APPLICATION NOTES

MODEL: MLY Torque Transducer
RANGE: ± YY mN•m
SERIAL: XXXX
Calibration Constant - ZZ.ZZ mV/mN•m

MAGNOVA, Inc. Pittsfield, MA 01201

Transducer - Mechanical Considerations

MLY transducers are installed in such a manner as to couple the torque from a driving device to a driven device. While the customary arrangement is for in-line torque transmission, MLY transducers also accommodate offset arrangements utilizing gears, pulleys, linkages, etc. There are no orientation restrictions, nor is there a preference for which shaft end is coupled to the driving or driven device. This allows the cable exit to fall on either side of the transducer.

Threaded holes in the bottom of the case provide for rigid mounting. *Mounting screws (preferably of non-magnetic material, e.g., stainless steel, titanium, brass) should not penetrate more than 0.22 inches (5.5 mm).* In-line torque transmission with a rigidly mounted case *requires* the use of flexible couplings or universal joints at *both* shaft ends. Such coupling means compensate for (small) angular and radial misalignments between coupled shafts without excessively loading support bearings. Some axial compliance is also necessary to accommodate dimensional variations associated with changing operating temperatures.

MLY transducers may also be supported by their shafts. Such "floating" arrangements *require* a rigid coupling at *one shaft end* and a flexible coupling at the other end. Either end may be the driver. Although the torque on the case is very small (arising from the inevitable internal friction and lubricant viscosity of the bearings) case rotation should be prevented by a *non binding* restraint. Common practice is to install a rod (preferably of non-magnetic material) having a 5-40 threaded end (with locknut) into the center hole in the bottom of the transducer case. This extension is allowed to bear freely against a fixed surface (either of two surfaces for rotation in both directions). A strap, wire, spring, or other flaccid member attached to the bottom of the transducer case may also be used. *The cable alone should not be used to prevent case rotation.*

For maximum dynamic response, the coupling means at both ends should be torsionally rigid and have low moments of inertia. For high speed operation, any hardware attached to the shaft should be close fitting and dynamically balanced. Set screws should have plastic (nylon) or brass tips to

prevent marring the stainless steel shafts. Clamp type attachments are preferred. For permanent attachment of couplings or shaft diameter adapters, adhesive bonding is satisfactory.

CAUTION: *Low range torque transducers are easily overloaded to damaging extents during installation. When tightening (or loosening) set screws or clamp screws, take care to hold the device being attached to the shaft (not the transducer case) in order to avoid applying torque to the transducer shaft. This caution is especially important when tightening the fasteners on a coupling device after the other shaft end is already coupled.*

Transducer - Electrical

Basic MLY transducers contain only 5.0 V internal regulators and associated filter capacitors. The output connections come directly from each of two Hall effect integrated circuits. Each output lead is at a nominal potential of 2.5 V above the power supply negative source. The transducer may be powered from any well filtered 8-18 Vdc source. Typical current requirement is 15 mA, rising as needed to drive low impedance loads.

The Hall cells present significant wide band noise. For many applications, e.g., analog or digital readout of torque, torque vs time, or torque vs other variable plots, closed loop controllers, etc., the presence of this noise is rarely troublesome. When viewing dynamic torque events on an oscilloscope, a low pass filter (an RC circuit is often sufficient) is recommended to block noise components above the maximum signal frequency of interest. Since inertia and compliance in the overall drive train typically limit mechanical bandwidth to well under 1 kHz, low pass filtering is usually effective. More complex filtering either by hardware or software may be required to maximize attainable bandwidth.

Electrical connections utilize the following conductor color codes:

Connection Type	**Power (+)**	**Power (–)**	**Output (+)***	**Output (–)**
Pigtail Leads	White	Green	Yellow	Brown
Attached Cable	White	Green	Yellow	Brown
Connector/Cable	Brown	Blue	White	Black

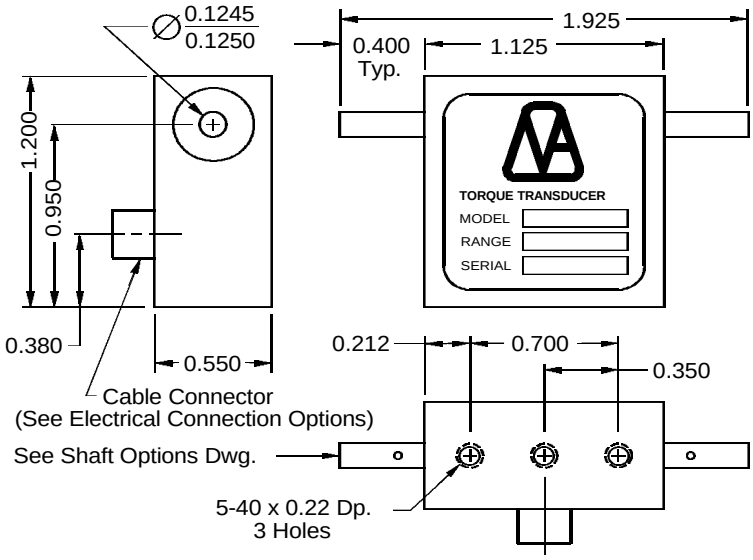
(*Positive output for Clockwise torque)
CAUTION: *Use care in wiring! Wrong connections can cause non repairable damage.*

Operation

The output signal under zero torque conditions may change with variations in ambient magnetic fields. Zero offset compensation should therefore be made *after* the transducer is installed. If the ambient field is sufficiently intense to change the zero torque signal more than 10 mV, the transducer may need to be torque cycled before a stable zero torque signal is achieved. Zero offsets up to 25% of the transducer range have no significant effect on the calibration constant.

Consult the factory if operation in regions having strong magnetic fields is anticipated. In general it is recommended to not bring magnets or magnetized tools close enough to touch the transducer case, bearings, or shaft.

Transducer - Dimensions



METER ASSEMBLY

The Meter Assembly is a modified Newport INFCP Infinity C Process Panel Meter. Modifications include a prewired power cord and plug, an On-Off switch, and a bulkhead connector for mating with the mini DIN plug at the end of the transducer cable. The case has also been fitted with a foldable bail to allow the instrument to stand at a convenient viewing angle. (If desired, the instrument can be panel mounted using the hardware provided. Removal of the bail and appropriate changes to the physical location of the electrical connections will also need to be made. Consult the factory if these changes are to be made.)

This Meter Assembly has additional capabilities in addition to serving as a display instrument for the transducer. These are described in the accompanying *Operator's Manual* for this instrument. Should it be desired to utilize any of these features, such as the analog output, or the internal relays and set points, it will be necessary to familiarize oneself with this manual.

The On-Off switch is an alternating position push button. The button will stay in the depresssed position when first pushed; the next push will cause it to release, etc.

Start-up

After connecting the transducer to the Meter Assembly, the plug on the power cord of the Meter Assembly should be inserted into a wall outlet supplying nominally 115 Vac at 60 Hz. The equipment is turned on by depressing the ***Red*** power switch located on the top rear panel. The meter should display **RST**, then **PROC** and then a number. Ideally, if no torque is being applied to the transducer, this number should be **0** (with a plus or minus sign) If the number displayed is other than **0**, depressing the **>/TARE** button in the bottom center of the front panel will cause the display to show **0** (even if a torque is applied). Application of clockwise torque to the transducer

will cause positive numbers to be displayed; counterclockwise torques will cause negative numbers to be displayed; the numbers representing the applied torque in units of milliNewton•meters.

The transducer and Meter Assembly have been calibrated at the factory as a complete torque measuring unit. Unless severely overloaded (more than 200% of rated torque) or abusively handled, the calibration should remain stable throughout many years of use. The equipment may be recalibrated at the factory, at an independent calibrating facility, or by the owner as, and if, deemed necessary. Since, when originally shipped the equipment had maximum combined errors from non-linearity, hysteresis and non-repeatability of less than 1% of the full range of the transducer, proper calibration will require the use of torque determining apparatus known to have substantially higher accuracy relative to each of these error sources.

If recalibration is to be undertaken by the owner, it will be necessary to carefully follow the instructions on pages 27-28 in the Meter Assembly *Owner's Manual*. It should be understood that the "known load" referred to in step 1 on page 27 of "approximately 0% of the transducer range" is to be the *counterclockwise* rated range of the transducer For example, if the rated range of the transducer is 25 mN•m, a *counterclockwise* torque of 25 mN•m should be applied to the transducer during steps 1 thru 6 on page 27. Pressing the >/**TARE** as indicated in step 7, should result in a display of **-25.0**, with the minus sign flashing. The display can be made to read **-25.0** by following steps 8-10 on pages 27-28. (Steps 8-10 and 15-18 may also be used to change the display to read in other torque units.)

CAUTION: *It is strongly advised that the user avoid accessing* **MENU** *items* **RD.S.O**., **IN 1**, **RD 1**, **IN-2** and **RD-2** *except with the intent to recalibrate the instrument.*