Schmelzmetall

Products and Solutions for high pressure die casting

The company

Schmelzmetall AG was founded in 1959 and it has developed into a world leader in innovative production of precipitation hardened copper alloys. Today Schmelzmetall group is a leading manufacturer of high performance alloys and represented worldwide by its own subsidiaries and partners.

Those Hovadur® alloys are melted and casted in one unit in inductively heated vacuum furnaces. In addition, no scrap of any kind is used in creating the alloys. Thanks to this aspect, the alloys achieve the highest degree of purity and excellent technological properties.

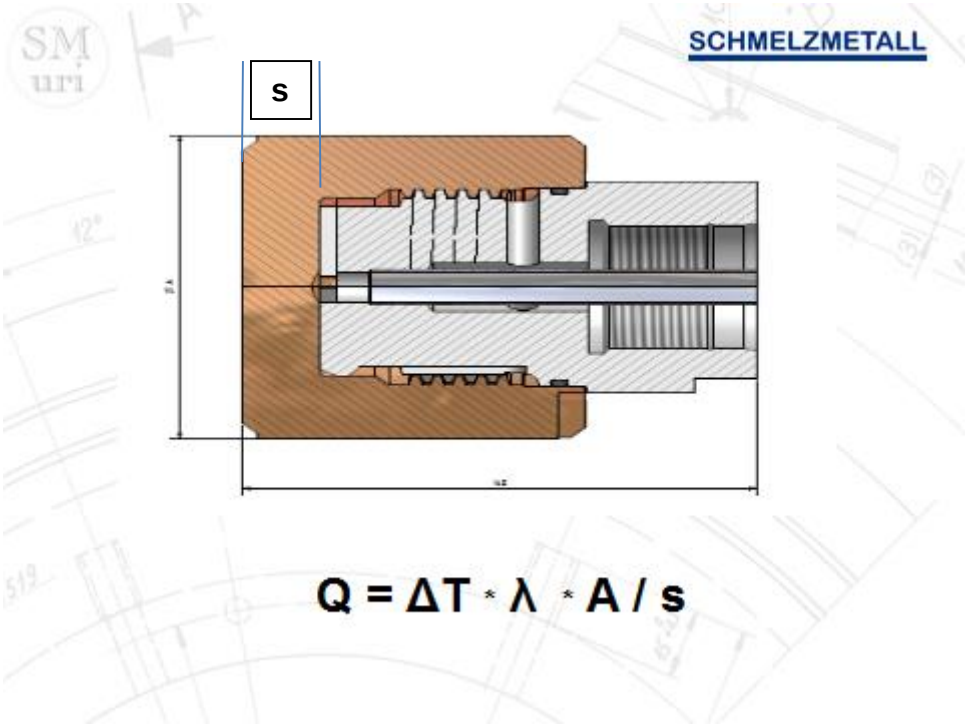
Based on over five decades of experience with a deep knowledge in the application fields, we can support our customers to get the best solution.

Our products are highly recommended for a variety of industrial applications and are indispensable in many sectors of modern industry.

Piston and piston – adapter system

With regard to this application Schmelzmetall can serve you with the best vacuum melted and casted alloys, namely, Hovadur® CNCS and CCNB. Whether in form of rod, rods cut in certain length or piston in accordance to your drawing.

The advantage of using a piston out of Hovadur® CNCS or CCNB instead of steel or cast iron would be, firstly, to reduce cycle time and secondly to lengthen the lifetime of the shot sleeve. Finally, the benefit for our customers is higher productivity and saving costs.



Reducing cycle time means to take the heat out of the injection gate and the biscuit as quick as possible. The heat transport Q –figure above- follows the above-mentioned formula. The inner diameter of the sleeve and the diameter of the piston is a given factor. Also ΔT, which is the difference of temperature between the cooling water in the piston and the temperature of the molten metal, like aluminium, is more or less fixed. In order to increase Q you can shorten s or use a material with a high thermal conductivity λ. Shortening the front thickness of the piston (s) is limited due to the strength of the material and the mechanical force towards the piston.

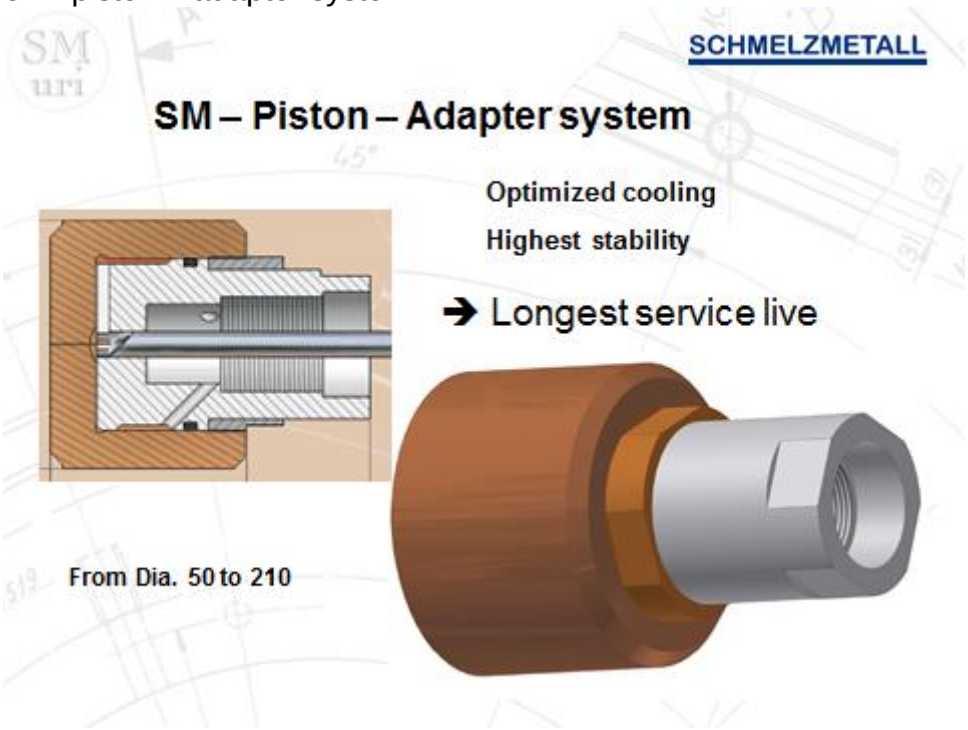
So the only real influence is λ, the thermal conductivity of the material is used for the piston. This is one of the main reason for using Hovadur® CNCS or CCNB instead of steel or cast iron for a piston. . In comparison to steel or cast iron, our alloys offer 10 to 12 time’s higher thermal conductivity!

In comparison with our direct competitors in copper alloys, we offer up to a 30% longer lifespan of the piston.

At an earlier stage, we have also compared the life-time of the piston made out of our alloys (Hovadur® CNCS and CCNB) to piston made out of cast iron and we found the same life-time for the pistons. However, with the advantage of better cooling, resultant in a shorter cycle-time and lengthening of the life-time of the shot sleeve!
A direct savings of costs is caused by lengthening the lifetime of the shot sleeve and reducing the cycle-time. The life-time of the shot-sleeve as the much more expensive component compared to the piston can rise up by 50 to 100 %.

Hovadur® piston-adapter system

Based on more than five decades of experience Schmelzmetall has developed its own piston – adapter system.



The connecting of the adapter to the piston rod can be done in accordance to customer`s request.
The main advantage of the piston-adapter developed at Schmelzmatall AG is the optimized cooling. The special construction of the inner chamber in combination with the adapter creates an excellent circulation of the cooling media, resultant in a proofed performance of cooling compared to standard copper piston.

An easy, effective connecting of the piston-head to the adapter by a thread-ring offers a quick piston change; therefore, without the need of special tools. Based on the special construction all the force towards the piston will take place at the front face of the adapter. The advantage is that there is no force to the thread and a quick change of the piston is possible at anytime.

Easy handling, special construction with optimized cooling and the performance of our Hovadur® alloys CNCS and CCNB are the assumption for a good service-life of the piston.

This is our way of increasing productivity and reducing cost.

Numerical investigations via Finite Element Method on the thermal impact among a casting cycle on a piston have been done in order to determine the dimensional deformation of the piston. We used the elasticity theory and the equations for thermal conductivity as the relevant equations for those investigations.
The elements (triangular pyramid and cuboids) used to illustrate the results were chosen to look for certain functions. For example, temperature distribution and dimensional deformation which could be pictured within adequate accuracy.

We compared the following three different pistons: one piston adapter system of Schmelzmetall, one common full copper piston and a competitive piston adapter system. The result of the investigations showed a clear difference in the temperature distribution over a piston and the resultant dimensional deformation.
At the same time, the shot sleeve with different filling grades and different kinds of temperature control has been investigated in the same way as the piston.

The final goal was to minimize the gap between the piston and the shot-sleeve, in order to reduce the sucking in of false air; in case of vacuum casting enabling the increase of casting quality. This is very important, especially, if evacuations are done among the shot-sleeve.

In practice we have proven the theoretical results.

As a result, we found a clear difference of the temperature at the biscuit of up to 100°C for the same product and casting cycle, and a difference in the return flow of the piston cooling as well.
Based on the above-mentioned results of an optimized piston of Schmelzmetall piston adapter system, we were able to reduce the vacuum value measured directly behind the vacuum valve by 30 mbar.
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In addition to all this developments and scientific investigations Schmelzmetall has developed a solution to further increase the lifespan of the piston-adapter system by implementing a wearing-ring at the front end of the piston.

This development can also be implemented to customer's piston. These modification can increase the lifespan of the piston by 2 – 4 times.