



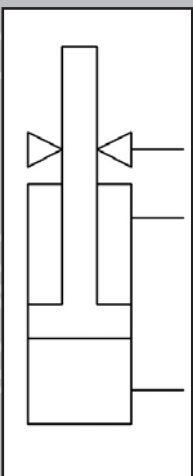
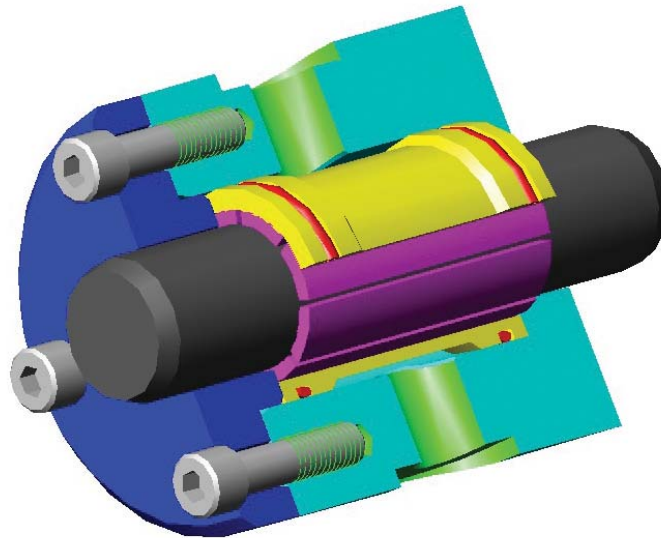
rampower

hydraulic equipment for all uses

TECHNICAL UPDATE Issue 1

FRICTION LOCKING SLEEVES

Zero Leakage - Zero Drift



Cost effective precision locking at *any* stroke position.

Hydraulic applied locking device for reciprocating hydraulic actuators.

Can be 'built in' to new actuators or fitted over an extended piston rod.

Prevents axial motion; slippage release of overload, re-locking after load reduced.

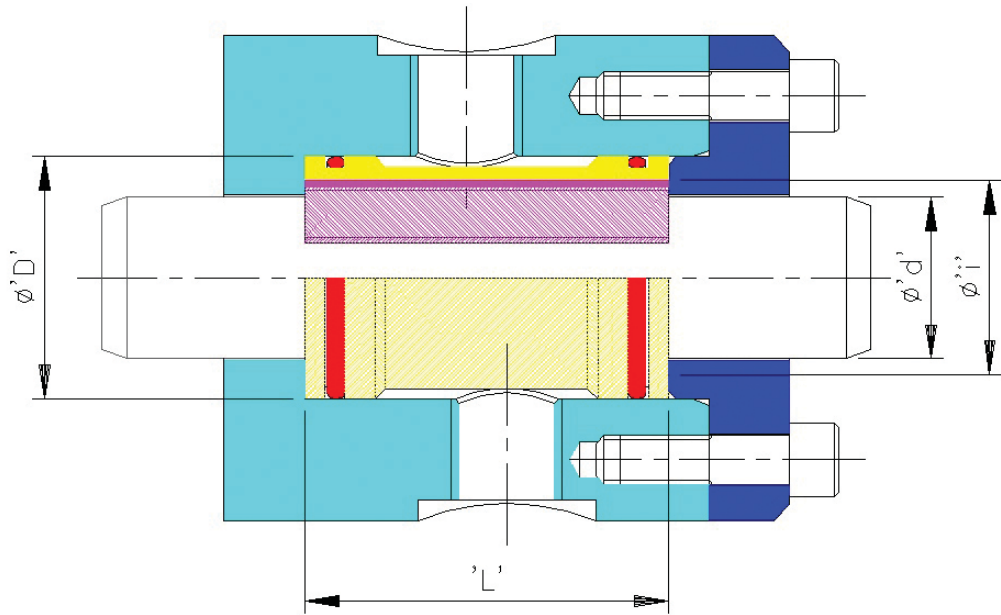
Locking force proportional to applied pressure. Lock releases on venting pressure.

Unique highly space efficient design giving improved power density.

Suitable for *double acting* and *single acting* rams, and other *shaft locking applications*.



Application of pressure around the outside of the diaphragm creates a frictional locking force between the leaves and the shaft. Loads are transferred from the shaft through the leaves and thus into the housing via the leaf shoulder. Locking force is a function of applied pressure, diaphragm diameter, and sleeve length. The entire leaf length is energised by use of a flexible diaphragm with integral end sealing elements.



Sleeves can be manufactured to any size, however, the following table gives some data on 'standard' sizes. Housing diameter as well as length can be varied to optimise locking force at a specific pressure requirement:

All dimensions in mm

Size ref	Shaft 'd' f7	Housing 'D' H9	Length 'L' +0.1	Interface 'i'
Ø16x40	16	26	40	20
Ø20x40	20	30	40	24
Ø28x45	28	38	45	32
Ø32x45	32	42	45	36
Ø36x50	36	46	50	40
Ø40x50	40	50	50	44
Ø45x50	45	55	50	49
Ø50x65	50	65	65	57
Ø56x70	56	71	70	63
Ø60x70	60	75	70	67
Ø70x80	70	85	80	77
Ø80x100	80	100	100	90
Ø90x100	90	110	100	100
Ø100x150	100	125	150	115
Ø110x125	110	130	125	120
Ø120x130	120	140	130	130
Ø140x125	140	165	125	152
Ø150x125	150	175	125	162

Performance data:

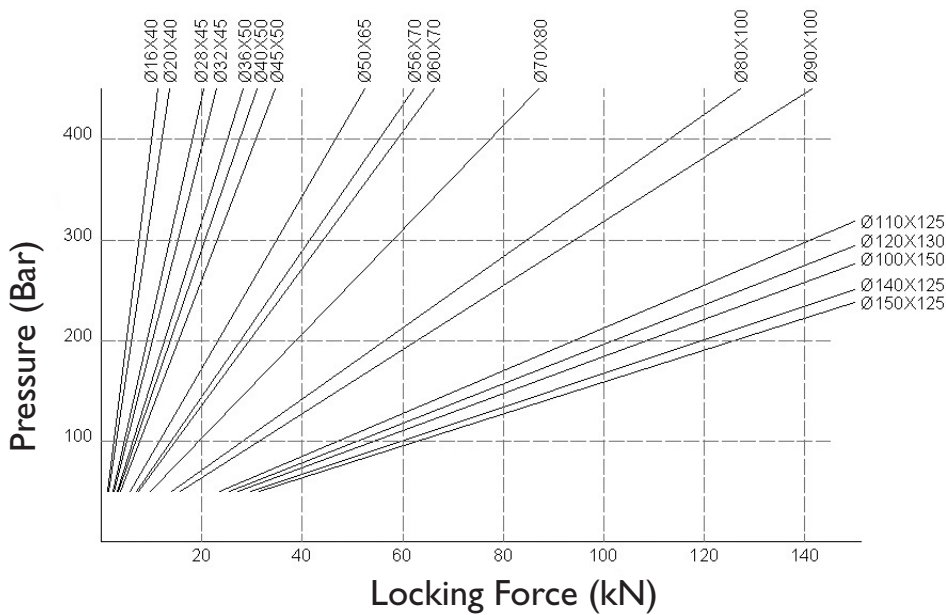
The anticipated locking force can be calculated from:

$$F = P \times L \times i \times \mu \times \pi / C$$

Where:

- F = holding force, kN
- P = clamping pressure, bar
- L = sleeve length, mm
- i = interface diameter, mm
- μ = coefficient of friction, generally > 0.1*
- C = conversion constant, 100

Important: Friction locking sleeves are not suitable for restraining torsional forces.



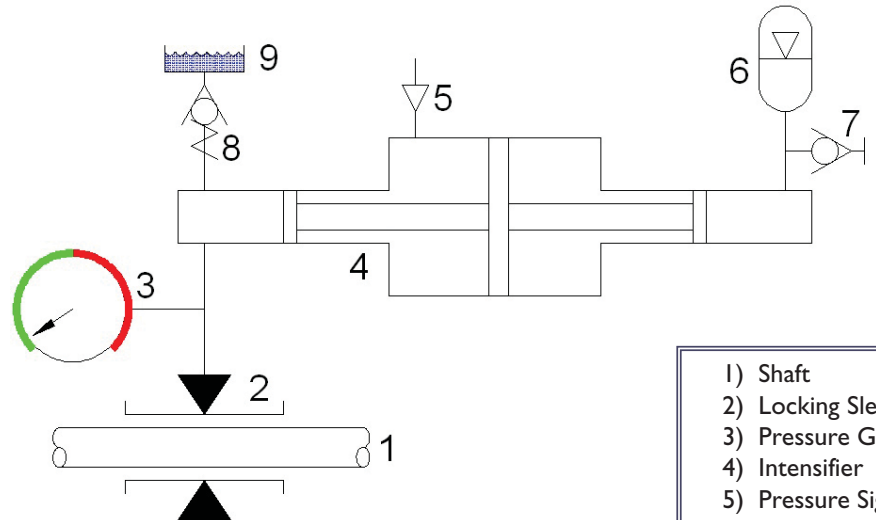
Assuming μ = 0.1

Pressure range	30 – 450 bar
Pressure medium	Mineral oil type HLP, ISO VG32 Please contact us for use with other fluids
Cleanliness requirements	NAS I 638 Class 9
Temperature range	-10°C to + 70°C
Shaft surface finish	0.2-0.4Ra
Housing surface finish	0.8 Ra
Shaft surface hardness	>250HV
Elastomeric materials	Polyurethane and Nitrile
Sleeve material	Aluminium Bronze*

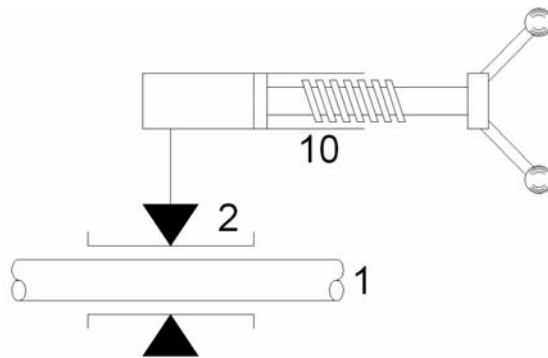
* For alternative materials, providing a higher coefficient of friction please contact our sales office

Hydraulic/Pneumatic release versions

Ram Power's experience with pressure intensifiers has enabled the development of pressure release versions of the locking sleeve. The will lock upon removal of pilot pressure.



- 1) Shaft
- 2) Locking Sleeve
- 3) Pressure Gauge
- 4) Intensifier
- 5) Pressure Signal
- 6) Hydraulic Accumulator
- 7) Test Point
- 8) Anti-Cavitation Check Valve
- 9) Recuperator Bottle
- 10) Screw/Capstan Pump



Capstan Pump Control

The use of a self locking pump, such as a capstan pump or a screw pump, provides manually applied locking which is maintained until the pressure is released.

Notes:

- 1) Friction locking devices are not suitable for use in safety critical applications.
- 2) Lubrication of the sleeve with mineral oil is permitted but not usually required, however, the use of greases, especially those containing solid lubricants, will have a detrimental effect on the holding force.
- 3) Friction locking sleeves must only be applied to static shafts, dynamic braking should be carried out by other hydraulic controls.
- 4) The information given in this leaflet is for guidance purposes only. We strongly recommend that you discuss your application with our technical department.



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