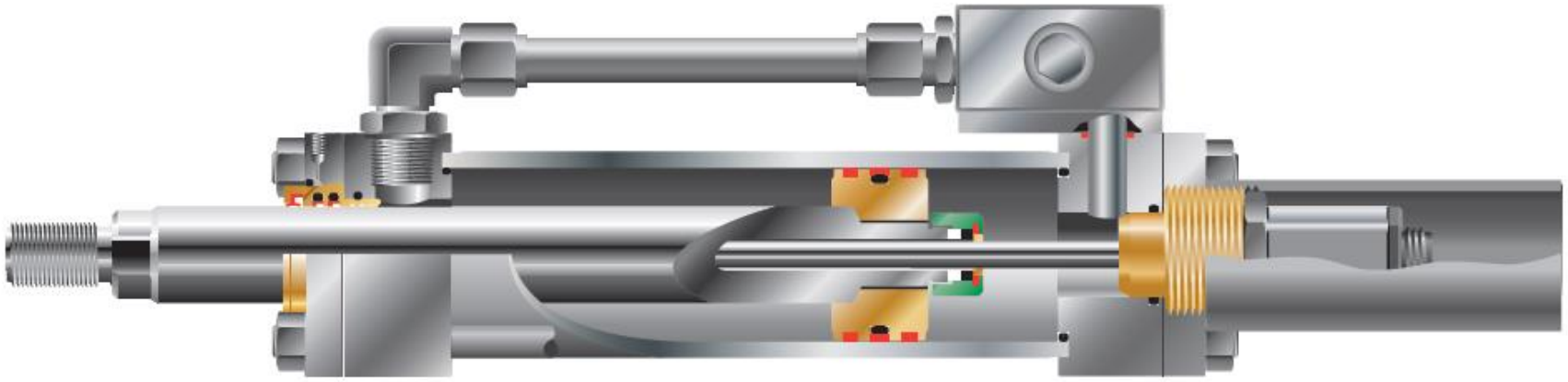
Parker Cylinder Division

2HX Series Heavy Duty Electro-Hydraulic Cylinders

ENGINEERING YOUR SUCCESS.

2HX Series

- 2HX is the 2H series cylinder with position feedback



- Available Series:
  - 2HX/3HX / 2HDX/3HDX / 2HBX/3HBX

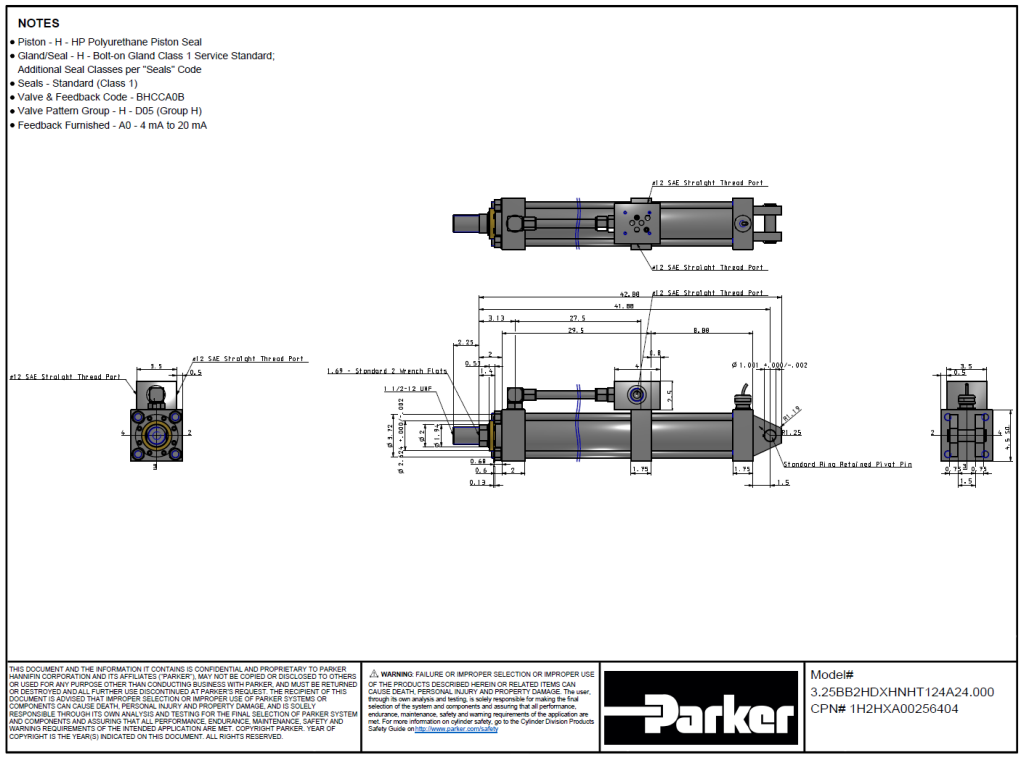
2HX Series – Where is it used?

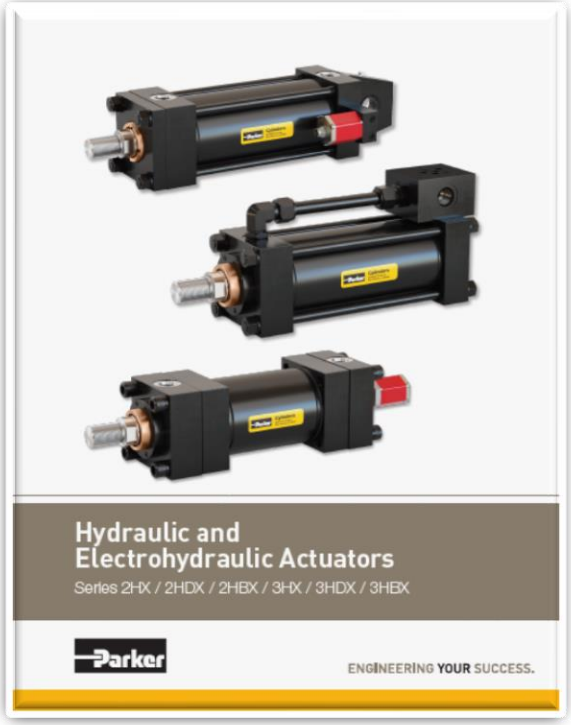
Applications requiring a higher degree of control

- High Speed Applications
- Position Control
- Motion Profiles
- Synchronizing Cylinders

2HX Catalog & Configurator

- New catalog and 3D CAD available
- Catalog HY08-1175-2/NA
- New Configurator available now





Parker

2HX Option Callout

Valve Manifold

Code	Description
N	N - None
B	B - Bolt-On
I	I - Integral

For applications requiring integral cap, consult factory.

Valve Location

Code	Description
N	N - Not Applicable
H	H - Head
C	C - Cap

Valve Pattern Group

Code	Description
N	N - Not Applicable
A	A - Servo Group A
D	D - Servo Group D
G	G - D03 (Group G)
H	H - D05 (Group H)
J	J - D06 (Group J)
K	K - D07 (Group K)
M	M - D08 (Group M)
X	X - Other, Please Specify

Feedback Option

Code	Description
N	N - None
C	C - MTS LDT
F	F - LRT
B	B - Balluff LDT
W	W - WaveScale
X	X - Other, Please Specify

Feedback Furnished

Feedback Furnished		Feedback Options		
Code	Description	C	B	W
NF	NF - No Feedback			
1P	1P - Prepare to Accept - Piston rod will be drilled to accept a probe with an electrical stroke equal to the cylinder net stroke.	✓	✓	
FR	FR - LRT Installed			
V0	V0 - 0 Vdc to +10 Vdc	✓	✓	✓
V1	V1 - +10 Vdc to 0 Vdc	✓	✓	✓
A0	A0 - 4 mA to 20 mA	✓	✓	✓
A1	A1- 20 mA to 4 mA	✓	✓	✓
A4	A4 - Other Analog - Specify required output.	✓	✓	✓
DE	DE - PWM, External Interrogation	✓	✓	
DI	DI - PWM, Internal Interrogation	✓	✓	
SS	SS - SSI Output [7]	✓	✓	✓
R0	R0 - Start/Stop	✓	✓	
D4	D4 - Other Digital - Specify required output.	✓	✓	✓

Feedback Protective Enclosures

Code	Description
N	N - Not Applicable
A	A - False Stage for LDT probes with integral cable
B	B - False Stage for LDT probes with connector and separate cable
D	D - Light Duty Cover
F	F - Medium Duty Cover for LDT probes with integral cable
G	G - Medium Duty Cover for LDT probe with connector and separate cable

Valve Mounting Options

Valve Manifold Options

Valve Manifold

Code	Description
N	N - None
B	B - Bolt-On
I	I - Integral

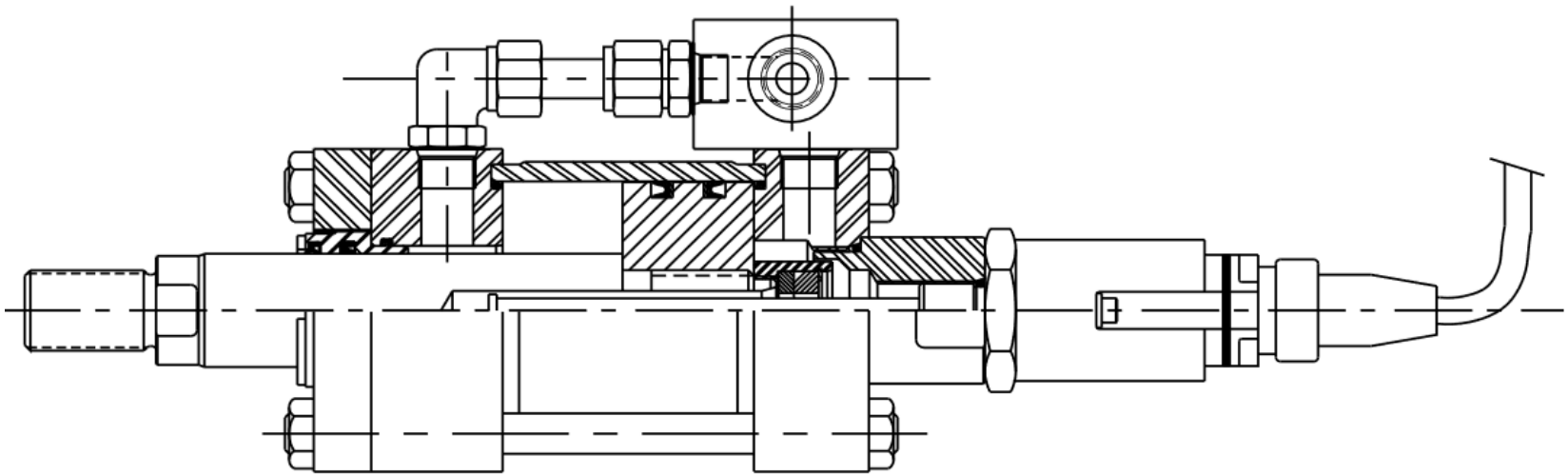
For applications requiring integral cap, consult factory.

Valve Location

Code	Description
N	N - Not Applicable
H	H - Head
C	C - Cap

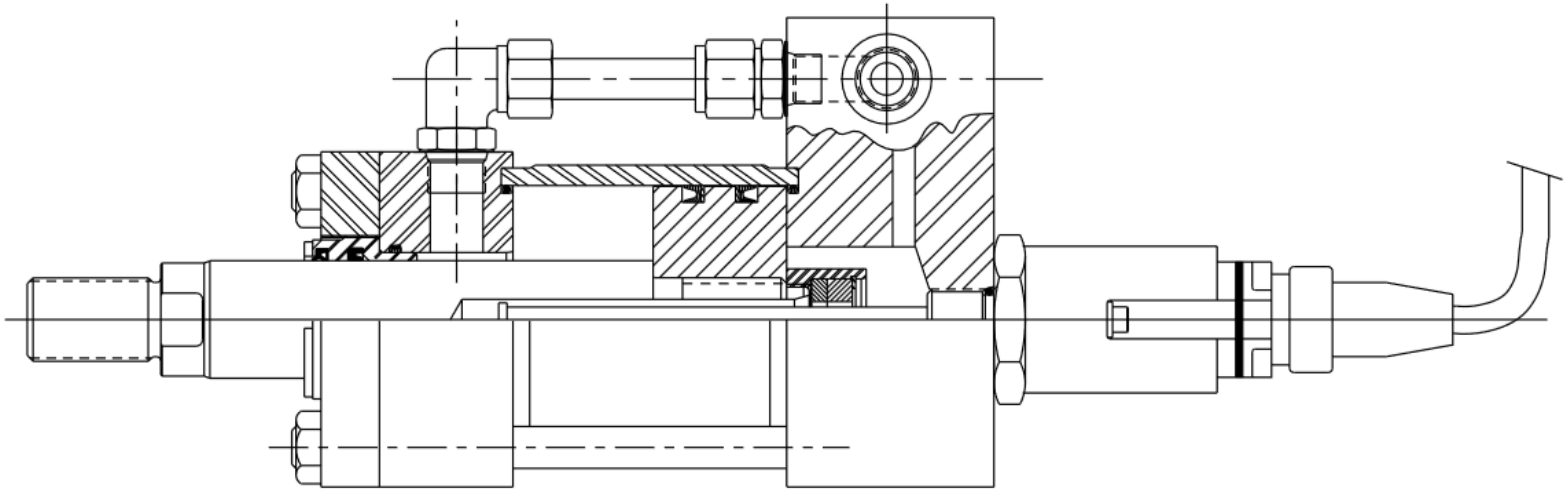
- Manifold options available for 2.00 thru 8.00 bore cylinders

Bolt-on Valve Manifold



- Minimum hydraulic line runs with closed cylinder and valve coupling
- Simplified machine design with integrated components
- Minimum interference with standard mounting dimensions
- Manifold may be mounted on head or cap end at any position not occupied
- 7 standard valve patterns
- Cylinder mounted valve eliminates assembly time and fittings.

Integral Valve Manifold



- Integral manifolds eliminate the bolt on assembly and associated seals
- Made to order option

Valve Manifold Patterns

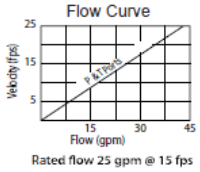
Valve Pattern Group

Code	Description
N	N - Not Applicable
A	A - Servo Group A
D	D - Servo Group D
G	G - D03 (Group G)
H	H - D05 (Group H)
J	J - D06 (Group J)
K	K - D07 (Group K)
M	M - D08 (Group M)
X	X - Other, Please Specify

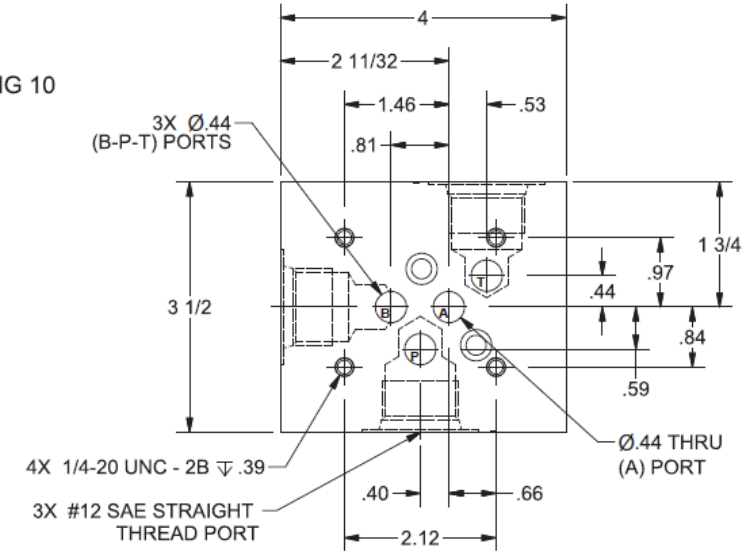
- Hydraulic Series Cylinders with Bolt-on Manifolds
- Manifolds to match standard valve patterns, bolted to head or cap end

Group H Valve
Manifold Pattern
NFPA D05, CETOP 5, NG 10

Parker D3** Valves



Rated flow 25 gpm @ 15 fps

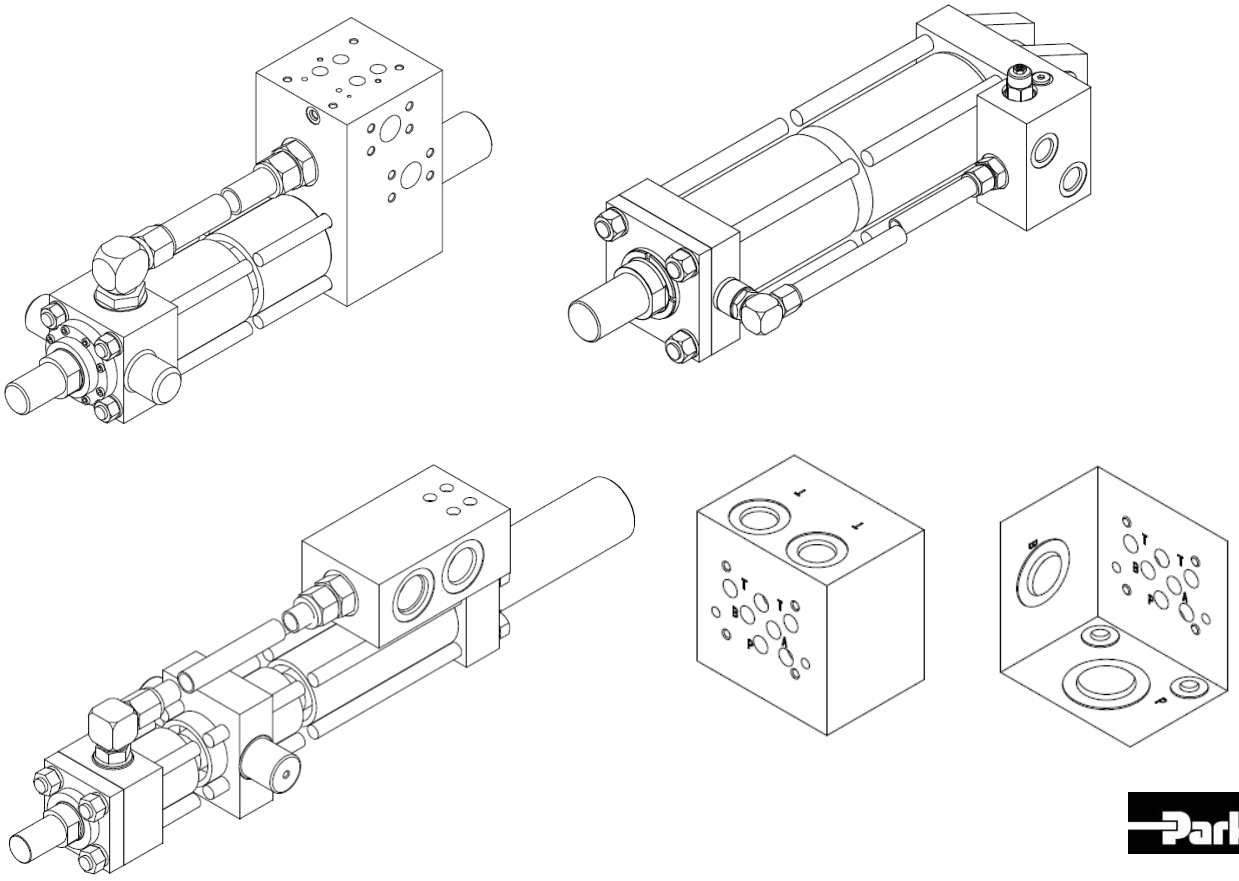


Valve Manifold Patterns

Valve Pattern Group

Code	Description
N	N - Not Applicable
A	A - Servo Group A
D	D - Servo Group D
G	G - D03 (Group G)
H	H - D05 (Group H)
J	J - D06 (Group J)
K	K - D07 (Group K)
M	M - D08 (Group M)
X	X - Other, Please Specify

- Custom Manifolds can be made to meet specific customer requirements



Feedback Devices and Technologies

Feedback Options

Feedback Option	
Code	Description
N	N - None
C	C - MTS LDT
F	F - LRT
B	B - Balluff LDT
W	W - WaveScale
X	X - Other, Please Specify

Feedback Technologies

- LDT – Linear Displacement Transducer

MTS SENSORS

BALLUFF

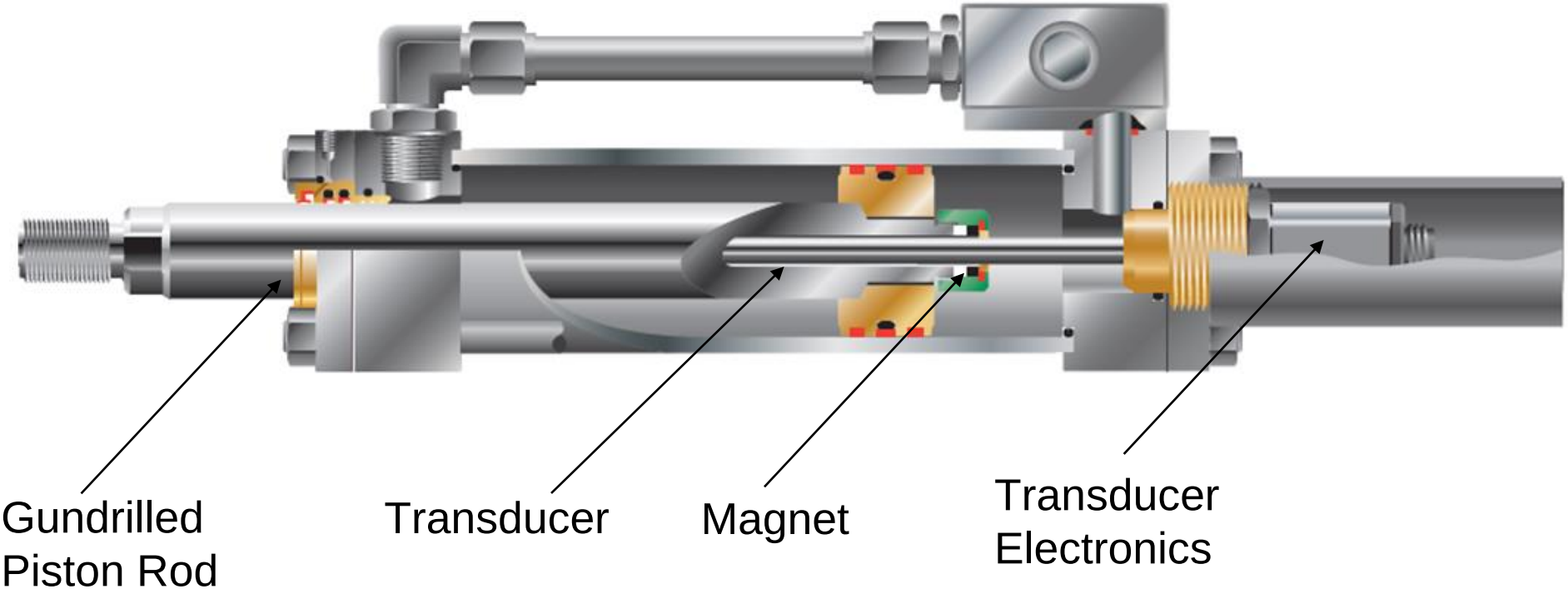
- Wavescale – Embedded LDT
- LRT – Linear Resistive Transducer

Parker

LDT
Linear Displacement Transducer

LDT – Linear Displacement Transducer

- Design Layout

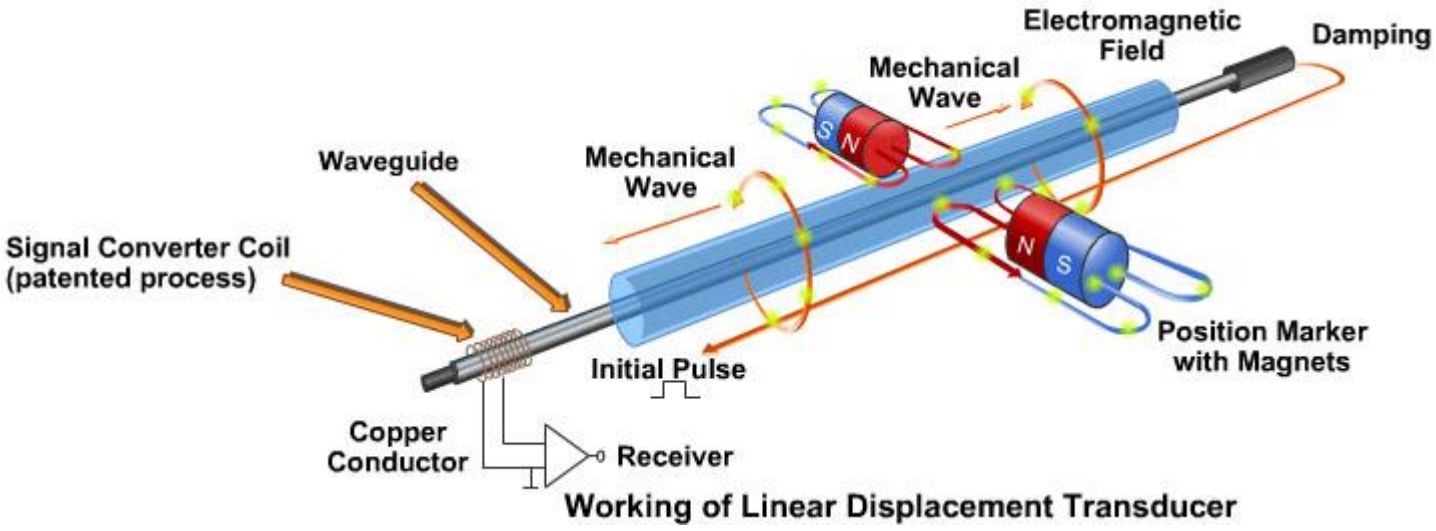


LDT – Linear Displacement Transducer

Basic Operation

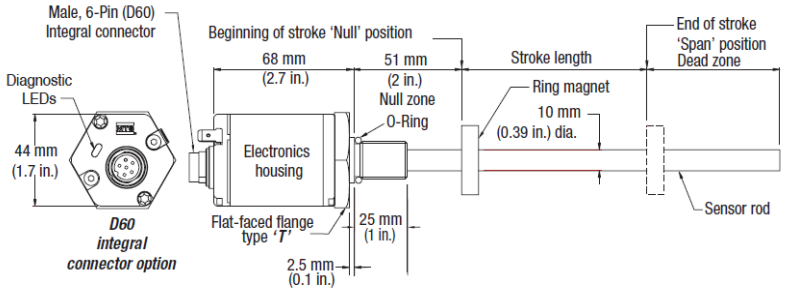
An interrogation pulse is launched along a waveguide. A magnet housed in the piston creates a magnetic field. When the interrogation pulse interacts with the magnetic field, a strain pulse is sent back to the head of the sensor.

The position of the magnet is determined by measuring the elapsed time between the launching of the interrogation pulse and the return to the strain pulse.



Working of Linear Displacement Transducer

LDT - Standard Specifications



Electrical Specifications	
Input Power	+24 VDC Nominal (20.4 to 28.8 VDC std) Optional: +9 to +28.8 VDC
Outputs	Analog: 0-10V, 10-0V, 4-20 mA, 20-4 mA Digital: Start/Stop or Pulse Width Modulation (PWM)
Resolution	Analog: Infinite Digital: 0.1, 0.01, and 0.005 mm
Hysteresis	< 4 µm
Repeatability	< ±0.001% full stroke (± 2.5 µm minimum)
Linearity Deviation	< ±0.02% full stroke (± 50 µm minimum)
Update Rate	Analog: < 1ms (typical) Digital: =probe length (inches) x 10 µsec/in. x number of circulations
Measuring Range	Analog: 50 to 2540 mm (2 to 100 in.) Digital: 50 to 7620 mm (2 to 300 in.)
Adjustability	Null/Span: 100% of electrical stroke length, 50 mm (2 in.) minimum distance between setpoints

General Specifications	
Operating Temperature	Operating: -40° F to 176° F (-40°C to 80°C); 185°F (85°C) maximum
Operating Pressure	5000 psi static 10,000 psi spike
Connection Type	D60 6-pin Male DIN, M16 Integral Connector Optional: 5-foot integral cable (pigtail termination)
Separate Cable	5-foot cable with D60 connector, standard, probe connector-style only (pigtail termination) (longer cable lengths are available)
Ingression	IP67 or IP68 for integral cable models
EMC Test	Emissions: IEC/EN 61000-6-3 Immunity: IEC/EN 61000-6-2 IEC/EN 61000-4-2/3/4/5/6/8, level 3/4 criterium A, CE qualified
Shock Rating	100 g (single hit) / IEC standard 68-2-27
Vibration Rating	15 g / 10-2000 Hz IEC standard 68-2-6
Null Zone	2 inches
Dead Zone	2.5 inches (2.6 inches for strokes greater than 197 inches)
Housing Style	Aluminum housing, diagnostic LED
Mounting Style	Threaded flange: 3/4-16 UNF-3A or M18 x 1.5

LDT - Standard Specifications

Table 1 – Envelope and Rod End Dimensions

For additional dimensions, consult Series 2H and Series 3H 7.00" and 8.00" Bore pages in the HY08-1314 Catalog.

Bore Ø	Rod No.	MM Rod Ø	Thread		A	LB Add Stroke	LG Add Stroke	VL	Rated Operating Pressure PSI
			Style 8 CC	Style 4 KK					
2.00	1 (Std.)	1.000	7/8-14	3/4-16	1.13	5.25	-	1.43	3000
	2	1.375	1 1/4-12	1-14	1.63	5.25	-	1.43	3000
2.50	1 (Std.)	1.000	7/8-14	3/4-16	1.13	5.38	-	1.43	1800
	2	1.750	1 1/2-12	1 1/4-12	2.00	5.38	-	1.43	3000
	3	1.375	1 1/4-12	1-14	1.63	5.38	-	1.43	3000
3.25	1 (Std.)	1.375	1 1/4-12	1-14	1.63	6.25	-	1.26	2130
	2	2.000	1 3/4-12	1 1/2-12	2.25	6.25	-	1.26	3000
	3	1.750	1 1/2-12	1 1/4-12	2.00	6.25	-	1.26	3000
4.00	1 (Std.)	1.750	1 1/2-12	1 1/4-12	2.00	6.63	-	1.26	2580
	2	2.500	2 1/4-12	1 7/8-12	3.00	6.63	-	1.26	3000
	3	2.000	1 3/4-12	1 1/2-12	2.25	6.63	-	1.26	3000
5.00	1 (Std.)	2.000	1 3/4-12	1 1/2-12	2.25	7.13	-	1.26	2510
	2	3.500	3 1/4-12	2 1/2-12	3.50	7.13	-	1.26	3000
	3	2.500	2 1/4-12	1 7/8-12	3.00	7.13	-	1.26	3000
	4	3.000	2 3/4-12	2 1/4-12	3.50	7.13	-	1.26	3000
6.00	1 (Std.)	2.500	2 1/4-12	1 7/8-12	3.00	8.38	-	1.43	3000
	2	4.000	3 3/4-12	3-12	4.00	8.38	-	1.43	3000
	3	3.000	2 3/4-12	2 1/4-12	3.50	8.38	-	1.43	3000
	4	3.500	3 1/4-12	2 1/2-12	3.50	8.38	-	1.43	3000
7.00	1 (std.)	3.000	2 3/4-12	2 1/4-12	3.50	-	8.50	0.41	3000
	2	5.000	4 3/4-12	3 1/2-12	5.00	-	8.50	0.41	3000
	3	3.500	3 1/4-12	2 1/2-12	3.50	-	8.50	0.41	3000
	4	4.000	3 3/4-12	3-12	4.00	-	8.50	0.41	3000
	5	4.500	4 1/4-12	3 1/4-12	4.50	-	8.50	0.41	3000
8.00	1 (std.)	3.500	3 1/4-12	2 1/2-12	3.50	-	9.50	0.41	3000
	2	5.500	5 1/4-12	4-12	5.50	-	9.50	0.41	3000
	3	4.000	3 3/4-12	3-12	4.00	-	9.50	0.41	3000
	4	4.500	4 1/4-12	3 1/4-12	4.50	-	9.50	0.41	3000
	5	5.000	4 3/4-12	3 1/2-12	5.00	-	9.50	0.41	3000

Pressure Rating

- Smaller rod diameters are sometimes de-rated

Wavescale Embedded LDT

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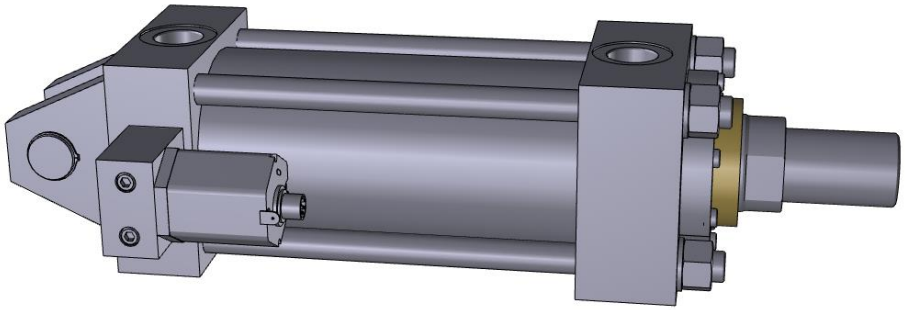
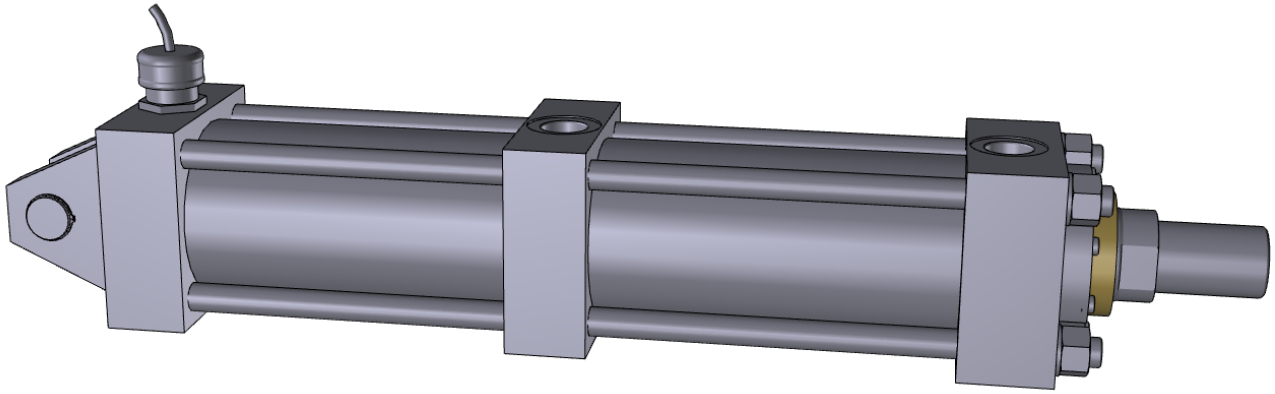
LDT Wavescale

Wavescale LDT

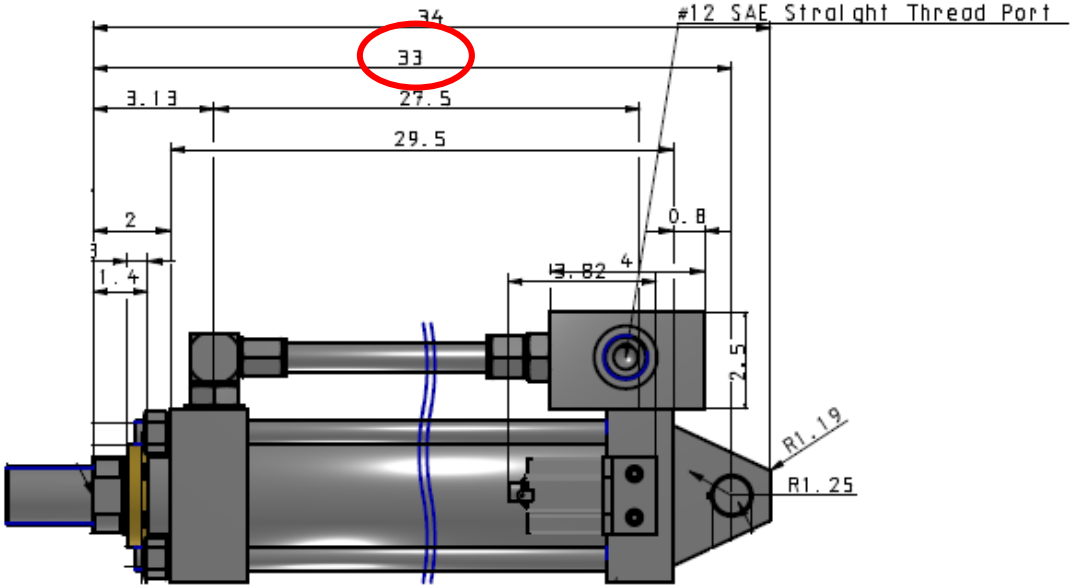


- Wavescale utilizes the same LDT technology, but reconfigures the electronics to be mounted on the side of the end cap
- Allow rear mount cylinders to be used without changing the envelope dimensions

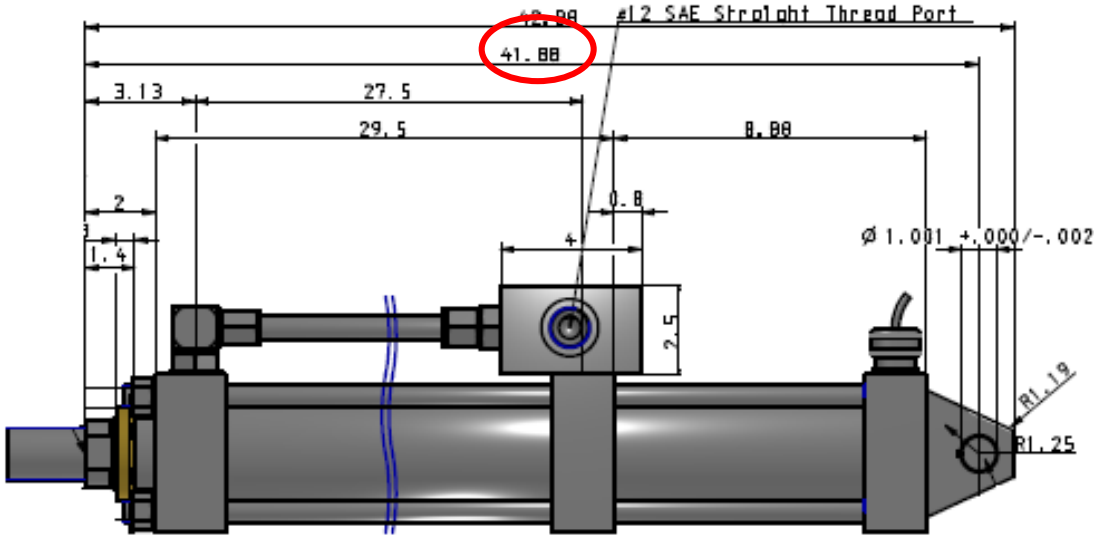
Standard LDT



LDT Wavescale

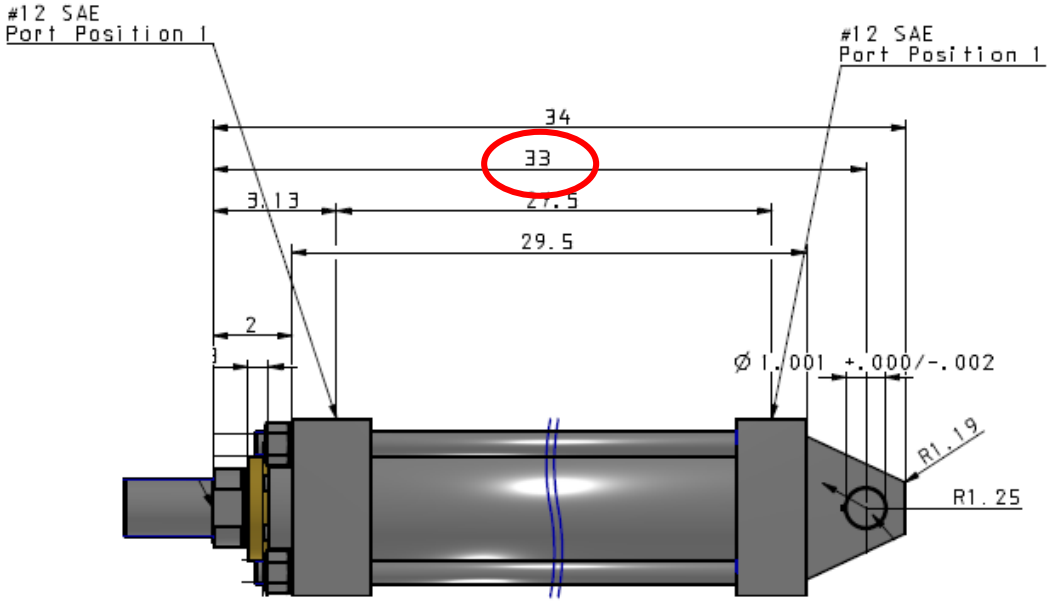


Wavescale Cylinder

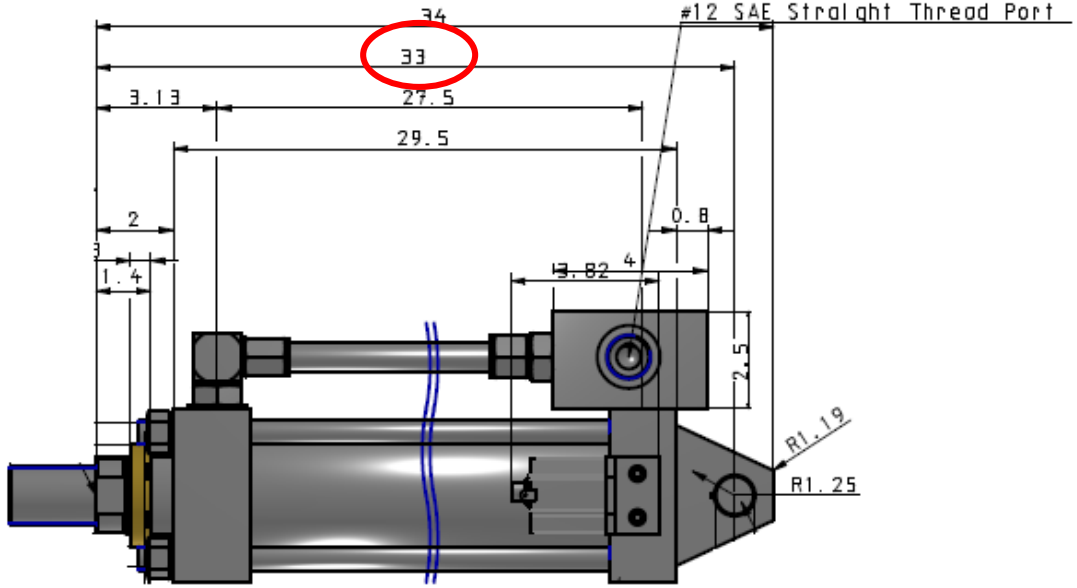


Standard LDT Cylinder

LDT Wavescale



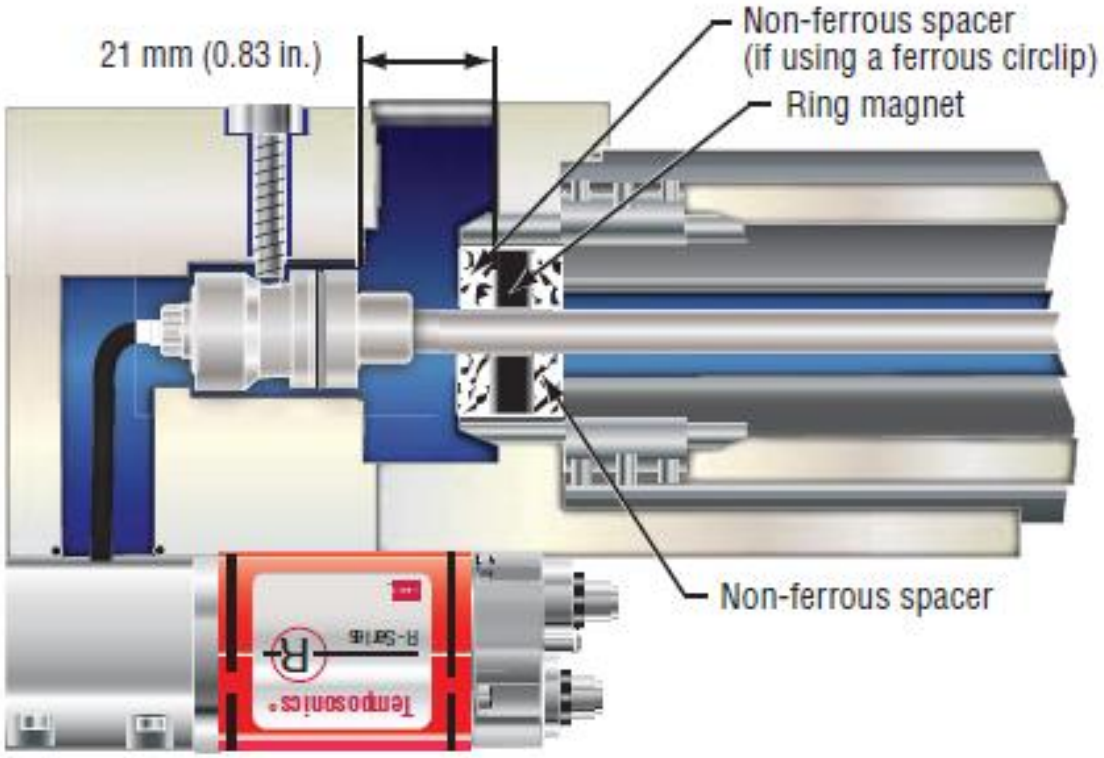
Standard Cylinder



Wavescale Cylinder

Parker

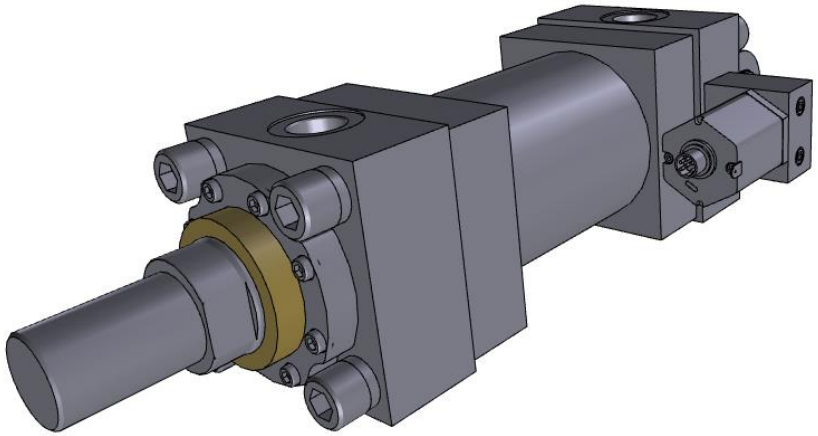
WaveScale RD4 (Embedded LDT)



LDT Wavescale

Options and Restrictions

- Electrical block can be located at any open positions
- No cap end cushion
- Not available prepared to accept transducer
- Some de-rated pressures for smaller rod diameter
- 2” bore wavescale cylinders will have SAE #8 ports



Legacy vs GenII Wavescale

Legacy Wavescale Design

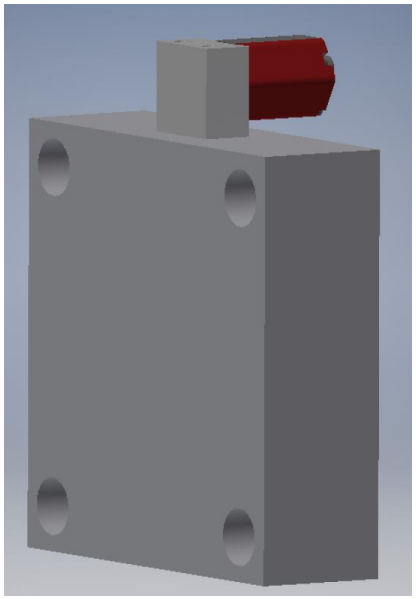
MTS LD2 Series

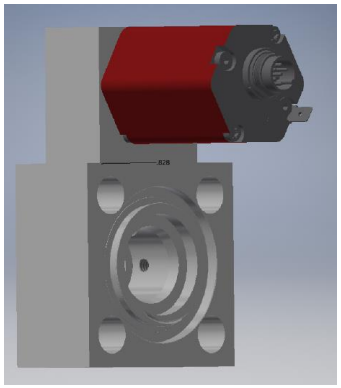
GenII Wavescale Design

MTS RD4 Series

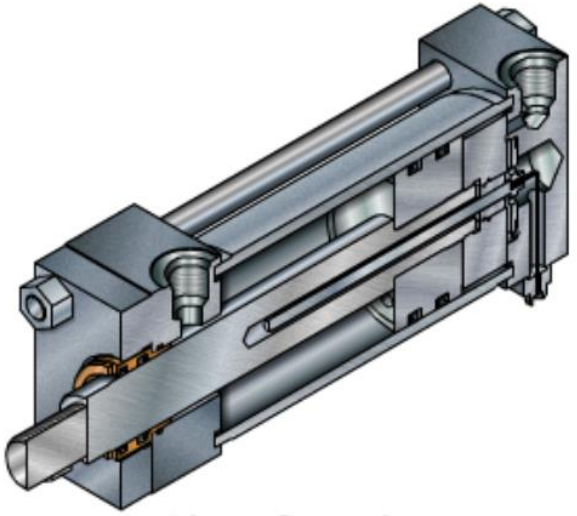
GenII RD4 Wavescale

- RD4 – “R” series electronics
  - Not the same outputs: no PWM, no Start-Stop
  - More specialized outputs: EtherCAT, EtherNet/IP, Profinet, Profibus-DP, SSI, CANbus
  - IP67 Sensor Electronics
  - Electronics head and mounting block





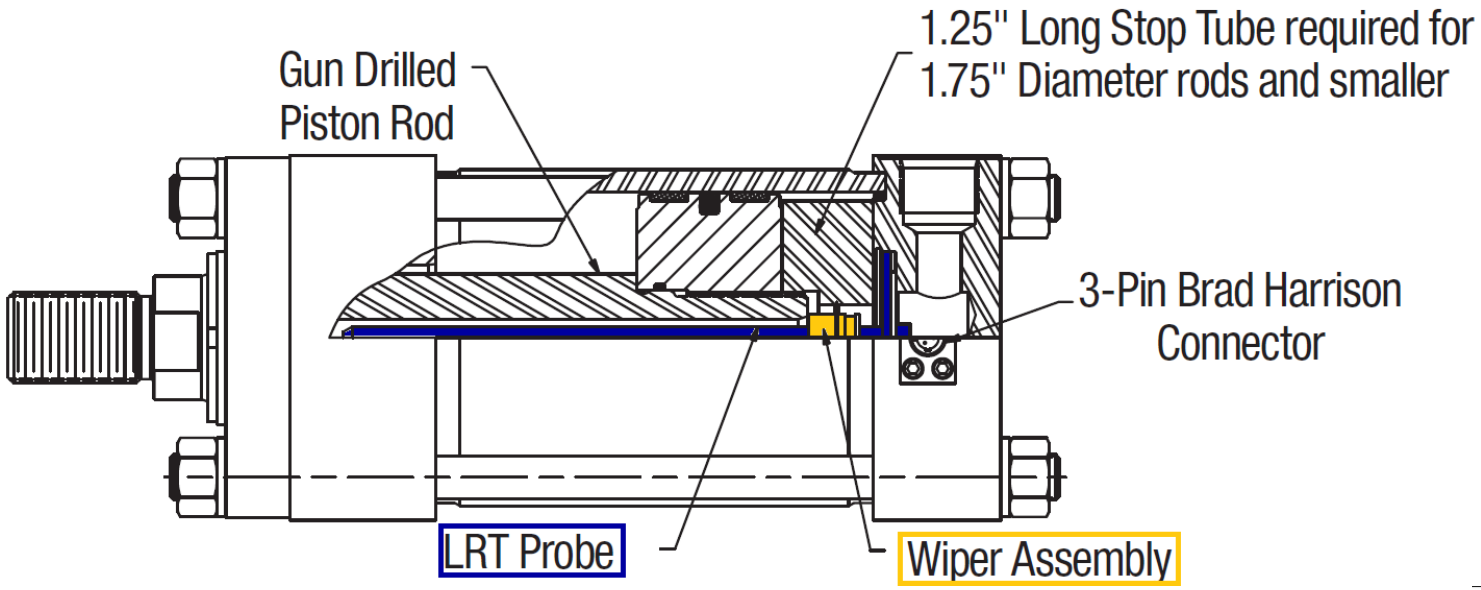
LRT Cylinder



Linear Potentiometer

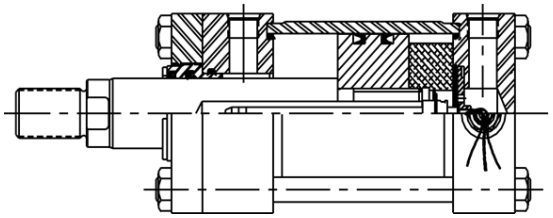
Parker LRT – How it works

- The Parker LRT is a uniquely designed position sensor that uses a resistive element to provide an analog signal of a cylinder's position. The LRT is a dual element type linear potentiometer with two independent elements mounted on either side of an anodized extrusion. The LRT operates as a voltage divider. This is done by shorting through the extrusion with the wiper assembly. The position of the load changes the resistive load proportional to its position along the cylinder stroke. The LRT is energized by applying a voltage across the unit, typically 10 VDC. As the resistive unit load changes with the cylinder stroke, the output voltage changes proportionally.

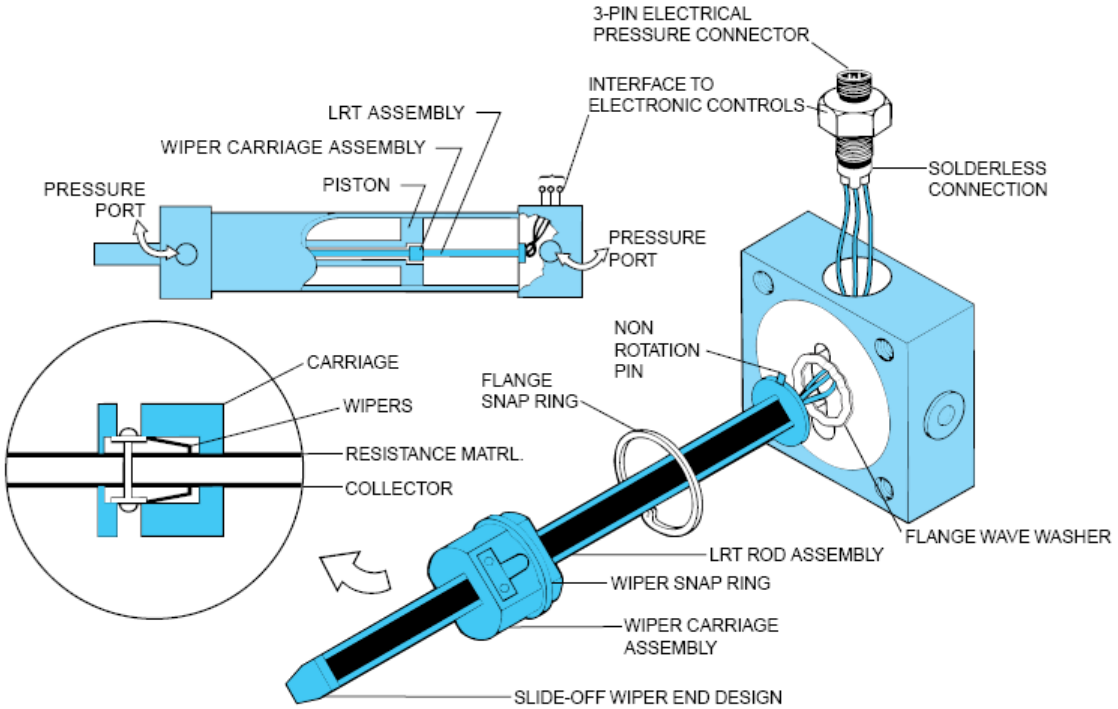


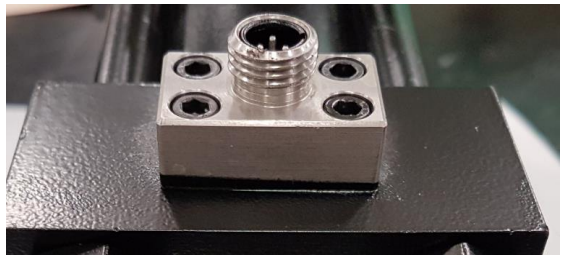
LRT - Restrictions/Concerns

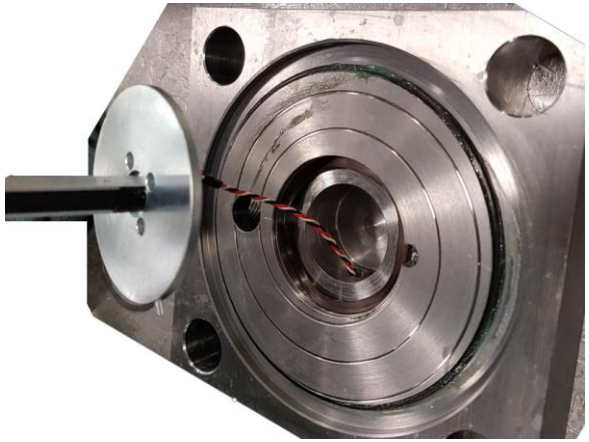
- Life Expectancy - 50 Million Inches of Travel
- Fluid - Petroleum Based Oils Only. No Water or Glycol
- No cushions on cap end
- 1 ¼” long cap end stop tube needed for rod sizes 1 ¾” and below
- Never “prepared to accept”



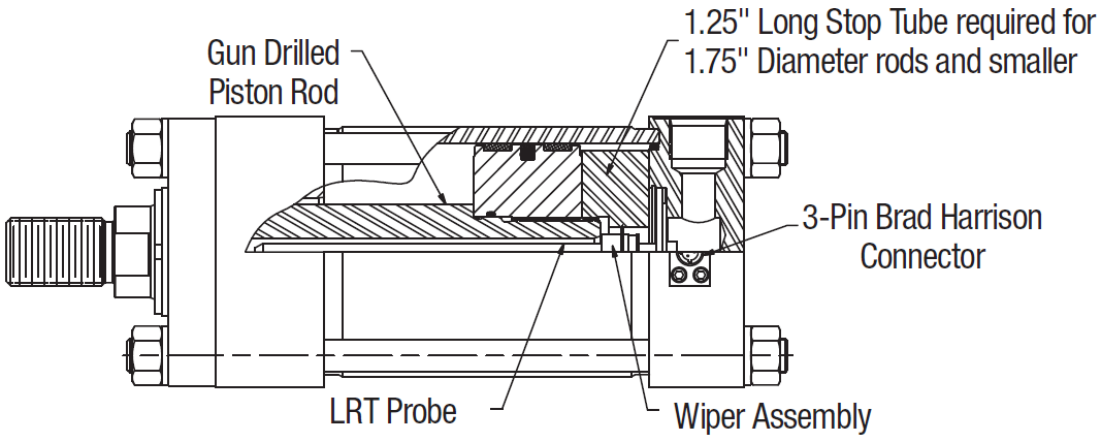
LRT same feedback Installation into a Cylinder







LRT - Standard Specifications



Electrical Specifications	
Input Power	5-50 VDC Nominal
Outputs	Analog
Resolution	Infinite
Repeatability	0.001 (dependent stroke)
Non-Linearity	0.1% (48" maximum) 1% (120" maximum)
Impedance Interface	Greater than 250k Ohms
Total Resistance	800Ω + 800Ω/inch of stroke (+/-20%)
Stroke Resistance	800Ω/inch of stroke (+/-20%)
End Voltage Loss	(V source) x (400/stroke x 800)
Power Dissipation	$(V\ source)^2$ x 800Ω + 800Ω/inch of stroke)

General Specifications	
Operating Temperature	Operating: -40° F to 160° F (-40°C to 80°C); Optional: 300°F maximum, consult factory
Operating Pressure	5000 psi static
Connection Type	3-pin Brad Harrison micro connector
Separate Cable	Not provided unless ordered separately
Cylinder Stroke Length	Up to 120 inches
Maximum Velocity (Hydraulic Fluid)	30 inches per second
Hydraulic Fluid	Must be non-water based
Life Expectancy	500 million inches of travel

Feedback Options

Feedback Options

Feedback Furnished

Feedback Furnished		Feedback Options		
Code	Description	C	B	W
NF	NF - No Feedback			
1P	1P - Prepare to Accept - Piston rod will be drilled to accept a probe with an electrical stroke equal to the cylinder net stroke.	✓	✓	
FR	FR - LRT Installed			
V0	V0 - 0 Vdc to +10 Vdc	✓	✓	✓
V1	V1 - +10 Vdc to 0 Vdc	✓	✓	✓
A0	A0 - 4 mA to 20 mA	✓	✓	✓
A1	A1- 20 mA to 4 mA	✓	✓	✓
A4	A4 - Other Analog - Specify required output.	✓	✓	✓
DE	DE - PWM, External Interrogation	✓	✓	
DI	DI - PWM, Internal Interrogation	✓	✓	
SS	SS - SSI Output [7]	✓	✓	✓
R0	R0 - Start/Stop	✓	✓	
D4	D4 - Other Digital - Specify required output.	✓	✓	✓

NF

- Cylinder piston rod will not be gundrilled and will not accept any feedback device
- Option used for cylinders with manifolds, but no feedback

Feedback Options

Feedback Furnished

Feedback Furnished		Feedback Options		
Code	Description	C	B	W
NF	NF - No Feedback			
1P	1P - Prepare to Accept - Piston rod will be drilled to accept a probe with an electrical stroke equal to the cylinder net stroke.	✓	✓	
FR	FR - LRT Installed			
V0	V0 - 0 Vdc to +10 Vdc	✓	✓	✓
V1	V1 - +10 Vdc to 0 Vdc	✓	✓	✓
A0	A0 - 4 mA to 20 mA	✓	✓	✓
A1	A1- 20 mA to 4 mA	✓	✓	✓
A4	A4 - Other Analog - Specify required output.	✓	✓	✓
DE	DE - PWM, External Interrogation	✓	✓	
DI	DI - PWM, Internal Interrogation	✓	✓	
SS	SS - SSI Output [7]	✓	✓	✓
R0	R0 - Start/Stop	✓	✓	
D4	D4 - Other Digital - Specify required output.	✓	✓	✓

1P

- Cylinder is prepared to accept an LDT
- Customer to supply and install
- Magnet will be based on selected LDT manufacturer

Feedback Options

Feedback Furnished

Feedback Furnished		Feedback Options		
Code	Description	C	B	W
NF	NF - No Feedback			
1P	1P - Prepare to Accept - Piston rod will be drilled to accept a probe with an electrical stroke equal to the cylinder net stroke.	✓	✓	
FR	FR - LRT Installed			
V0	V0 - 0 Vdc to +10 Vdc	✓	✓	✓
V1	V1 - +10 Vdc to 0 Vdc	✓	✓	✓
A0	A0 - 4 mA to 20 mA	✓	✓	✓
A1	A1- 20 mA to 4 mA	✓	✓	✓
A4	A4 - Other Analog - Specify required output.	✓	✓	✓
DE	DE - PWM, External Interrogation	✓	✓	
DI	DI - PWM, Internal Interrogation	✓	✓	
SS	SS - SSI Output [7]	✓	✓	✓
R0	R0 - Start/Stop	✓	✓	
D4	D4 - Other Digital - Specify required output.	✓	✓	✓

Output Options

- Cylinder shipping from the factor with feedback devices installed at Parker must call out the desired output

Feedback Options

Feedback Furnished

Feedback Furnished		Feedback Options		
Code	Description	C	B	W
NF	NF - No Feedback			
1P	1P - Prepare to Accept - Piston rod will be drilled to accept a probe with an electrical stroke equal to the cylinder net stroke.	✓	✓	
FR	FR - LRT Installed			
V0	V0 - 0 Vdc to +10 Vdc	✓	✓	✓
V1	V1 - +10 Vdc to 0 Vdc	✓	✓	✓
A0	A0 - 4 mA to 20 mA	✓	✓	✓
A1	A1- 20 mA to 4 mA	✓	✓	✓
A4	A4 - Other Analog - Specify required output.	✓	✓	✓
DE	DE - PWM, External Interrogation	✓	✓	
DI	DI - PWM, Internal Interrogation	✓	✓	
SS	SS - SSI Output [7]	✓	✓	✓
R0	R0 - Start/Stop	✓	✓	
D4	D4 - Other Digital - Specify required output.	✓	✓	✓

Output Options

- Cylinder shipping from the factor with feedback devices installed at Parker must call out the desired output

Feedback Options

Feedback Furnished

Feedback Furnished		Feedback Options		
Code	Description	C	B	W
NF	NF - No Feedback			
1P	1P - Prepare to Accept - Piston rod will be drilled to accept a probe with an electrical stroke equal to the cylinder net stroke.	✓	✓	
FR	FR - LRT Installed			
V0	V0 - 0 Vdc to +10 Vdc	✓	✓	✓
V1	V1 - +10 Vdc to 0 Vdc	✓	✓	✓
A0	A0 - 4 mA to 20 mA	✓	✓	✓
A1	A1- 20 mA to 4 mA	✓	✓	✓
A4	A4 - Other Analog - Specify required output.	✓	✓	✓
DE	DE - PWM, External Interrogation	✓	✓	
DI	DI - PWM, Internal Interrogation	✓	✓	
SS	SS - SSI Output [7]	✓	✓	✓
R0	R0 - Start/Stop	✓	✓	
D4	D4 - Other Digital - Specify required output.	✓	✓	✓

Digital Outputs

- Digital outputs generally require more detailed information

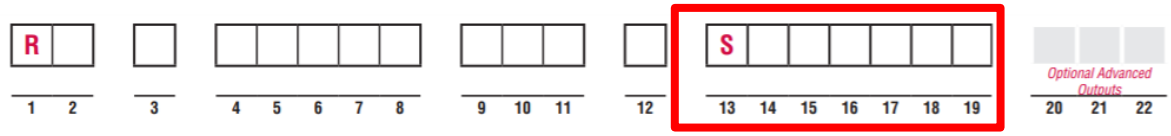
Digital Position
When specifying Pulse Width Modulation (PWM), specify Internal or External Interrogation and the number of circulations

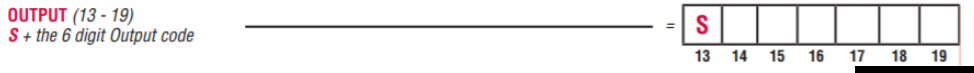
SSI
Specify data length, output format, resolution, filtering performance, and measuring direction

CAN
Specify protocol, baud rate, and resolution
For all "Other Outputs," consult factory

MTS SENSORS

SSI Output Code





Parker

Feedback Options

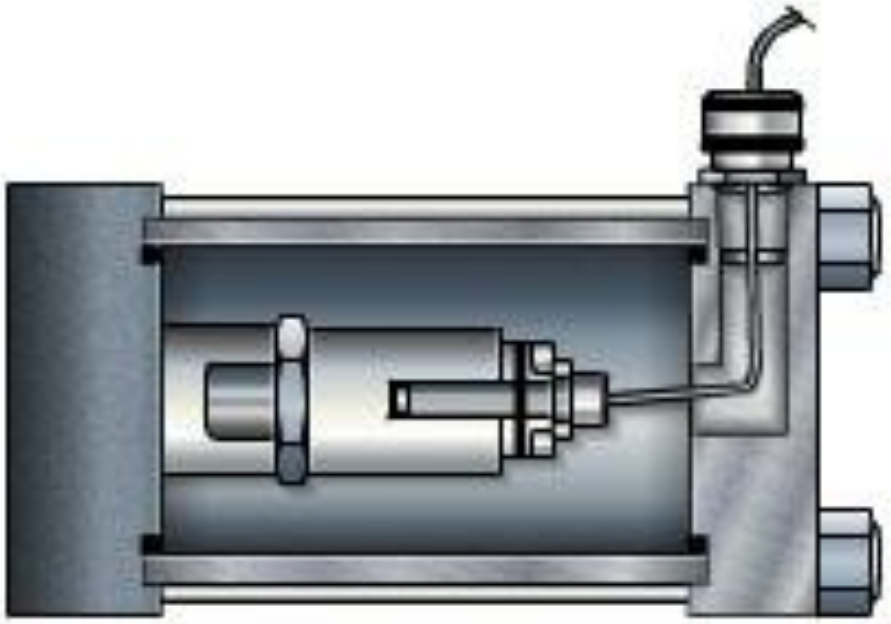
Feedback Furnished

Feedback Furnished		Feedback Options		
Code	Description	C	B	W
NF	NF - No Feedback			
1P	1P - Prepare to Accept - Piston rod will be drilled to accept a probe with an electrical stroke equal to the cylinder net stroke.	✓	✓	
FR	FR - LRT Installed			
V0	V0 - 0 Vdc to +10 Vdc	✓	✓	✓
V1	V1 - +10 Vdc to 0 Vdc	✓	✓	✓
A0	A0 - 4 mA to 20 mA	✓	✓	✓
A1	A1- 20 mA to 4 mA	✓	✓	✓
A4	A4 - Other Analog - Specify required output.	✓	✓	✓
DE	DE - PWM, External Interrogation	✓	✓	
DI	DI - PWM, Internal Interrogation	✓	✓	
SS	SS - SSI Output [7]	✓	✓	✓
R0	R0 - Start/Stop	✓	✓	
D4	D4 - Other Digital - Specify required output.	✓	✓	✓

FR

- Only option available for LRT
- LRT cannot be supplied prepped only

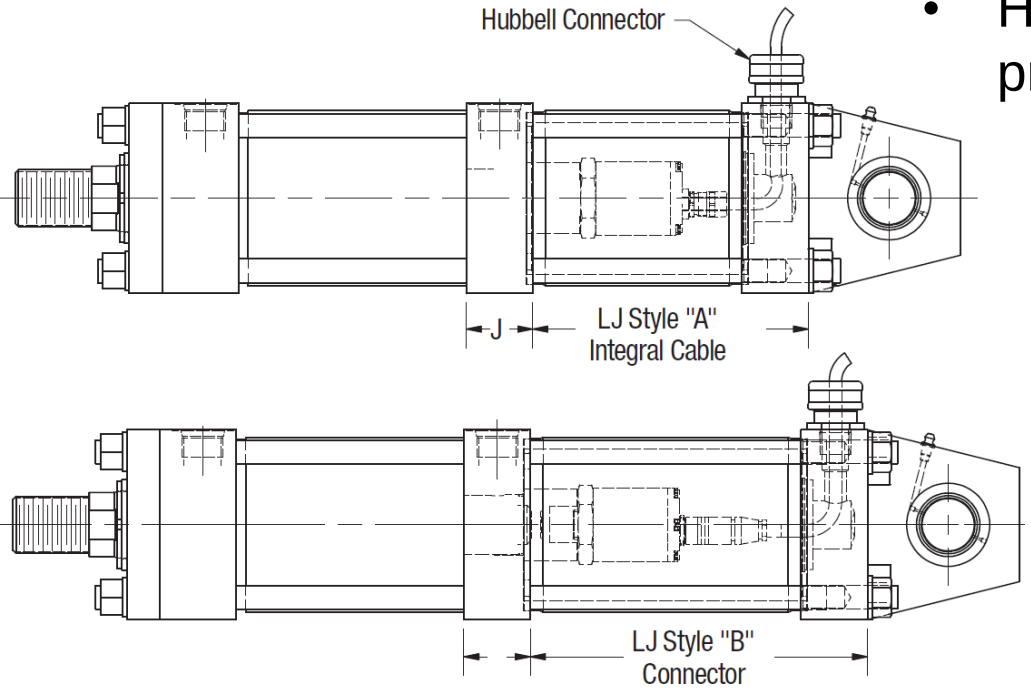
LDT Protective Enclosures



Style A: False Stage

Feedback Protective Enclosure

Feedback Protective Enclosures	
Code	Description
N	N - Not Applicable
A	A - False Stage for LDT probes with integral cable
B	B - False Stage for LDT probes with connector and separate cable
D	D - Light Duty Cover
F	F - Medium Duty Cover for LDT probes with integral cable
G	G - Medium Duty Cover for LDT probe with connector and separate cable



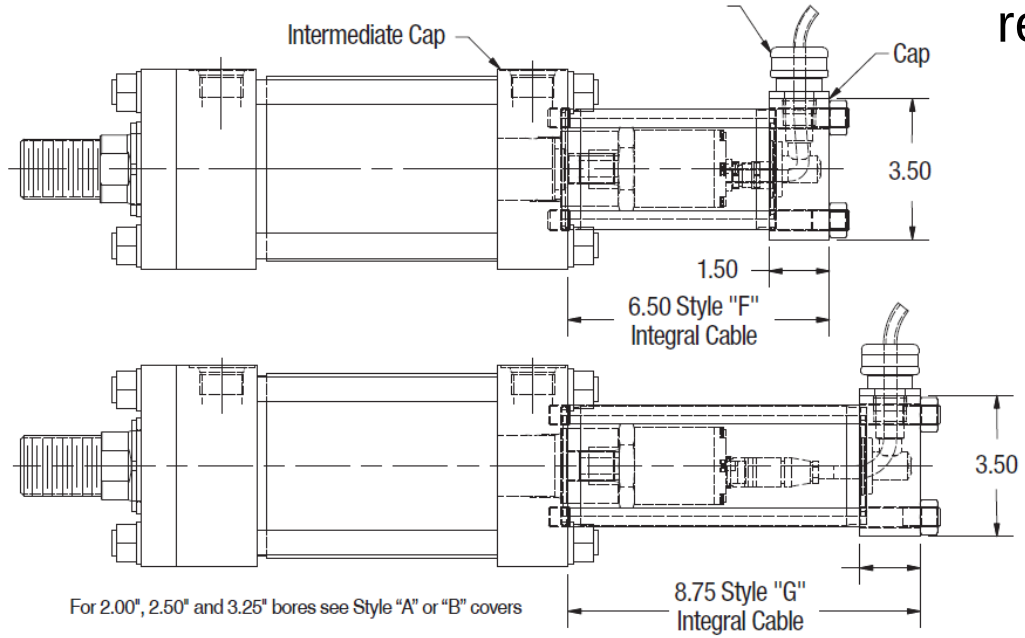
False Stage

- Required for standard LDT design when used with rear mounts
- Options for two cable types
- Heavy duty enclosure for maximum protection of electronics

Bore Ø	2.00	2.50	3.25	4.00	5.00	6.00	7.00	8.00
J	1.50		1.75			2.25	2.75	3.00
LJ Style "A"	7.00		7.25			7.75	8.25	8.50
LJ Style "B"	8.75		8.88			9.50	9.00	9.25

Feedback Protective Enclosure

Feedback Protective Enclosures	
Code	Description
N	N - Not Applicable
A	A - False Stage for LDT probes with integral cable
B	B - False Stage for LDT probes with connector and separate cable
D	D - Light Duty Cover
F	F - Medium Duty Cover for LDT probes with integral cable
G	G - Medium Duty Cover for LDT probe with connector and separate cable



False Stage

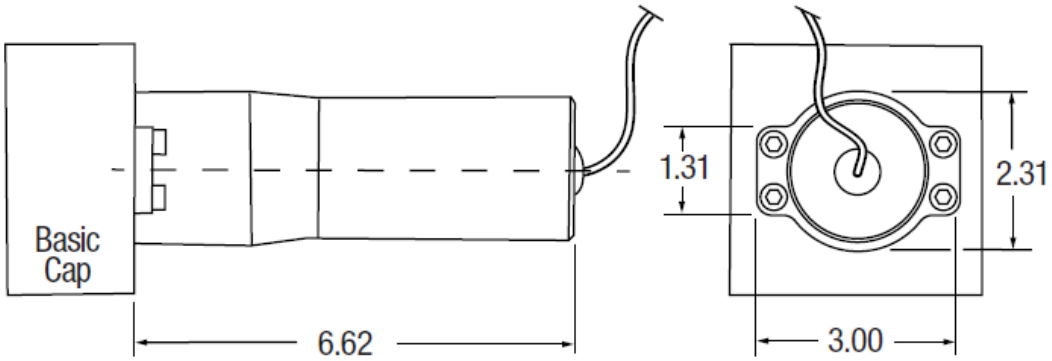
- Required for standard LDT design when used with rear mounts
- Options for two cable types
- Used for heavy duty enclosure when rear mounts are not used

Feedback Protective Enclosure

Feedback Protective Enclosures	
Code	Description
N	N - Not Applicable
A	A - False Stage for LDT probes with integral cable
B	B - False Stage for LDT probes with connector and separate cable
D	D - Light Duty Cover
F	F - Medium Duty Cover for LDT probes with integral cable
G	G - Medium Duty Cover for LDT probe with connector and separate cable

Light Duty Enclosure

- Aluminum housing for light duty protection of the electronics
- Integral cable only – no connector



Feedback Protective Enclosure

Feedback Protective Enclosures	
Code	Description
N	N - Not Applicable
A	A - False Stage for LDT probes with integral cable
B	B - False Stage for LDT probes with connector and separate cable
D	D - Light Duty Cover
F	F - Medium Duty Cover for LDT probes with integral cable
G	G - Medium Duty Cover for LDT probe with connector and separate cable

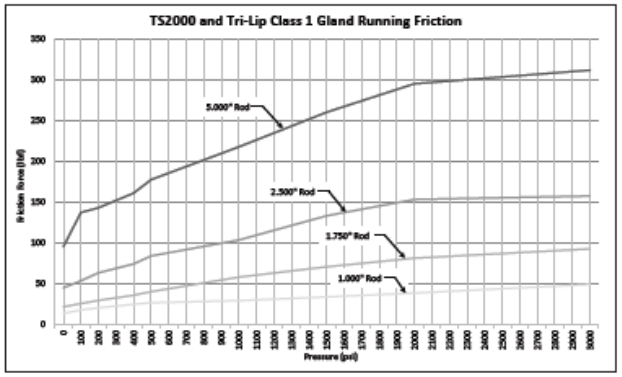
No Enclosure

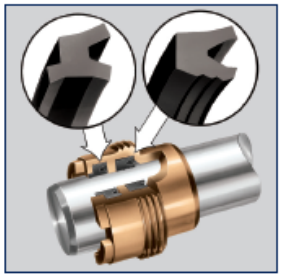
- Electronics will be exposed
- D60 connector is standard
  - Cable sold separately
- Integral cable is optional
  - Called out as a special note

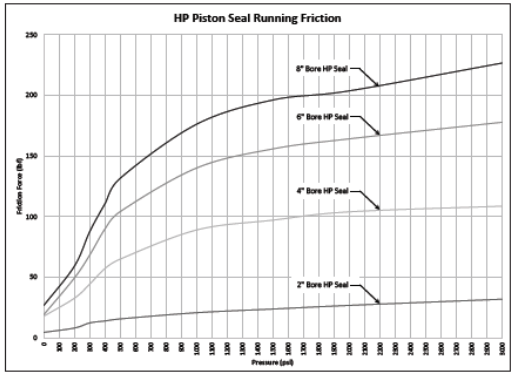
2HX Options and Accessories

Low Friction Seals

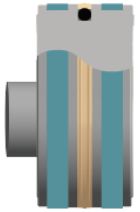
- Low friction seals are recommended for applications with high piston velocities (excess of 50 in/sec) and tight tolerance positioning.

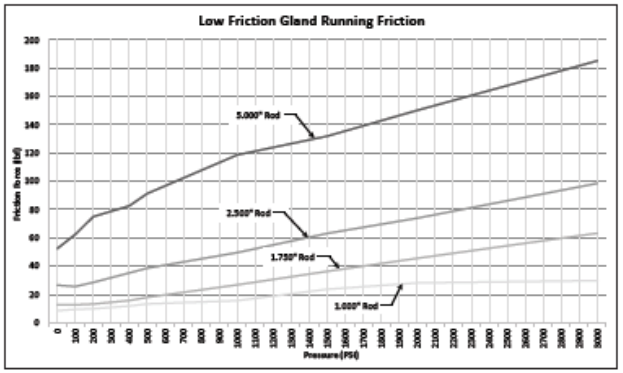


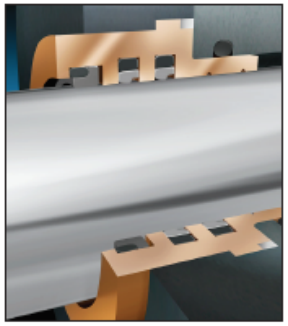


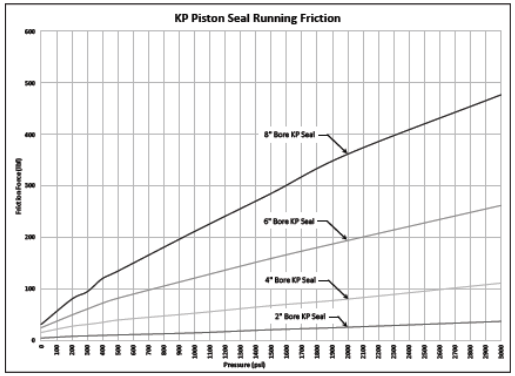


Parker HP Polyurethane Piston Seal

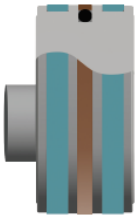








Parker KP Filled PTFE Piston Seal



Thank you for your attention!

Questions so far?