



## MHR SERIES

### Miniature General Purpose AC LVDT

#### SPECIFICATIONS

- ♦ **Small size and low mass core**
- ♦ **High output signal**
- ♦ **Stroke ranges from  $\pm 0.005$  to  $\pm 2$  inches**
- ♦ **AC operation from 2kHz to 20kHz**
- ♦ **Stainless steel housing**
- ♦ **Imperial or metric threaded core**

The legendary **MHR Series** LVDTs provide precision measurements in space restrictive applications. With a diameter of just 3/8 inch [9.5mm], and an extremely lightweight core, the MHR Series is ideal for applications where excessive core weight could influence the motion; with less inertia, accurate measurements at higher displacement speeds are easier to achieve. The lightweight core also reduces mechanical stresses and helps preserve the structural integrity of the core actuation assembly.

The high output sensitivity resulting from the close electrical coupling between the coil and core provides ample signal for interfacing with practically all signal conditioners and conditioning circuits. The magnetic stainless steel housing provides electromagnetic and electrostatic shielding.

The high temperature operation (200°C) model, MHR-T is available for stroke ranges of  $\pm 0.025$  to  $\pm 1$  inch. A High pressure (vented case) model, MHR-V is also available. The MHR is compatible with the full line of Measurement Specialties LVDT signal conditioners.

Like in most of our LVDTs, the MHR windings are vacuum impregnated with a specially formulated, high temperature, flexible resin, and the coil assembly is potted inside its housing with a two-component epoxy. This provides excellent protection against hostile environments such as high humidity, vibration and shock.

#### FEATURES

- ♦ Compact size
- ♦ Lightweight core
- ♦  $\pm 0.25\%$  linearity (100% stroke)
- ♦ Shock and vibration tolerant
- ♦ Stainless steel case
- ♦ Calibration certificate supplied with each unit

#### APPLICATIONS

- ♦ X, Y, Z stage position feedback
- ♦ Wire-die bonding machines
- ♦ Cylinder position feedback
- ♦ Voice coil testing
- ♦ Materials testing machines
- ♦ Space restricted installations

## PERFORMANCE SPECIFICATIONS

| ELECTRICAL SPECIFICATIONS (common) |                   |
|------------------------------------|-------------------|
| Input voltage                      | 3 VRMS sine wave  |
| Input frequency                    | 2kHz to 20kHz     |
| Test frequency                     | 2.5kHz (standard) |

| ELECTRICAL SPECIFICATIONS @ 10kHz (recommended operation) |                   |                   |                   |                  |                  |                  |                 |                |                |
|-----------------------------------------------------------|-------------------|-------------------|-------------------|------------------|------------------|------------------|-----------------|----------------|----------------|
| Parameter                                                 | MHR 005           | MHR 010           | MHR 025           | MHR 050          | MHR 100          | MHR 250          | MHR 500         | MHR 1000       | MHR 2000       |
| Stroke range                                              | ±0.005<br>[±0.13] | ±0.010<br>[±0.25] | ±0.025<br>[±0.64] | ±0.05<br>[±1.27] | ±0.10<br>[±2.54] | ±0.25<br>[±6.35] | ±0.5<br>[±12.7] | ±1<br>[±25.4]  | ±2<br>[±50.8]  |
| Sensitivity V/V/inch<br>[mV/V/mm]                         | 8.70<br>[343]     | 6.05<br>[238]     | 8.10<br>[319]     | 3.15<br>[124]    | 2.80<br>[110]    | 2.07<br>[81.5]   | 1.96<br>[77.2]  | 0.77<br>[30.3] | 0.49<br>[19.3] |
| Output at stroke ends<br>mV/V (*)                         | 43.5              | 60.5              | 202.5             | 157.5            | 280              | 517.5            | 980             | 770            | 980            |
| Phase shift                                               | +38°              | +20°              | +21°              | +8°              | +5°              | +7°              | +7°             | -1°            | -15°           |
| Input impedance<br>(PRIMARY)                              | 84Ω               | 165Ω              | 238Ω              | 419Ω             | 400Ω             | 345Ω             | 264Ω            | 155Ω           | 504Ω           |
| Output impedance<br>(SECONDARY)                           | 302Ω              | 300Ω              | 485Ω              | 154Ω             | 200Ω             | 420Ω             | 810Ω            | 450Ω           | 1780Ω          |
| Non-linearity                                             | ±% of FR          |                   |                   |                  |                  |                  |                 |                |                |
| @ 50% stroke                                              | 0.20              | 0.10              | 0.15              | 0.15             | 0.15             | 0.15             | 0.15            | 0.20           | /              |
| <b>@100% stroke (max)</b>                                 | <b>0.25</b>       | <b>0.25</b>       | <b>0.25</b>       | <b>0.25</b>      | <b>0.25</b>      | <b>0.25</b>      | <b>0.25</b>     | <b>0.25</b>    | <b>0.50</b>    |
| @125% stroke                                              | 0.30              | 0.35              | 0.25              | 0.35             | 0.25             | 0.35             | 0.30 (**)       | 0.50           | /              |
| @150% stroke                                              | 0.40              | 0.35              | 0.30              | 0.50             | 0.30             | 0.50 (**)        | 0.75 (**)       | /              | /              |
| Null voltage (max.)                                       | 2.5% FRO          | 1.0% FRO          | 0.5% of FRO       |                  |                  |                  |                 |                |                |

| ELECTRICAL SPECIFICATIONS @ 2.5kHz (standard calibration) |                   |                   |                   |                  |                  |                  |                 |               |               |
|-----------------------------------------------------------|-------------------|-------------------|-------------------|------------------|------------------|------------------|-----------------|---------------|---------------|
| Parameter                                                 | MHR 005           | MHR 010           | MHR 025           | MHR 050          | MHR 100          | MHR 250          | MHR 500         | MHR 1000      | MHR 2000      |
| Stroke range                                              | ±0.005<br>[±0.13] | ±0.010<br>[±0.25] | ±0.025<br>[±0.64] | ±0.05<br>[±1.27] | ±0.10<br>[±2.54] | ±0.25<br>[±6.35] | ±0.5<br>[±12.7] | ±1<br>[±25.4] | ±2<br>[±50.8] |
| Sensitivity V/V/in<br>[mV/V/mm]                           | 3.19<br>[126]     | 3.36<br>[132]     | 4.36<br>[172]     | 2.55<br>[100]    | 2.40<br>[94]     | 1.73<br>[68]     | 1.60<br>[63]    | 0.70<br>[27]  | 0.47<br>[19]  |
| Output at stroke ends,<br>mV/V (*)                        | 16                | 33.6              | 109               | 127.5            | 240              | 432.5            | 800             | 700           | 940           |
| Phase shift                                               | +73°              | +59°              | +58°              | +36°             | +30°             | +33°             | +23°            | +6°           | +3°           |
| Input impedance<br>(PRIMARY)                              | 59Ω               | 78Ω               | 116Ω              | 141Ω             | 135Ω             | 147Ω             | 145Ω            | 100Ω          | 304Ω          |
| Output impedance<br>(SECONDARY)                           | 260Ω              | 192Ω              | 286Ω              | 90Ω              | 125Ω             | 268Ω             | 445Ω            | 370Ω          | 13620Ω        |
| Non-linearity                                             | ±% of FR          |                   |                   |                  |                  |                  |                 |               |               |
| @ 50% stroke                                              | 0.20              | 0.10              | 0.15              | 0.15             | 0.15             | 0.15             | 0.15            | 0.20          | /             |
| <b>@100% stroke (max)</b>                                 | <b>0.25</b>       | <b>0.25</b>       | <b>0.25</b>       | <b>0.25</b>      | <b>0.25</b>      | <b>0.25</b>      | <b>0.25</b>     | <b>0.25</b>   | <b>0.25</b>   |
| @125% stroke                                              | 0.30              | 0.35              | 0.25              | 0.35             | 0.25             | 0.35             | 0.30 (**)       | 0.50          | /             |
| @150% stroke                                              | 0.40              | 0.35              | 0.30              | 0.50             | 0.30             | 0.50 (**)        | 0.75 (**)       | /             | /             |
| Null voltage (max)                                        | 3% FRO            | 1.5% FRO          | 0.5% of FRO       |                  |                  |                  |                 |               |               |

(\*) Unit for output at stroke ends is millivolt per volt of input voltage

(\*\*) Requires special reduced core length

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Miniature General Purpose AC LVDT

| ENVIRONMENTAL SPECIFICATIONS & MATERIALS |                                                                                                             |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| Operating temperature                    | -65°F to +300°F [-55°C to 150°C]                                                                            |
| Shock survival                           | 1,000 g (11ms half-sine)                                                                                    |
| Vibration tolerance                      | 20 g up to 2KHz                                                                                             |
| Housing material                         | AISI 400 Series stainless steel                                                                             |
| Electrical connection                    | Six lead-wires, 32 AWG stranded Copper, PTFE insulated, 1 foot [0.3m] long ( <i>longer wires optional</i> ) |
| IEC 60529 rating                         | IP61                                                                                                        |

### Notes:

*All values are nominal unless otherwise noted*

*Electrical specifications are for the test frequency indicated in the table*

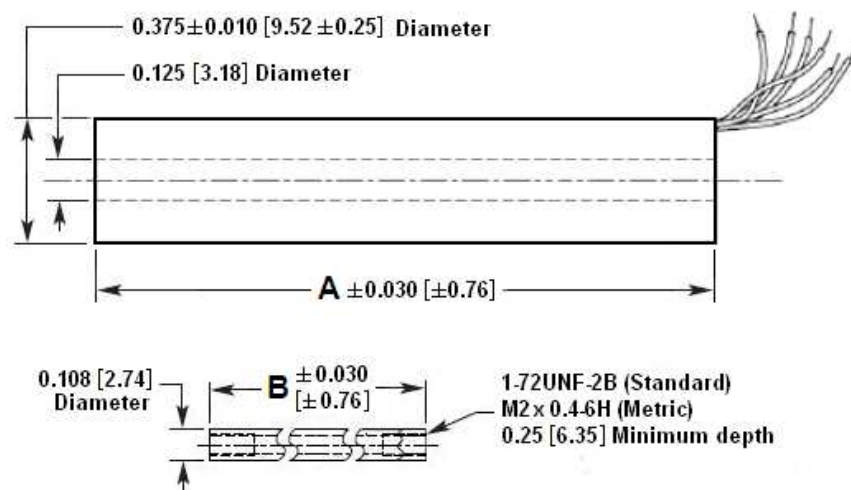
*Dimensions are in inch [mm] unless otherwise noted*

*FR: Full Range is the stroke range, end to end; FR=2xS for  $\pm S$  stroke range*

*FRO (Full Range Output): Algebraic difference in outputs measured at the ends of the range*

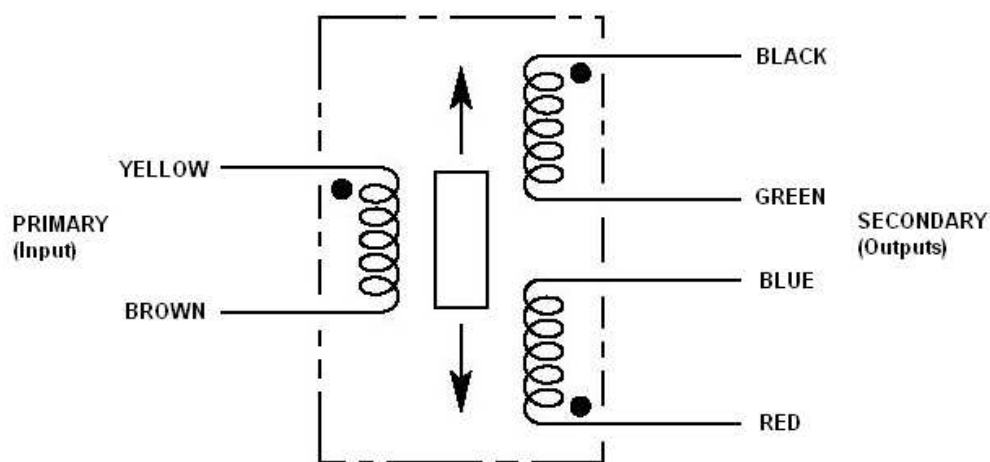
## MECHANICAL SPECIFICATIONS

| Parameter             | MHR 005        | MHR 010         | MHR 025         | MHR 050         | MHR 100         | MHR 250         | MHR 500          | MHR 1000         | MHR 2000         |
|-----------------------|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|------------------|
| Body length "A"       | 0.375<br>[9.5] | 0.535<br>[13.6] | 0.660<br>[16.8] | 0.815<br>[20.7] | 0.990<br>[25.1] | 1.850<br>[47.0] | 3.300<br>[83.82] | 5.600<br>[142.2] | 8.000<br>[203.2] |
| Core length "B"       | 0.180<br>[4.6] | 0.233<br>[5.9]  | 0.400<br>[10.2] | 0.500<br>[12.7] | 0.625<br>[15.9] | 1.125<br>[28.6] | 2.000<br>[50.8]  | 3.000<br>[76.2]  | 3.00<br>[76.2]   |
| Body weight oz<br>[g] | 0.07<br>[2]    | 0.11<br>[3]     | 0.18<br>[5]     | 0.21<br>[6]     | 0.21<br>[6]     | 0.32<br>[9]     | 0.60<br>[17]     | 0.92<br>[26]     | 1.4<br>[40]      |
| Core weight oz<br>[g] | 0.004<br>[0.1] | 0.007<br>[0.2]  | 0.016<br>[0.5]  | 0.016<br>[0.5]  | 0.025<br>[0.7]  | 0.032<br>[0.9]  | 0.056<br>[1.6]   | 0.088<br>[2.5]   | 0.088<br>[2.5]   |



*Dimensions are in inch [mm]*

## WIRING INFORMATION



Connect Blue to Green for differential output

## ORDERING INFORMATION

| Description      | Model   | Part Number  |
|------------------|---------|--------------|
| ±0.005 inch LVDT | MHR 005 | 02560405-000 |
| ±0.010 inch LVDT | MHR 010 | 02560406-000 |
| ±0.025 inch LVDT | MHR 025 | 02560407-000 |
| ±0.05 inch LVDT  | MHR 050 | 02560408-000 |
| ±0.10 inch LVDT  | MHR 100 | 02560409-000 |

| Description     | Model    | Part Number  |
|-----------------|----------|--------------|
| ±0.25 inch LVDT | MHR 250  | 02560410-000 |
| ±0.5 inch LVDT  | MHR 500  | 02560411-000 |
| ±1 inch LVDT    | MHR 1000 | 02560412-000 |
| ±2 inch LVDT    | MHR 2000 | 02561033-000 |

| OPTIONS                 |                 |              |
|-------------------------|-----------------|--------------|
| 5.0 kHz calibration     |                 | XXXXXXXX-002 |
| 10 kHz calibration      |                 | XXXXXXXX-003 |
| Metric threaded core    |                 | XXXXXXXX-006 |
| 10 foot long lead-wires | Consult factory | XXXXXXXX-040 |

**Note:** Add multiple option dash numbers together to determine proper ordering suffix

Example: MHR 1000, ±1 inch, with 5 kHz calibration and metric threaded core, P/N 02560412-008

| ACCESSORIES                                                |              |
|------------------------------------------------------------|--------------|
| Core connecting rod, 6 inches long, 1-72 threads           | 05282945-006 |
| Core connecting rod, 12 inches long, 1-72 threads          | 05282945-012 |
| Core connecting rod, 24 inches long, 1-72 threads          | 05282945-024 |
| Core connecting rod, 36 inches long, 1-72 threads          | 05282945-036 |
| Core connecting rod, 6 inches long, M2x0.4 metric threads  | 05282976-006 |
| Core connecting rod, 12 inches long, M2x0.4 metric threads | 05282976-012 |
| Mounting block                                             | 04560954-000 |

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Miniature General Purpose AC LVDT

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