

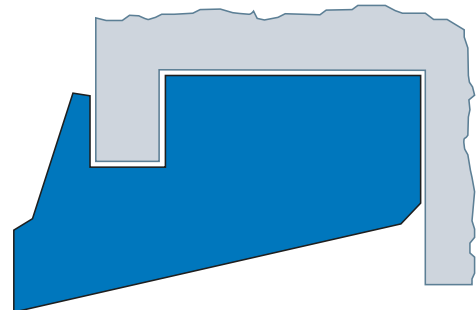
One of the most demanding applications for hydraulic cylinders is the 'leg' in a longwall mining roof support. Two 'legs' are situated side by side, mounted in a base and connected to a canopy.



UNDERGROUND ROOF SUPPORTS

Due to the very high risk of fire, the cylinders use 95% water and 5% emulsion for the fluid media. The lubricity for the seals is very poor and the water is difficult to seal. A special electroplating process coats the rods with a nickel/bronze alloy because the typical hardchrome does not last in the acidic environment. This plating alone causes issues for the rod sealing system, requiring tough polyurethane elastomers that must have excellent abrasion resistance as well as 100% resistance to hydrolysis.

The rod wiper has a massive job to do, keeping out coal, dirt, dust and water. A 'flap' is incorporated into the design to cover the gland so contaminants do not build up. The material must be incredibly strong to cope, so HSA uses a hard, self-lubricating polyurethane with a unique lip design.



**HSA USES POLYESTER
FABRIC REINFORCED
GUIDE RINGS WITH A
SPECIAL EPOXY RESIN
COMPOUND THAT HAS
PROVEN ITSELF IN
APPLICATIONS WITH
VERY HIGH SIDE LOADS.**



**HSA USES A VARIETY OF DESIGNS,
ALL MADE FROM TOUGH
POLYURETHANE COMPOUNDS,
DEPENDING ON THE INDIVIDUAL
REQUIREMENT.**

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The loads on leg cylinders are enormous, especially considering the angle the legs are mounted on. This requires guide rings that have very good compression strength and very good performance in the water-based fluid due to the frictional drag. Selecting the right material for the correct guide rings ensures the long term performance and seal life.

The enormous load also requires a special piston seal that is more than capable of holding it. It is absolutely imperative for the roof support to do exactly that - hold up the roof. If the load reaches yield, a valve opens to prevent leg failure. When this happens, the inner stage of the double-acting telescopic leg can result in over 600 bar pressure.

The inner piston seal must cope with the very high pressure, resist extrusion and tolerate dilation of the inner cylinder. A combination of robust anti-extrusion rings and backup washers are used to help the piston seal assembly without compromising its integrity.

Because the water-based fluid is very difficult to seal, even the static gland seals are unique to prevent leakage between the gland and the cylinder.

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