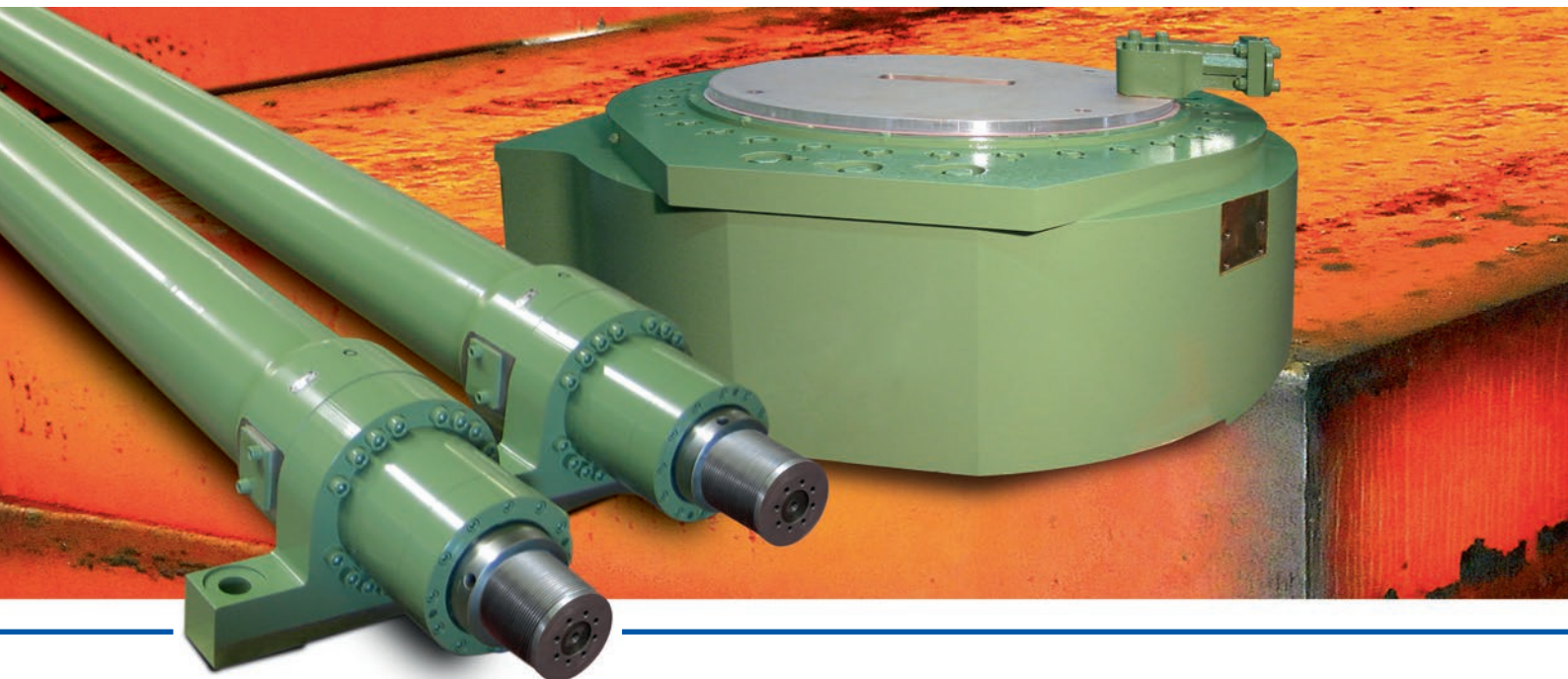

HUNGER

Hydraulik

EIN UNTERNEHMEN DER HUNGER-GRUPPE

Hydraulic Cylinders for Steel Mills



Your Partner for Complete Solutions

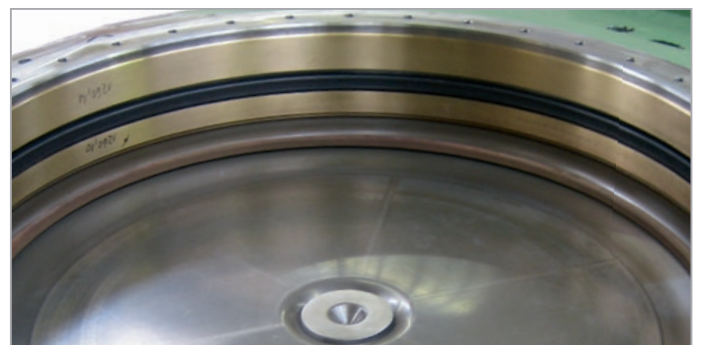
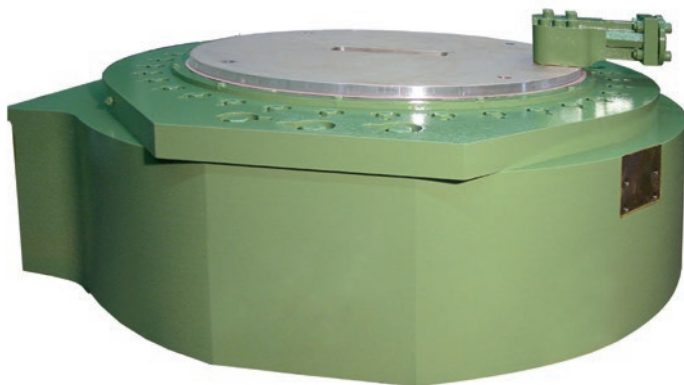
AGC (Automatic Gauge Control) - Roll force cylinders



Roll force cylinders operate in the tough environment of steel mills, used in the manufacture of sheet and bar stock. Smooth and efficient operation of these cylinders is of utmost importance together with reliability and long life.

At the initial design phase the focus is on a very robust design incorporating wear resistant bearing materials and optimized low friction sealing elements. Control manifold blocks with servo control valves, safety valves and pressure sensors can also be provided with roll force and AGC cylinders.

- Customized heavy duty cylinder design, optimized for reliable long life
- Piston and rod surface with hard chrome layer and/or hardened surface
- Hunger DFE-low friction seal elements
- Piston guiding with bronze or plastic compound bearings
- Integrated position measuring system as an option
- Integrated anti rotation device as an option
- Integrated spherical bearings or roller bearings as an option

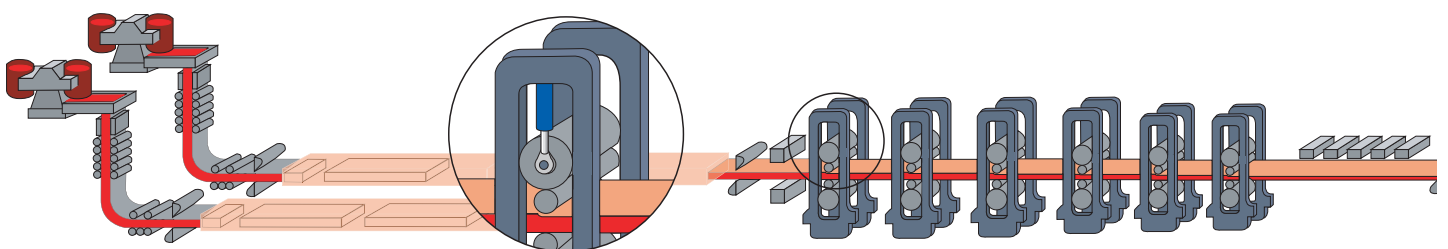


welded bronze guide in cylinder

Technical data:

- Piston diameter up to: 1.600 mm
- Stroke up to: 600 mm
- Design pressure: 400 bar

In addition to new cylinders refurbishment and modernisation of used roll force cylinders can be offered as a cost effective and fast alternative solution.



Work roll change cylinders



- Customized, robust and reliable cylinder design
- If applicable, a pre-bent cylinder rod to compensate gravity induced deflection
- Hunger DFE-low friction seals and bearing elements

Work roll change cylinders are used to extract old roll sets from the mill stand and to insert new roll sets. Roll change out depends on roll wear scale, the number of slabs that it has produced or if the steel grade being rolled is changed. Even though the cylinder is not directly used in the mill process its continuous availability and reliability are very important to guarantee shortest roll change out times.

Technical data:

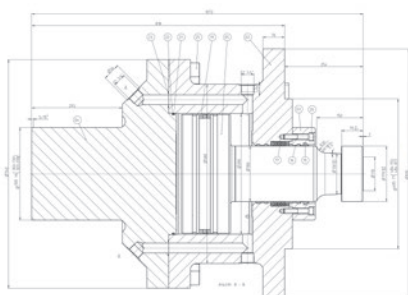
- Piston diameter up to: 600 mm
- Stroke up to: 12.500 mm
- Design pressure up to: 300 bar

Mandrel expansion cylinders



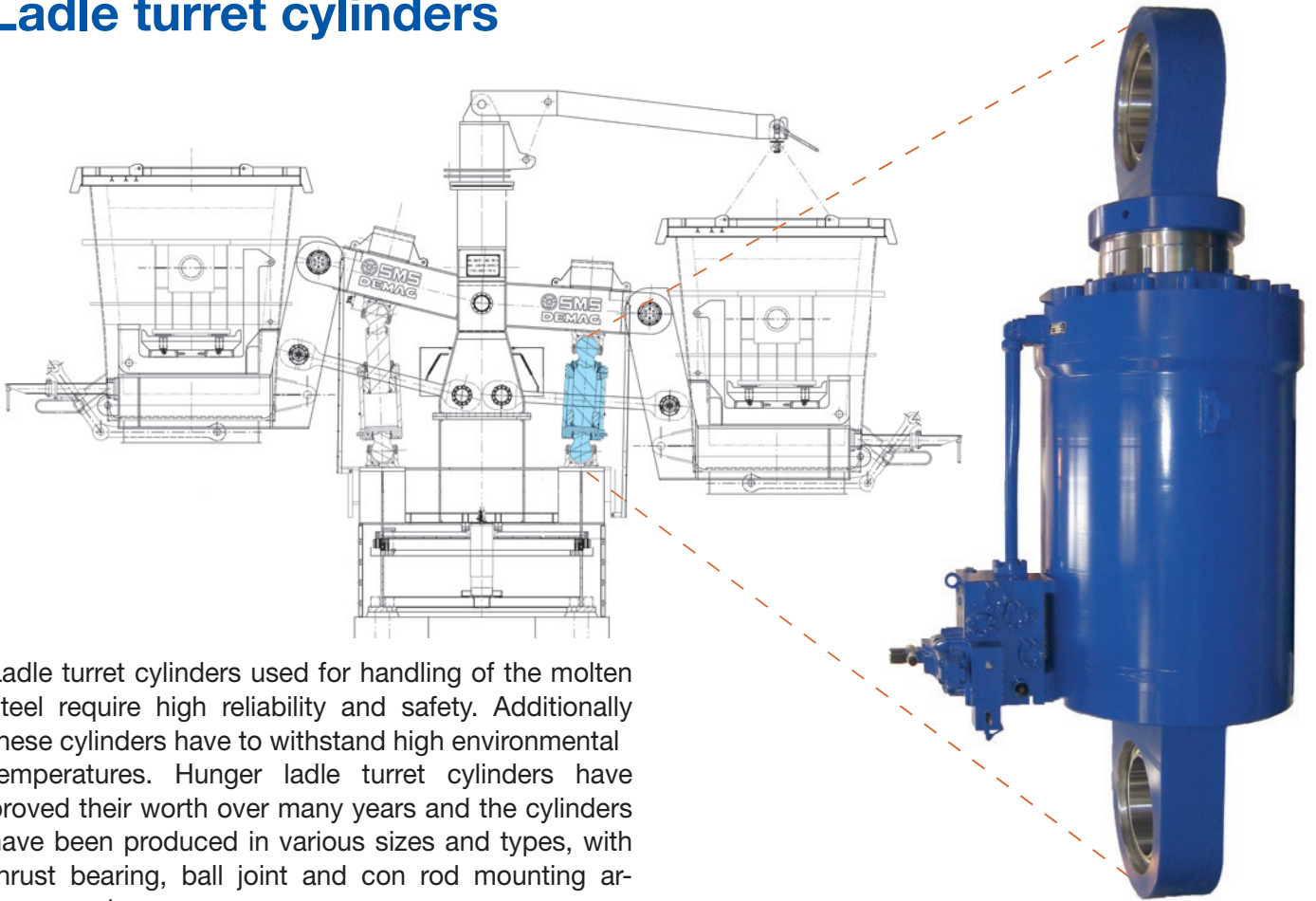
Mandrel expansion cylinders rotate with the mandrel and coil and therefore require a hydraulic rotary distributor to be flanged to the cylinder bottom to feed oil into the cylinder.

The cylinder and the rotary distributor must perform reliably and well at changing rotation speeds and the clamping pressure in the cylinder must be maintained at all times throughout the steel sheet coiling process.

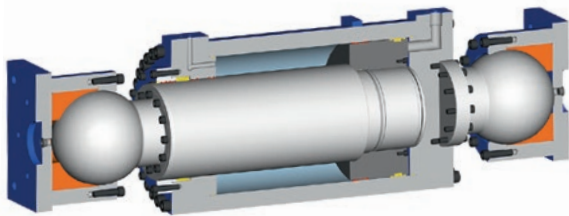


- Oil feed channels integrated into the cylinder body
- Hunger DFE-low friction seals and bearing elements
- Hunger rotary distributor flanged to cylinder bottom
- Hunger rotary distributor with two or more channels for rotation speeds up to 400 min⁻¹
- Integrated position measuring systems available

Ladle turret cylinders



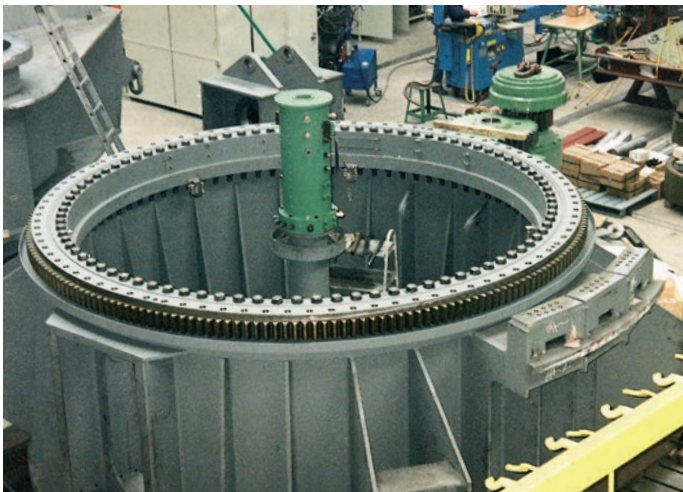
Ladle turret cylinders used for handling of the molten steel require high reliability and safety. Additionally these cylinders have to withstand high environmental temperatures. Hunger ladle turret cylinders have proved their worth over many years and the cylinders have been produced in various sizes and types, with thrust bearing, ball joint and con rod mounting arrangements.



Technical data:

- Piston diameter up to: 850 mm
- Stroke up to: 1.000 mm
- Design pressure up to: 300 bar

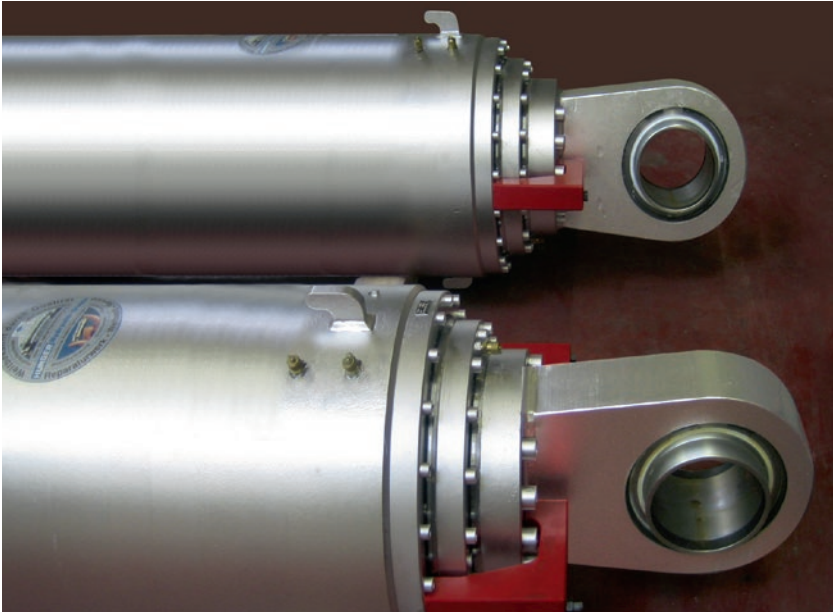
- Customized, sturdy and optimized cylinder design for long life
- Single or double acting design
- Rod surface with hard chrome layer or with Ceraplate layer
- Hunger DFE-low friction seal elements, optimized for high temperatures
- Piston and rod guiding with bronze or plastic compound bearing
- Spherical bearings, spherical ball joints or flange mounting interfaces



multi-channel rotary distributor in a ladle turret



Furnace cylinders

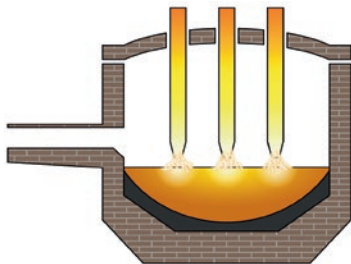


two stage telescopic furnace tilting cylinders

Furnaces in steel mills require hydraulic cylinders for tilting operations and to move and clamp doors and flaps. These cylinders are often exposed to high temperatures. It is essential that the movement of the furnace tilting cylinders is smooth and stick slip free. This is guaranteed by the use of Hunger DFE-low friction seals and bearing elements combined with finely polished cylinder bore and rod surfaces. Load control valves and pipe rupture valves guarantee safe load holding under all circumstances.

- Customized, durable and optimized cylinder design for long life
- Single or double acting design
- Rod surface with hard chrome layer or with Ceraplate layer
- Hunger DFE-low friction seals and bearing elements, optimized for higher temperatures
- Compatible with fire resistant fluids
- Integrated position measuring systems available.

Electrode regulating cylinders

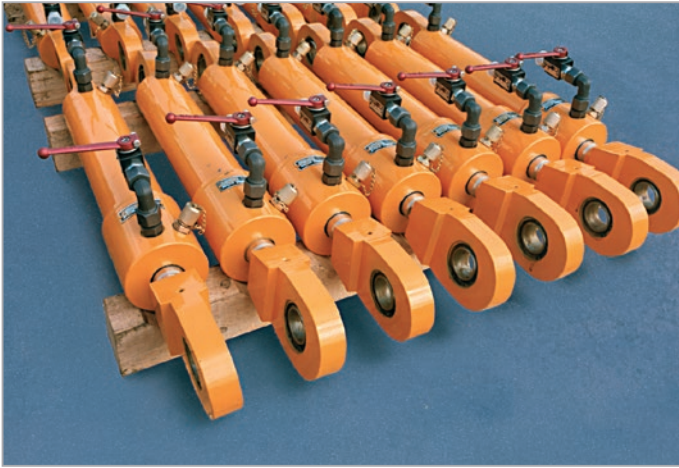


Electrode regulating cylinders have to work in a dirty and hot environment. An efficient wiper element together with heat resistant seal and bearing elements are essential for the performance and long life of electrode regulating cylinders.

For safety reasons these cylinders often work with fire resistant hydraulic fluids which require special materials for the sealing elements.

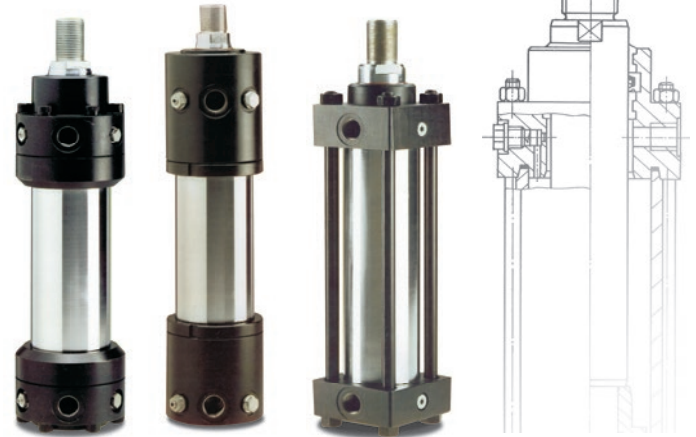
- Customized single or double acting design
- Rod surface with hard chrome layer or with Ceraplate layer
- Hunger DFE-low friction seal and bearing elements, optimized for high temperature operation
- Compatible with fire resistant fluids

Standard cylinders and special solutions



A number of standard hydraulic cylinders are utilised in all steel plants for secondary functions, handling and automated material processes.

The Hunger standard cylinder catalogue offers different types and mounting arrangements with piston diameters from 32 mm up to 320 mm, stroke lengths up to 6.000 mm and operating pressure levels of 105, 160, 210, 250 and 350 bar.



The size combinations and installation dimensions conform to CETOP standards.

All cylinders are equipped with Hunger seals and bearing elements and are available with hard chrome layers or Ceraplate rod coating.

Special hydraulic cylinder solutions



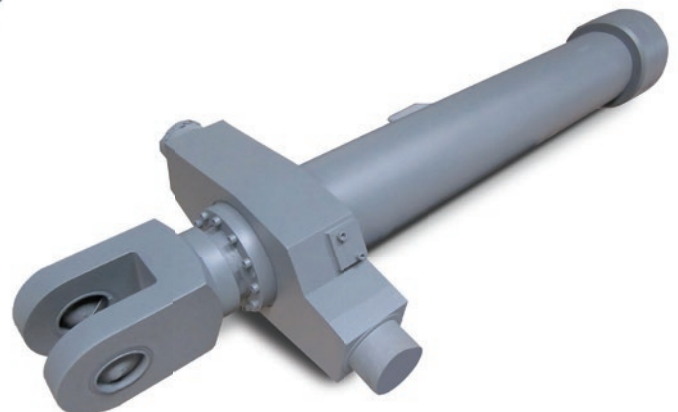
electro-mechanical press cylinder

For some steel mill applications hydraulic cylinders are required with special features, for example mechanical spindles, oil porting through trunnion pins, protection shields or water cooled covers.

For these applications our engineers will work with you to find the optimum solution which best suits the application and your requirements.



steel mill cylinder with water cooled housing



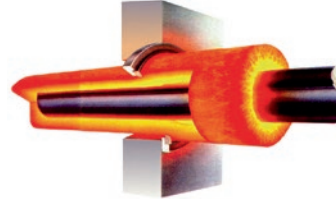
steel mill cylinder with oil ports on trunnion

Mandrel bars

In continuous mandrel rolling mills and extrusion mills a number of piercing mandrels and mandrel bars are required to manufacture different sizes of seamless steel tubes.

During the mill process these mandrels and bars are subjected to high temperatures, shock loading and high mechanical forces. This leads to heavy wear on the affected surfaces and significant material loss.

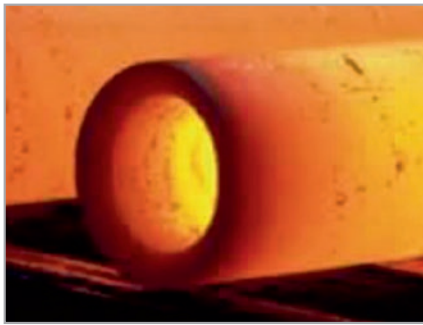
With hardened and chromed surfaces basic wear resistance can be achieved but using Hunger Ultraplate coating the mandrel life will be multiplied several times.



- Lengths up to 18 m
- Surfaces hardened with hard chrome layer or Ultraplate layer



Piercing mandrels



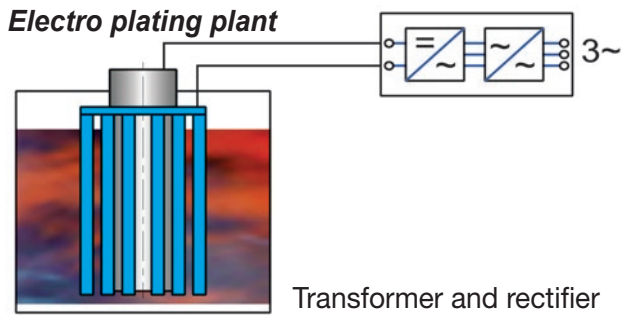
To increase the quality and lifetime of piercing mandrels for hot steel tube manufacturing, they can be coated with a plasma welded layer which offers advantages in comparison to standard piercing mandrels with a hardened and chromed surface. Carried out tests with piercing mandrels with plasma welded overlay in a comparable application did show practically no wear under mechanical load and heat stress whereas the standard mandrels have had significant material loss on the critical diameter.

Based on these results an up to three times longer lifetime of the plasma welded piercing mandrels can be expected.



Used standard piercing mandrel with significant material loss on outside diameter and plasma welded piercing mandrel without diameter change.

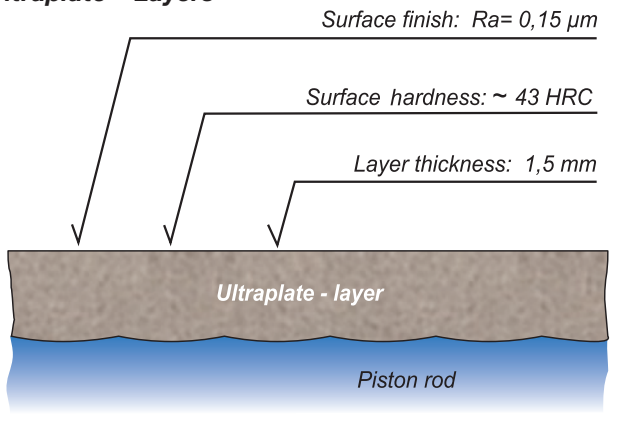
Hard chrome plating



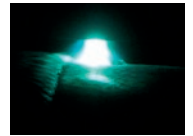
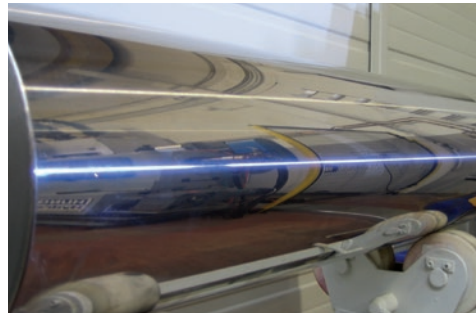
- Layer thickness of 30 ... 100 μm
- surface finish: $R_a = 0,15 \mu\text{m}$
- Surface Hardness: 750 ... 950 HV
- Composite layers possible

Ultraplate rod coating

Ultraplate - Layers

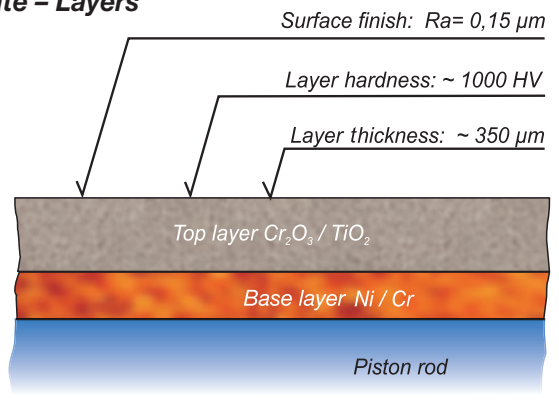


- Plasma welding technology (P.T.A.) for stainless steel layers
- Different sea water resistant materials available
- Suitable for marine atmosphere, splash zone or submerged condition



Ceraplate rod coating

Ceraplate - Layers



- Thermally sprayed Ni/Cr base layer and $\text{Cr}_2\text{O}_3 / \text{TiO}_2$ top layer
- Other materials (metallic or carbide) on request
- Suitable for on deck installations with normal working cycle



For more details please see our brochure **SURFACE COATING SYSTEMS.**

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