ReadyLink™ EtherNet/IP™ LDT with RapidRecall™

Ordering Guide & Technical Information

EtherNet/IP™

EtherNet✓IP™
conformance tested

ABSOLUTE PROCESS CONTROL
KNOW WHERE YOU ARE... REGARDLESS

AMETEK®
FACTORY AUTOMATION

Products include GEMCO® linear and rotary sensors. Our sensors are absolute and never require homing or calibrating in the event of a power loss and are built in the USA to meet global application needs.

The **ReadyLink™ EtherNet/IP™ LDT with RapidRecall™** is our newest linear displacement transducer (LDT) being developed with an EtherNet/IP™ network interface. The Network LDT provides maximum flexibility for installation and ease of use in demanding, high-performance, networked industrial applications. EtherNet/IP™ is an Industrial Ethernet implementation of the Common Industrial Protocol (CIP), managed by the Open DeviceNet Vendor Association (ODVA). EtherNet/IP™ was introduced in 2001 and today is the most developed, proven and complete industrial Ethernet network solution available for manufacturing automation. EtherNet/IP™ systems require only a single point network connection for both configuration and control, thus simplifying installation and wiring.

Our linear displacement transducer line utilizes advanced, proven Magnetostrictive technology to provide highly precise and absolute non-contact position feedback down to 1 micron resolution.   We package these sensors to survive in the most demanding and hostile environments. The position of the magnet on the sensing element is precisely determined by a time of flight method. The LDT converts this position value where it is transmitted to the customer controller via the Ethernet Network.

The AMETEK **ReadyLink™ EtherNet/IP**™ LDT is a smart device; it has a RapidRecall™ Configuration Module to help aid in the configuration of the LDT. This module can also be used to help configure the static IP address of the LDT. The module has three rotary DIP switches that allow the user to configure how the IP address will be assigned. The RapidRecall™ module can also store all user configurations. Once the LDT has been configured, these settings can be uploaded to the module.

The Network LDT is available in two different package styles; the 953N is our Rod Style package that is suitable for installation into hydraulic cylinders and our 957N Brik Low Profile Style package that incorporates the same electronics but is housed in an aluminum style extrusion.

Features
- *RapidRecall™* Configuration Module
- Supports: Star, Line & DLR (Device Level Ring) topology
- Supports Encoder 22h Profile
- 5 status LEDs to monitor functionality of LDT and Network status
- IP address selection flexibility – Providing both local switch & software setting capability
- Setup via web browser – No special configuration software required
- Ability to backup and restore unit configuration in **RapidRecall™** Configuration Module
- Ability to reset unit to factory defaults
- Diagnostics and alarm functionality (web page)
- Status Bits: Position & Velocity out of programmable limits range
- Wide input power operating range (7 – 30VDC) – Standard M12 connector
- IP67 Rated
- Non-contact technology (Magnetostrictive)
- Longevity: Nothing to wear out
- Simplified system wiring

EtherNet/IP™

EtherNet√IP™
conformance tested

Overview

The Network LDT supports Star, Line and Device Level Ring (DLR) topology and supports static IP address setting or DHCP (Dynamic Host Control Protocol). DLR provides device level network rerouting in the event of a break in the ring. The static IP address can be assigned via the network, or the last octet can be set manually via three rotary DIP switches. There are five diagnostic LEDs located on the cover next to the connectors that indicate the status of the LDT and Network communication.

Data is communicated over the Ethernet Network using two types of messaging:
- I/O Messaging (Position, Velocity & Status Bits)
- Explicit Messages (Parameters & Configuration)

I/O Messaging is used for time critical data such as position, velocity and status. Explicit messages are used for configuration data such as position scaling, resolution and count direction, among other parameters. The EtherNet/IP™ Network LDT module conforms to the Encoder device profile device type 22h.

The AMETEK *ReadyLink™ EtherNet/IP*™ LDT with *RapidRecall™* is a smart device; it has a RapidRecall™ Configuration Module to help aid in configuration of the LDT. This module is located on the head assembly of the LDT, next to the connectors. The RapidRecall™ module can be used to help configure the static IP address of the LDT and store all user defined configurations. In the module there are three rotary DIP switches that allow the user to configure how the IP address is assigned as well as other functions. Once the LDT has been configured, these settings can be uploaded to the module. One of the key benefits to uploading the configuration data to the RapidRecall™ module is that if anything was to ever go wrong with the LDT, the RapidRecall™ module with the entire user programmed settings can be removed from the original unit and installed on the replacement unit. With a simple setting of the DIP switches the user configuration settings can be downloaded from the RapidRecall™ module to the new LDT.

The Network LDT has three connectors. The incoming power is supplied via a 4-pin M12-A style connector. The network communication will be through either of the two 4-pin M12-D coded connectors.
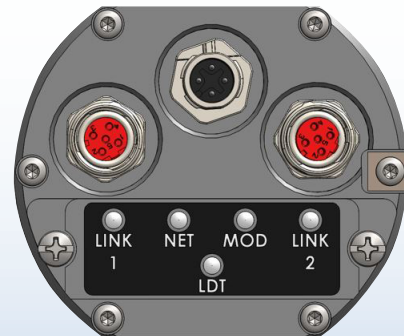
MALE 4 PIN (M12-A) INPUT VOLTAGE

INPUT VOLTAGE		
PIN NUMBER	WIRE COLOR	SUPPLY VOLTAGE
1	BROWN	+24 VDC
2	WHITE	NO CONNECTION
3	BLUE	DC GROUND (FOR SUPPLY)
4	BLACK	NO CONNECTION

FEMALE 4 PIN (M12-D) BUS LINKS 1 AND 2

| BUS CONNECTIONS LINK 1 AND 2		
PIN NUMBER	WIRE COLOR	FUNCTION
1	WHITE/ORANGE	Tx+
2	WHITE/GREEN	Rx+
3	ORANGE	Tx-
4	GREEN	Rx-

Programming the IP Address

There are four ways to program the IP address in the Network LDT:

- Through our IPconfig network utility program
- Through BOOTP/DHCP server
- Through a web browser (DHCP or static IP addressable)
- Through the rotary DIP switches on the *RapidRecall™* Configuration module

*These modes are determined by how the DIP switches are set in the **RapidRecall™** Network Configuration Module.*

STATIC IP ADDRESS SWITCHES

SW1   SW2   SW3
100's   10's   1's
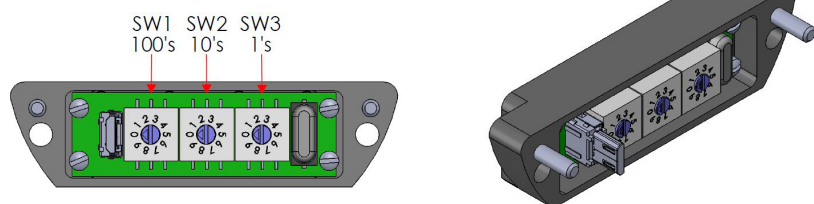
The IPconfig network utility program as well as the EDS files are available on our website *www.ametekfactoryautomation.com*. The network utility program allows the user to detect any AMETEK Network LDT on the network, even if the unit's configuration is outside the host's subnet.
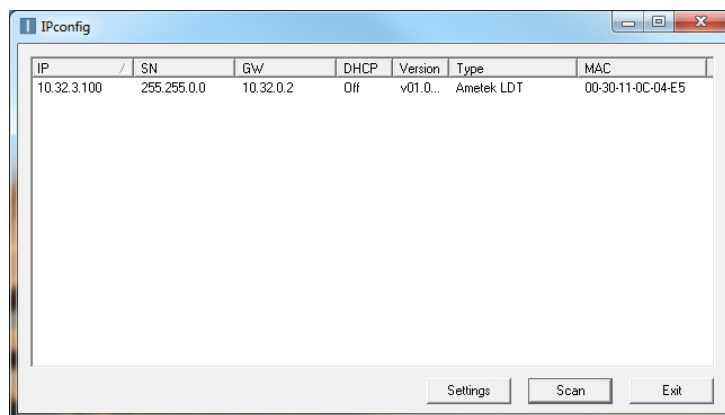
IP Addressing Modes

Static IP Address Selection – *Via Rotary DIP Switches*

DIP Switch Position	Function	IPconfig, BOOTP, Web page Programmability	DHCP	Static IP Address
000	DHCP	No	Enabled	Disabled
001 to 254	Static IP address lower octet value; upper 3 octets from previous setup stored in LDT non-volatile memory	No	Disabled	Enabled
255	Entire Address assigned in LDT non-volatile memory - IP Address 203.078.111.147 (User entered) - On power up, will default to last known IP address or if set for DHCP setting	Yes	Programmable	Programmable

The ReadyLink™ Network LDT is completely configurable and can be set for your specific needs. Parameters such as counting direction, position and velocity format, resolution, zero position, velocity upper and lower end limits as well as position end limits are all programmable.

Absolute Control In The World Of Automation

Features

RapidRecall™ Configuration Module

The RapidRecall™ Configuration Module can be used to help aid in user configuration of the LDT. This module can be used to help configure the static IP address of the LDT. In the module there are three rotary DIP switches that allows users to configure how the IP address is assigned. The Configuration Module can store the user configuration settings. Once the LDT has been configured these settings can be uploaded to the module. One of the key benefits to uploading the configuration data to the Configuration Module is that, if anything was to ever go wrong with the LDT, the module can be removed from the original unit and installed on the replacement unit and the user configuration settings could be restored.

Wide Ranging Power Supply

The Network LDT is designed with a wide ranging input power supply. It can operate anywhere between 7 to 30 volts DC at 2.3 watts of power. With this wide ranging supply the same unit can be used in industrial (24V) or mobile (12V) applications. Another key advantage with the wide ranging supply is that on long cable runs, you typically do not need to worry about voltage drop to the incoming power; therefore eliminating the need for a separate power supply to power the LDT.

Diagnostics and Alarm Functionality

A unique feature built into the Network LDT is its position upper and lower limits as well as velocity upper and lower limits. The user can program values into each of these limits, if the position or velocity of the LDT exceeded these limits, the network LDT will transmit a unique alarm bit for each alarm condition. Providing process alarm condition detection and annunciation based upon position and velocity conditions improves speed of response to defined fault conditions, and prevents the user from having to write ladder logic and tying up process time to monitor these conditions.

Automatic Gain Control

The Network LDT has an auto-tuning capability and automatically compensates for non-standard magnet assemblies or adverse application conditions. The Automatic Gain Control feature automatically searches and finds the magnet on power up. If power is applied without a magnet on the LDT, the LED will turn RED indicating no magnet signal is detected.

Position Update

The position of the magnet along the active measuring range is precisely determined by a time of flight method. The Network LDT converts this position value where it is transmitted to the host controller via the network. All displacement outputs are absolute and do not lose their position after loss of power. Position update frequencies are available up to 1,000 measurements per second (length dependent).

Counting Direction and Resolution

The Network LDT can be configured in a variety of different configurations. Features such as position and velocity parameters are user configurable for increasing or decreasing counts, along with the desired resolution. A forward direction setting will increase counts as the magnet moves from the head of the LDT towards the tip. The default zero position is closest to the head of the LDT but can be user defined at time of set-up to be located anywhere along the active stroke range (Area between Null and Dead Bands). The resolution of the positional output is also configurable and can be set for English (Imperial) or metric units.

Diagnostics

To help aid in troubleshooting, the Network LDT is equipped with four network LEDs and a bi-color LDT status LED. These LEDs are labeled Link1, Net, Mod, Link 2 and LDT. The four top row LEDs will be used to display diagnostics and network status, the bottom row LDT LED is used to display the status of the Linear Transducer. If there is ever a loss of magnet, the LDT LED will turn red and the unit will transmit a position of zero or last valid position (user defined), as well as send a fault message to the network that the unit has lost its signal. A green LDT LED indicates that the magnet is within the sensing range and the LDT is working properly.
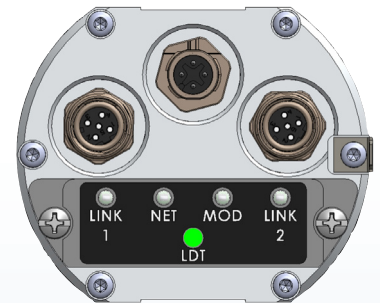
Web Server

To help aid in configuring the units IP address and user settings, there is an internal web server in the Network LDT. These web pages can be used to monitor and configure the Network LDT. The intent of the web pages is to provide nearly the same functionality that exists through the CIP network interface.

The Home web page is loaded when the module's IP address is specified by the users' web browser. The Home page provides an introduction to the module, its capabilities and the modules identification information.

Displayed on the Home page:
- General product and company introduction
- Menu to all other web pages
  - Position & Status
  - Configuration
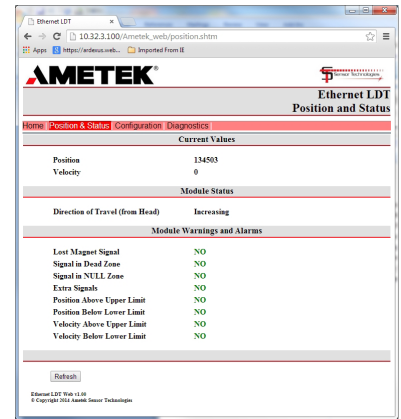 - Diagnostics
- Module Part Number
- Module Serial Number
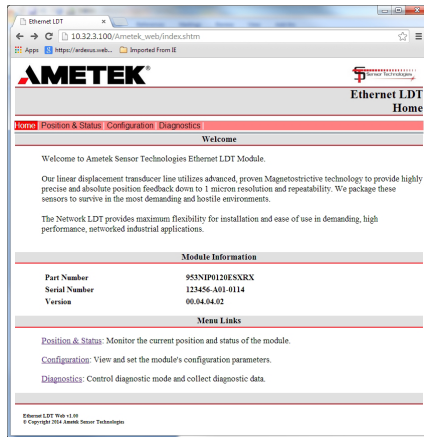
Position Status Page

The Position Status web page displays the current position and status data of the LDT.

Displayed on the Position Status page:
- Position Value
- Velocity Value
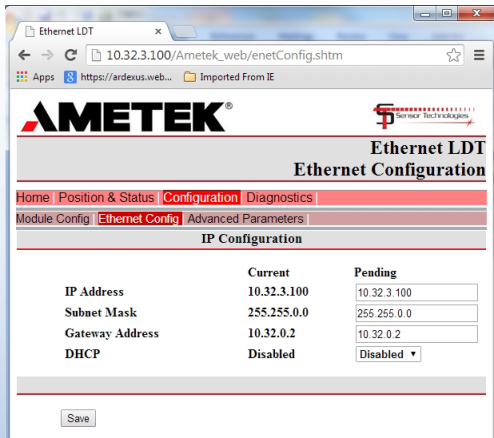- Direction of Travel
- Status and Alarm Flag Status

Ethernet Configuration Page

The Ethernet Configuration web page provides the ability to view and set the Ethernet configuration parameters.

Displayed and settable via the Ethernet Configuration web page:
- IP Address
- Subnet Mask
- Gateway Address
- DHCP Enable

Position Sensor Configuration Page

The Position Sensor Configuration web page provides an interface to view and set the position sensor parameters.

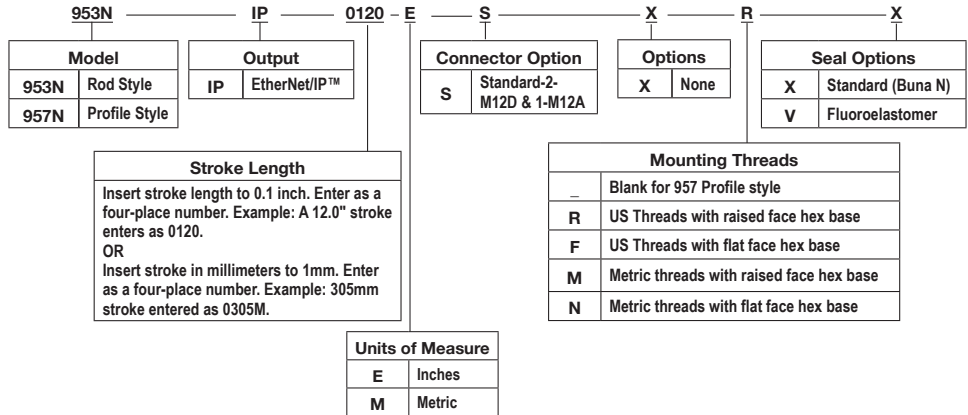Displayed and settable via the Position Sensor Configuration page:
- Counting Direction
- Position Format
- Position Measuring Increment
- Position Filter Type
- Position Low Limit
- Position High Limit
- Velocity Format
- Velocity Filter Type
- Minimum Velocity Setpoint
- Maximum Velocity Setpoint
- Fault Output Type
- Sync Mode
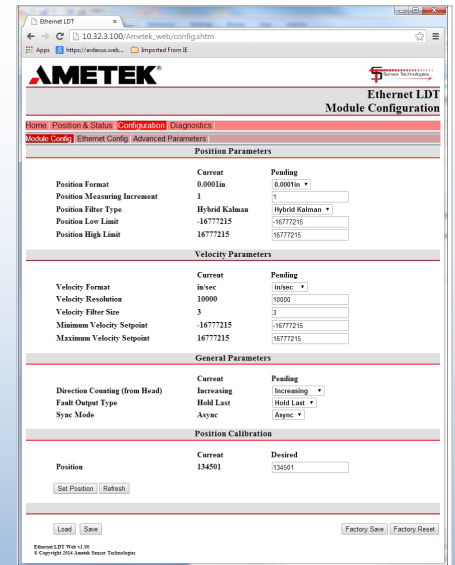
Part Numbering System

The **ReadyLink™ EtherNet/IP™** LDT is available in either the 953 Rod Style package or the 957 Profile Style package. The numbering scheme listed will break down the numbering system for each style. The "Unit of Measure" allows users to select either inches or millimeters (Note: This is only for the active stroke length of the linear transducer. The resolution, direction and counting format are all user defined and can be changed during the configuration set-up process). Since the Rod Style products are typically installed in Hydraulic cylinders the "Mounting Threads Options" field allows users to match the requested thread to that of the cylinder.

The "Seal Option" has two choices: X = Standard Buna N or V = Fluoroelastomer. The best option for an application depends on where the unit is mounted and what chemicals it is exposed to.

953N — IP — 0120 — E — S — X — R — X

Model	
953N	Rod Style
957N	Profile Style

Output	
IP	EtherNet/IP™

Connector Option	
S	Standard-2-M12D & 1-M12A

Options	
X	None

Seal Options	
X	Standard (Buna N)
V	Fluoroelastomer

Stroke Length
Insert stroke length to 0.1 inch. Enter as a four-place number. Example: A 12.0" stroke enters as 0120.
OR
Insert stroke in millimeters to 1mm. Enter as a four-place number. Example: 305mm stroke entered as 0305M.

Units of Measure	
E	Inches
M	Metric

Mounting Threads	
_	Blank for 957 Profile style
R	US Threads with raised face hex base
F	US Threads with flat face hex base
M	Metric threads with raised face hex base
N	Metric threads with flat face hex base

Rod Style

The 953N Rod style transducer is available in stroke lengths form 1" to 300". The transducer is available in English (Imperial) or metric stroke lengths as well as English ¾" x 16 or metric M18 x 1.5 mounting threads.

Magnets are always ordered as a separate line item. Depending on how and where the LDT will be mounted will help to determine which magnet option is best suited for your application.

Rod Style Dimension Drawing (PD-0124400)
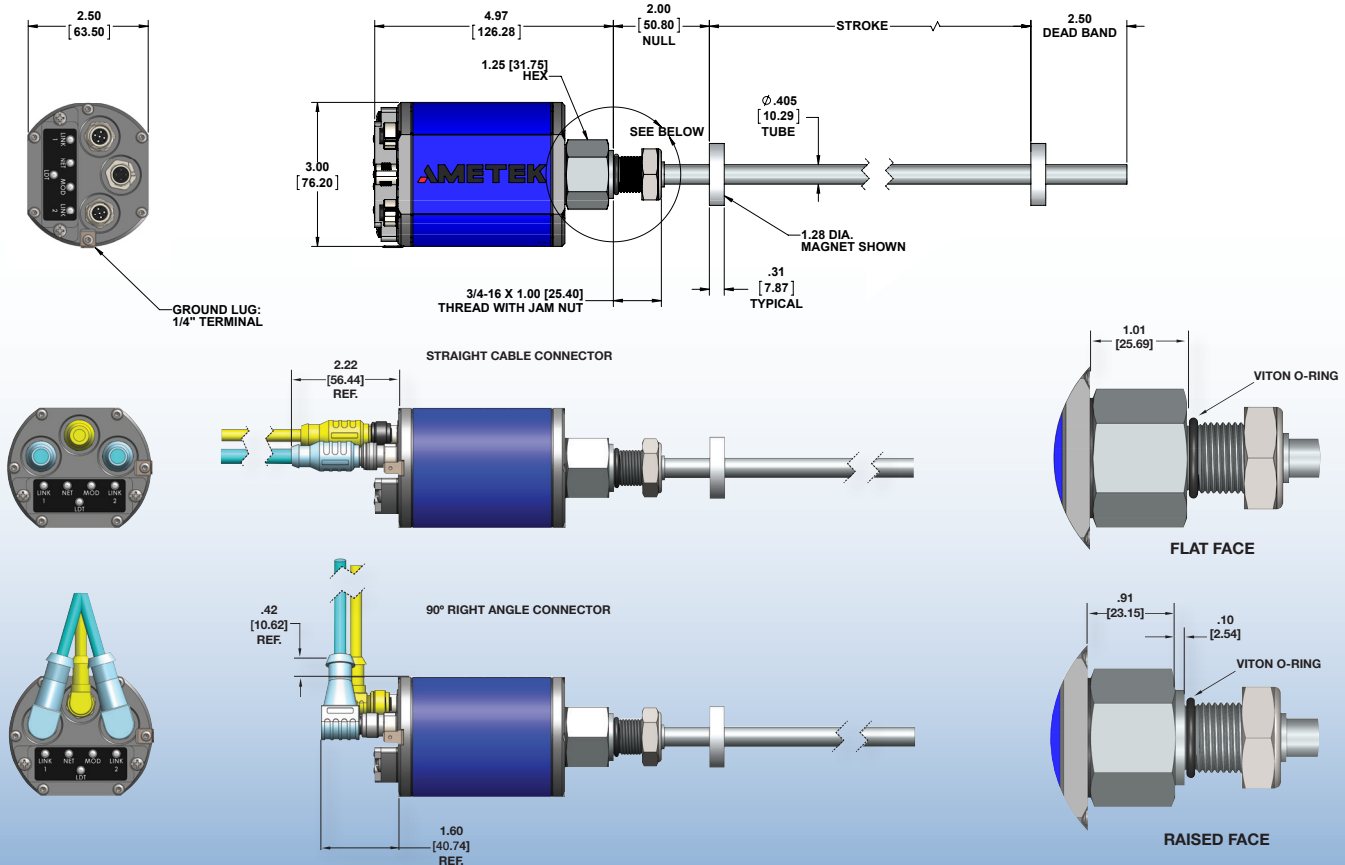
Profile Style

The 957N Profile style transducer is available in stroke lengths form 1" to 180". The transducer can be mounted vertically or horizontally using the SD0522000 mounting foot. The mounting feet slide in the grooves on the lower part of the extrusion and clamp down when tightened.

Magnets are always ordered as a separate line item, choices are our slide magnets or floating magnet assemblies. The slide magnets are made of a self-lubricated high wear polymer Delrin™, and are designed to move effortlessly along the transducer in guide tracks, or for truly non-contact we offer a floating magnet assembly that can be installed up to ¼" above the extrusion. A variety of hardware is available for attaching the slide magnet to the moving portion of the process.

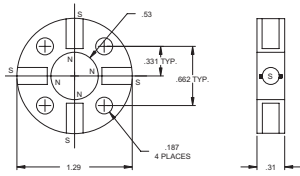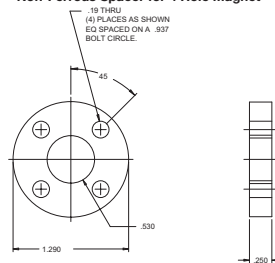### Profile Style Dimension Drawing (PD-0124500)
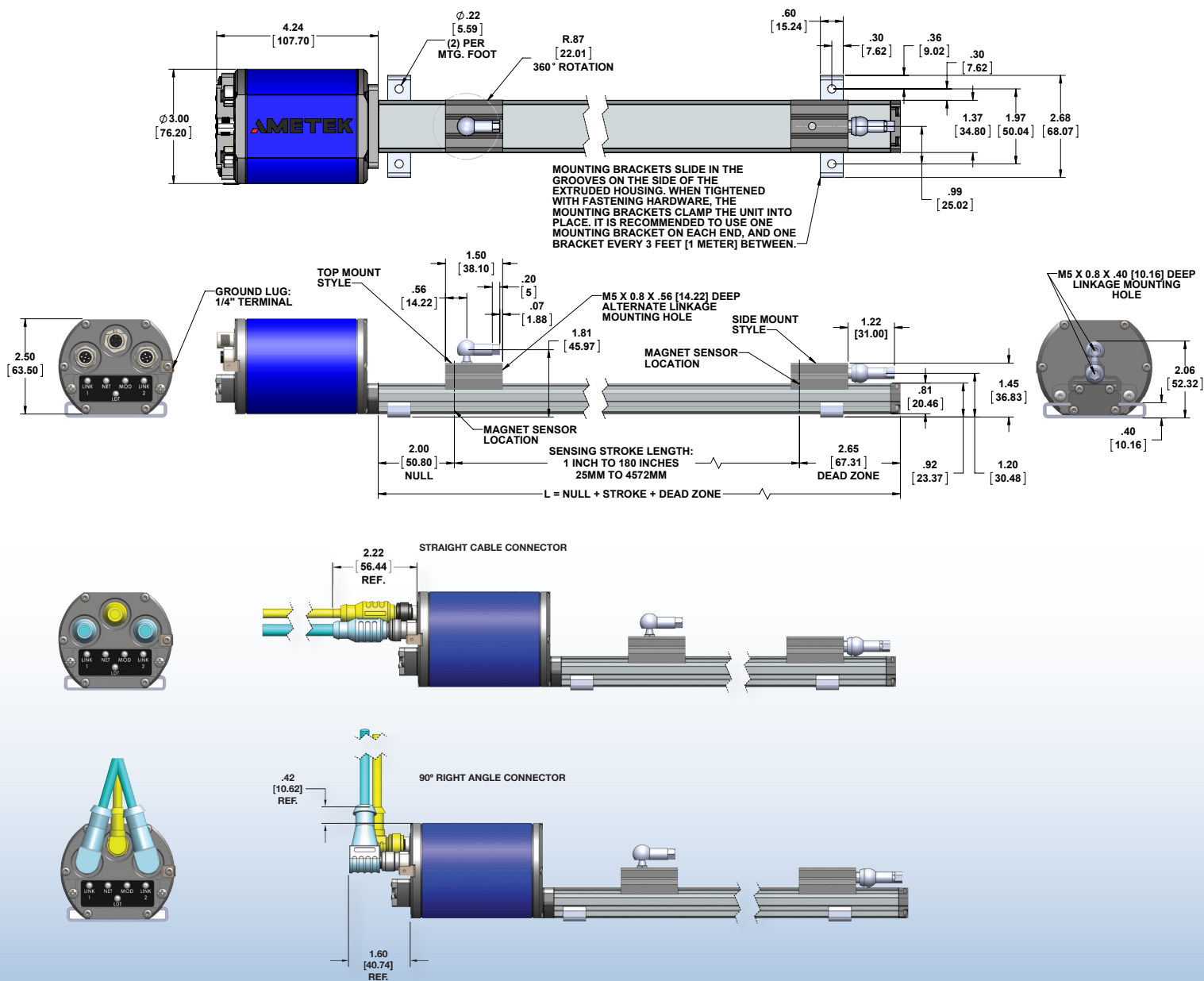
Accessories

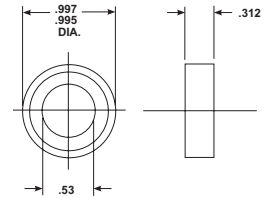## Rod Style Magnets

Standard 4 Hole Magnet

.53
.331 TYP.
.662 TYP.
.187
4 PLACES
1.29
.31

Standard P/N: SD0400800
Stainless Steel P/N: SD0480900

Non-Ferrous Spacer for 4 Hole Magnet

.19 THRU
(4) PLACES AS SHOWN
EQ SPACED ON A .937
BOLT CIRCLE.
45
.530
1.290
.250

MATERIAL: ALUMINUM
P/N: M0822400

Cylinder Magnet

.997
.995
DIA.
.312
.53

Standard P/N: SD0410300
Teflon Coated P/N: SD0410301

Aluminum Split Magnet

.31
.812
.53
.187
(2) PLACES
.234
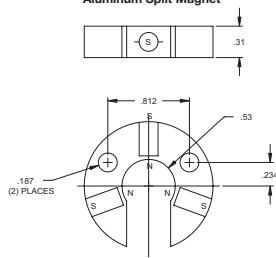
MAT'L.: ALUMINUM
P/N: SD0403900

Non-Ferrous Spacer for Split Magnet

.25
.812
.406
.19 DIA. THRU
(2) PLACES
.234
.56
SLOT
1.290
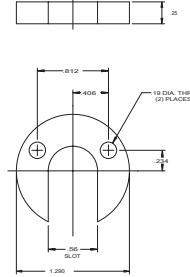
MAT'L.: ALUMINUM
P/N: M0750500

Large Split Magnet

.38
1.407
.75 THRU
.187 THRU
(2 PLACES)
.406
2.50 REF.

NOTE: USE THIS MAGNET WITH ROD
SUPPORT BRACKET SD0411100
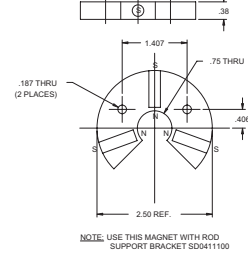
Standard P/N: SD0411200
Stainless Steel P/N: SD0411201

Profile Style Accessories

M5 X .8 X .40 DEEP
(M5 X 20.32 X 10.16)
LINKAGE MTG. HOLE
.41 (10.41)
.28 (7.11)
1.12 (28.45)
.87 (22.10)
R.87 (22.10)
360° ROTATION
1.13 (28.70)
.88 (22.35)
.31 (7.87)
.69 (17.53)
1.37 (34.80)
.25 (6.35) TO
CENTERLINE
MAGNET SENSOR
1.29 (32.77)
.33 (8.38)
1.50 (38.10)
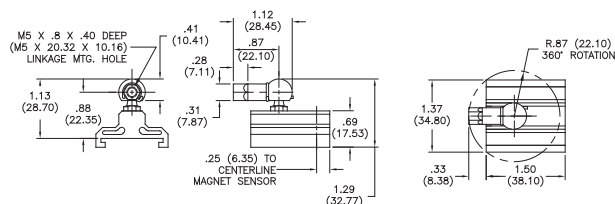
Slide Magnet Assembly- Top Mounted Swivel
P/N: SD0521800

1.37
ø.50
M5 X .8 X .40 DEEP
LINKAGE MTG. HOLE
1.22
.87
1.50
.53
.27
.28
.28
25°
.69
MAX. PIVOT ANGLE
.25 TO CENTERLINE MAGNET SENSOR
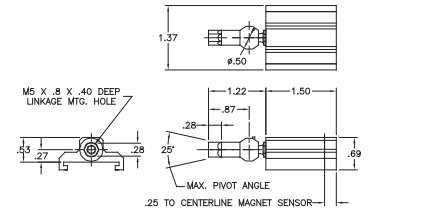
Slide Magnet Assembly - End Mounted Swivel
P/N: SD0521801

.18 (4.57)
1.67 (42.42)
1.31 (33.27)
.38 (9.65)
.07 (1.78)
S
.56 (14.22)
.81 (20.57)
N
.28 (7.11)
ø.20 (5.08)
2 PLACES
NOTE MAGNET ORIENTATION
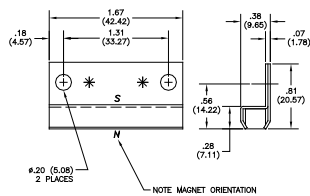
Large Floating Magnet Assembly
P/N: SD0551500

ø.22 (5.59)
(4 HOLES)
.60 (15.24)
.30 (7.62)
1.97 (50.04)
.24 (6.10)
.64 (16.26)
1.250
1.220
(31.00-31.75)
.37 (9.40)
.08 (2.03)
2.68 (68.07)

MAT'L: 316 STAINLESS STEEL
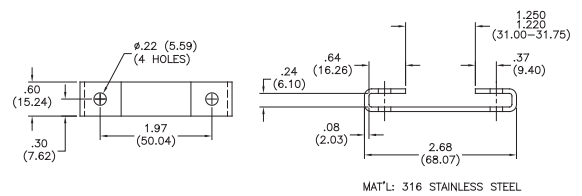
Mounting Foot - (Order two per LDT, plus one every 3 feet)
P/N: SD0522000

"L"
.40
ø.31
M5 X 0.8 TAP
.40 DEEP
MAT'L: ALUMINUM
M5 X 0.8
THREAD
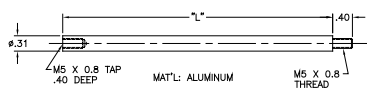
Control Arm
P/N: 955ARMXX (X = Inches)

1.66 [42.0]
1.30 [33.0]
0.75 [19.0]
0.71 [18.0]
.19 [5.0]
0.32 [8.0]
0.24 [6.0]
PIVOT ANGLE
MAX.
30°
M05 THREAD
0.32 [8.2]
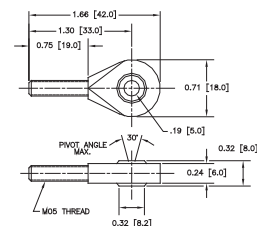
Rod Ends
P/N: 04570252

Network Cable Assemblies

Straight Connector	Right Angle Connector	RJ45 Connector

Description / Part Number

Description	Part Number
Communications Cable M12-D Straight to M12-D Straight – CAT 5e, Shielded Cable - Available in 1 & 5 Meter lengths	949038L1M = 1 meter 949038L5M = 5 meter
Communications Cable M12-D Straight to M12-D Right Angle – CAT 5e, Shielded Cable - Available in 1 & 5 Meter lengths	949039L1M = 1 meter 949039L5M = 5 meter
Communications Cable M12-D Right Angle to M12-D Right Angle – CAT 5e, Shielded Cable - Available in 1 & 5 Meter lengths	949040L1M = 1 meter 949040L5M = 5 meter
Communications Cable M12-D Straight to RJ45 – CAT 5E, Shielded Cable- 5 Meter	949041L5M
Communications Cable M12-D Right Angle to RJ45 – CAT 5e Shielded Cable - 5 Meter	949042L5M
Connector End Cap - Unused connectors should be covered by this End Cap	04521619

Power Cable Assemblies

Straight Connector	Right Angle Connector

Description	Part Number
Power Cable M12-A Straight to flying leads- Shielded – Available in 5, 10 & 15 Meter lengths	949043L5M = 5 meter 949043L10M = 10 meter 949043L15M = 15 meter
Power Cable M12-A Right Angle to flying leads - Shielded – Available in 5, 10 & 15 Meter lenghts	949044L5M = 5 meter 949044L10M = 10 meter 949044L15M = 15 meter

Consult factory for longer lengths or cables not listed above.

Specifications

Connectors	
Power	M12-A Coded
EtherNet (2 Connectors)	M12-D Coded

Displacement	
Rod Style	1" to 300" – 316 stainless steel guide tube with thick wall aluminum cover
Profile Style	1" to 180" – thick wall aluminum cover and extrusion
Dead Band	2.50" Rod Style, 2.65" Profile Style
Null	2.00"
Internal Position Resolution	0.00003" (0.7 micron)
Non-linearity	Less than ± 0.01% of stroke (1) (± 0.003" typical)
Hysteresis	Less than 0.001"
Repeatability	Equal to output resolution
Position Temperature Drift	(6µm + 5ppm · Stroke)/°C

Operating Temperature	
Head (Electronics)	-40°F to 185°F (-40°C to 85°C)
Guide Tube	-40°F to 221°F (-40°C to 105°C)
Storage Temperature	-40°F to 185°F (-40°C to 85°C)

Electrical Specifications	
Input Voltage	7 to 30 VDC
Power Consumption	2.3W maximum (at 30 VDC), 2.1W typical at 1ms interrogation time and 24V input voltage
Current Draw	275mA maximum (at 7VDC), 87.5mA @ 24VDC typical

Data Format	
Measured Variables	Single magnet displacement and velocity
Position Measurement Reference	Offset to preset value (User Configurable)
Measurement Direction	Forward or reverse (User Configurable)
Position Format (Units):	centimeter, millimeter, micron, inch, 0.01 inch, 0.001 inch, 0.0001 inch (User Configurable)
Position Measuring Increment	1 to 100 (User Configurable)
Velocity Format (Units):	centimeter/sec (User Configurable) inch/sec
Velocity Resolution	1 to 65535 (User Configurable)
Measurement Mode	Asynchronous

Interface Specifications	
Interface Type	EtherNet/IP
Data Transmission Rate	100 Mb/s maximum

| Other Specifications	
Enclosure Rating	IP-67 (IEC 60529)
Shock	100G (IEC 60068-2-27)
Vibration	15G (IEC 60068-2-6)
Guide Tube Pressure (Rod style)	5,000 PSI constant (10,000 PSI spike)
Approvals	CE (EMC) EN 61000-6-2 & EN 61000-6-4 ODVA Compliant

AMETEK®
FACTORY AUTOMATION

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

955 BRIK Gen III & 955S Smart BRIK

- Low profile LDT
- Analog output 4-20mA, 0-10 VDC, +/-10 VDC, digital output
- Programmable zero and span
- Stroke length to 180"
- Wide input voltage range
- Optional floating magnet
- Diagnostic LED

Other Products

B/W Controls
LIQUID LEVEL TECHNOLOGY

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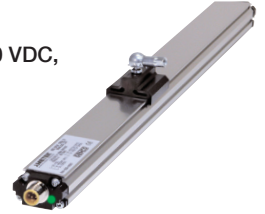
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