GEMCO®

Series 950MD

Protective Housing for Rod Style Linear Transducers

Ordering Guide and Technical Information

950MD

Designed to protect Linear Displacement Transducers

- **All Stainless Steel Construction**
- **Simplifies mounting and serviceability**
- **Reduces Downtime**

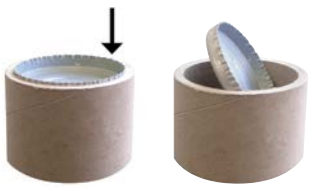
AMETEK®
FACTORY AUTOMATION

Contents

NOTE: Ametek has checked the accuracy of this manual at the time it was approved for printing. This manual may not provide all possible ways of installing and maintaining the 950MD Mill Duty Housing. Any errors or additional possibilities to the installation and maintenance of the LDT will be added in subsequent editions. Comments for the improvement of this manual are welcome.

Unpacking
Carefully remove the contents of the shipping carton and check each item on the packing slip before destroying the packing materials. Any damage must be reported to the shipping company. If you do not receive all of the parts, contact Ametek at 800-635-0289 (US and Canada) or 248-435-0700 (International).

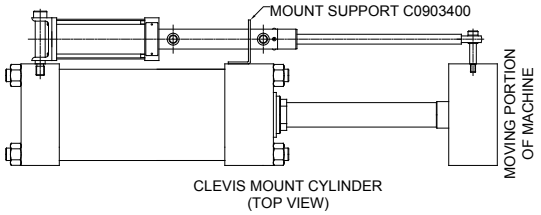
Most housings are shipped in a thick wall cardboard tube. To remove the metal end cap, use a large, flat blade screwdriver or a metal rod and tap on the inner edge of the cap until it pivots. Grab the cap and pull it out. Use caution as the edge of the metal cap may be sharp.



Chapter 1: Series 950MD Mill Duty Housing

The Series 950 Mill-Duty Housing (950MD) was designed for applications where mounting a stand-alone a Magnetostrictive Rod Style Linear Displacement Transducer (LDT) is prohibitive. Potential physical damage, environmental conditions or mounting limitations are all elements that are involved in specifying a linear position feedback system that will perform flawlessly for many years to come. The 950MD housing has been designed to eliminate all the above problems by protecting the linear transducer from physical and environmental damage such as temperature, corrosives, shock & vibration, or dust and debris. Additionally, the 950MD offers a simple two point mounting scheme that can compensate for lateral and/or horizontal movement of the machine while in operation.

The Gemco® 950MD housing is perfect for retrofitting existing hydraulic cylinders with a Linear Displacement Transducer to provide a continuous position feedback signal. The 950MD allows for a convenient way to mount the 950MD and internal linear displacement transducer parallel to the cylinder or equipment in motion. This eliminates the need to tear down and gun drill the cylinder to accommodate a linear transducer, simply for providing position feedback that had not previously been available. The housing may also be of benefit when you have an existing cylinder in operation that does not allow for an easy removal of the linear transducer.



The standard 950MD Housing contains a ½" spherical Front Rod End with approximately ¾" of adjustment (length).

This spherical rod end allows mechanical movement in a horizontal and/or vertical motion to compensate for any mechanical slop or misalignment between the housing and machine. A rear trunnion mount is provided for mounting either directly in front of the head assembly or on the rear of the head. An optional ¾" spherical rod end can be supplied on the rear of the unit (See figure 4-2 for details).

The back cap is supplied with threaded and plugged holes that allow for field installation of the ¾" diameter trunnion mount bracket to the back cap. The trunnion mount bracket is positioned at the point where the head and barrel connect. A simple exchange of hardware is all that is necessary to move the trunnion mount bracket to the back cap and plug the no longer required bracket mounting holes. When ordering the ¾" rear rod end option, the trunnion mount bracket is not supplied since it would not be required. The actuator rod is supported by two bearings within the guide tube. The front piston bearing contains a wiper assembly to keep contaminants from entering the guide tube. The rear, or movable, bearing assembly is manufactured from Rulon®. This high-temperature polymer material provides low wear and smooth operation.

The linear transducer magnet is mounted within the rear bearing assembly. The magnet is our 1" O.D. cylinder magnet (SD0410300). The magnet is positioned 2" from the end of the transducer hex base when the 950MD Mill Duty Housing is fully retracted and at the end of the linear transducers full stroke when the piston is fully extended.

When the 950MD was originally designed, all Linear Transducers had a 2" Null and a 5" Dead Band. Today the Industry standard Null and Dead Bands are 2" and 2.5" respectively. When specifying an LDT to be used in a the 950MD Mill-Duty Housing, you must specify a 2" Null Zone and a 2.5" or 5" Dead Band minimum to ensure mechanical and electrical compatibility. Either Dead band will work with the standard 950MD Housing. Stroke lengths for the 950MD and Linear Transducer should match to ensure that the magnet cannot be stroked off the sensors guide tube.

Due to the fact that the standard Mill-Duty Housing has a mechanical stroke identical to the LDT active stroke, no physical over-stroke exists. If it is possible that the machine the Mill Duty Housing is coupled to, can extend/retract beyond the stroke supplied, damage may occur to the Mill-Duty Housing and possibly to the machine. To compensate for this, we call out fully retracted/fully extended over-stroke dimensions for the Mill-Duty Housing. These values are essentially the additional stroke length added to the Mill- Duty Housing. The reason they are called out separately is to alert the user that when entering these areas, they are out of the LDT active stroke area. If an extended over-stroke is specified, the LDT must be ordered with a Dead Band + X (extended stroke value). If a retracted over-stroke is specified, the LDT must be specified with a Null value of 2" + Y (retract over-stroke value).

The Mill-Duty Housing offers either a conduit entrance for hard wiring directly to the LDT within the head or an external connector and mate. The connector attaches to the LDT inside of the housing via a small pigtail connector within the head.

Chapter 2: Detailed Product Description and Materials of Construction

The 950MD consists of a 304 Stainless Steel body, barrel, piston, head and trunnion mount bracket. The standard Mill-Duty Housing includes the complete housing assembly with provisions to accept a Rod style Linear Transducer. All bolts, nuts and mounting hardware required for a complete installation are included. There are also several optional items available.

The standard ½" diameter rod end with mounting bolt, the ¾" diameter trunnion mounting bolt, and some of the optional MS connectors on the head are the only items that are not Stainless Steel on the standard assembly. This is also true of the optional ¾" diameter front and rear rod ends with their mounting bolts. These rod ends and all mounting bolts can be ordered in Stainless Steel as an option. The 12mm Euro connector options C3 and C4 come standard in Stainless Steel.

The 950MD head cover assembly is removable to allow installation of a rod style Linear Transducer that will screw into the standard ¾"-16 mounting thread. For Linear Transducers with metric mounting threads, as an option, we can offer a metric base that will allow a Linear Transducer with a M18 X 1.5 thread to be installed inside the 950MD Housing.

The standard head cover assembly contains one ½" NPT conduit port for wiring to the LDT. As an option we offer a variety of connector options on the outside cover, these allows for quick disconnect. Use of the optional connector will require that the LDT also have a connector on it in lieu of a potted cable. This will allow for a quick connect at the LDT internally and on the 950MD head externally.

The 950MD head is sealed with O-rings and contains two threaded air purge openings that are plugged at time of shipment, but available for use to air cool the LDT head with filtered and regulated air. By removing the plugs and installing the proper size air fittings, you can cool the head (electronics) for high temperature applications. An optional Barrel Air purge is also available upon request. The optional Vortex air cooler may also be specified for the head and/or barrel or an optional water jacket for AMETEK/Gemco LDT's can be supplied.

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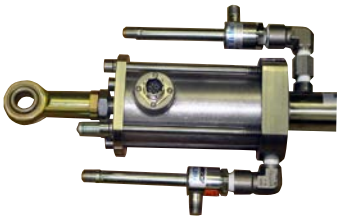
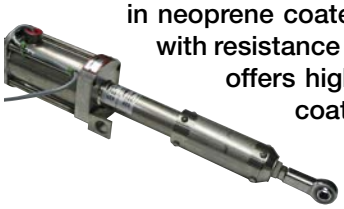
Chapter 3: Optional Items



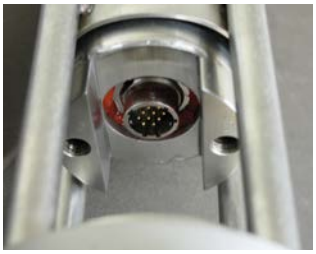
Vortex Air Cooler - The standard 950MD is equipped with air purge ports. In many cases, running clean shop air through the head is sufficient to cool the linear transducers electronics. For severe temperature applications a Vortex Air Cooler may be desired. A Vortex Air Cooler accepts standard shop air (80 - 100 PSIG). The air is ejected through a generator in a Vortex spin chamber where the air stream revolves in a tube at up to 1,000,000 RPM. In simplest terms the inner stream gives off energy in the form of heat to the outer stream and the inner stream exits the opposite end as hot air. The Vortex Cooler is capable of generating air flows as cold as -40° F.

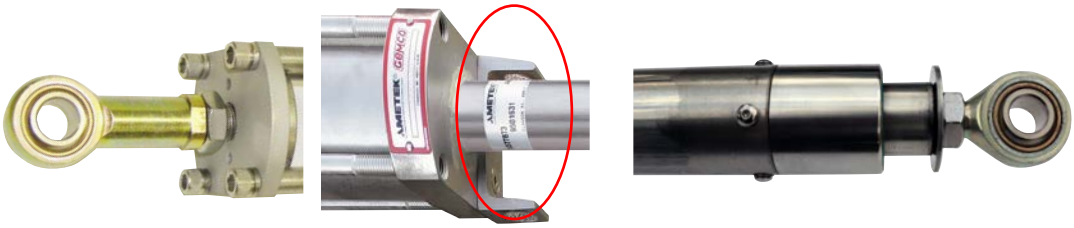
Protective Boots - To give added protection to the actuator rod, protective boots are available. These boots attach between the end of the Mill-Duty guide tube and the end of the actuator rod assembly. The boots are offered in neoprene coated nylon for most standard applications. They offer -60° F to 250° F operating range with resistance to water and oil. Also available, silicone coated fiberglass offers high temperature resistance from -100° F to 550° F; Teflon-coated fiberglass offers -100° F to 500° F operating range with a high degree of corrosion resistance and optional stainless steel boots for rugged applications.



Water-Cooled Head Assemblies - In applications where extreme temperatures are present and air cooling is not appropriate, water-cooled head assemblies are available. Cooling jackets within the head assembly allow water to flow around the electronics.

Front and Rear Mount Spherical Rod Ends – The Housing comes standard with a ½" Front Rod End and Rear ¾" Trunnion bracket for mounting. In applications where two spherical rod ends are desired, we offer an optional ¾" Rear mount spherical rod end. The ¾" rear rod end attaches to a threaded bolt extending from the rear of the housing, there is also an optional ¾"" front rod end that is available. As a standard the Front and Rear rod ends are made from steel. Stainless steel rod ends are available as an option.





Delrin Liner - Used in longer horizontal applications, typically 60" or longer to prevent wear on the LDT's guide tube as the 950MD housing is stroked. The Delrin liner is installed inside of the 950MD barrel and prevents sag of the LDT's guide tube.

Chapter 4: Dimension Drawings

Standard 950MD

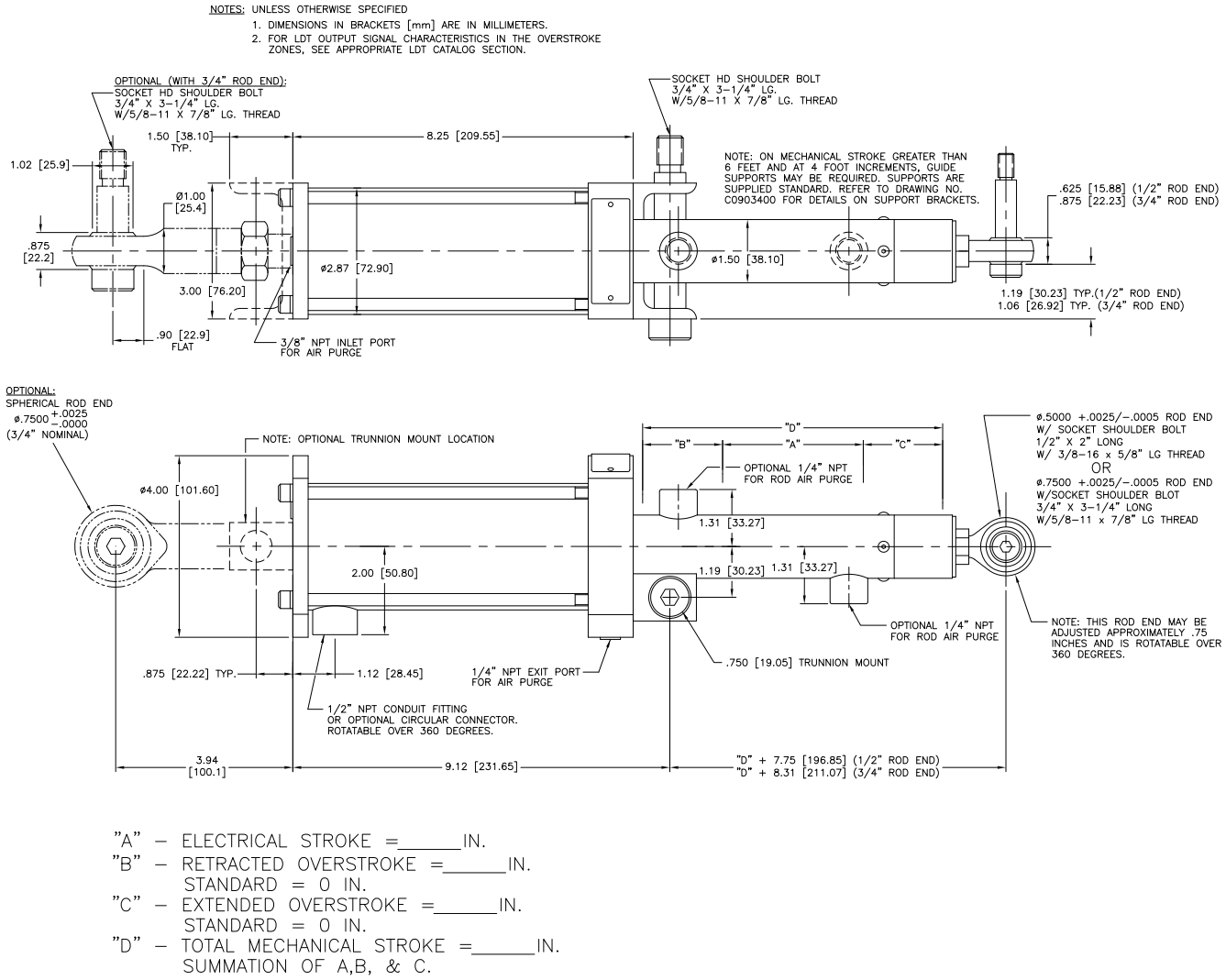


Figure 4:1- Standard 950MD Housing with Front Rod End and Clevis – Drawing D0258200

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Mill-Duty with Rear Mount Spherical Rod End

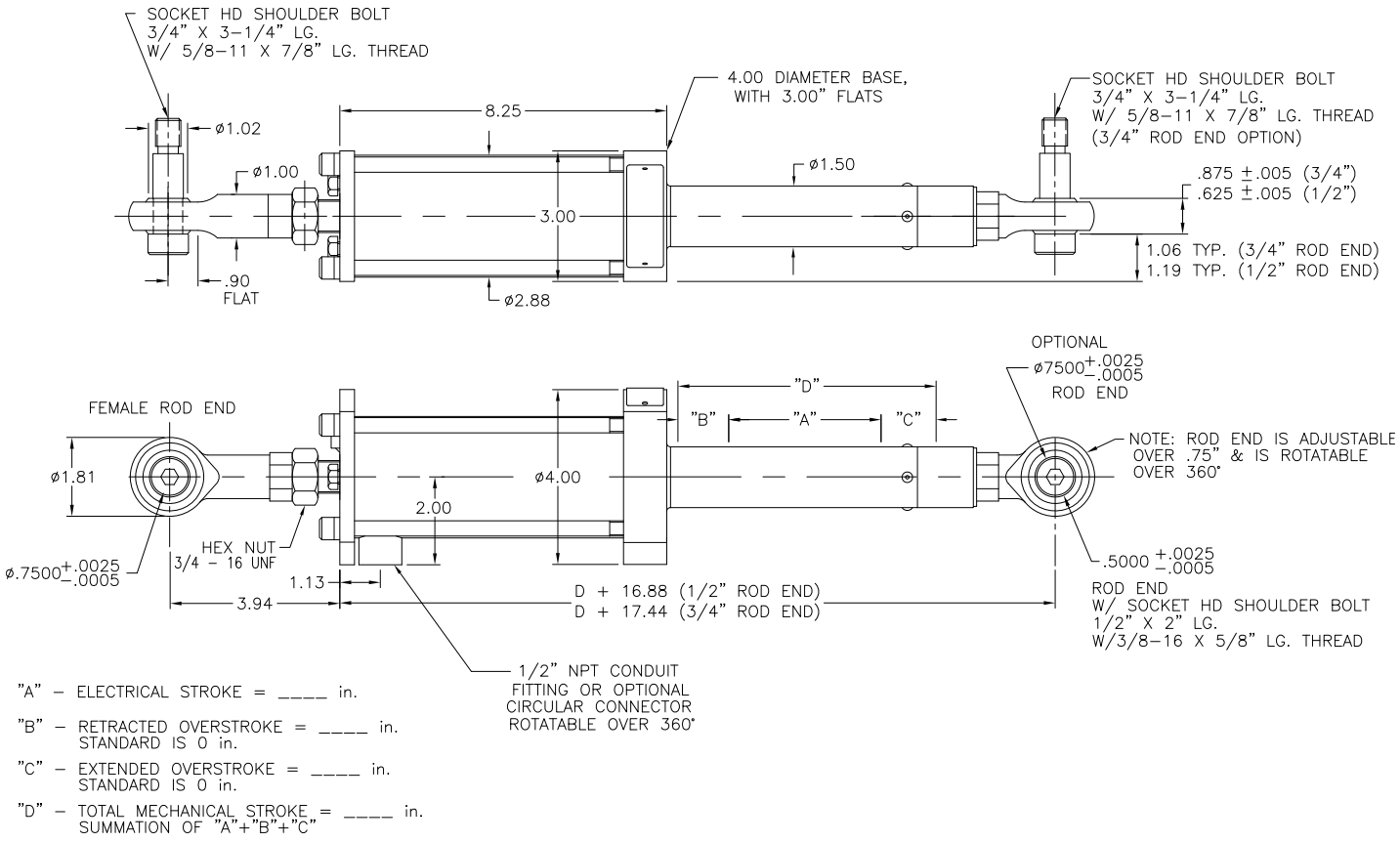

Figure 4:2- Standard 950MD Housing with Front & Rear Rod Ends – Drawing D0231800

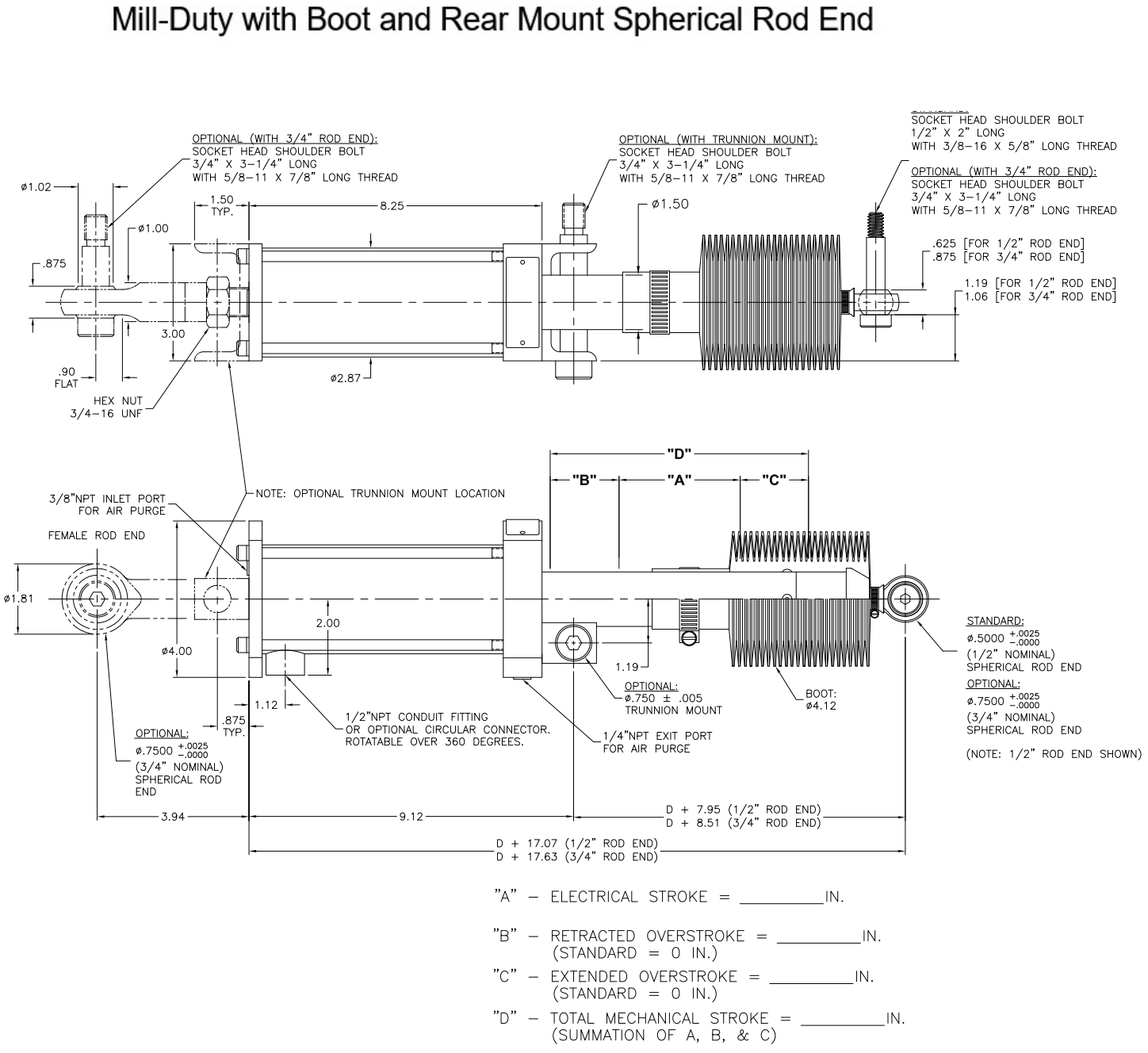

Figure 4:3 – Standard 950MD Housing with Boot and Front & Rear Rod End option – Drawing D0252801

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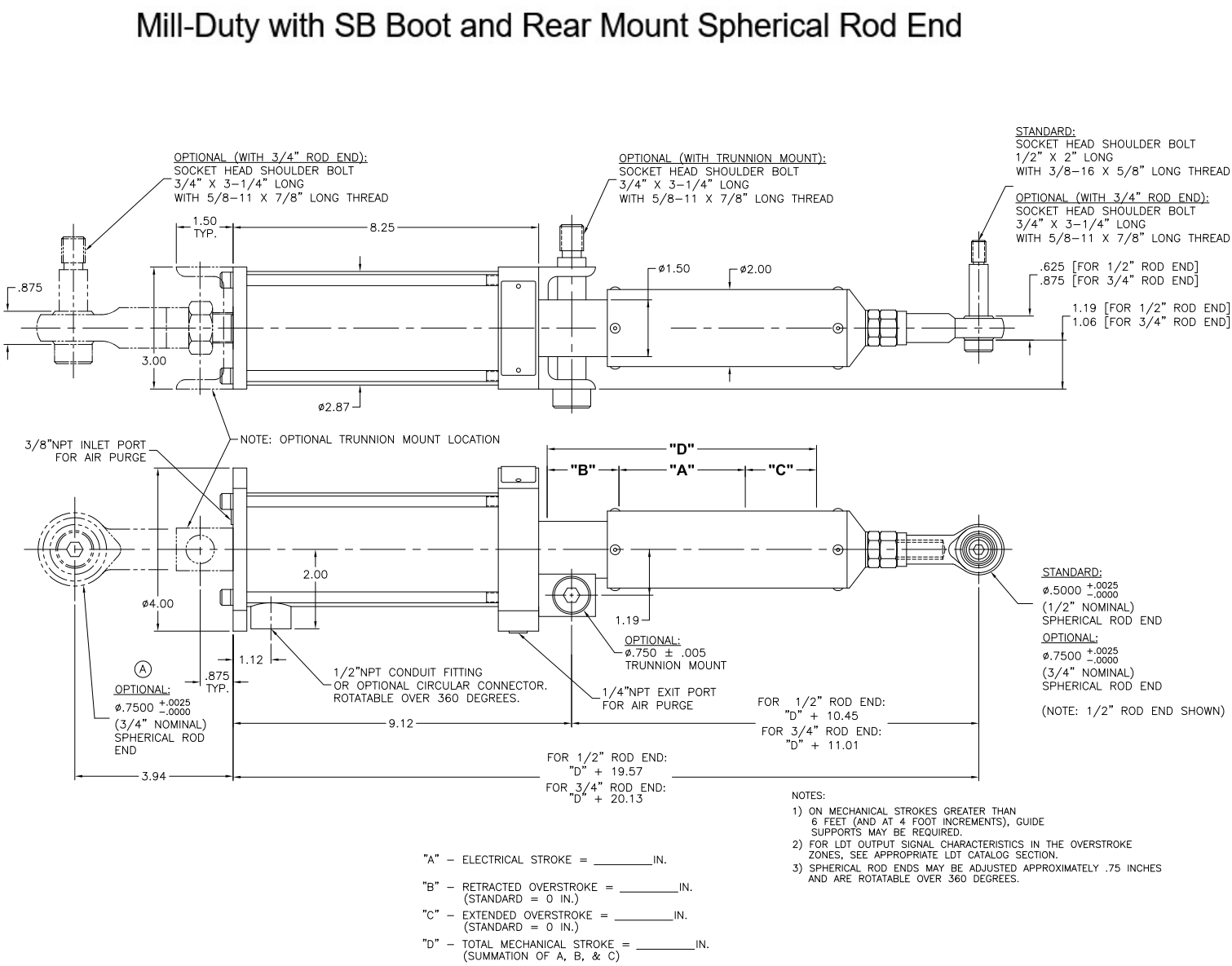

Figure 4:4 – Standard 950MD Housing with Stainless Boot and Front & Rear Rod End options – Drawing D0252800

Mill-Duty for 953N ReadyLink Network LDT

Note: 950MD with option “N” have larger diameter covers with three ¾” NPT conduit entrances

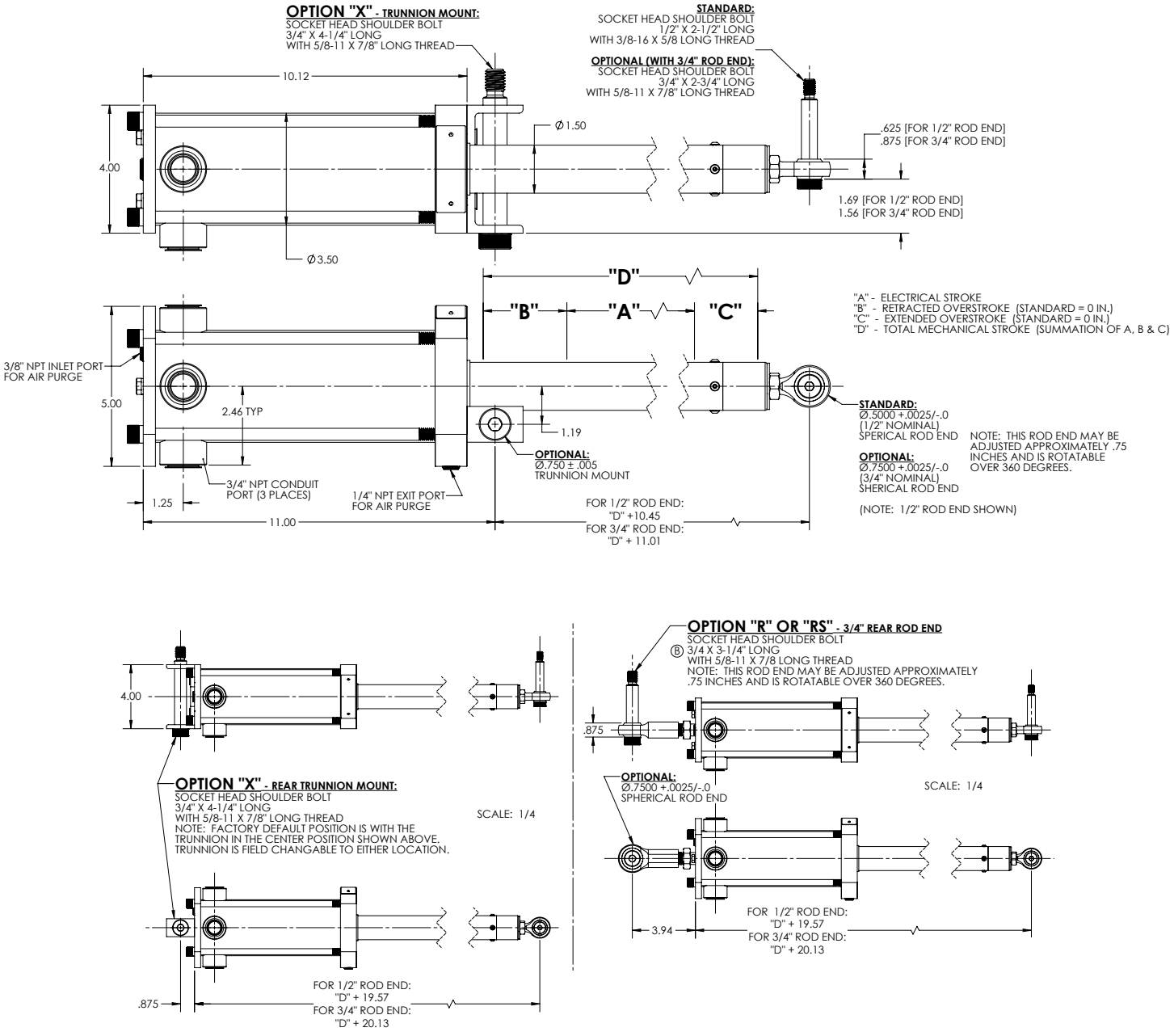

Figure 4:5 – Special 950MD Housing for 953N Network LDT – Clevis Mount with optional Front & Rear Rod Ends – Drawing PD0129400

Note: Designed for Gemco 953 Network LDT.

Mill-Duty for 953N ReadyLink Network LDT – Boot Option

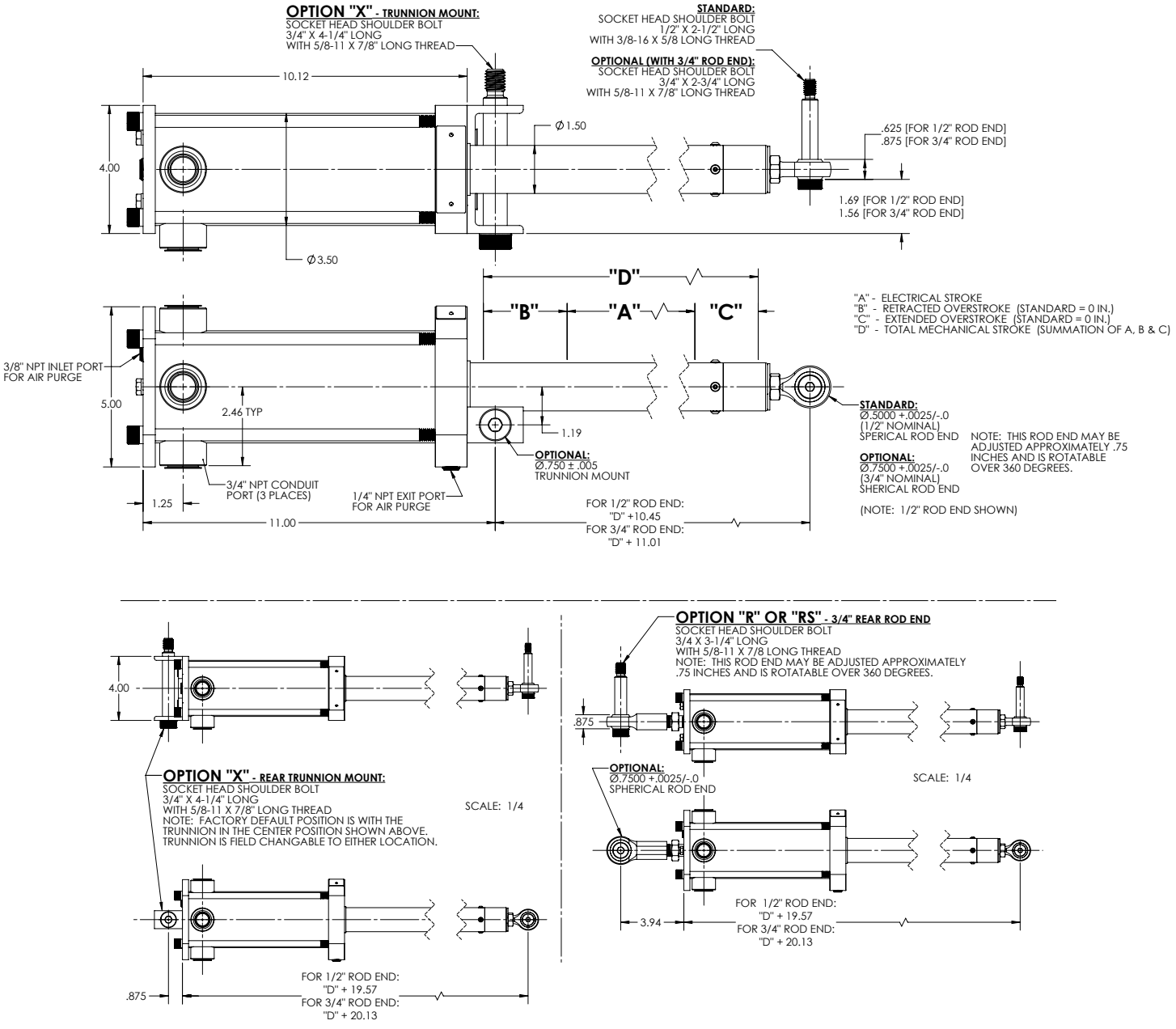

Figure 4:5a – Special 950MD Housing for 953N Network LDT – Protective Boot option - Clevis Mount with optional Front & Rear Rod Ends – Drawing PD0129400

Note: Designed for Gemco 953 Network LDT.

Chapter 5: Mounting Considerations for Hydraulic Cylinders

The following information is intended to aid the user in mounting the Series 950MD to a hydraulic cylinder. The details shown here are only guidelines; because so many possible applications and configurations exist, it is up to the design engineer to determine the exact mounting.

A) Hydraulic Cylinder Mounting Block – In many instances it is not feasible to drill and tap the end cap on cylinders. It is recommended that a tap block be welded to the cylinder end cap. The block should be as parallel to the front mounting surface as possible.

B) Trunnion Mount Socket Head Shoulder Screw – A 3/4" x 3-1/4" shoulder bolt is supplied for trunnion mounting. The shoulder extends approximately 1/4" from the trunnion mount. This extension allows for rotational movement of the trunnion over the shoulder bolt. If a longer distance between the trunnion mount and the interface device is required, a longer shoulder bolt should be used. A pipe with an I.D. slightly larger than the shoulder bolt O.D should be placed over the shoulder bolt between the trunnion mount and the interface device. Leave approximately 1/4" play between the trunnion mount and interface device to accommodate rotational movement.

C) Barrel Support Bracket – Each Mill-Duty housing with a stroke of 6 feet or greater is supplied with barrel support brackets (every 6' Increment). The support brackets operate to keep the barrel from sagging under its own weight. The bracket is configured to support the barrel without greatly restricting side-to-side and up/down movement. The barrel support bracket(s) should be mounted so that the barrel support hole is centered over the barrel. Mounting configurations that put a force load on the tube may affect the operation and longevity of the unit.

D) Front Spherical Rod End – A 1/2" x 2" shoulder bolt is provided to interface with the spherical rod end. The rear trunnion allows for some up/down movement of the Mill-Duty housing while the spherical rod end allows both up/down and side-to-side movement to accommodate for misalignment. The shoulder bolt attaches to the movable portion of the machine that the cylinder is driving. A pipe with an I.D. clearance for a 1/2" shoulder bolt should be placed between the spherical rod end and the interface surface, allowing 1/4" clearance for proper movement.

E) Rear Mount Trunnion (Spherical Rod End) – In cases where the trunnion is to be mounted on the rear of the Mill-Duty housing, most notably with clevis mount cylinders, the following points should be noted; 1) A clevis pin modification needs to be made to allow the rear shoulder bolt to mount to It. This can be as simple as drilling/tapping larger pins or welding a nut to the end of a pin. 2) For best results the trunnion shoulder bolt should be directly centered with the clevis pin. 3) With a rear mount trunnion, the Mill-Duty housing sits farther forward on the cylinder, thus potentially putting the active stroke of the Mill-Duty housing too far forward. Care should be taken when mounting to prevent this situation. An optional rear mount 3/4" spherical rod end is also available. See drawing for mounting considerations.

F) Active Stroke/Mechanical Stroke – The Mill-Duty housing has typically been supplied with a mechanical stroke that is the same as the electrical active stroke of the linear displacement transducer. It is possible to get an additional retract and/or extend over-stroke to accommodate cylinder over-stroke conditions. When mounting the Mill-Duty housing, make sure that there is sufficient clearance when the cylinder is fully retracted and sufficient stroke length on the Mill-Duty housing when the cylinder is fully extended. Otherwise, damage to the Mill-Duty housing and/or the machine could occur.

G) A 1/2" Conduit Fitting is supplied for wiring of the linear displacement transducer. If the Mill-Duty housing will be moving in/out or side-to-side during operation, hard conduit is not recommended. A short length of flexible conduit (approximately 2 feet) connected to a junction box is normally the best method of connection. ***Note: If option "N" Network LDT Housing option is selected, there will be three ¾" NPT conduit entrances.***

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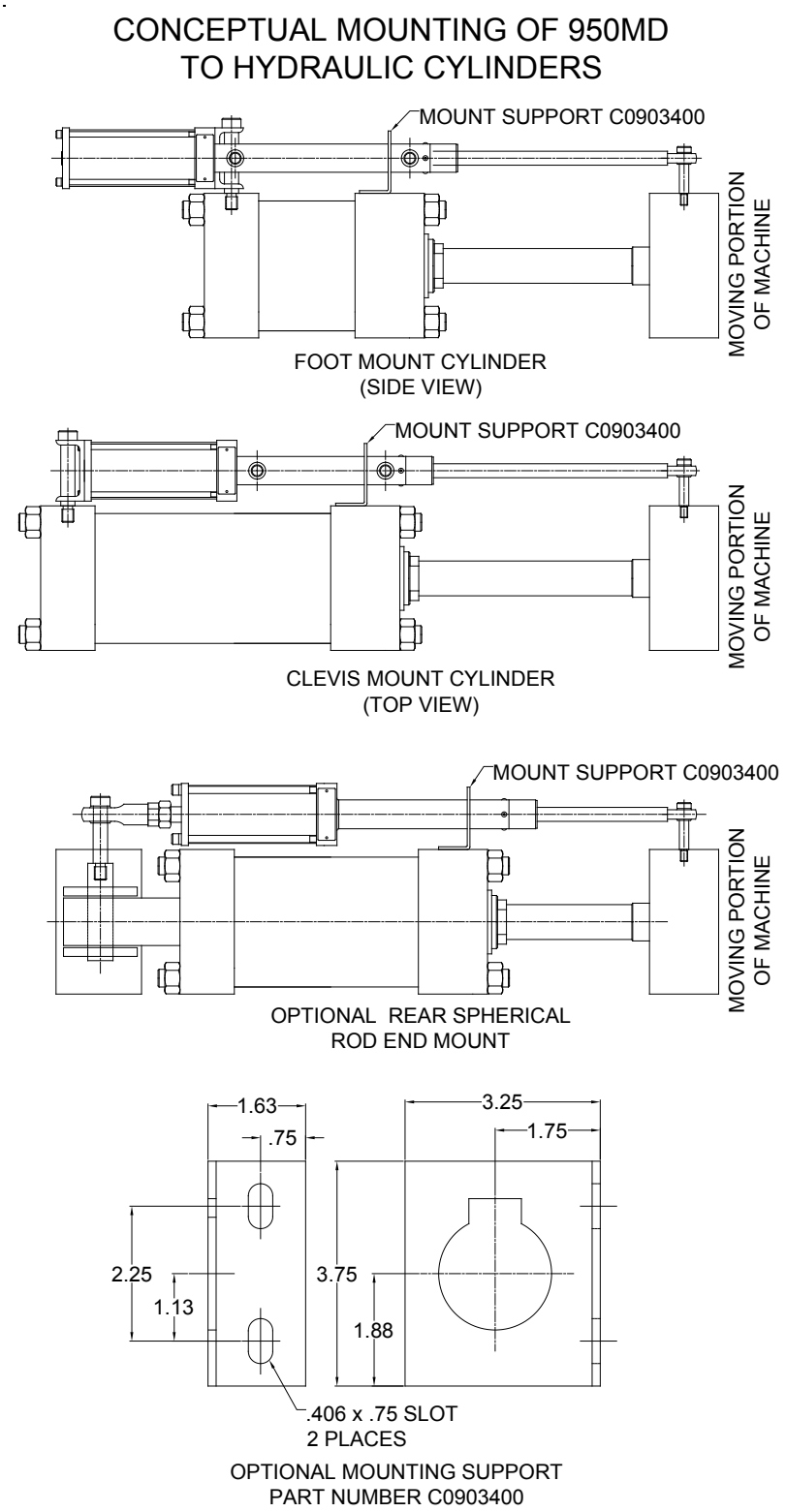

Figure 5.1 – Conceptual Mounting to Hydraulic Cylinders

Chapter 6: Installing the LDT

The 950MD head cover assembly is removable to allow installation of a rod style linear transducer. The 950MD housing comes standard with ¾”-16 x 1.00 mounting thread. An optional Metric thread of M18 X 1.5 can also be supplied upon request. The head cover assembly typically contains a ½” NPT conduit port for wiring to the LDT or optionally an MS connector can be installed for the external wiring. Use of the MS connector will require that the LDT also have a connector on it in lieu of a potted cable.

To install or replace the LDT, remove the four cover shoulder bolts. Remove the end cap and cover. Install the LDT to base. If you have one of the connector options, connect the patch cable to the LDT before re-assembling the 950MD.

Note: Make sure cover is seated against O-ring when assembled.

Connections and Wiring

The 950MD Mill-Duty is only the protective housing. The housing is designed to accept Rod Style Linear transducers. The linear transducer is always ordered separately. The cover assembly must be removed to access the linear transducer. Refer to linear transducers’ manual for wiring details.

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Appendix A: Part Numbering

The 950MD Mill-Duty Housing is a protective stainless-steel housing designed to help protect and simplify mounting of Magnetostrictive rod style linear transducers. The standard 950MD Housing is designed for linear transducers with US ¾"-16 mounting threads. Consult factory for metric mounting thread options.

The 950MD Mill-Duty Housing is only the protective housing, there is always a Linear Transducer installed under the protective cover. The Linear Transducer is always ordered as separate item.

950MD — 12A — 0B — 0C — X — S

Active Stroke in Inches

Determine the "active" stroke to be measured by "A"

Fully Retracted Over-Stroke in Inches

Insert length of retracted over-stroke in inches followed by "B". If no retract over-stroke is required, simply insert "OB"

Fully Extended Over-Stroke in Inches

Insert length of extended over-stroke in inches followed by "C". If no extended over-stroke is required, simply insert "OC"

Connector	
X	Standard 1/2 inch NPT conduit fitting (It is suggested to order a quick discconnect connector on the LDT)
C2	Environmental 10-Pin MS cconnector and mate on side of housing (Designed to be used with Gemco LDT's that have connector option "E". Specify the Gemco LDT to be used withing the body of the order, if the housing being used with a ccompetitive probe, please contact a Customer Service Representative at 800.635.0289
C3	5 Pin, 12mm, Euro Connector on Side of Housing (for 952A or 953A w/connector option S only)
C4	6 Pin, 12 mm, Euro Connector on Side of Housing (for 953D and 953SSI w/connector option S only)
C5A	10 Pin STD - to 953A 5 Pin Euro (Designed for Gemco LDT's with 5-Pin M12 connectors
C5D	10 Pin STD - to 953D 5 Pin Euro (Designed for Gemco LDT's with 5-Pin M12 connectors
NC	No Head Cover on the 950MD Housing
W	Special Head cover for LDT using water cooled jacket. Allows entry and exit of water lines. NOTE: This option does not support connector options. This option relies on the LDT connector option for field wiring.
CGA	Cord Grip Stainless Steel for Cable dia. .19" - .25"
CGB	Cord Grip Stainless Steel for Cable dia. .25" - .31"
CGC	Cord Grip Stainless Steel for Cable dia. .31" - .38"
CGP	Cord Grip Stainless Steel for Cable dia. .1" - .3"

Options	
X	None
V	Vortex air cooler
B1	Protective boot – neoprene coated nylon (-60ºF to +250ºF)
B2	Protective boot – silicone coated fiberglass (-100ºF to +550ºF)
B3	Protective boot – teflon coated fiberglass (100ºF to 500ºF)
R	Rear mount spherical rod end 3/4"
F	Front mount spherical rod end 3/4"
RS	Stainless steel rear mount spherical rod end 3/4" with 304 stainless steel mounting bolt
FS	Stainless steel front mount spherical rod end 3/4" with 304 stainless steel mounting bolt
L	Delrin liner for extended life cycle on longer horizontal applications (used to protect the LDT rod assembly)
SB	304 stainless steel mounting bolt
A	Barrel Air Purge
N	953N Network LDT Housing option. Only supports connector option X. Larger diameter cover with three 3/4" NPT conduit entrances. See dimension drawing PD00129400
NOTE: Consult Factory for Custom Configurations	

Note 1: Guide tube support brackets are supplied as standard for strokes of 72" or greater.
Note 2: Special high temperature, abrasion resistant and oil resistant cables are available. Consult your Customer Service Representative.

Designed for AMETEK / Gemco Linear Transducers. *Consult factory for compatibility with competitive model Linear Transducers.*

950MD Compatibility Guide		
Model	Compatibility	Notes
950IS	Consult Factory	Need 950-1445MD LDT – Longer cover assembly needed for 950IS LDT's
952	Yes	Designed for LDT with 2" Null & 2.5" to 5" Dead Band
953A, D, SSI	Yes	Designed for LDT with 2" Null & 2.5" to 5" Dead Band
953N (Network)	Yes *	* Must select housing option "N" for 953N Network LDT
959CT	Yes	959CT must order with 2" Null and 2.49" Dead Band

Mating Cable Assemblies

The 950MD Mill-Duty Housing is only the protective housing, there is always a Linear Transducer installed under the protective cover. Refer to the linear transducer brochure and manual for the appropriate cabling.

Appendix B: Specifications

General Specifications	
Displacement	1” to 240” in .1” increments
LDT Mounting Threads	3/4”-16 (Standard), Consult Factory for LDT’s with metric threads

Null & Dead Bands (LDT)	
Null	2.0” Designed for Linear Transducers with 2.0” Null bands
Dead	2.5” Designed for Linear Transducers with 2.5” to 5.0” Dead bands

Mechanical Specifications - Housing	
Material - Housing	304 Stainless Steel
Rod Ends	Steel (Plated), Stainless Steel Rod Ends (optional)

Temperature	
Head (Cover Assembly) with LDT installed	-40°C to + 85°C
Guide Tube	-40°C to + 105°C
Storage	-40°C to + 105°C

Ingress Protection	
Protection level	IP65 (per EN 60529)

Connection Options	
5 Pin - M12	5 pin -A-Code (Connector option C3)
6 Pin - M12	6 pin -A-Code (Connector option C4)
10 Pin - MS Style Connector	10 pin MS Style Connector (Connector option C2, C5A, C5D)
1/2” NPT Conduit Entrance x 1	1/2” NPT Conduit Entrance (Connector option “X”)
3/4” NPT Conduit Entrance x 3	3/4” NPT Conduit Entrance - Option “N” Network LDT - Only

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NOTES:

953 VMAX LDT

- Shock resistant to 1000Gs
- Vibration resistant to 30Gs
- Analog outputs, 0-10 VDC, +/-10 VDC, 0-5 VDC, +/-5 VDC, 4-20mA
- Digital output Start/Stop, Control Pulse, and Variable Pulse (PWM)
- SSI (Synchronous Serial Interface) 24, 25, or 26 Bit, Binary or Gray Code, Synchronous or Asynchronous Mode
- Removable cartridge
- IP68 rating
- Stroke length to 300"
- Input power range is 7 to 30 VDC
- Programmable zero and span
- Diagnostic Tri-Color LED

959CT LDT

- Compact Threaded Rod Style LDT
- All Stainless Steel Construction
- Wide variety of Analog Outputs
- Vibration Resistance to 20 Gs
- Shock Resistance to 100 Gs
- Stoke Lengths to 100”
- 16-bit Resolution
- Diagnostics
- IP68 Rating
- Programmable Zero and Span Points

Other Products

B/W Controls™ LIQUID LEVEL TECHNOLOGY

GEMCO

GEMCO
LINEAR DISPLACEMENT TRANSDUCERS
PLC INTERFACE PRODUCTS
ROTARY POSITION PRODUCTS
PROGRAMMABLE LIMIT SWITCHES
EXTREME DUTY CABLE REEL PRODUCTS
ROTARY LIMIT SWITCHES
RESOLVERS
MILL DUTY ENCLOSURES
ULTRA HIGH SPEED PLS
SAFETY PRODUCTS

CATRAC®

Rockwell Automation
Encompass™ Product Partner
Americas • Asia-Pacific

MADE IN AMERICA

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Email: apt.sales@ametek.com
Web: www.ametekfactoryautomation.com

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