MCRT® 27000T Non-Contact WHEEL TORQUEMETERS
(TORQUE WHEELS)

For DC Operated Versions with ±5 Volt DC Analog Outputs, See Bulletin 7801

Unprecedented Immunity to Contamination & Vibration
- Waterproof, Corrosion Resistant Construction
- Extraordinary Immunity to Extraneous Loads and Temperature Gradients
- 4 mV/V Output or, ±5 Volt Output (Option V)

Measure Road Load, Braking Effort and Wheel Speed
- Installs Simply Without Vehicle Rework
- No Slip Rings, Ferrite’s, or Semiconductor Gages
- NIST Traceable Dead Weight Calibration*
  *Calibration performed in our accredited metrology laboratory (NVIAP Lab Code 200487-0).
  For details see www.himmelstein.com or accreditation link at www.nist.gov
- Torque Ranges: 250 to 100,000 lbf-in (28 to 11,300 N-m)

To excite and display Torque only, use Models 701 or 711. For Torque, Speed and HP, use Model 721. See Bulletins 371 & 370.
**Description**

Himmelstein torque wheels are non-contact, rotary transformer coupled wheel torquemeters. They accurately measure wheel torque and speed during driving, braking, and coastdown. Standard units are available for front wheel, rear wheel, and all wheel drive applications. Uses include characterization of actual driving conditions, and coastdown, emissions correlation, braking and chassis dynamometer tests.

Installation is made without vehicle rework. Mounting the torquemeter on a standard wheel produces a small offset. The offset can be eliminated with a modified wheel; either customer or Himmelstein furnished. Torquemeter weight and inertia emulate a conventional wheel.

Excellent temperature compensation and a unique sensor design provides intrinsic immunity to temperature gradients and radial and cornering loads. That design also achieves clamping load cancellation. Superb, rotary transformers provide non-contact signal coupling to the rotating strain gage bridge. These advanced devices contain no ferrite’s thus eliminating vulnerability to impact damage. Reduced frontal area models are available when aerodynamic drag is critical. Standard and optional zero velocity sensors provide 60 pulses/revolution (ppr). Optional encoder provides 3600 ppr (512 ppr for MCRT® 27830/27835).

Himmelstein readouts are available with NIST traceable system dead weight calibration. These computer compatible instruments measure torque, speed and compute wheel power(s). Computer based test systems with real time storage, computation, and plotting are also available. Wheel Torquemeters with Option V operate from a single unregulated dc supply and provide dual ±5V outputs with built-in filtering; see Bulletin 7801 for details.

**Unprecedented Immunity to Cable and Connector Contamination**

MCRT® 27000T Series Torque Wheels are constructed of corrosion resistant materials and water-proofed to permit operation in shallow water. Nonetheless, during real-world field tests, connections must be opened to change tires, adjust brakes, etc. Those acts expose the measurement circuit to shunting errors from salt and other contaminants. Even though cables and connectors are sealed, testing in sub-zero temperature makes cable insulation brittle which, when subjected to vibration, can fatigue and expose the circuit to contamination.

These new torquemeters exhibit unprecedented tolerance to inevitable cable shunts. When compared to a directly wired strain gage sensor, the effect of external cable shunts has been reduced by 1000* times. And, you get these results with standard carrier amplifiers. Furthermore, you receive the added benefits of Himmelstein rotary transformer technology, including elimination of internally generated shunting errors and noise from slip-ring/brush debris. All this plus 4 mV/V output and newly enhanced immunity to electrical noise.

**General Specifications**

Non-Linearity: ................................................. $\leq \pm 0.1\%$ of full scale.

Hysteresis: ...................................................... $\leq \pm 0.1\%$ of full scale.

Non-Repeatability: .......................................... $\leq \pm 0.05\%$ of full scale.

Accuracy (combined non-linearity, hysteresis, and non-repeatability)... $\leq \pm 0.1\%$ of full scale.

Stability, 6 months ........................................ $\leq \pm 0.15\%$ of full scale.

Effect of Rotation on Zero: .................................. $\leq \pm 0.025\%$ of F.S.

Typical Radial Loading Crosstalk (% F.S.) ............................................. (0.8)(Radial Load in LBS) / Full Scale Rating in LB – IN

Typical Bending (Cornering) Load Crosstalk (% F.S.) .................................. (0.8)(Bending Moment in LB – IN) / Full Scale Rating in LB – IN

Effect of Clamping Loads:

<table>
<thead>
<tr>
<th>Zero:</th>
<th>$\leq 0.3%$ of full scale.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Span:</td>
<td>$\leq 0.1%$ of full scale.</td>
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</table>

**Notes:**

1. When ordered with amplifier and cable, the system is dead weight calibrated traceable to the NIST.
2. Torquemeters only are dead weight calibrated with factory cable and amplifier. Calibration transfer is guaranteed only when used with a Himmelstein amplifier and cable with like part numbers.
3. "F.S." denotes "Full Scale".
4. "deg F." denotes "degree Fahrenheit".
5. Speed ratings are for continuous, bi-directional operation.
6. All wheel torquemeter models are waterproof and may be operated in shallow water. Please contact factory with your specific requirements.
7. Specifications are subject to change without notice.
Installation Alternatives

Himmelstein wheel torquemeters can be installed using the standard vehicle wheel, or with a modified wheel. A standard wheels’ centerline is offset from its’ normal location. Use a modified wheel to eliminate this offset and thus maintain normal steering geometry and handling. Modified wheels should be used for coastdown and over the road testing to reduce drag and interference with road obstructions. Reduced frontal area model MCRT® 27830T/27835T torque wheels are recommended for these critical applications.

When axle and wheel adapters are purchased they will be furnished with standard dimensions, unless specified differently. Request certified prints for torquemeters, axle adapters, and wheel adapters. Variations in the size and location of wheels, brake assemblies, spindles, tie rods, chassis geometry and possible part motions; make it imperative that the user thoroughly analyze his installation and assure himself the mounted torquemeter will clear other vehicle components under his expected driving conditions. If a special torquemeter configuration or range is needed, please contact the factory.

Using a Modified Wheel Assembly

Maintains original wheel position

Required installation for:
- MCRT® 27830T
- MCRT® 27835T
- MCRT® 27820T
- MCRT® 27920T
- MCRT® 27860T
- MCRT® 27920T
- MCRT® 27930T
- MCRT® 27860T
- MCRT® 27960T

Optional installation for:
- MCRT® 27820T
- MCRT® 27840T

This installation requires the following items:

1. Axle Adapter(2) - See Figure 3 if wheel torquemeter has a 4, 5, 6 or 8 bolt pattern. For universal bolt patterns, see Figure 1.
2. Wheel Torquemeter - See Page 6 for outline dimensions.
3. Modified Wheel(2) - See Figure 2.

NOTES:
(1) Certified prints for all items are available on request.
(2) Available as S. Himmelstein & Co. options.
(3) See following pages for additional details.

Using a Standard Wheel and a Wheel Adapter

Positions original wheel outboard by:
- MCRT® 27820T ..........approx. 2-1/4”
- MCRT® 27840T ..........approx. 3-5/8”

Installation only available for:
- MCRT® 27820T
- MCRT® 27840T

This installation requires the following items:

1. Axle Adapter(2) - See Figure 3 if wheel torquemeter has a 4, 5, 6 or 8 bolt pattern. For universal bolt patterns, see Figure 1.
2. Wheel Torquemeter - See Page 6 for outline dimensions.
3. Wheel Adapter(2) - See Figure 4, based upon wheel bolt pattern.

NOTES:
(1) Certified prints for all items are available on request.
(2) Available as S. Himmelstein & Co. options.
(3) See following pages for additional details.
Figure 1. Axle Adapter Kit
Two Piece

NOTES:
(1) FOR UNIVERSAL BOLT PATTERNS
(2) X DIMENSION MUST BE LONGER THAN LUG & NUT.
IF OVERALL PART THICKNESS IS < 1.094 + 'A', CONSULT THE FACTORY.
(3) 'Y' DIMENSION < 6.500 MUST BE REVIEWED BY FACTORY
(4) ADAPTER PLATE MATERIAL IS STEEL.

Figure 2. Modified Wheel

NOTES:
(1) MODELS MCRT 27820T & MCRT 27840T ONLY.
(2) ADAPTER PLATE MATERIAL IS ALUMINUM.

Figure 3. Axle Adapter Kit – One Piece

NOTES:
(1) FOR 4, 5, 6, & 8 BOLT PATTERNS.
(2) ADAPTER PLATE MATERIAL IS STEEL.
(3) 'H' DIMENSION < 6.500 MUST BE REVIEWED BY FACTORY
(4) MACHINED INSERT MATERIAL IS STEEL.

Figure 4. Wheel Adapter Kit

NOTES:
(1) MODELS MCR7 27820T & MCR7 27840T ONLY.
(2) ADAPTER PLATE MATERIAL IS ALUMINUM.

GENERAL NOTES:
(1) TORQUEMETER ATTACHMENT FASTENERS INCLUDED WITH ALL KITS.
(2) ALL DIMENSIONS ARE IN INCHES.
## Detailed Specifications, MCRT® 27000T Series Wheel Torquemeters

<table>
<thead>
<tr>
<th>MCRT® MODEL</th>
<th>TORQUE RANGE</th>
<th>TORQUE OVERLOAD</th>
<th>TORSIONAL STIFFNESS</th>
<th>MAXIMUM RADIAL LOAD</th>
<th>MAXIMUM BENDING MOMENT</th>
<th>ROTATING INERTIA</th>
<th>MAX. WT.</th>
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<td></td>
<td>(lbf-in)</td>
<td>(N-m)</td>
<td>(lbf-in)</td>
<td>(N-m)</td>
<td>(lbf-in/rad)</td>
<td>(lbs)</td>
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<td><strong>Reduced Frontal Area Rotary Transformer Models with 10X Overload; Available in 4 or 5 Bolt Patterns</strong></td>
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<td><strong>Large Thru-Bore Rotary Transformer Models for 4WD; 2X Overload; Available in Universal Bolt Pattern Only</strong></td>
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<td>3,900</td>
</tr>
</tbody>
</table>

Notes: 1. Maximum radial loads and bending moments may be applied simultaneously with full scale torque.
2. Inertia and weight values do not include the axle adapter or rotary transformer; see note 3.
3. A typical, Himmelstein furnished axle adapter has an inertia of 1.1 in-ozf sec\(^2\) and weighs 5.2 lbs.
4. All specifications are subject to change without notice.
5. For light truck applications, use the following Models (consult factory for details):
   - MCRT® 27860TE 1,000 to 2,000 lbf-in, with 10X overload, eight bolt pattern and 5 inch through bore for hub clearance
   - MCRT® 27960TE 5,000 to 100,000 lbf-in with 2X overload, eight bolt pattern and 5 inch through bore for hub clearance
   - MCRT® 27940TB,E 1,000 lbf-in with 10X overload, spider mounted transformer for 4WD applications

### Order Numbers:

<table>
<thead>
<tr>
<th>Model No.*</th>
<th>MCRT® 27820T</th>
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</thead>
<tbody>
<tr>
<td>Bolt Pattern</td>
<td></td>
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<tr>
<td>Option Codes:</td>
<td></td>
</tr>
<tr>
<td>Code A - Standard Speed Pickup</td>
<td>outputs 60 voltage pulses per revolution, amplitude proportional to speed</td>
</tr>
<tr>
<td>Code Z - Optional Zero Velocity Speed Pickup</td>
<td>outputs 60 voltage pulses per revolution. Requires 5 to 15 volt DC power, pulse amplitude is approximately 0.5 volts less than supply voltage</td>
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<tr>
<td>Code O - Optional Encoder</td>
<td>3600 ppr (512 ppr for MCRT® 27830/27835) encoder for enhanced speed measurement resolution. Outputs TTL pulses, requires 5 volt DC power supply</td>
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</table>

* The T suffix denotes a mV/V output torquemeter. Replacing with a V suffix, i.e., MCRT® 27820VA(5-4)Z specifies a DC Operated Torquemeter. That is one powered by a single, unregulated dc supply and which outputs dual ±5V signals. See Bulletin 7801 for details.

**Patent Notice:** S. Himmelstein and Company torquemeters are manufactured under one or more of the following U.S. Patents: RE 26,501; 3,441,886; 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
MCRT® 27000T Series Wheel Torquemeters, Outline Dimensions

**MCRT® 27820T/MCRT® 27840T**

- Clearance slots for axle studs & lug nuts \(4.750 \text{ in. (C,C)}\)
- Clamping ring assembly for rotary transformer removal
- Standard speed sensor (MST06A-10S-45)
- Drain

- #10-32 UNF-2B x 3/4 deep for cable strain relief/flexible strap
- 16-5/16 - 18 UNC-2B tapped holes on 8.750 in. B.C.C., for attaching a modified tire

**MCRT® 27830T/ MCRT® 27835T**

- Bolt holes for attaching axle adapter plate
- Drain
- Standard speed sensor (MST06A-10S-45)
- 16-5/16 - 18 UNC-2B tapped holes on 8.750 in. B.C.C., for attaching a modified wheel

**MCRT® 27820TU/MCRT® 27840TU**

- Bolt holes for attaching axle adapter
- Clamping ring assembly for rotary transformer removal
- Standard speed sensor (MST06A-10S-45)
- Drain
- #10-32 UNF-2B x 3/4 deep for cable strain relief/flexible strap
- 16-5/16 - 18 UNC-2B tapped holes on 8.750 in. B.C.C., for attaching a modified tire

**MCRT® 27920TU/MCRT® 27930TU**

- Bolt holes for attaching axle adapter
- Drain
- Standard speed sensor (MST06A-10S-45)
- Bolt holes for attaching axle adapter plate
- #10-32 UNF-2B x 3/4 deep for cable strain relief/flexible strap
- 16-5/16 - 18 UNC-2B tapped holes on 8.750 in. B.C.C., for attaching a modified wheel

**NOTES:**
1. Mat ing connectors are supplied
2. All dimensions are in inches

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