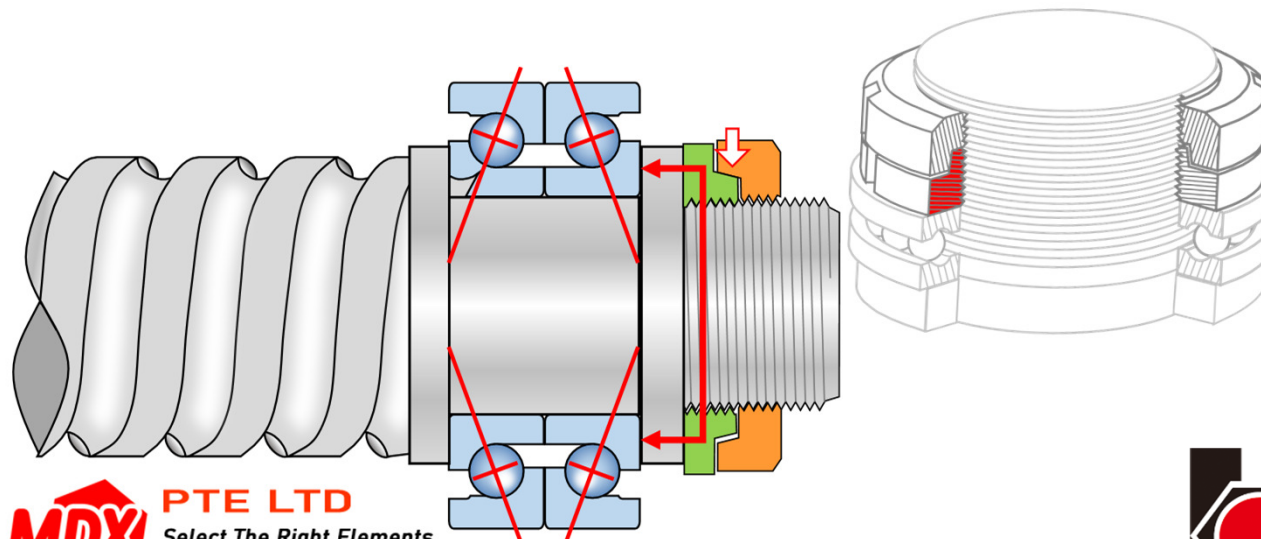
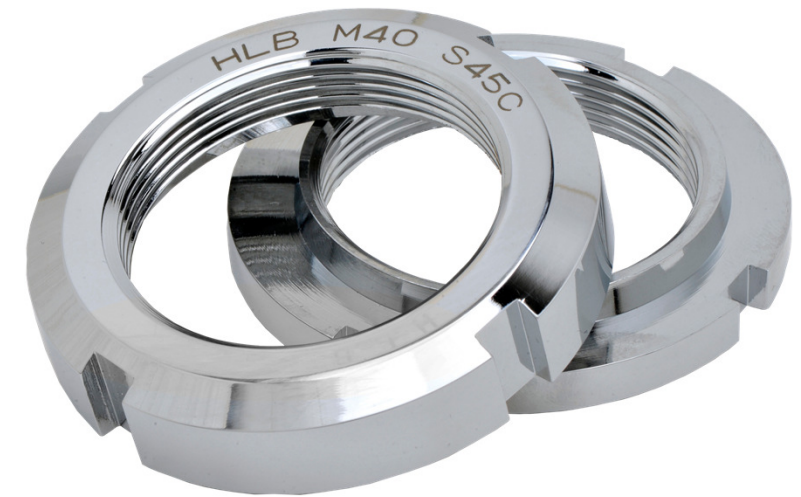


HLB[®] HARDLOCK BEARING NUT

*Anti-Loosening
Self-Locking Nut*

For Injection Molding Machine

“In response to advance use of electric drive system with ball screws has become more prevalent for faster production speed than conventional hydraulic system, **the start and stop rotating speed have become difficult for lock nuts to remain stationary.**”



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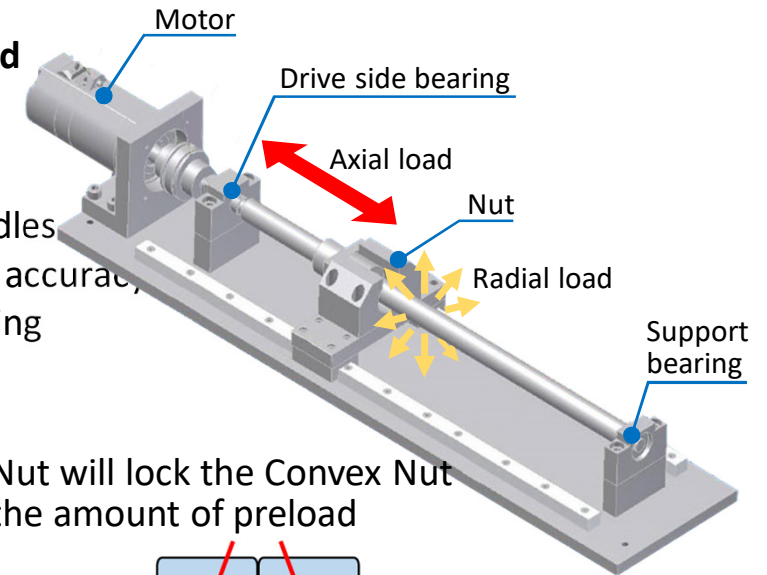
HARDLOCK[®]

HARDLOCK Bearing Nut (HLB) used for Ball Screws of Injection Molding Machines

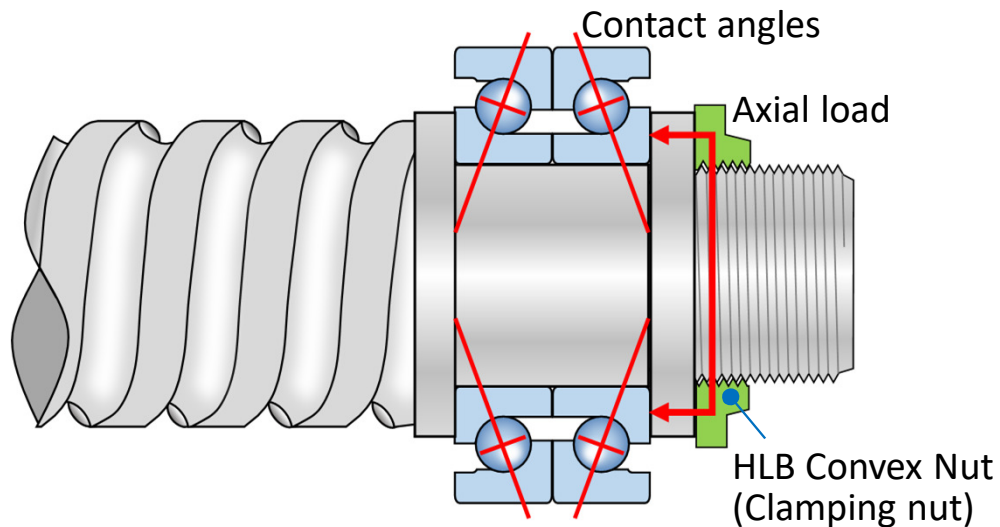
More and more injection molding machines utilize ball screws with accurate servo motors to ensure the quality and shorten the manufacturing cycle.

The ball screws for the injection molding machine are required to bear **high load and rotary movement starting/stopping at high speed within a short distance**, which places high demands on **bearings** and **lock nuts** as well.

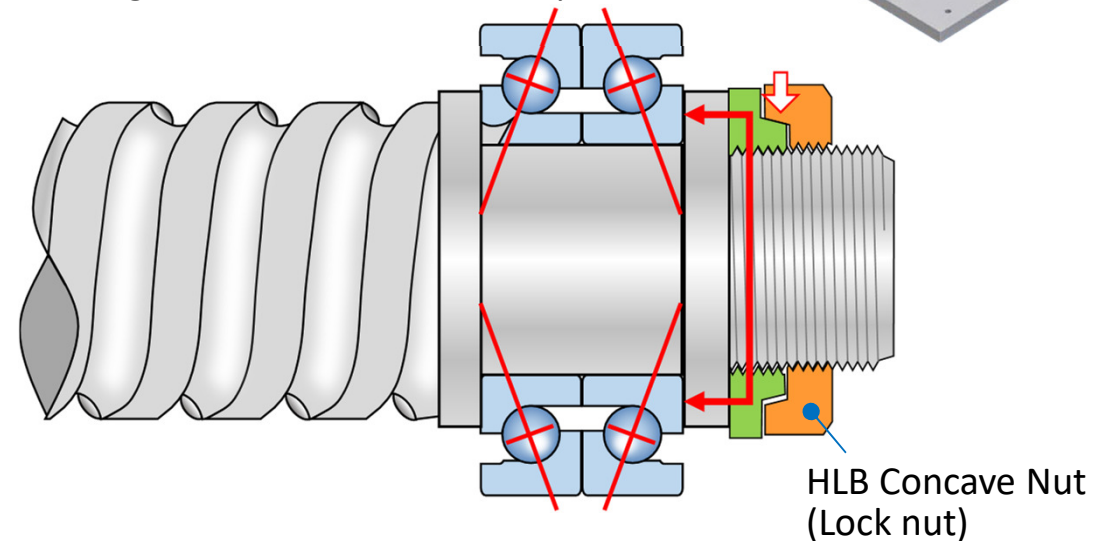
Applications such as injection molding machines, robots and machine tool spindles require precision rotary motion with a higher degree of stiffness and positional accuracy. To achieve this, a sustained load must be applied to the drive side bearings during assembly to remove excess play - that is called **preload**.



- ① Exact preload can be achieved by torque control tightening on the HLB Convex Nut




- ② HLB Concave Nut will lock the Convex Nut regardless of the amount of preload



HARDLOCK Bearing Nut can be tightened to exact torque required to generate correct **preload** and at the same time stay still to support the bearings that carry **high axial load represented by thrust and reaction force**.

Ball Screws in the Injection Molding Machine

HARDLOCK Bearing Nuts (HLB) have great potential for the use with Ball Screws especially for mold clamping and screw ram, where high load capability is required.

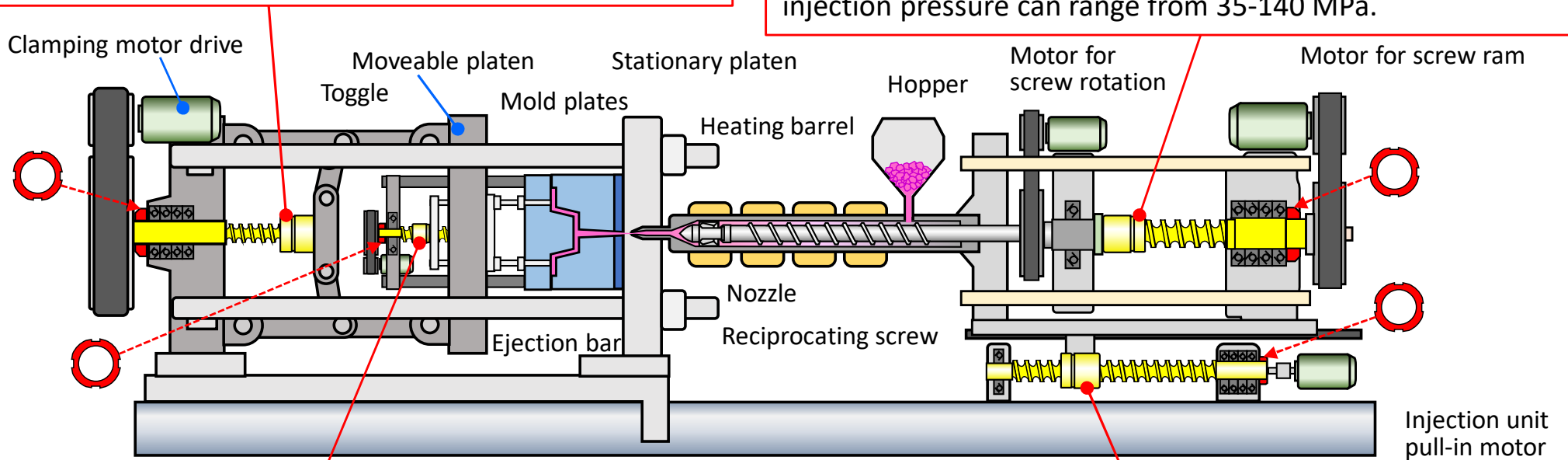
 HARDLOCK Bearing Nut can be considered for use.

Ball screw for mold clamping

The molten plastic is forced under high pressure injected into the mold cavity, the clamping force applied to molds must oppose the separating force caused by the injection. It varies from 50kN to over 15,000kN depending on the size of products and required accuracy.

Ball screw for screw ram

The molten plastic is driven by a reciprocating screw into the mold. Then the screw is forced forward to apply pressure to make sure that all of cavities and spaces have been filled and keep appropriate pressure for the duration of a cooling time. The cavity needs to be filled quickly before the gate becomes blocked by solidified plastic. The ball screw shall carry axial loads and high speed and the injection pressure can range from 35-140 MPa.



Ball screw for ejection bar

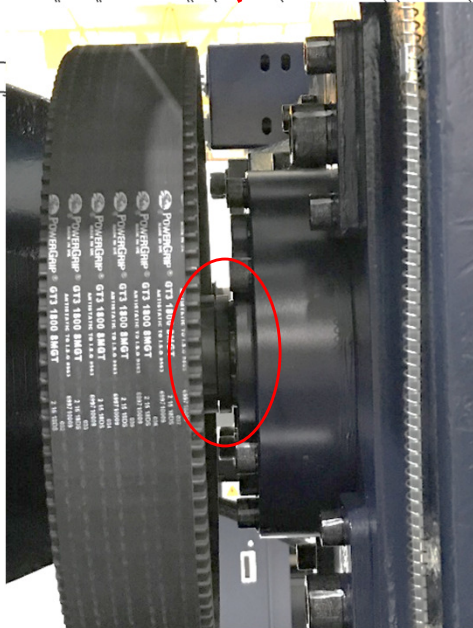
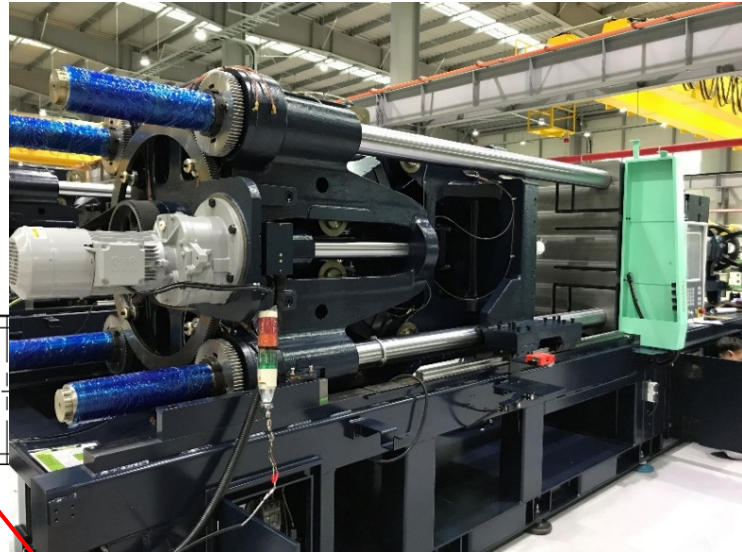
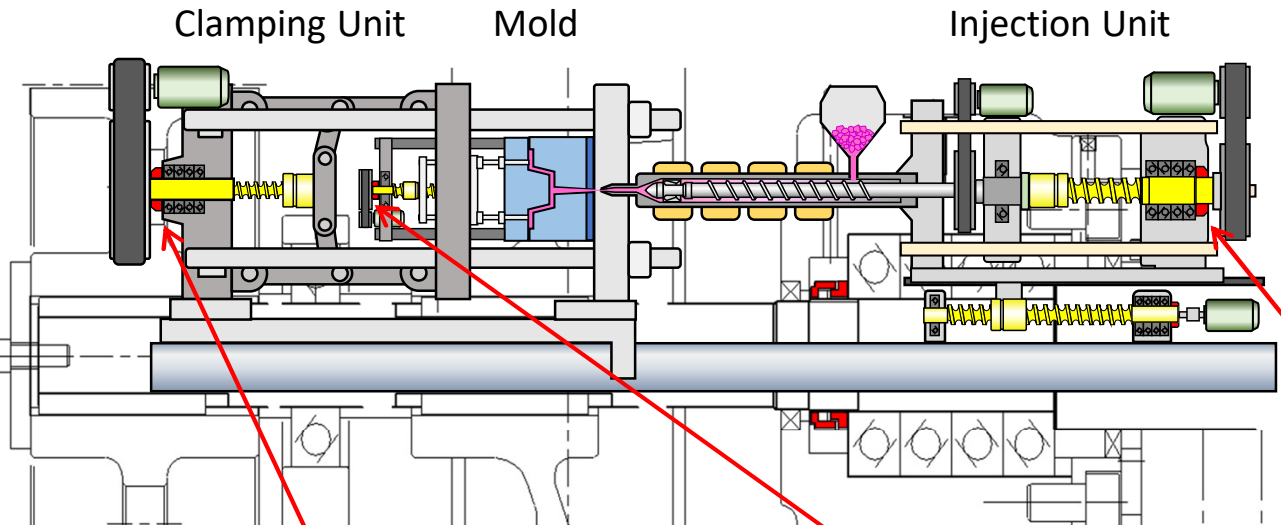
The plastic material is removed from the mold with an ejection system using ejector pins. The mold can be shut again after ejection and another shot can be injected for the process to begin again. This requires less power than clamping and injection process.

Ball screw for injection unit pull-in

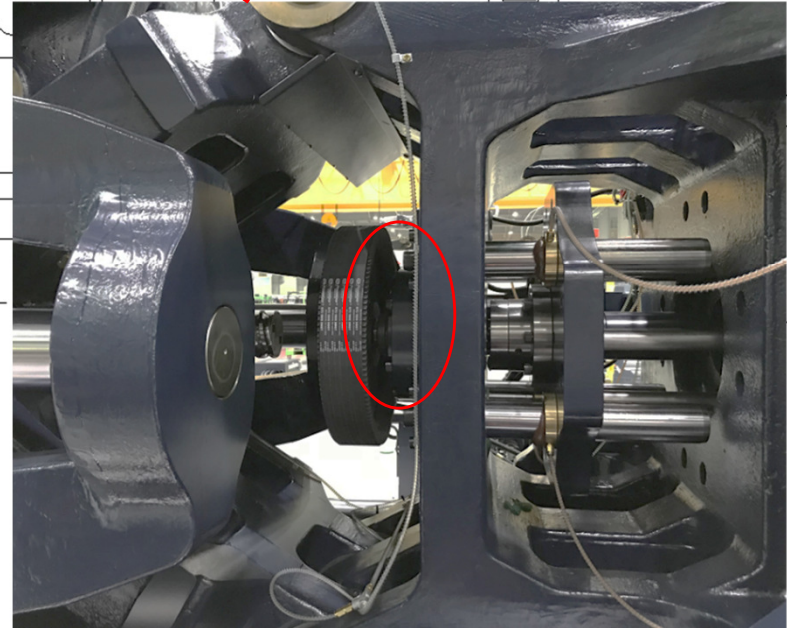
This process is required only for the start of repeated molding cycles. The actuator moves the injection unit forward to have the nozzle of the injection cylinder contact the sprue bushing of the molding die. This is a slow speed process and high power is not required.

Diagram of an electric injection molding machine (Some mechanical details are simplified)

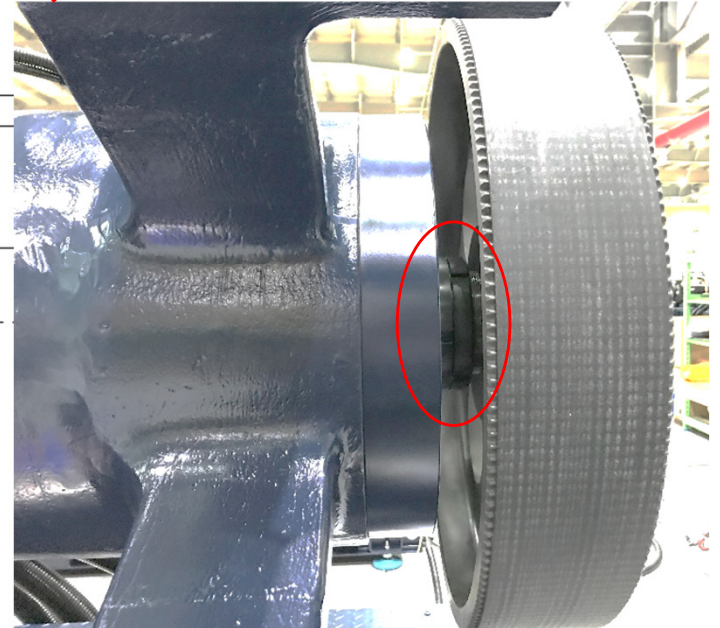
Actual Usage of HARDLOCK Bearing Nut



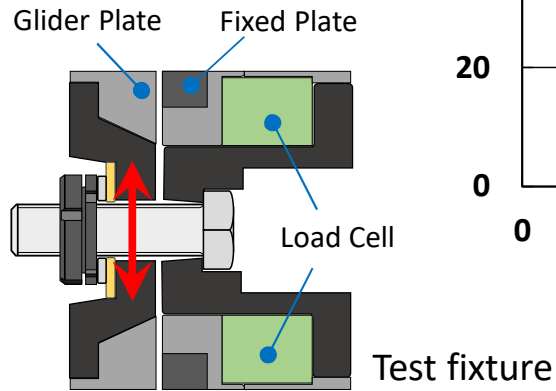
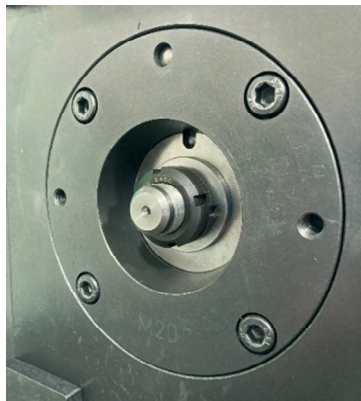
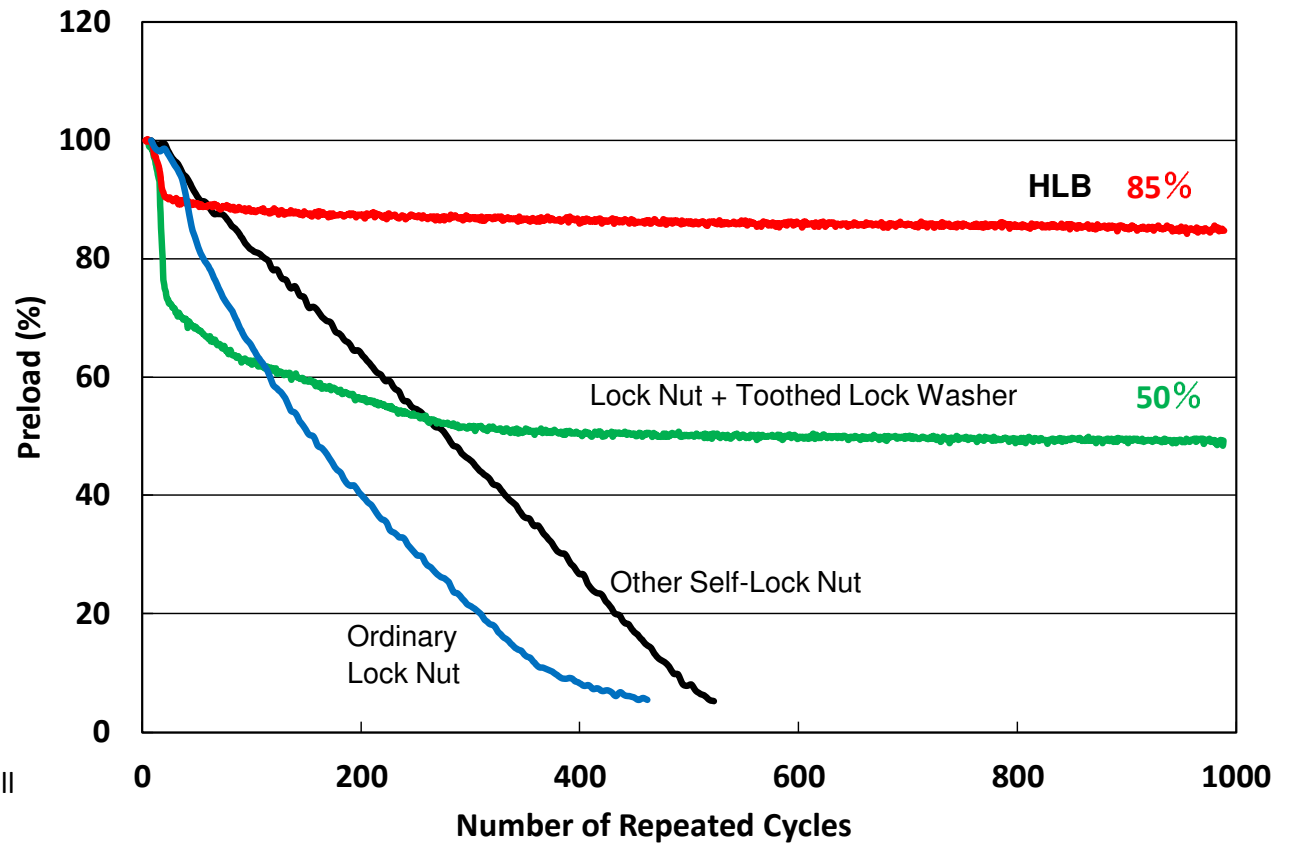
Ball screw for mold clamping
Clamping force (kN):
1,000 - 2,450



Ball screw for ejector bar
Ejector force (kN): 30 - 42
Ejector speed (mm/s): 150 - 430



Ball screw for screw ram
Injection pressure (MPa): 158 - 259
Holding pressure (MPa): 142 - 230



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