

Technical article

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The value of good knurling

Real-life examples: for a shear-resistant metal frame assembly, professionally executed knurling is absolutely essential

Windows and glass façades bring light and quality of life to a building. Aluminium frames, which are lightweight whilst having high strength and excellent resistance to temperature and moisture fluctuations, are the first choice. The thermal insulating profiles made from fibreglass-reinforced polyamide and positioned between the metal inner and outer shells provide for a comfortable indoor climate.

The insulating bar and metal profile are supposed to form a form-fit and friction-locked connection. A basic prerequisite for this to occur is that the geometries of the bar foot and the receiving chamber of the profile are compatible (Fig. 1). The first step involves both noses of the aluminium cavity being knurled. If the bar is now inserted, the pressing wheel presses the jagged noses into the plastic. As a result of the pressure, the teeth of the knurled edge 'bite' deeply into the thermal insulating profile on both sides (Fig. 2).

The assembly produced in this way must be able to withstand diverse stresses over a long period of time – and must be able to do so from the start. For example, withstanding the high temperature during powder coating or later, in the application, the stresses resulting from heat and cold. A flawlessly snug connection is therefore indispensable. TS EN 14024 lays down the minimum requirement relating to the shear strength of these frame assemblies.

Different factors contribute towards a shear-resistant assembly (Fig. 3):

- Through a high rolling pressure, the hammer of the metal profile is pressed against the insulating bar. BUT: this frictional connection declines, due to the material, when exposed to stresses through temperature, for example during powder coating.
- When the coating is being baked, the adhesive sheath of the Coex sealing wire melts. It thereby fills the capillary joint between the polyamide and aluminium and seals it, making it waterproof. Over and above this, this adhesive film provides an additional safeguard against displacement of the assembly. BUT: this strength alone is not sufficiently great to ensure the strength of the assembly.
- As is evident from Fig. 3, the effect brought about by sharp-toothed knurling makes a crucial contribution to a long-lasting high shear strength of the assembly.

The quality of the knurling is therefore particularly important for a shear-resistant connection. Knurling that is not cleanly executed, for example as a result of a worn knurling wheel, produces an inadequate result. Serration is ideal when a surface ratio of 4:1 of polyamide to aluminium is achieved (Fig. 4).

Combined with compatible assembly geometry, sharply toothed knurling makes it possible to create a long-lasting, robust assembly. In this way manufacturers achieve high quality standards and normative guidelines are adhered to. Last but not least, this is also good news for the building owners who can now take pleasure in their aluminium window for a long time.

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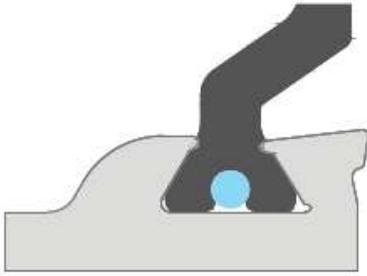


Figure 1: The receiving chamber of the metal profile creates the connection with the thermal insulating bar. It is essential for the geometries of the plastic bar and the cavity to match.



Figure 2: Step by step to the shear-resistant assembly – knurling, insertion, pressing (by rolling).

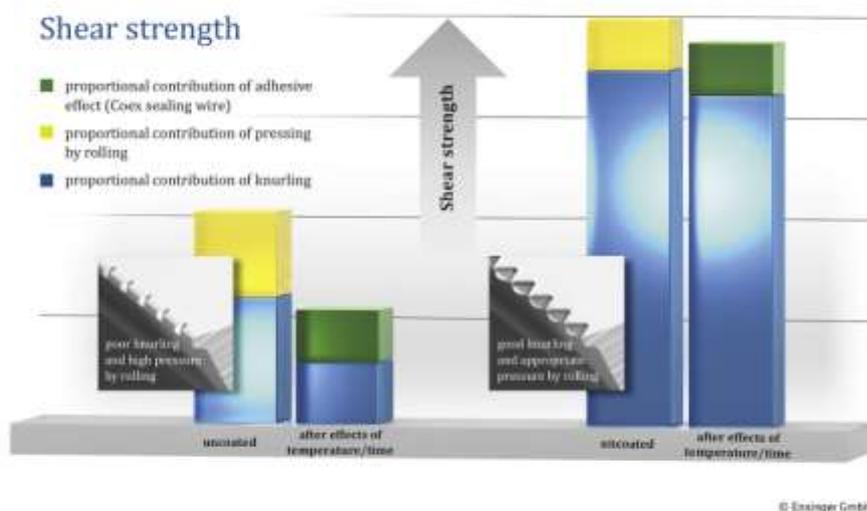


Figure 3: Various factors contribute towards shear strength. After the effects of temperature and aging it is however primarily the serration of the knurling (blue), which gives the metal frame assembly the required stability. A particularly high rolling pressure (yellow) is not capable of compensating for poor knurling.



Fig. 4: The knurling quality is crucial. Schematically represented on the left is professionally executed knurling, in the middle sufficiently good serration, on the right the sharp-toothed knurling with an ideal ratio of polyamide to aluminium.

Picture caption: Ensinger GmbH

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Ensinger GmbH is among the world's leading developers and producers of insulating profiles for window, door and facade construction. The profiles marketed under the brand name insulbar® create a thermal separation between the inside and outside shells of metal frames. Insulation systems using insulbar profiles achieve optimum values in terms of energy savings and cutting the cost of heating and cooling. At the same time, insulbar profiles comply with the most stringent quality standards in every respect. They have been in successful operation around the world for over 30 years. For more information, go to www.insulbar.de/en.

About Ensinger

The Ensinger group is engaged in the development, manufacture and sale of compounds, semi-finished materials, profiles and technical parts made of engineering and high-performance plastic. Ensinger makes use of a number of different manufacturing methods, in particular extrusion, machining and injection moulding. Employing a total workforce of 2,300 in 28 locations, the family firm is represented in all the important industrial regions of the world with its own production plants or sales branches. For more information, go to www.ensinger-online.com.

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