SPIROL®
WHITE PAPER

Solid Pin Retention Features

by Jeff Greenwood, Product Sales Engineer - Pins
SPIROL International Corporation, Danielson, CT, U.S.A.

Solid Pins are commonly used as permanent fasteners in a wide range of applications. They are retained by the harder Solid Pin displacing material in the softer host component(s). There are two primary methods of accomplishing this:

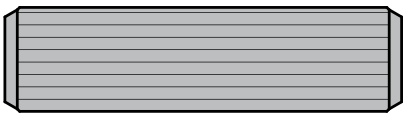
1. **Press-fit:** Press-fit dowels and straight pins are typically retained in the assembly by being pressed into holes that are smaller than the pin diameter. The pins are retained by compressing the host material.

2. **Retention features:** Retention features (i.e. knurls and barbs) are often preferred over press-fit dowels because they allow for wider hole tolerances and lower insertion forces during assembly. Knurls and barbs carve into the softer host component, and displace the host material into the valleys of the knurls and barbs. This results in more frictional contact area between the pin and hole, and thus higher retention as compared to simple press-fit doweling.

This White Paper describes the common types of retention features and can serve as a reference tool when designing a new product. There are several types of Solid Pin retention features, and it's beneficial for designers to take advantage of the characteristics associated with each retention feature. The four most common retention features are described below.

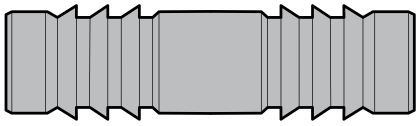
Straight Knurls

Straight knurls provide strong resistance to rotational forces but minimal resistance to axial loads. Therefore, straight knurls are often recommended when the pin is used to transmit torque, such as when used as an axle to rotate a wheel. In this type of application, the pin would have a partial knurl equivalent (or shorter) to the thickness of the retaining component. The mating component could then rotate about the pin's "blank" (non-knurled) section.



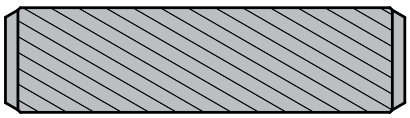
Barbs

Barbs were designed specifically for use in plastic assemblies. The raised barbs are angled backwards, opposite the direction of insertion. The plastic of the host component naturally backfills around the metal barb after installation permanently joining the components together. Barbs provide the greatest retention among the retention features discussed in this White Paper.

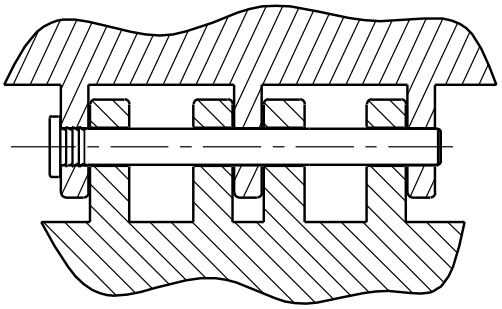


Helical Knurls

Like a screw, Solid Pins with helical knurls rotate as they enter the hole and cut into the host component. The helical knurls provide greater surface contact than straight knurls, therefore providing greater resistance to back out. Helical knurls provide resistance to both axial loads and rotational forces. In dynamic applications with solely rotational loads (like the wheel and axle mentioned above), straight knurls are preferred because helical knurls subjected to torque have a propensity to rotate further into or out of the hole - depending on the direction of rotation. In general, helical knurls are the most versatile among the Solid Pin retention features.

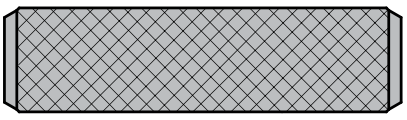


Application example:
SPIROL LP500 Latch Pin in Automotive Door Handle



Diamond Knurls

Although they are very common, diamond knurls provide little value compared to the other retention features. Diamond knurls shred the host apart during installation and introduce a risk of particles escaping the hole. While they do provide some retention, it is minimal. Diamond knurls should be avoided.



Solid Pin Retention Features in Comparison

	Straight Knurls	Helical Knurls	Diamond Knurls	Barbs
Resistance to axial loads	**Limited**	**Good**	**Limited**	**Great**
Resistance to rotational forces	**Great**	**Good**	**Limited**	
Use in plastic assemblies	✓	✓	✓	✓
Use in non-plastic assemblies	✓	✓	✓	

SPIROL *offers*
Application Engineering support!

SPIROL Application Engineers will review your application needs and work with your design team to recommend the best solution. For technical support, feel free to contact **SPIROL** directly or start the process by selecting **Pinning Applications** in our **Optimal Application Engineering** portal at **www.SPIROL.com**

Technical Centres

Europe

SPIROL United Kingdom
17 Princewood Road
Corby, Northants
NN17 4ET United Kingdom
Tel. +44 1536 444800
Fax. +44 1536 203415

SPIROL France
Cité de l'Automobile ZAC Croix Blandin
18 Rue Léna Bernstein
51100 Reims, France
Tel. +33 3 26 36 31 42
Fax. +33 3 26 09 19 76

SPIROL Germany
Ottostr. 4
80333 Munich, Germany
Tel. +49 89 4 111 905 71
Fax. +49 89 4 111 905 72

SPIROL Spain
08940 Cornellà de Llobregat
Barcelona, Spain
Tel. +34 93 669 31 78
Fax. +34 93 193 25 43

SPIROL Czech Republic
Pražská1847
Slaný 274 01
Czech Republic
Tel. +420 313 562 283

SPIROL Poland
Aleja 3 Maja 12
00-391 Warszawa, Poland
Tel. +48 510 039 345

Americas

SPIROL International Corporation
30 Rock Avenue
Danielson, Connecticut 06239 U.S.A.
Tel. +1 860 774 8571
Fax. +1 860 774 2048

SPIROL Shim Division
321 Remington Road
Stow, Ohio 44224 U.S.A.
Tel. +1 330 920 3655
Fax. +1 330 920 3659

SPIROL Canada
3103 St. Etienne Boulevard
Windsor, Ontario N8W 5B1 Canada
Tel. +1 519 974 3334
Fax. +1 519 974 6550

SPIROL Mexico
Avenida Avante #250
Parque Industrial Avante Apodaca
Apodaca, N.L. 66607 Mexico
Tel. +52 81 8385 4390
Fax. +52 81 8385 4391

SPIROL Brazil
Rua Mafalda Barnabé Soliane, 134
Comercial Vitória Martini, Distrito Industrial
CEP 13347-610, Indaiatuba, SP, Brazil
Tel. +55 19 3936 2701
Fax. +55 19 3936 7121

Asia Pacific

SPIROL Asia Headquarters
1st Floor, Building 22, Plot D9, District D
No. 122 HeDan Road
Wai Gao Qiao Free Trade Zone
Shanghai, China 200131
Tel. +86 21 5046 1451
Fax. +86 21 5046 1540

SPIROL Korea
160-5 Seokchon-Dong
Songpa-gu, Seoul, 138-844, Korea
Tel. +86 21 5046-1451
Fax. +86 21 5046-1540

email: info-uk@spirol.com

SPIROL.co.uk