

SPIROL[®]

SLOTTED SPRING PINS



SPIROL® Slotted Spring Pins manufactured to **ASME B18.8.4M Type B (Metric), ASME B18.8.2 (Inch), and ISO 8752 (EN 28752)** are available from stock.



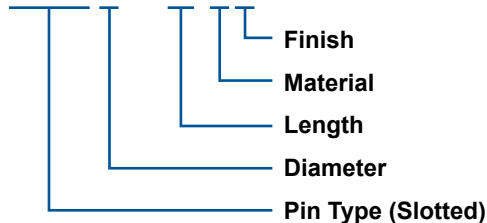
- The ASME B18.8.2 range meets the requirements of most pins per NASM 10971 (formerly MIL-P-10971), NASM 16562 (formerly MS 16562), NAS 561, SAE J496, and SAE AS7207 (Superseded AMS 7207 and MS 171401-MS 171900).
- DIN 1481 is interchangeable with ISO 8752 (EN 28752) except for a difference in length tolerance.

IATF 16949 and ISO 9001 certifications ensure consistent quality.

- **Commitment to Quality.** SPIROL is committed to being a leader in production technology and regularly invests back into our business. All Slotted Spring Pins are produced on high quality machinery that is routinely maintained and periodically rebuilt to ensure the highest quality product in the industry.
- **Manufacturing Controls.** There is clear identification of job status, including all inspections, as the lot progresses through the manufacturing processes. Capability studies are used to verify machine process capability. Statistical process control is used for all processes using variable and attribute data.
- **Calibration and Gage Control.** All gages are calibrated at scheduled intervals, traceable back to national standards. The control records are readily available in electronic format.
- **All parts are traceable** through each manufacturing process back to the original raw material test certificate. Each lot has a unique identification number on the box.
- **Contract Review / Quality Planning.** A formal procedure exists for the specification and acceptance of new orders by sales, manufacturing and quality.
- **Document / Drawing Control.** All drawings, standards and specifications are controlled.
- **SQA approval of suppliers and subcontractors** is maintained by supplier system audits and monitoring of supplier quality performance.
- **System audits** are carried out regularly by independent auditors addressing continuous improvement opportunities.

PART DESCRIPTION

SLTP 4 X 20 BK



MATERIALS*

Type	Grade
High Carbon Steel	UNS G10700 / G10740 C67S (1.1231) / C75S (1.1248)
Stainless Steel, Austenitic (Nickel)	UNS S30200 / S30400 X10CrNi18-8 (1.4310)
Stainless Steel, Martensitic (Chrome)	UNS S42000 X30Cr13 (1.4028)

* All standard materials conform to that as specified in ASME B18.8.2, ASME B18.8.4M Type B and ISO 8752.

Contact **SPIROL** for design assistance:
www.spirol.com/s/slottedpindesign/

SPIROL produces Slotted Pins to both the American National Standard, ASME B18.8.4M, and the International Standard, ISO 8752 (EN 28752). It is our recommendation that you consider ASME pins for all new applications and for your current applications if you are experiencing insertion problems or performance failures. Our recommendation is based on these important advantages of ASME pins:

- **Lower insertion force** as a result of the smaller free diameter of the pin in relation to the nominal hole. The pin is securely retained in the hole based on increased wall thickness, higher minimum hardness, and the minimal slot after insertion.
- **No interlocking** because the maximum gap in the free diameter state is always less than the wall thickness of the pin.
- **Available with zinc plating for added corrosion resistance.** Not only will ISO pins interlock during the plating process, but in the event that they become loose again after plating, there will be sections of the pin that are not plated. Therefore, SPIROL does not offer ISO pins with zinc plating.
- **Higher shear strength** based on increased wall thickness, a higher minimum hardness, and narrower slots which close under load to ensure that the pins fail instantaneously rather than progressively in shear.

SHEAR STRENGTH COMPARISON

NOM. DIA.	ISO kN	ASME kN	INCREASE %
1.5	1.58	1.8	13.9
2	2.82	3.5	24.1
2.5	4.38	5.5	25.6
3	6.32	7.8	23.4
4	11.24	12.3	9.4
5	17.54	19.6	11.7
6	26.04	28.5	9.4
8	42.76	48.8	14.1
10	70.16	79.1	12.7
12	104.1	104.1	0



COMPARISON OF RECOMMENDED HOLES

ASME recommends tolerance class H10 for holes up to Ø2.5mm and H12 for Ø3mm and larger. ISO recommends H12 for all diameters.

NOM. DIA.	ISO	ASME
1.5	1.5 / 1.6	1.5 / 1.56
2	2 / 2.1	2 / 2.07
2.5	2.5 / 2.6	2.5 / 2.58
3 and up	No difference	No difference

ASME pins Ø3mm and larger can be substituted for ISO pins without any review or change. Pins Ø1.5mm to Ø2.5mm require a relatively minor reduction in the maximum specified hole.

COMPARISON OF TECHNICAL SPECIFICATIONS

Diameter – ASME pins have a smaller expanded or free diameter relative to the nominal hole.

Chamfer Specification – ASME specifies a maximum chamfer diameter from 0.1mm to 0.5mm smaller than the nominal hole diameter whereas ISO only specifies a chamfer diameter less than the nominal hole diameter.

Straightness – ASME specifies a straightness requirement. ISO does not address it at all.

Shear Strength – ASME specifies a minimum double shear strength for austenitic stainless steel. ISO does not.

Wall Thickness – ASME pins have a wall thickness equal to or greater than ISO pins and a greater cross sectional area based on both thickness and strip width.

Hardness – The hardness specification for ASME is higher for carbon steel and lower for martensitic stainless steel as compared to ISO. The allowable ranges of hardness overlap significantly, but the mean hardness of each is different. Proper manufacturing practices employing SPC will result in hardness values that are indistinguishable between standards for each material.

Length Tolerance – The differences are minimal:

PIN LENGTH	ISO	ASME
4 - 10mm	± 0.25mm	± 0.40mm
12 - 24mm	± 0.50mm	± 0.40mm
26 - 50mm	± 0.50mm	± 0.50mm
55 - 75mm	± 0.75mm	± 0.60mm
80 - 100mm	± 0.75mm	± 0.75mm

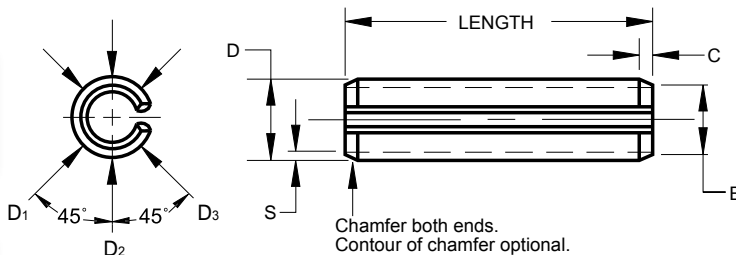
STANDARD METRIC

PIN MATERIALS AND HARDNESS

B	High Carbon Steel	HV 458-560
C	Martensitic Stainless Steel	HV 423-544
D	Austenitic Stainless Steel	Work Hardened

PIN FINISHES

K	Plain
T	Mechanical Zinc Plated



Plain carbon steel pins have a protective oil finish.

METRIC SPECIFICATIONS

NOMINAL DIAMETER		1.5	2	2.5	3	4	5	6	8	10	12
DIAMETER ØD	MAX. ¹	1.66	2.19	2.72	3.25	4.30	5.33	6.36	8.45	10.51	12.55
	MIN. ²	1.58	2.10	2.62	3.14	4.16	5.17	6.18	8.22	10.25	12.28
CHAMFER DIAMETER B	MAX.	1.4	1.9	2.4	2.9	3.9	4.8	5.8	7.8	9.7	11.7
CHAMFER LENGTH C	MAX.	0.7	0.8	0.9	1.0	1.2	1.4	1.6	2.0	2.4	2.8
	MIN.	0.15	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.6
WALL THICKNESS S	NOMINAL	0.35	0.45	0.55	0.65	0.8	1.0	1.2	1.6	2.0	2.5
RECOMMENDED HOLE SIZE	MAX.	1.56	2.07	2.58	3.10	4.12	5.12	6.12	8.15	10.15	12.18
	MIN.	1.50	2.00	2.50	3.00	4.00	5.00	6.00	8.00	10.00	12.00
MIN. DOUBLE SHEAR STRENGTH, kN	CARBON & MARTENSITIC SST	1.8	3.5	5.5	7.8	12.3	19.6	28.5	48.8	79.1	104.1
	AUSTENITIC SST	1.0	2.0	3.2	4.5	7.2	11.4	16.6	28.4	46.1	60.7

¹ Maximum diameter measured with go-ring gage. ² Minimum diameter is the average of D1, D2 and D3.

STANDARD SIZES

NOMINAL DIAMETER		1.5	2	2.5	3	4	5	6	8	10	12
LENGTH	5										
	6										
	8										
	10										
	12										
	14										
	16										
	18										
	20										
	22										
	24										
	26										
	28										
	30										
	32										
	35										
	40										
	45										
	50										
	55										
60											
65											
70											
75											
80											

Nominal Pin Length	Length Tolerance
Up to 24mm incl.	± 0.40mm
Over 24mm to 50mm incl.	± 0.50mm
Over 50mm to 75mm incl.	± 0.60mm
Over 75mm	± 0.75mm

Straightness Gauge Specifications ³			
Nominal Pin Length	Gage Length	Gage Hole Diameter = Maximum Pin Diameter Plus:	
		MIN.	MAX.
Up to 24mm incl.	25mm ± 0.15mm	0.20mm	0.22mm
24mm – 50mm	50mm ± 0.15mm	0.40mm	0.43mm
Over 50mm	75mm ± 0.15mm	0.60mm	0.64mm

Available in high carbon and stainless steel (all)

Only available in high carbon

³ The straightness over the length of the pins shall be such that the pin will pass freely through a ring gage of the length and diameter specified. All dimensions apply prior to plating • Other sizes and materials available to order • Produced in accordance with ASME B18.8.4M TYPE B

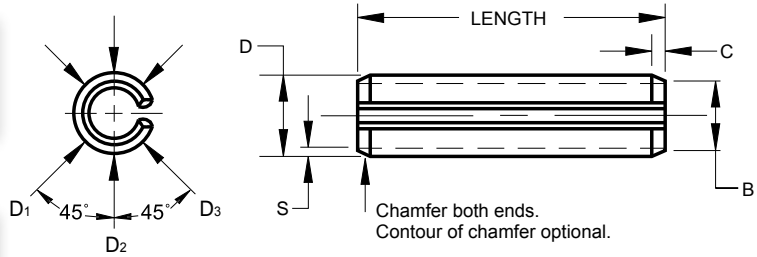
STANDARD INCH

PIN MATERIALS AND HARDNESS

B	High Carbon Steel	HV 458-560
C	Martensitic Stainless Steel	HV 423-544
D	Austenitic Stainless Steel	Work Hardened

PIN FINISHES

K	Plain
T	Mechanical Zinc Plated



Plain carbon steel pins have a protective oil finish.

INCH SPECIFICATIONS

NOMINAL DIAMETER	➤	.062	.078	.094	.125	.156	.187	.250	.312	.375	.500	
		1/16	5/64	3/32	1/8	5/32	3/16	1/4	5/16	3/8	1/2	
DIAMETER ØD	MAX. ¹	.069	.086	.103	.135	.167	.199	.264	.330	.395	.524	
	MIN. ²	.066	.083	.099	.131	.162	.194	.258	.321	.385	.513	
CHAMFER DIAMETER B	MAX.	.059	.075	.091	.122	.151	.182	.245	.306	.368	.485	
CHAMFER LENGTH C	MAX.	.028	.032	.038	.044	.048	.055	.065	.080	.095	.110	
	MIN.	.007	.008	.008	.008	.010	.011	.012	.014	.016	.025	
WALL THICKNESS S	NOMINAL	.012	.018	.022	.028	.032	.040	.048	.062	.077	.094	
RECOMMENDED HOLE SIZE	MAX.	.065	.081	.097	.129	.160	.192	.256	.318	.382	.510	
	MIN.	.062	.078	.094	.125	.156	.187	.250	.312	.375	.500	
MIN. DOUBLE SHEAR STRENGTH	CARBON & MARTENSITIC SST	LBS.	430	800	1,150	1,875	2,750	4,150	7,050	10,800	16,300	27,100
		KN.	1.91	3.56	5.12	8.34	12.23	18.46	31.36	48.04	72.51	120.55
	AUSTENITIC SST	LBS.	250	460	670	1,090	1,600	2,425	4,100	6,300	9,500	15,800
		KN.	1.11	2.05	2.98	4.85	7.12	10.79	18.24	28.02	42.26	70.28

¹Maximum diameter measured with go-ring gage. ²Minimum diameter is the average of D1, D2 and D3.

STANDARD INCH SIZES

NOMINAL DIAMETER	➤	.062	.078	.094	.125	.156	.187	.250	.312	.375	.500
		1/16	5/64	3/32	1/8	5/32	3/16	1/4	5/16	3/8	1/2
LENGTH	.187	3/16									
	.250	1/4									
	.312	5/16									
	.375	3/8									
	.437	7/16									
	.500	1/2									
	.562	9/16									
	.625	5/8									
	.687	11/16									
	.750	3/4									
	.812	13/16									
	.875	7/8									
	.937	15/16									
	1.000	1									
	1.125	1-1/8									
	1.250	1-1/4									
	1.375	1-3/8									
	1.500	1-1/2									
	1.625	1-5/8									
	1.750	1-3/4									
1.875	1-7/8										
2.000	2										
2.250	2-1/4										
2.500	2-1/2										
2.750	2-3/4										
3.000	3										

Straightness Gauge Specifications ³		
Nominal Pin Length	Gage Length	Gage Hole Diameter = Maximum Pin Diameter Plus:
Up to 1"	1.000" ± .005"	.007"
1" - 2"	2.000" ± .005"	.010"
Over 2"	3.000" ± .005"	.013"

Nominal Pin Length	Length Tolerance
Up to 1" incl.	± .015
Over 1" to 2" incl.	± .020
Over 2" to 3" incl.	± .025
Over 3" to 4" incl.	± .030
Over 4"	± .035

Available in high carbon and stainless steel (all) Only available in high carbon

³ The straightness over the length of the pins shall be such that the pin will pass freely through a ring gage of the length and diameter specified. All dimensions apply prior to plating • Other sizes and materials available to order • Produced in accordance with ASME B18.8.2

ISO 8752

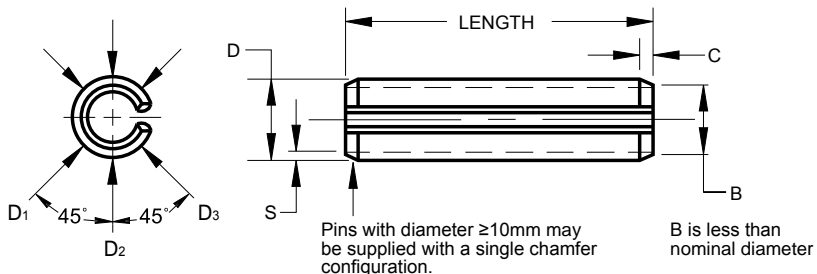
PIN MATERIALS AND HARDNESS

B	High Carbon Steel	HV 420-520
D	Austenitic Stainless Steel	Work Hardened

PIN FINISHES

K	Plain
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Plain carbon steel pins have a protective oil finish.



METRIC SPECIFICATIONS

NOMINAL DIAMETER		1.5	2	2.5	3	3.5	4	5	6	8	10	12
DIAMETER ØD	MAX. ¹	1.8	2.4	2.9	3.5	4.0	4.6	5.6	6.7	8.8	10.8	12.8
	MIN. ²	1.7	2.3	2.8	3.3	3.8	4.4	5.4	6.4	8.5	10.5	12.5
CHAMFER LENGTH C	MAX.	0.45	0.55	0.60	0.70	0.80	0.85	1.10	1.40	2.00	2.40	2.40
	MIN.	0.25	0.35	0.40	0.50	0.60	0.65	0.90	1.20	1.60	2.00	2.00
WALL THICKNESS S	NOMINAL	0.3	0.4	0.5	0.6	0.75	0.8	1.0	1.2	1.5	2.0	2.5
	RECOMMENDED MAX.	1.60	2.10	2.60	3.10	3.62	4.12	5.12	6.12	8.15	10.15	12.18
HOLE SIZE	MIN.	1.50	2.00	2.50	3.00	3.50	4.00	5.00	6.00	8.00	10.00	12.00
MIN. DOUBLE SHEAR STRENGTH HIGH CARBON STEEL, kN ³		1.58	2.82	4.38	6.32	9.06	11.24	17.54	26.04	42.76	70.16	104.1

¹ Maximum diameter measured with go-ring gage.

² Minimum diameter is the average of D1, D2 and D3.

³ Shear strength for austenitic stainless steel is not specified.

STANDARD SIZES

NOMINAL DIAMETER		1.5	2	2.5	3	3.5	4	5	6	8	10	12
LENGTH	5											
	6											
	8											
	10											
	12											
	14											
	16											
	18											
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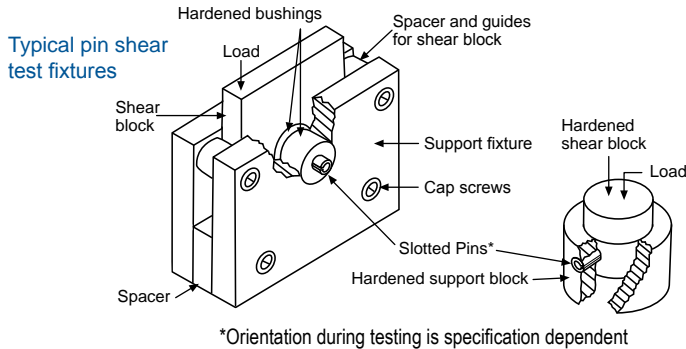
Nominal Pin Length	Length Tolerance
Length Tolerance - ISO 8752	
4mm to 10mm	± 0.25mm
12mm to 50mm	± 0.50mm
55mm to 100mm	± 0.75mm
Length Tolerance - DIN 1481 (Ref)	
4mm to 10mm	+ 0.5mm
12mm to 50mm	+ 1.0mm
55mm to 100mm	+ 1.5mm

 Only available in high carbon and austenitic stainless steel
 Only available in high carbon

Other sizes and materials available to order.

Shear Strength

The shear test procedure is set forth in ISO 8749, ASME B18.8.2, ASME B18.8.4M, SAE J496, and NASM 10971, which are nearly identical in substance.



Shear values specified will only be obtained under the conditions noted in the referenced standards. Of special note:

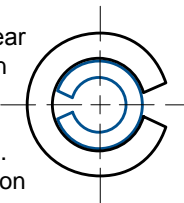
- The clearance at the shear plane cannot exceed 0.15mm or .005".
- The hole has to be the nominal pin diameter (tolerance H6) with a hardness of not less than HV 700.
- The shear planes have to be at least one pin diameter from each end, and at least two diameters apart.
- ISO 8752 pins are shear tested with the slot up, aligned with the shear load.
- ASME B18.8.2, ASME B18.8.4M, NASM 10971, and SAE J496 pins are shear tested with the slot rotated 90° to the shear load.

Recommended Pin/Shaft Ratio

The recommended maximum ratio is 1 to 3; that is the pin diameter should never exceed 33.3% of the shaft diameter. If this limit is exceeded, the remaining material in the shaft is inadequate and the shaft will fail before the pin.

Double Pinning

In situations requiring exceptionally high shear strength, it is possible to use pins in combination by driving an inner pin into an already inserted outer pin. The gaps should be 180° opposed. The recommended hole needs to be increased. It is suggested you consult SPIROL Application Engineers in these situations.



Which Stainless?

Martensitic chrome stainless steel is hardened and has strength comparable to high carbon steel. It also withstands most common atmospheric and environmental conditions in the presence of free oxygen. Austenitic nickel stainless steel provides the best corrosion protection against normal environmental conditions in both oxygenating and non-oxygenating atmospheres. However, this material is not heat treated and therefore it is not as strong and does not have the fatigue resistance of chrome stainless steel. Austenitic stainless steel Slotted Pins are not recommended for dynamic applications as they will work harden under shock and vibration, and should never be installed into hardened holes.

Why Mechanical vs. Electroplated Zinc?

Slotted Spring Pins are particularly susceptible to hydrogen embrittlement due to the high stress area directly opposite the slot. Mechanical zinc plate eliminates the risk associated with hydrogen embrittlement often caused by the electroplating process.

Hole Preparation

Holes can be drilled, punched or cast with no need for additional reaming or sizing. Care should be taken to avoid undersized holes to eliminate potential pin damage during insertion. The following points are suggested for your consideration:

- Break or debur the edges, particularly in case of hardened holes.
- Countersinking is not recommended as it increases the clearance at the shear plane.
- In the case of cast or sintered metal holes, a lead-in radius should be specified.
- Whenever possible, punched holes should be punched in the same direction as the direction of pin insertion.
- Eliminate hole misalignment problems by drilling holes together.
- In the case of hardened collars or similar components, flatten the component at the entry of the hole to avoid two-point contact as the pin starts into the hole.
- *Note: The recommended hole sizes in this catalog may not be true for all applications. Components may require a different hole size to ensure the proper function of the assembly. For this reason, it is recommended that SPIROL be consulted on new designs.*

APPLICATIONS ENGINEERING

SPIROL offers complimentary Application Engineering to assist you in your new design, supported by state-of-the-art manufacturing centers and worldwide stocking facilities to simplify the logistics of delivering your product.

Through partnering with companies in the design stage, we not only help design the most appropriate Spring Pin for your application, but we also make the critical recommendations for the interface between our product and your assembly.

PIN INSTALLATION TECHNOLOGY

SPIROL offers a standard line of Pin Installation Equipment, from manual to fully automatic modules. This allows us to recommend and provide a total assembly solution that will lower your assembly costs while improving the quality of your end product.



SPECIALS

Should a standard Slotted Pin not work for your application, SPIROL will design a custom Spring Pin to meet your requirements. Examples of special Spring Pins include: Lengths, Diameters, Materials, Finishes, Tolerances and Packaging.

All special parts are subject to minimum order quantities.



**Innovative fastening solutions.
Lower assembly costs.**



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SPIROL.com

Please refer to www.SPIROL.com for current specifications and standard product offerings.

SPIROL Application Engineers will review your application needs and work with you to recommend the optimum solution. One way to start the process is to visit our **Optimal Application Engineering** portal at SPIROL.com.