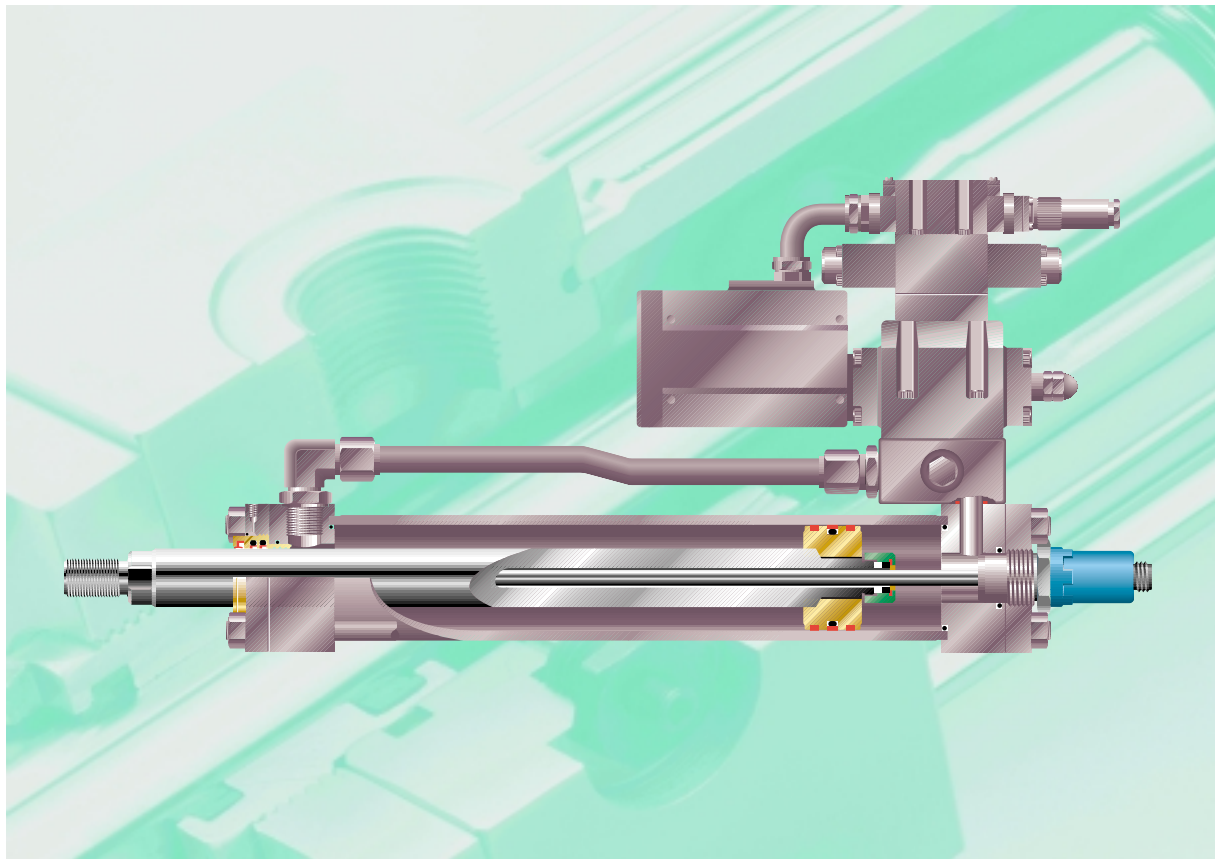




LDT Feedback Transducers

For Servo and Proportional Control

Catalogue 1175/LDT/1-GB



(To be completed when requesting further information)

Electro-Hydraulic Actuators

Parker Ref.

Contact Information

Name	Job title
Company	
Address	
.....	Post code
Telephone	Fax

Application and System Data

Application Details

1 Machine type and function	8 Cylinder speed (min/max, m/s)
.....	9 Mass (kg)
.....	10 Working life (cycles)
.....	11 Shock duty (heavy/medium/light)
2 Cylinder attitude (° to horizontal)	
<i>For more complex motions, please supply a drawing</i>	

Control System

1 Type of controller
2 Make/model
3 Inputs: sink/source/analogue/digital/LDT direct
4 Signal type
5 Other

Hydraulic Data

1 Maximum working pressure (bar)
2 Maximum system pressure (bar)
3 Axial force on cylinder (push/pull, kN)
4 Fluid medium and viscosity
5 Max. available flow (l/min)
6 Oil temperature (min/max, °C)
7 Ambient temperature (min/max, °C)

System Requirements

1 Speed control ±.....%
2 Position control: open/closed loop

Cylinder and Transducer Data

Cylinder Specification *See Model Numbers, Page 7*

1 Bore (mm)	17 Air bleeds
2 Cushion – head end	18 Gland drain
3 Double rod (Special – consult factory)	
4 Mounting style	
5 Mounting modifications	
6 Series (2HX, HMX etc.)	
7 Ports	
8 Piston type/loadholding capability	
9 Special features	
10 Rod number	
11 Rod end style	
12 Rod end thread	
13 Cushion – cap end (Special – consult factory)	
14 Working or net stroke (mm)	
16 Port positions	

Transducer Performance *See Specification, Page 3*

1 Absolute position accuracy ±.....
2 Repeatability ±.....
3 Temperature range (°C)
4 Synchronization (external/internal)
5 Outputs (0-10V, 4-20mA, digital etc.)

Electro-Hydraulic Data *See Model Numbers, Page 7*

1 Manifold
2 Manifold position
3 Feedback transducer type
4 Conditioning electronics

Please photocopy, complete and forward/fax to:
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Introduction

The addition of a transducer and conditioning electronics to a hydraulic actuator creates a system which responds rapidly and accurately to control signals for position and velocity, without the need for mechanical re-setting. By combining the sophistication of electronics with the enormous power densities offered by hydraulic motion, greater machine flexibility is achieved and set-up times are cut to a minimum.

To select a feedback device for a specific application, a balance has to be achieved between accuracy, cost and durability. Parker recommends the transducers shown below, but can supply cylinders fitted with almost any transducer requested by the customer.

Feedback Transducers from Parker

A full range of magnetostrictive and inductive transducers is available from Parker. This data sheet covers the LDT transducer, and summarizes the electronics, manifold and valve options available. Other data sheets in this series describe the different transducer options available – your Parker Sales Office will be pleased to supply copies on request. For more detailed information about individual transducers, manufacturers' data sheets are available.

The performance of Parker's standard range of transducers is summarized in the following Selection Guide.

Transducer Selection Guide

	PLT	LDT	LVDT
Type	Magnetostrictive	Magnetostrictive	Inductive
Mounting Position	Internal	Internal	Internal
Max stroke	3.5m	3.5m	0.8m
Max speed	2.5m/s	2.5m/s	(200Hz)
Resolution	Analogue o/p – 0.1mV/0.2µA Digital o/p – 0.01mV min	Analogue o/p – infinite Digital o/p – 5µ max	Infinite
Repeatability	6µm max	±0.001% of full stroke	±0.1% of full stroke
Linearity	±0.05% of full stroke	±0.05% of full stroke	±0.5% of full stroke
Operating temperature	-20°C to +80°C	-40°C to +65°C	-30°C to +150°C
Temperature coefficient	0.004% per °C	0.009% per °C	0.03% per °C
Max working pressure	210 bar	350 bar	210 bar
Outputs	Analogue and digital	Analogue and digital	Analogue
Fluid suitability	All	All	All
Environment	Medium levels of shock and vibration	Medium levels of shock and vibration	High levels of shock, vibration and temperature

The Linear Displacement Transducer

The linear displacement transducer or LDT is a magnetostrictive device which provides analogue or digital information of actuator position through the interaction of two magnetic fields. Applications for the LDT include closed loop feedback to achieve accurate position, velocity or motion control. On open loop systems, an LDT may be used as a continuous, infinite resolution position monitoring device.

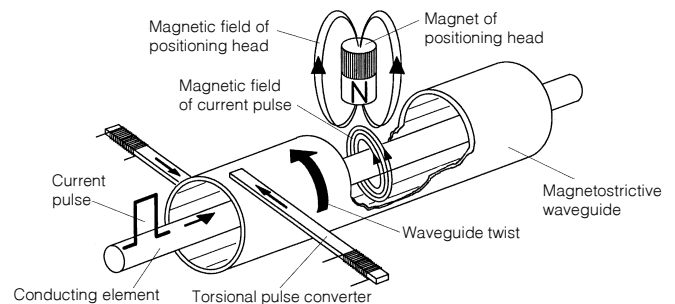
Applications

Parker feedback systems are suitable for precision control of a wide variety of applications, including:

- Machine tools
- Robots
- Flight simulators
- Woodworking machinery
- Paper machinery
- Valve mechanisms
- Injection moulding equipment
- Marine stabilisation systems
- Rubber processing equipment
- Aerial and antennae positioning systems
- Welding equipment
- Process control systems
- Life cycle testing systems

Operating Principles

The two magnetic fields which are central to the operation of the LDT are generated by a permanent magnet on the actuator piston, and by a magnetic pulse produced by a current pulse launched along a wire inside the waveguide tube. The interaction between the two fields produces a torsional strain pulse, which travels down the waveguide tube and is sensed by a coil at the end of the device. The position of the permanent magnet is established by measuring the elapsed time between the launching of the current pulse and the arrival of the strain pulse. Interface electronics convert this information to a digital or analogue output.



Note: In line with our policy of continuing product improvement, specifications in this catalogue are subject to change without notice.

Actuator Designation

Where a standard Parker actuator is fitted with a feedback device, an 'X' is added to the Series name – see 'Model Numbers' on page 7. Thus, when fitted with a feedback device, a Series 2H cylinder becomes a 2HX, and a Series HMI or HMD becomes an HMX, etc.

Mounting Styles and Dimensions

Linear Displacement Transducers or LDTs may be ordered for most Parker tie rod and roundline actuators. The transducer increases the overall build length by an amount which varies with the mounting style chosen. The tables show the variations in dimensions which result when an HMI/HMD or 2H cylinder is specified with an LDT. For the dimensional changes to other actuator series, please contact the factory.

The tables of dimensions which follow must be used in conjunction with the current version of the appropriate actuator product catalogue. Except where specified below, the dimensions of an actuator fitted with an LDT are identical with those of the standard, non-feedback actuator. If you are unsure whether you have the latest version of the catalogue, please consult your Parker sales office before ordering.

Working Pressure Restrictions

The recommended maximum working pressures of cylinders fitted with a transducer may be lower than that of the standard cylinder, due to the internal drilling of the piston rod. Maximum working pressures for individual bore/rod combinations of 2HX and HMX cylinders are shown in the table below. For working pressure restrictions to other cylinder series, please consult the factory.

Note: for stroke lengths in excess of 1250mm, and for applications involving high cycle rates, high frequencies or shock loads, further pressure restrictions may apply – please consult the factory.

CE Marking

Transducers and associated components fitted by Parker are CE marked, where appropriate, to certify that they meet the requirements of EC Directive 89/336/EEC for electromagnetic compatibility.

Protective Covers

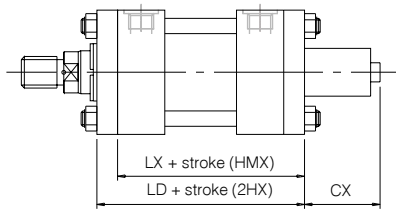
Protective covers for the transducer body are available to special order. Please contact the factory for details.

Dimensions – Series 2HX Cylinder with LDT

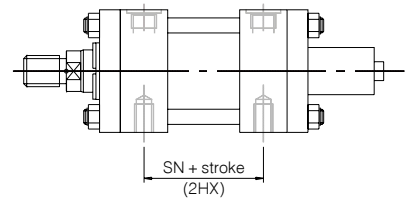
Bore φ	Rod No.	Rod φ	CX	LD	LY	SV	SN	XE	XF	XJ1	Max Working Pressure Bar
38.1	2	25.4	138	143	133	105	73	-	-	137	210
50.8	1	25.4	133	156	140	98	73	398	396	137	110
	2	34.9	133	156	140	98	73	404	402	143	210
63.5	1	25.4	133	159	143	92	76	401	N/A	140	60
	2	44.5	133	159	143	92	76	414	431	152	210
	3	34.9	133	159	143	92	76	407	424	146	210
82.6	1	34.9	130	184	165	111	89	439	N/A	162	130
	2	50.8	130	184	165	111	89	448	460	172	210
	3	44.5	130	184	165	111	89	445	457	168	180
101.6	1	44.5	131	197	175	108	95	472	N/A	175	110
	2	63.5	131	197	175	108	95	481	490	184	210
	3	50.8	131	197	175	108	95	475	484	178	190
127.0	1	50.8	131	210	187	121	108	491	N/A	190	110
	2	88.9	131	210	187	121	108	497	507	197	210
	3	63.5	131	210	187	121	108	497	507	197	200
	4	76.2	131	210	187	121	108	497	N/A	197	200
152.4	1	63.5	149	213	187	130	130	534	N/A	213	130
	2	101.6	149	213	187	130	130	534	585	213	210
	3	76.2	149	213	187	130	130	534	N/A	213	210
	4	88.9	149	213	187	130	130	534	585	213	210
177.8	1	76.2	149	241	216	146	149	588	N/A	238	150
	2	127.0	149	241	216	146	149	588	N/A	238	210
	3	88.9	149	241	216	146	149	588	N/A	238	190
	4	101.6	149	241	216	146	149	588	N/A	238	210
203.2	1	88.9	149	267	241	172	168	626	N/A	260	140
	2	139.7	149	267	241	172	168	626	N/A	260	210
	3	101.6	149	267	241	172	168	626	N/A	260	190
	5	127.0	149	267	241	172	168	626	N/A	260	210

All dimensions are in millimetres unless otherwise stated

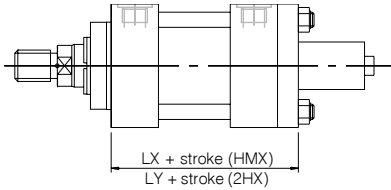
All Mountings – Common dimensions



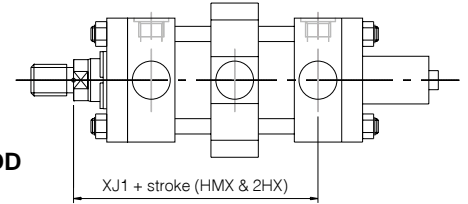
Base Mounting Style F



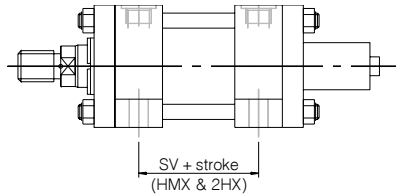
Front Flange Mounting Style JJ



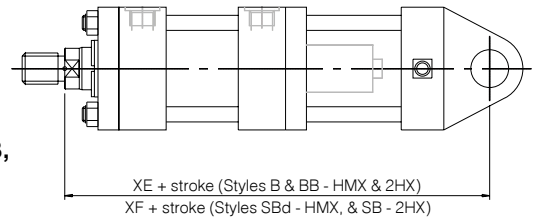
Trunnion Mountings Styles D, DB & DD



Base Mounting Style C



Rear Pivot Mountings Styles B, BB, SB & SBd



Rear Flange Mountings

Depending on the method of mounting, feedback transducers may be available with rear flange-mounted cylinders. Please contact the factory with details of the application.

Dimensions – Series HMX Cylinder with LDT

Bore ϕ	Rod No.	Rod ϕ	CX	LX	SV	XE	XF	XJ1	Max Working Pressure Bar
40	2	28	145	135	105	-	-	138	210
50	2	36	139	141	99	411	410	144	210
	3	28	139	141	99	411	410	144	180
63	1	28	139	143	93	420	426	153	110
	2	45	139	143	93	420	426	153	210
	3	36	139	143	93	420	426	153	210
80	1	36	127	164	110	447	456	170	130
	2	56	127	164	110	447	456	170	210
	3	45	127	164	110	447	456	170	210
100	1	45	125	173	107	475	479	194	130
	2	70	125	173	107	475	479	194	210
	3	56	125	173	107	475	479	194	210
125	1	56	125	197	131	514	529	214	210
	2	90	125	197	131	514	529	214	210
	3	70	125	197	131	514	529	214	210
160	1	70	155	188	130	541	570	230	180
	2	110	155	188	130	541	570	230	210
	3	90	155	188	130	541	570	230	210
200	1	90	155	242	172	632	666	276	140
	2	140	155	242	172	632	666	276	210
	3	110	155	242	172	632	666	276	210

All dimensions are in millimetres unless otherwise stated

Bore Sizes and Mounting Styles

The Series 2HX and HMX bore sizes and mounting styles listed on pages 4-5 are those for which an LDT is commonly specified. Where a different bore size or mounting style is required, modification may be possible to allow a transducer to be added – please contact the factory for details.

Rod Diameters

For heavy duty or high cycling applications, large diameter piston rods are recommended. Please refer to the rod selection information in the appropriate cylinder catalogue.

Piston and Seal Options

Feedback devices may be specified with any of the piston and gland seal options shown in the cylinder catalogues. Seals are available in a variety of compounds for standard or high temperature use, and for use with different fluids.

Where fine control of acceleration, velocity and position are required, the 'Servo' option should be specified – see 'Model Numbers' on page 7. Servo cylinders combine low friction piston and gland seals with specially selected rods and tubes.

Cushions

On cylinders with integral feedback, cushioning is normally available at the head end only. Cushioning at the cap end requires special designs – please contact the factory with details of the application.

Gland Drains

The accumulation of fluid behind the gland wiperseal of long stroke cylinders, or cylinders with constant back pressure, can be relieved by specifying the option of a gland drain. Full details are contained in the appropriate cylinder catalogue.

Analogue and Digital Outputs

Parker offers various types of LDT transducer, to suit the specific requirements of the application. With models which do not support an analogue output directly from the transducer head, conditioning electronics are available. In each case, the outputs supported are 0-10V, 4-20mA and 0-20mA. Digital output is available from all types of LDT transducer, in conjunction with suitable conditioning electronics. Please contact the factory for further information.

Manifold Options

Manifolds can be supplied in a variety of positions, to suit most commonly available valves and valve interfaces. Please consult the factory for details.

Proportional and Servo Valves

Both open and closed loop control of cylinder position and velocity can be achieved using proportional valves. For applications where fine control of acceleration, velocity and position are required, Parker recommends servo valves. Please contact the factory for details.

Seal Friction

The effects of seal friction are influenced by a wide range of factors. The following information is offered as a guide but, for critical applications, measurements should be made under simulated or actual operating conditions.

Calculation of Running Friction

The seal friction attributable to the cylinder is calculated as the sum of the friction due to the individual sealing elements of the gland and piston. The following formulae apply for 2HX and HMX cylinders, with speeds in excess of 0.1m/s. For other cylinder series, please consult the factory.

Series	Seal Type	Friction (Newtons)		
		Wiper	+ Rod Seal	+ Piston Seal
2HX	Lipseal	2d	+ 2F _L d	+ 4F _L D
	HiLoad	2d	+ 2F _L d	+ 2F _p D
	Low Friction	2d	+ 5F _p d	+ F _p D
HMX	Standard	2d	+ 2F _L d	+ F _N D
	LoadMaster	2d	+ 2F _L d	+ F _N D
	Low Friction	2d	+ 5F _p d	+ F _p D

Where: d = rod diameter (mm)
 D = bore diameter (mm)
 F_L = friction factor for standard rod seals and Lipseal pistons
 F_N = friction factor for Standard piston seals
 F_p = friction factor for PTFE seals

Friction factors may be read from the chart below. Note that the curves are based on the performance of a cylinder with the servo option – see 'Piston and Seal Options' above.

Calculation of Break-Out Friction

Break-out friction may be approximated by applying the following correction factors:

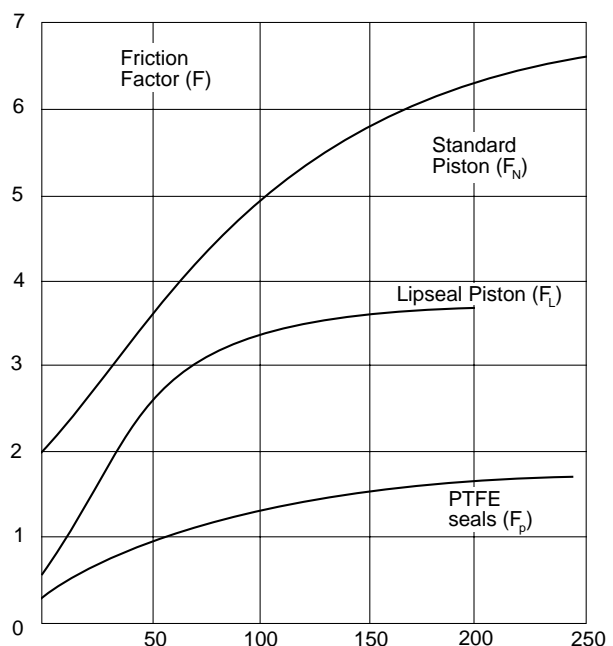
$$F_L \times 1.5; \quad F_N \times 2; \quad F_p - \text{no correction needed}$$

Example

Series: HMX Bore: 50mm
 Rod: 36mm rod Seals: Low friction
 Operating pressure: 100 bar

$$\text{Friction} = 2d + 5F_p d + F_p D$$

$$= (2 \times 36) + (5 \times 1.3 \times 36) + (1.3 \times 50) = 371\text{N}$$



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