	0°
2204M	6	5.375	5.250	4-1/2	3-3/4	3-3/4	7/16-20 UNF-2B	8	4.000	22.5°
2205M	8	7.375	7.250	5-1/2	4-3/4	4-3/4	5/8-18 UNF-2B	12	5.750	15°
2206M	8	6.000	14	10.5	5-1/4	0.313	1.020 thru	8	11.000	22.5°
2207M	8	6.000	15	10.5	5-1/4	0.313	1.520 thru	8	12.000	22.5°

Performance Specifications

Bridge Impedance: (Ohms, nominal) 350
 Output: (mV/V, nominal) ±2 except 1.3 for Model 2200M(1-1)
 Zero Unbalance: (% of Range) ≤±1
 Combined Error (% of Full Scale) ≤±0.1
 Includes effects of Nonlinearity, Hysteresis and non-return to zero load
 Nonrepeatability: (% of Full Scale) ≤±0.05
 Calibration Error: (% of Full Scale, @ 75 DegreesEF) ≤±0.05
 Measurement Bandwidth²: External Conditioner Dependent
 Zero Drift: ≤±0.002 (% of Full Scale/°F)

Span Drift: ≤±0.002 (% of Reading/°F)
 Compensated Temperature Range: +75 to +175 °F
 Usable Temperature Range: -65 to +225 °F
 Control Range: External Conditioner Dependent
 Output Signal Polarity With CW torque through torque meter: positive
 Note: output polarity changes with torque direction
 Overrange: External Conditioner Dependent
 Excitation (ac or dc): 15V, max., should be regulated
 Power Supply Effect: External Conditioner Dependent

REACTION TORQUE MEASUREMENTS

Permit accurate determination of static and dynamic torque with a stationary (non-rotating) transducer even though the device under test may be rotating at high speed. Reaction torque measurements are based on Newton's third law of angular motion which states, "when a body exerts a torque upon another body, the second exerts an equal torque upon the first in the opposite direction and about the same axis of rotation." Referring to **Figure 1**, the reaction torque path must be through the torquemeter, so the torquemeter will accurately measure torque applied to the clutch and, with appropriate electronics, the test set-up can readily determine peak or slip torque.

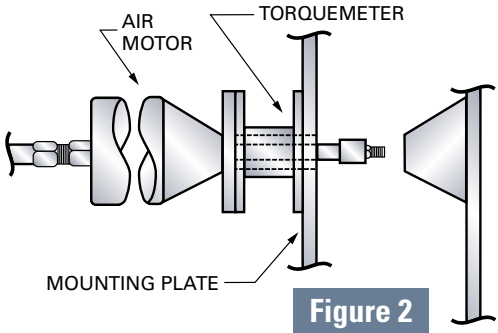
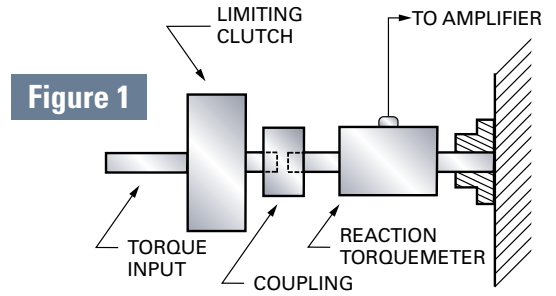
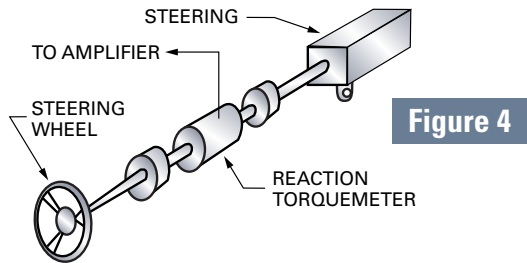
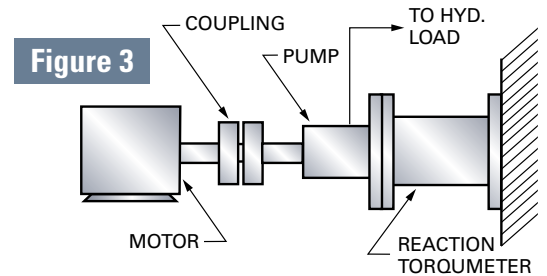


Figure 2 shows how a hollow reaction torquemeter is used to measure the output torque of an air tool. The torquemeter will accurately measure the instantaneous tool output torque even though it rises rapidly (in milliseconds) as the fastener seats. However, all the reaction torque must pass through the torquemeter—a rotating union (or equal) must be used at the air supply end to eliminate shunting part of the reaction torque through the air lines and thus producing a measurement error. Although it is possible to satisfy this requirement (no unwanted shunt torque paths) in an air tool application, other potential applications can have significant, unavoidable shunt torque paths which, in turn, will limit the accuracy of the reaction measurement. An in-line torque measurement should be used in such cases.

Figure 3 illustrates a measurement similar to that of **Figure 2** but with a significant and very basic difference. Here the torquemeter measures the reaction of the power absorbing device instead of the power producing device. The torquemeter will measure the total reaction torque of the absorber but that torque is not necessarily equal to the output torque of the motor. For example, when the system is being accelerated (or decelerated), the motor output torque is equal to the torque required to accelerate the output shaft (the product of angular acceleration and total load inertia—including absorber rotor, intermediate shaft and couplings), the windage torque of the total load



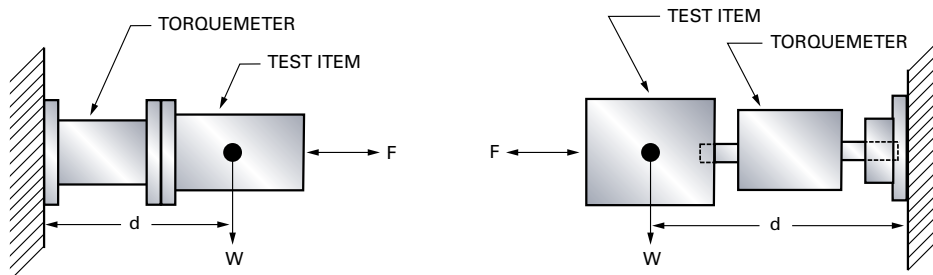
and the real torque load of the absorber. In a set-up like this, no reaction measurement will see either the acceleration or windage torques and, as a result, it will be in error to the extent such torques exist. The acceleration torque error component disappears when a shaft is at a constant speed but windage errors are always present. Only in-line torque measurements are immune to these error sources.

Reaction torquemeters are an economical solution where in-line measurements are required but where angular motion is restricted and cycle rates are low thus permitting cable "wind-up". **Figure 4** illustrates such an application.

EXTRANEANUS LOADS

Any force or moment the torquemeter sees other than the reaction torque input is an extraneous load. Depending on installation (see illustration), these could include bending moments and axial thrust (tension or compression). The tabulation summarizes the maximum safe extraneous load that can be applied to the torquemeter assuming they are applied singly. Crosstalk errors from such loads will be typically 1% or less and, assuming they are constant, can be electrically zeroed.

- W = weight of test item
- F = thrust force, if any
- d = distance to test item center of gravity
- Wxd = bending moment



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