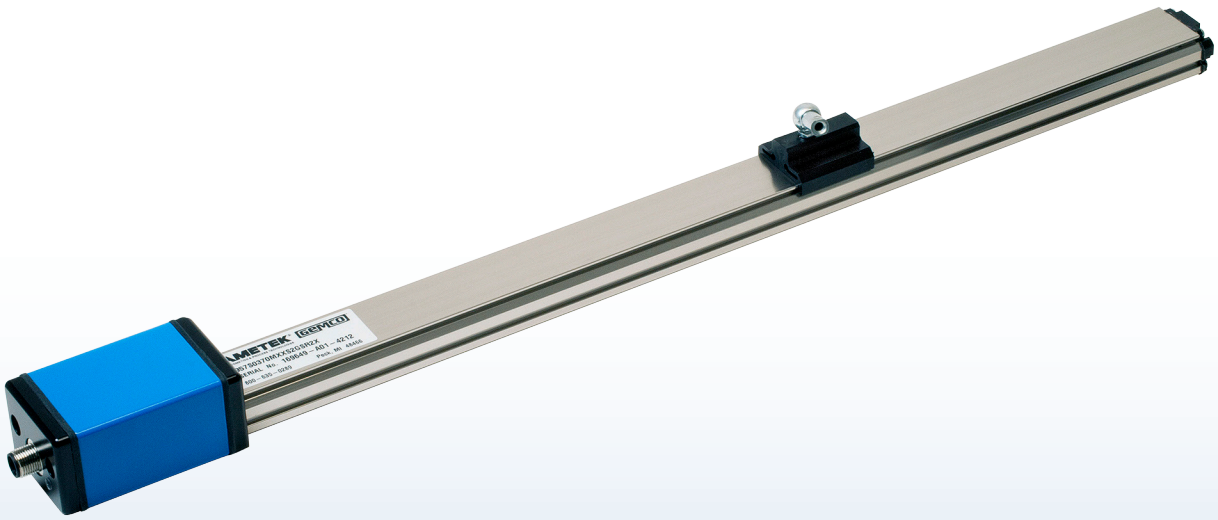
GEMCO®

Series 957D Brik™

Linear Displacement Transducer

Installation Manual

957D-Digital Brik™



ABSOLUTE PROCESS CONTROL
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AMETEK®

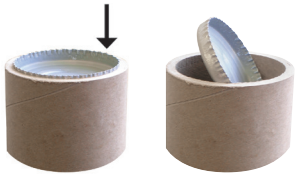
Contents

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 LDT. 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 probes are shipped in a Tube. To remove the metal end cap, use a large, flat blade screw driver 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.



If you have an RMA warranty claim, pack the probe in a shipping tube or with stiff reinforcement to prevent the probe from being bent in transit.

Chapter 1: 957D Overview

The 957D Brik is a magnetostrictive Linear Displacement Transducer (LDT) for highly accurate continuous machine positioning in a variety of industrial applications.

This sensor is built to withstand the most severe environmental conditions and is completely absolute. This means that power loss will not cause the unit to lose position information or require re-zeroing. The non-contact design allows this device to be used in highly repetitive applications without mechanical wear.

Features

The 957D has a truly unique feature. This LDT has auto-tuning capability, the ability to sense a magnet other than the standard slide magnet and adjust its signal strength accordingly.

There is an indicator LED that is located at the connector end of the probe and provides visual status information regarding the operation of the probe. Green indicates proper or normal operation. Red indicates the loss of the magnetic signal or a probe failure. The LED turns Yellow if no interrogation signal is detected. When the probe is in the normal mode of operation, the LED with remain illuminated continuously.

LED Colors	
Green	Magnet is present and within the active range.
Red	Fault, the LDT has lost its signal from the magnet or the magnet has moved into the Null Zone or Dead Band.
Yellow	No external interrogation pulse detected.

NOTE: The series number on your LDT is a record of all the specific characteristics that make up your unit. This includes what interface type it is, its output signal and range, the type of connector the unit uses, and stroke length. For a translation of the model number, see Chapter 6 Part Numbering System.

The 957D Brik with Digital Output is a Linear Displacement Transducer. It provides a Control Pulse, Start/Stop or Variable Pulse output signal that is proportional to the position of the magnet assembly along the length of the probe.

Chapter 2: Installing the LDT

Units can be ordered in span lengths up to 180 inches long in .1 inch increments. The optional slide magnet is designed to move effortlessly along the transducer in guide tracks, or the standard floating magnet assembly can be positioned up to ¼" above the unit. A variety of hardware is available for attaching the magnet slide to the moving portion of the process.

The 957 Brik™ has a few truly unique features. One feature is the LDT's auto-tuning capability, the ability to sense a magnet other than the standard slide magnet and adjust its signal strength accordingly.

Mounting

The transducer can be mounted vertically or horizontally using the supplied SD0522000 mounting brackets. The mounting brackets slide in the grooves on the lower part of the extrusion and clamp down when tightened. It is recommended to use one mounting bracket on each end and every three feet between.

Ferro-magnetic material, which is material readily magnetized, should be placed no closer than ¼" from the sensing surface of the LDT.

Magnet Assembly

Magnet choices are the Floating Magnet or the Slide Magnet assemblies. When using the Floating Magnet assembly SD0551500, the magnet should be installed within ¼" of the sensing surface. The magnet assembly should also be installed in such a manner that it remains an even distance from the aluminum extrusion throughout the entire stroke. Improperly installed magnets can result in output signal non-linearity, or loss of Magnet signal.

2.1 Dimensions

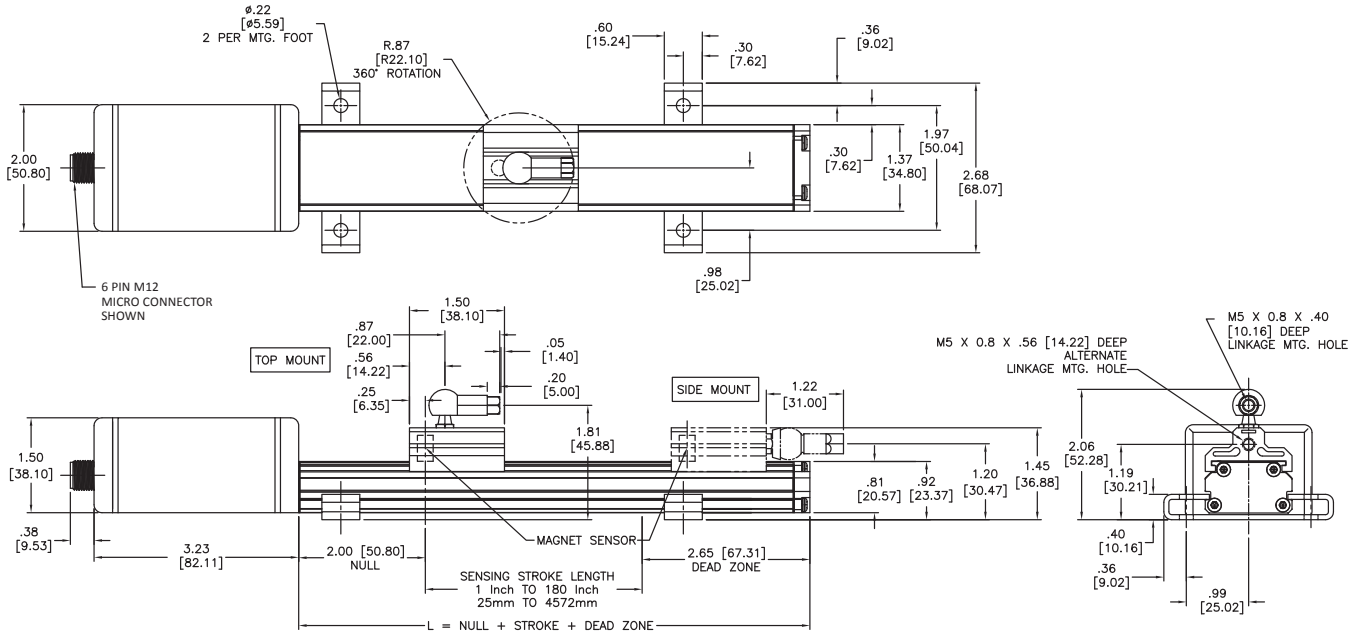
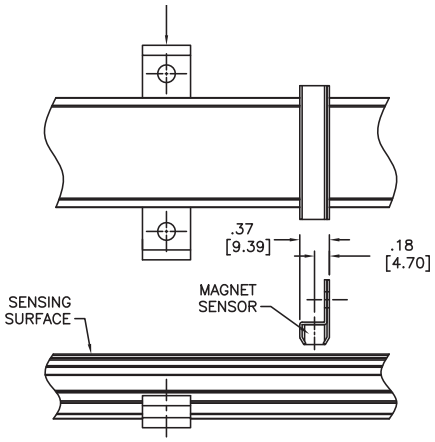


Figure 2-1 957D Dimension Drawing for Reference

2.2 Mounting Bracket



MOUNTING BRACKETS (SD0522000) SLIDE IN THE GROOVES ON THE SIDE OF THE EXTRUDED HOUSING. WHEN TIGHTENED DOWN WITH FASTENING HARDWARE THE MOUNTING BRACKETS CLAMP THE UNIT INTO PLACE. IT IS RECOMMENDED TO USE ONE MOUNTING BRACKET ON EACH END AND EVERY THREE FEET BETWEEN.

Figure 2-2 Mounting Bracket (SD0522000)

2.3 Magnet Position

The sliding magnet is designed to move along the extrusion. The magnet can be slide mounted (Part # SD0521801) top mounted (Part # SD0521800), or floating magnet (Part #SD0551500). Refer to figure 2-2.

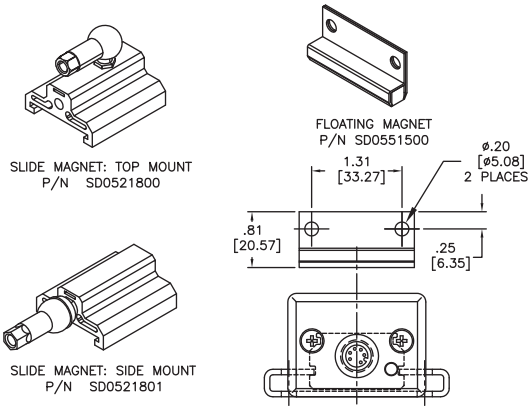


Figure 2-3 Magnet Sensor

When using the Floating Magnet assembly SD0551500, the magnet should be installed within ¼" of the sensing surface. The magnet assembly should also be installed in such a manner that it remains an even distance from the aluminum extrusion throughout the entire stroke. Improperly installed magnets can result in output signal non-linearity, or loss of Magnet signal.

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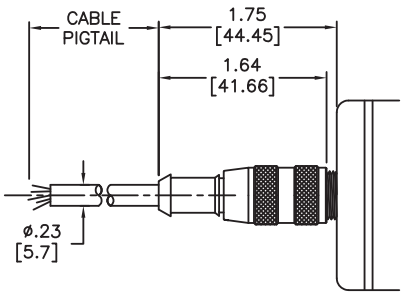
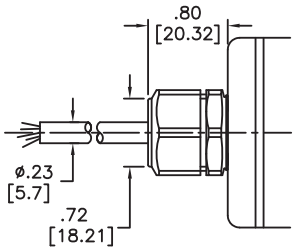
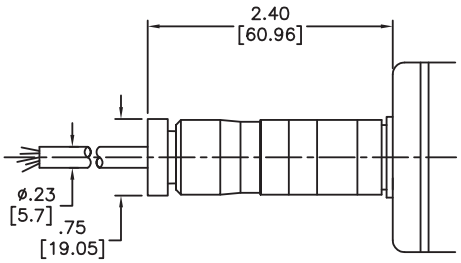
2.4 Connector Options



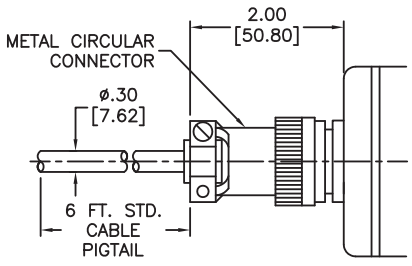
CONNECTOR OPTION S



CONNECTOR OPTIONS C & H



CONNECTOR OPTIONS M & B



CONNECTOR OPTION E

Figure 2-4 Standard Cable Connector Options 957D

Chapter 3: Wiring

3.1 Wiring Connections

Once the LDT has been installed, wiring connections can be made. The 957D has four different connector options. Please refer to the part number label to help identify which wiring diagram is correct. There are two groups of connections that will need to be made. They are as follows:

- Power Supply Connections (including grounding and shielding)
- LDT Input/Output Connections

Power Supply/Ground Connections

The 957D Brik™ is available with many different connector/wiring options. Refer to part numbering on unit in question for proper wiring. See Chapter 6 for part numbering grid and figures 3-4 through 3-9 for wiring details.

Connector option S is an industry standard 6 pin 12mm Euro style cordset with a shield. Option B is an 8 pin DIN with a shield, and option M is a 6 pin DIN with a shield. To reduce electrical noise, the shield must be properly used. Connect the cable's shield to the controller system GND. The cable shield is NOT connected at the transducer extrusion. Always observe proper grounding techniques such as single point grounding and isolating high voltage (i.e. 120/240 VAC) from low voltage (7-30 VDC cables).

WARNING: Do not use molded cordsets with LEDs!

It is preferable that the cable between the LDT and the interface device be one continuous run. If you are using a junction box, it is highly recommended that the splice junction box be free of AC and/or DC transient-producing lines. The shield should be carried through the splice and terminated at the interface device end.

NOTE: When grounding the LDT, a single earth ground should be connected to the Power Supply Common (circuit ground). The LDT Power Supply Common should be connected to the Power Supply Common (-) terminal. The LDT power supply (+VDC) should be connected to the power supply positive terminal (+). The LDT cable shield should be tied to earth ground at the power supply. The LDT analog common should not be connected to earth ground and should be used for connection to interface devices only. For assistance, refer to your LDT's wiring drawing in this chapter.

In order for the LDT to operate properly, the external power supply must provide a voltage between 7-30 VDC. The power supply must be rated at one watt minimum. The power supply should provide less than 1% ripple with 10% regulation.

WARNING: Do not route the LDT cable near high voltage sources.

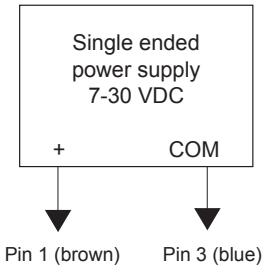


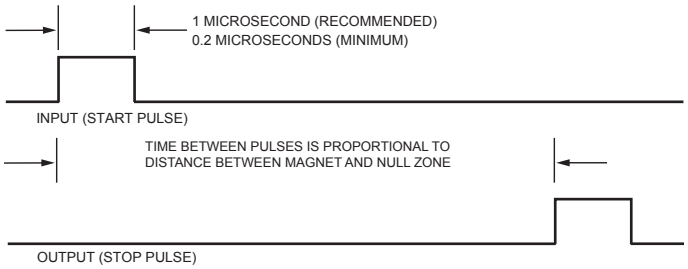
Figure 3-1: Power Supply Wiring

The power supply should be dedicated to the LDT to prevent noise and external loads from affecting it. When powering up more than one LDT on a single power supply, each unit will draw approximately one watt.

3.1 CP (Control Pulse)

The Control Pulse signal interface of the VMAX digital output series is a differential RS-422 output. The maximum cable length for the differential digital LDT's is 1,500 feet. To initiate a start pulse, an external device is used. This start pulse should be a minimum of 1.0 microsecond in duration. After the start pulse is received, the LDT will generate a stop pulse of 2 microseconds in duration. The time between the leading edge of the start pulse to the leading edge of the stop pulse is proportional to the distance from the Null Zone to the Magnet. The order of these two pulses is illustrated in the Figure 3-1. To wire the 953D-CP, see Figure 3-4/3-9. For proper grounding information, see Section 3.1.

Figure 3-1 957D-CP



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3.2 VP (Variable Pulse)

The Variable Pulse signal interface of the VMAX digital output series is a pulse width modulated signal (RS-422). The maximum cable length for the differential LDT's is 1,500 feet. This LDT can also be configured for external or internal interrogation. External interrogation is when an external device connected to the LDT generates a start pulse. This start pulse should be a minimum of 1.0 microsecond in duration. Within 50 nanoseconds after the leading edge of the start pulse has been received, the LDT will generate an output pulse. The duration of the output pulse is proportional to the distance from the Null Zone to the Magnet. The order of these two pulses is illustrated in Figure 3-2. The 953D-VP can also generate internal interrogations. This LDT will continually output pulse width modulated signals. As with a 953D-VP using an external interrogation, the duration of this output pulse is proportional to the distance from the Null Zone to the Magnet. This is illustrated in Figure 3-2a. To wire the 953D-VP, see Figure 3-4/3-9. For proper grounding information, see Section 3.1.

Recirculations

The method used to improve the resolution of a system using a digital LDT. The "on" Time of a pulse width output is multiplied by a specific factor (from 1-255). This multiplication provides more counting time for the counter in the customer's electronics, thus improving the resolution. The only disadvantage to the higher recirculation numbers is the time needed to process the signal.

Figure 3-2a 957D-VP with External Interrogation

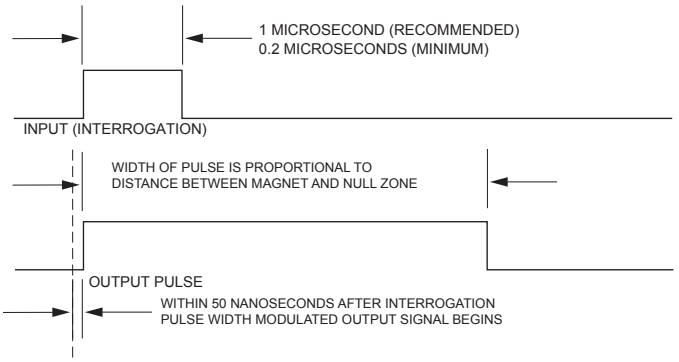
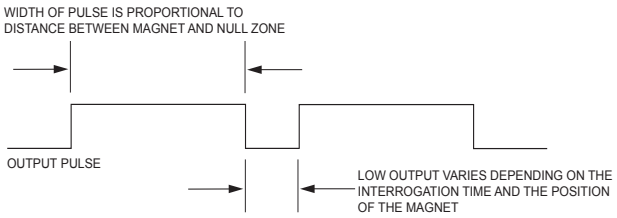


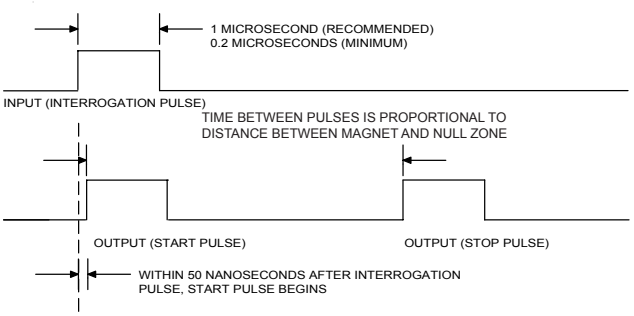
Figure 3-2b 957D-VP with Internal Interrogation



3.3 RS (Start/Stop)

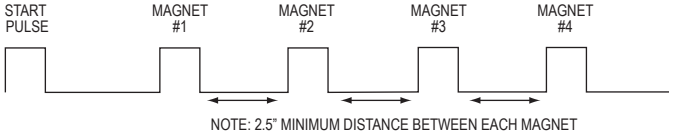
The Start/Stop signal Interface of the VMAX digital output series is differential RS-422 output. The maximum cable length for diferential LDT's is 1500 feet. To initiate a start pulse, an external device is used. This start pulse should be a minimum of 1.0 microsecond in duration. Within 50 nanoseconds after the leading edge of the start pulse, the LDT will generate a start pulse of 2 microseconds in duration. A stop pulse of 2 microseconds in duration will follow. The time it takes from the leading edge of the start pulse to the leading edge of the stop pulse is proportional to the distance from the Null Zone to the Magnet. The order of these two pulses is illustrated in Figure 3-3. To wire the 953D-RS, see Figures 3-4/3-9. For proper grounding information, see Section 3.1.

Figure 3-3 957D-RS



MULTI-MAGNETS

The digital 953 VMAX (Start/Stop outputs only) comes standard with the ability to sense multiple positions at one time using one LDT. Multiple magnets can be placed on the transducer rod at a minimum of 2.5 inches apart. This feature is recommended for use with meters and controllers with the capability to detect multiple signals.



3.4 TP (TTL Level Start/Stop)

The 953TP is a single ended TTL level start/stop LDT typically used to replace neutered style probes. The TTL level signal is referenced from the gate + and Interrogation + signals to the power supply common. To initiate a start pulse, an external device is used. This start pulse should be a minimum of 1.0 microsecond in duration. Within 50 nanoseconds after the leading edge of the start pulse, the LDT will generate a start pulse of 2 microseconds in duration. A stop pulse of 2 microseconds in duration will follow. The time it takes from the leading edge of the start pulse to the leading edge of the stop pulse is proportional to the distance from the Null Zone to the Magnet. The order of these two pulses is illustrated in Figure 3-3. To wire the 953D-TP, see Figures 3-4/3-9. Except do not connect the interrogation - & gate - wires For proper grounding information, see Section 3.1.

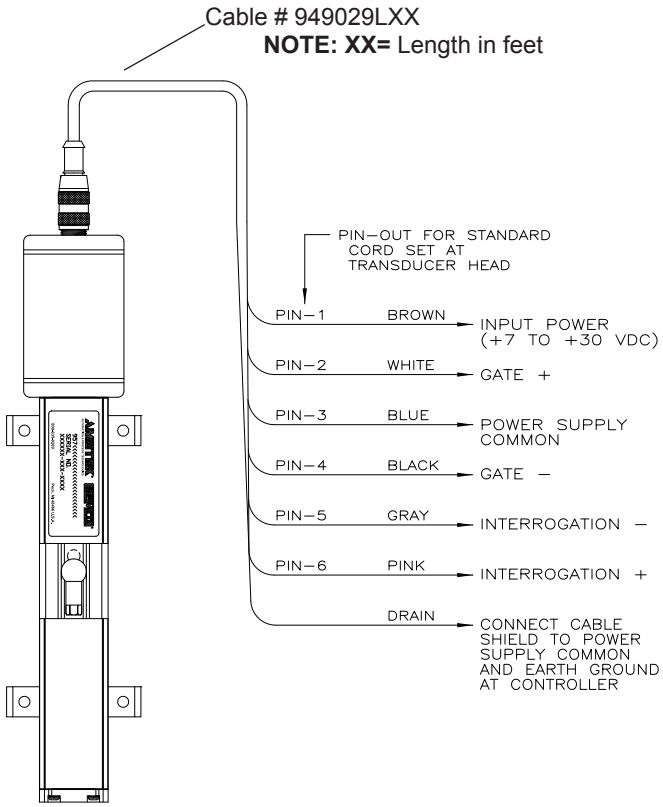


Figure 3-4: Wiring for Connector Option "S", 6 Pin Micro

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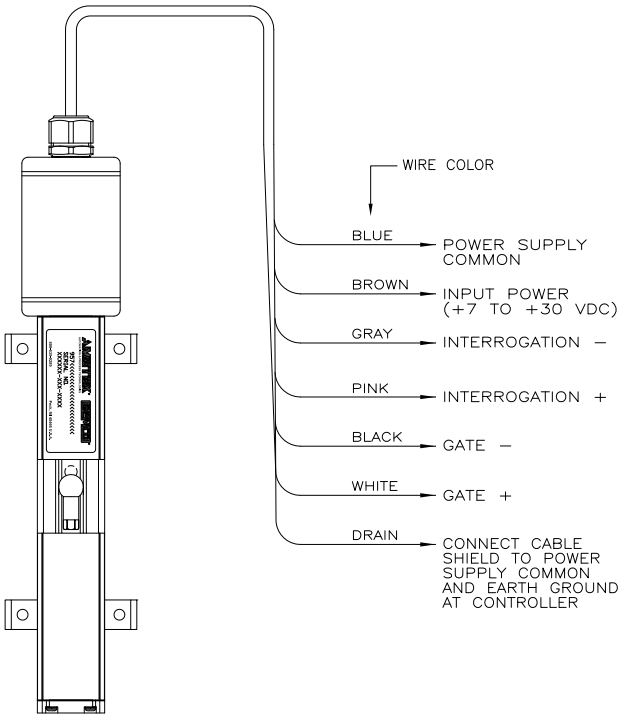


Figure 3-5: Wiring for Connector Option "C", Integral Cable Assembly

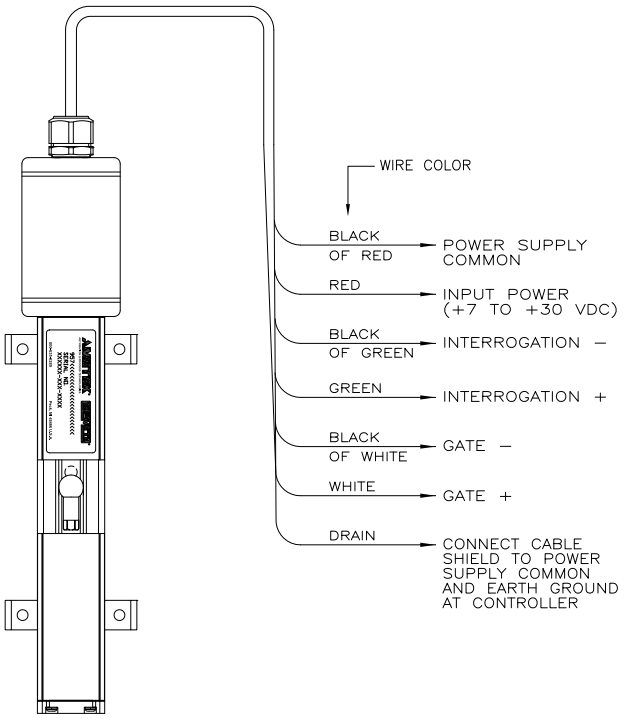


Figure 3-6: Wiring for Connector Option "H", High Temp Integral Assembly

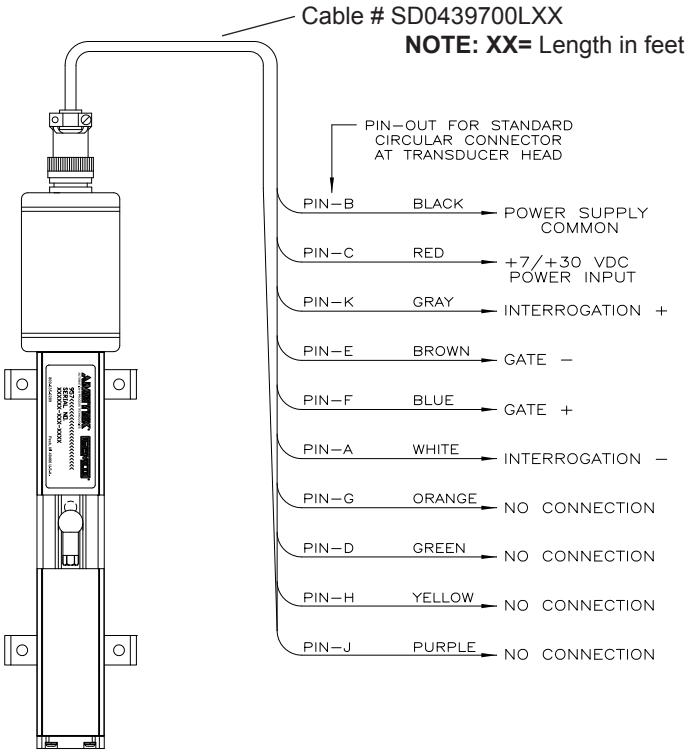
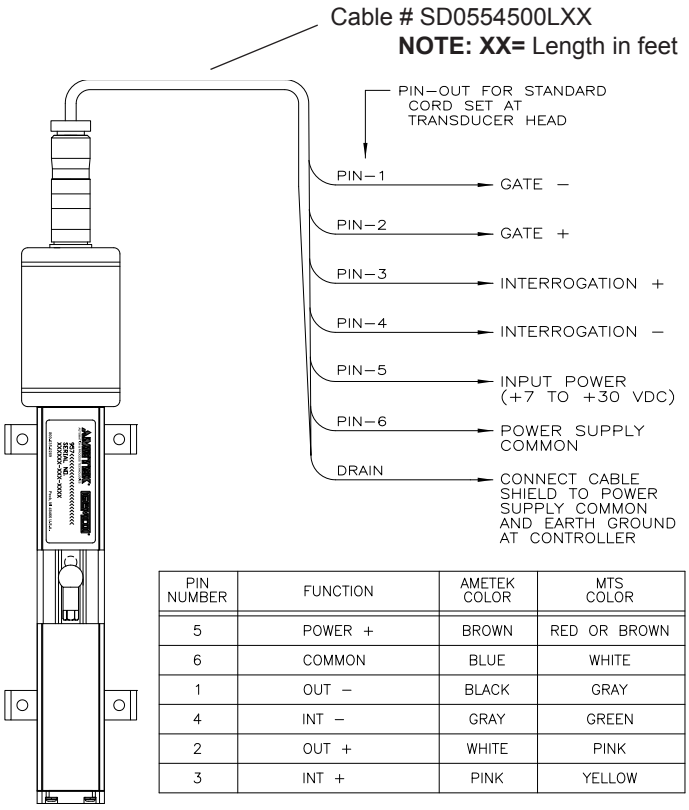


Figure 3-7: Wiring for Connector Option "E", 10 Pin MS Connector



PIN NUMBER	FUNCTION	AMETEK COLOR	MTS COLOR
5	POWER +	BROWN	RED OR BROWN
6	COMMON	BLUE	WHITE
1	OUT –	BLACK	GRAY
4	INT –	GRAY	GREEN
2	OUT +	WHITE	PINK
3	INT +	PINK	YELLOW

Figure 3-8: Wiring for Connector Option "M", 6 Pin DIN

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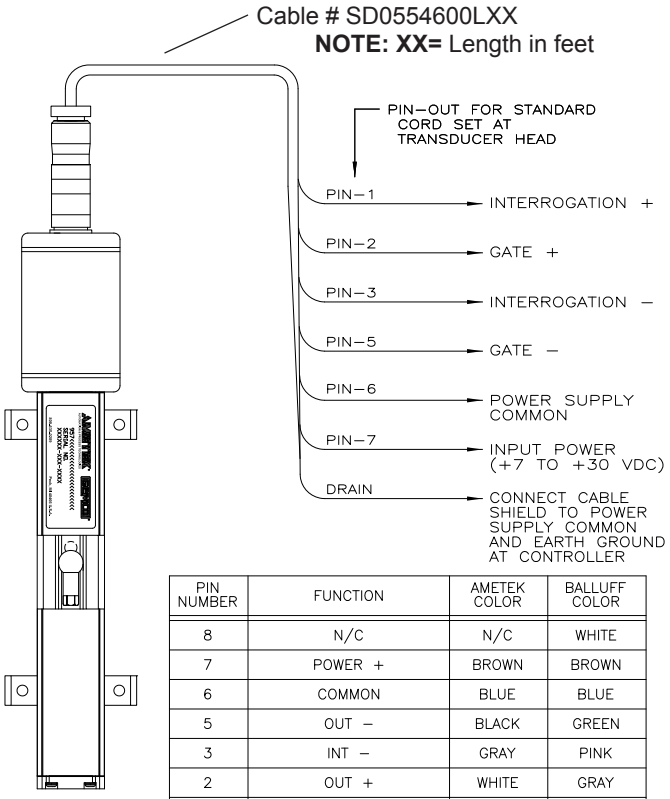


PIN NUMBER	FUNCTION	AMETEK COLOR	BALLUFF COLOR
8	N/C	N/C	WHITE
7	POWER +	BROWN	BROWN
6	COMMON	BLUE	BLUE
5	OUT –	BLACK	GREEN
3	INT –	GRAY	PINK
2	OUT +	WHITE	GRAY
1	INT +	PINK	YELLOW

Figure 3-9: Wiring for Connector Option "B", 8 Pin DIN, Digital Output

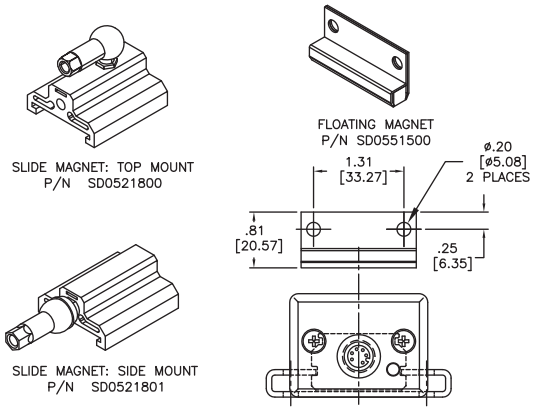
Chapter 4: Features

4.1 Automatic Gain Control

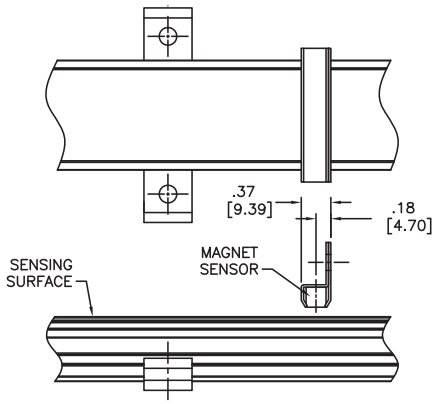
The Automatic Gain Control feature will automatically search and find the magnet on power up, if power is applied without a magnet on the LDT, the LED will turn RED indicating no magnet signal is detected. Turn power off and place magnet within the active stroke area. Re-apply power.

4.2 Magnet Position

The sliding magnet is designed to move along the extrusion. The magnet can be slide mounted (Part # SD0521801) top mounted (Part # SD0521800), or floating magnet (Part #SD0551500). Refer to figure 2-2.



When using the Floating Magnet assembly SD0551500, the magnet should be installed within ¼" of the sensing surface. The magnet assembly should also be installed in such a manner that it remains an even distance from the aluminum extrusion throughout the entire stroke. Improperly installed magnets can result in output signal non-linearity, or loss of Magnet signal.



Chapter 5: Troubleshooting

Troubleshooting describes common problems that may occur when installing the LDT and offers possible solutions to these problems. If, after reading this appendix, you are unable to resolve a problem, contact our technical support department at 1-800-635-0289.

General Checks

Make sure that the magnet is located within the LDT's active stroke area. Magnet assemblies should be positioned so that they can move freely over the entire area of the active stroke without binding or pushing on the rod.

NOTE: Ferromagnetic material (material readily magnetized) should be located no closer than 0.25" from the sensing surface of the LDT. This includes mounting brackets, magnet spacers, magnet brackets, and mounting screws. Ferromagnetic material can distort the magnetic field, causing adverse operation or failure of the LDT.

Check all LDT wires for continuity and/or shorts. It is preferable that the cable between the LDT and the interface device be one continuous run. If you are using a junction box, it is highly recommended that the splice junction box be free of AC and/or DC transient-producing lines. The shield should be carried through the splice and terminated at the interface device end.

Power Supply Check

This will help you to determine if your power supply is adequate for the LDT to operate properly, or if the LDT's cable has a short or open.

In order for the 957D to operate properly, the external power supply must provide a level between 7 to 30 VDC. A power supply providing voltage above this specified range may damage the LDT. A power supply providing power below this specified range will not be sufficient to power the LDT. When powering more than one LDT on a single power supply, remember that each LDT typically requires 1 watt of power*. The amount of current draw will vary based on the input voltage used. To calculate the current draw for a particular LDT, divide the LDT wattage by the input voltage. For example, 1 watt divided by 24 VDC equals 40mA.

If your LDT is not operating properly, the LDT's cable may have an open or short, or the power supply is not supplying sufficient power. To verify this, perform the following steps:

1. Turn the power supply off.
2. Remove the mating connector from the LDT.
3. Turn the power supply on.
4. Using a digital voltmeter, check from the Power Supply Common to the Power Supply + on the mating end of the cable for a level between +7 and +30 VDC.

If reading is between 7 and 30 VDC, turn power supply off and go to step 7. If reading is below 7 VDC, either your power supply is not providing enough power or the LDT's cable possibly has a short/open. Readings of no voltage or minimal voltage (less than 5 volts) may be due to short/open in the cable. If reading is **NOT** between 7 and 30 VDC, go to step 5. If reading is above 30 VDC, adjust power supply or replace.

5. Turn the power supply off.
6. Check the continuity of the individual wires of the cable between the power supply and the LDT. Check for continuity from one end of the cable to the other. Also verify that no shorts exist between pins.
7. Reconnect the mating connector to the LDT.
8. Turn power supply on.
9. Using a digital voltmeter, check the power supply's "+" and "-" terminals for a voltage between 7 and 30 VDC.

Low voltage readings may indicate a power supply with a wattage (current) rating that is too low. (Each LDT requires approximately 1 watt). If the cabling checks out in step 6 and your voltage is below 7 VDC, check your power supply current rating. If voltage is between 7 to 30 VDC and the LDT is still inoperative, contact factory.

Diagnostic LED	
LED Color	**Description**
None	No power to LDT.
Green	Magnet is present and within the active programmed range.
Yellow	No external interrogation signal detected.
Red	Fault, the LDT has lost its signal from the magnet or the magnet has moved into the Null Zone or Dead Band.

If a problem exists after reading this section, please contact our technical support department.

Chapter 6: Part Numbering

Part Numbering - Digital, CP and RS

957D — RS — 0120 — E — S — X

Output	
CP	Control Pulse
RS	RS-422 Start/Stop Pulse
TP	TTL Level Start/Stop Typically used to replace neutered style probes.

Units of Measure	
E	Inches
M	Metric

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. Metric length includes metric mounting, M18x1.5. Unless Specified Otherwise

Connector Option	
S	Standard 6 Pin, 12mm Euro
C_	Integral Cable Assembly. Insert length in feet. Example: C6 = 6 foot cable.
M	6 Pin DIN, MTS Style D60
B	8 Pin DIN, Balluff S32
E	Environmental 10 Pin MS Connector compatible w/951 & 952 LDTs w/ connector option “E”.
H_	High Temp., Integral cable assembly 200º C Teflon Cable. Insert length in feet. Example: H6= 6 foot High Temp Teflon Cable.

* If stroke is in inches, cable is in feet. If Stroke is in metric, cable is in meters

Options	
X	None

Part Numbering - Digital, VP (PWM)

957D — VP — 0120 — E — S — I — 001 — X

Output	
VP	Variable Pulse

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

Connector Option	
S	Standard 6 Pin, 12mm Euro
C_	Integral Cable Assembly. Insert length in feet. Example: C6 = 6 foot cable.
M	6 Pin DIN, MTS Style D60
B	8 Pin DIN, Balluff S32
E	Environmental 10 Pin MS Connector compatible w/951 & 952 LDTs w/ connector option “E”.
H_	High Temp., Integral cable assembly 200º C Teflon Cable. Insert length in feet. Example: H6= 6 foot High Temp Teflon Cable.

* If stroke is in inches, cable is in feet. If Stroke is in metric, cable is in meters

Interrogation Mode	
I	Internal Interrogation
E	External Interrogation

Number of Recirculations	
001	001 (Standard) to 255

Options	
X	None

Chapter 6: Part Numbering (cont'd)

Magnets & Mounting Feet	
Part Number	**Description**
SD0521800	Slide Magnet Assembly, Top Mounted Swivel
SD0521801	Slide Magnet Assembly, Side Mounted Swivel
SD0551500	Large Width Floating Magnet
SD0522000	Mounting Foot - Minimum 2 required per unit

957D Cable Connections	
Part Number	**Description**
949029L6	6 Pin, 6 Foot, Straight Connector (Option S)
949029L12	6 Pin, 12 Foot, Straight Connector (Option S)
949030L6	6 Pin, 6 Foot, Right Angle Connector (Option S)
949030L12	6 Pin, 12 Foot, Right Angle Connector (Option S)
SD0439700LXX	10 Pin, Straight Connector (Option E)
SD0439701LXX	10 Pin, Right Angle Connector (Option E)
SD0554500LXX	6 Pin, DIN Straight Connector (Option M)
SD0554600LXX	8 Pin, DIN Straight Connector (Option B)
Note: XX Denotes length in feet. Consult factory for longer lenghts or cables not shown	

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Chapter 7: Specifications

General Specifications	
Connector	6 pin 12mm Euro/Micro standard. Intergrated cable assembly, 6 pin or 8 pin DIN & 10 pin MS optional.
Displacement	1" to 180"
Dead Band	2.65" (67.31 mm) standard
Null Zone	2.00" (50.8 mm) standard
Linearity	Less than +/- 0.01% or +/- 0.005", whichever is greater. (+/- 0.003" typical)
Repeatability	Equal to Resolution of controller
Hysteresis	0.008"
Resolution	Controller dependent
Operating Temperature	-40° to 185° F (-40° to 85° C)
Storage Temperature	-40° to 221° F (-40° to 105° C)
Shock & Vibration Shock Vibration	 1,000Gs (lab tested) IEC 60068-2-27 30Gs (lab tested) IEC 60068-2-6
Approvals	CE, 89/336/EEC (EMC)

Electrical Specifications	
Input Voltage	7-30 VDC
Current Draw	One watt typical at 1ms interrogation time with no recirculations. Faster interrogation times and/or recirculations increase power consumption
Interface Specifications - Clock	RS-422, 470 Ohm termination resistance
Interface Specifications - Gate	RS-422, 2.0V min @ 100 Ohm termination
Diagnostics	Tri-Color LED beside connector/cable exit. See LED output summary chart

Cable Specifications				
Cable Type	**Gauge**	**Jacket**	**Temp**	**Bend Radius**
Connector Options "S", "M", "B", "C"	22	PVC	-50°C to 105°C	Moving Applications – 2.36" Fixed Applications – 1.18"
High Temp Integral Cable "H" Option	22	Teflon	-70°C to 200°C	Moving Applications – 4.6" Fixed Applications –2.3"
Connector Option "E"	22	Polyurethane	-50°C to 105°C	Moving Applications – 2.36" Fixed Applications – 1.18"

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