GUHRING

# NC Spot Drills

GUHRING – YOUR WORLDWIDE PARTNER

GUHRING

# SpyroTec

- round, precise and chatter-free countersinking
- reduction of feed force by 60 %
- reduction of radial force by 50 %

## THE INNOVATIVE, HELICAL HSS AND HSCO COUNTERSINK

The axial and radial forces that occur during countersinking operations are significantly reduced due to the unique geometry of the SpyroTec cutting edges. The convex form and variable pitch of the helical cutting edges results in a stable countersinking process with minimal vibration, even when using a hand drill. Round, precise, chatter-free countersinking is guaranteed. The TiAlN coating ensures higher wear resistance and thermal protection, which guarantees longer tool life in many different materials and applications.

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- standard program
- 90°, 82°, and 60° countersinks
- round shank version
- tri-flat shank version
- long length round shank version

**ALSO AVAILABLE IN SETS!**

### CONVEX CUTTING EDGES

Three different convex cutting edges in combination with three unequal helix angles enable extremely stable and low-vibration cutting processes without any chatter marks.

Visit www.Guhring.com for further information on SpyroTec countersinks

## 90° NC spot drills

| Series | 557 | 568 |
|---|---|---|
| Tool material | HSS | HSS |
| Coating | Uncoated | TiN |
| Shank form | cyl. | cyl. |

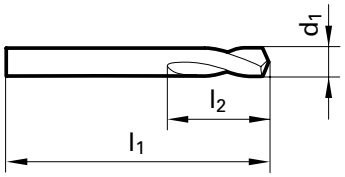
WN Guhring Std. | N Type | 90° Point angle | h6 Tolerance on Ø | R Cutting direction

| Material | | Suitability uncoated | Suitability TiN |
|---|---|---|---|
| P | Steel | ○ | ● |
| M | Stainless steel | ○ | ○ |
| K | Cast iron | ○ | ● |
| N | Aluminum | ● | ● |
| S | Ni / Ti alloys | | |
| H | Hardened steel | | |

●=Optimal ○=Secondary

relieved cone
only suitable for spotting
Shank diameter = cut diameter

*Operating parameters pg. 13*




| Diameter (d1) | | | | l1 | l2 | Code no. | EDP Number | EDP Number |
|---|---|---|---|---|---|---|---|---|
| inch | wire | ltr | mm | mm | mm | | | |
| 0.1181 | | | 3.00 | 46.00 | 12.00 | 3.000 | **9005570030000** | **9005680030000** |
| 0.1575 | | | 4.00 | 55.00 | 12.00 | 4.000 | **9005570040000** | **9005680040000** |
| 0.1969 | | | 5.00 | 62.00 | 14.00 | 5.000 | **9005570050000** | **9005680050000** |
| 0.2362 | | | 6.00 | 66.00 | 16.00 | 6.000 | **9005570060000** | **9005680060000** |
| 0.2500 | 1/4 | E | 6.35 | 70.00 | 17.00 | 6.350 | **9005570063500** | **9005680063500** |
| 0.3150 | | | 8.00 | 79.00 | 21.00 | 8.000 | **9005570080000** | **9005680080000** |
| 0.3748 | 3/8 | | 9.52 | 89.00 | 25.00 | 9.520 | **9005570095200** | **9005680095200** |
| 0.3937 | | | 10.00 | 89.00 | 25.00 | 10.000 | **9005570100000** | **9005680100000** |
| 0.4724 | | | 12.00 | 102.00 | 30.00 | 12.000 | **9005570120000** | **9005680120000** |
| 0.5000 | 1/2 | | 12.70 | 102.00 | 30.00 | 12.700 | **9005570127000** | **9005680127000** |
| 0.6248 | 5/8 | | 15.87 | 115.00 | 38.00 | 15.870 | **9005570158700** | **9005680158700** |
| 0.6299 | | | 16.00 | 115.00 | 38.00 | 16.000 | **9005570160000** | **9005680160000** |
| 0.7500 | 3/4 | | 19.05 | 131.00 | 45.00 | 19.050 | **9005570190500** | **9005680190500** |
| 0.7874 | | | 20.00 | 131.00 | 45.00 | 20.000 | **9005570200000** | **9005680200000** |
| 0.9843 | 63/64 | | 25.00 | 151.00 | 53.00 | 25.000 | **9005570250000** | **9005680250000** |
| 1.0000 | 1 | | 25.40 | 156.00 | 53.00 | 25.400 | **9005570254000** | **9005680254000** |

## 90° NC spot drills - long length

Series **559**

| WN | N | 90° | h6 | R |
|---|---|---|---|---|
| Guhring Std. | Type | Point angle | Tolerance on Ø | Cutting direction |

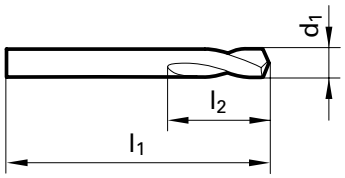
| | |
|---|---|
| Tool material | **HSS** |
| Coating | Uncoated |
| Shank form | cyl. |

| Material | | Suitability |
|---|---|---|
| **P** | Steel | ○ |
| **M** | Stainless steel | ○ |
| **K** | Cast iron | ○ |
| **N** | Aluminum | ● |
| **S** | Ni / Ti alloys | |
| **H** | Hardened steel | |

●=Optimal ○=Secondary

relieved cone
only suitable for spotting
Shank diameter = cut diameter

*Operating parameters pg. 13*




| Diameter (d1) | | | | l1 | l2 | Code no. | EDP Number |
|---|---|---|---|---|---|---|---|
| inch | wire | ltr | mm | mm | mm | | |
| 0.2500 | 1/4 | E | 6.35 | 105.00 | 17.00 | 6.350 | **9005590063500** |
| 0.3150 | | | 8.00 | 118.00 | 21.00 | 8.000 | **9005590080000** |
| 0.3748 | 3/8 | | 9.52 | 132.00 | 25.00 | 9.520 | **9005590095200** |
| 0.5000 | 1/2 | | 12.70 | 159.00 | 30.00 | 12.700 | **9005590127000** |
| 0.6248 | 5/8 | | 15.87 | 186.00 | 38.00 | 15.870 | **9005590158700** |
| 0.7500 | 3/4 | | 19.05 | 213.00 | 45.00 | 19.050 | **9005590190500** |
| 1.000 | 1 | | 25.40 | 216.00 | 53.00 | 25.400 | **9005590254000** |

## 90° NC spot drills

| Series | 1136 | 1133 |
|---|---|---|
| Tool material | HSCO | HSCO |
| Coating | Uncoated | FIREX |
| Shank form | cyl./flat | cyl./flat |

WN Guhring Std. | N Type | 90° Point angle | h6 Tolerance on Ø | R Cutting direction

| Material | | Suitability uncoated | Suitability FIREX |
|---|---|---|---|
| P | Steel | ○ | ● |
| M | Stainless steel | ○ | ● |
| K | Cast iron | ○ | ● |
| N | Aluminum | ● | ● |
| S | Ni / Ti alloys | ○ | ○ |
| H | Hardened steel | | |

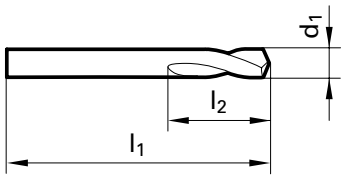
●=Optimal ○=Secondary

relieved cone
only suitable for spotting
Co-alloyed high speed steel
increased wear resistance

Shank diameter = cut diameter

* Weldon flat on drills ≥ 6mm diameter

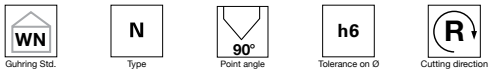
*Operating parameters pg. 14*




| Diameter (d1) | | | | l1 | l2 | Code no. | EDP Number | EDP Number |
|---|---|---|---|---|---|---|---|---|
| inch | wire | ltr | mm | mm | mm | | | |
| 0.1181 | | | 3.00 | 46.00 | 12.00 | 3.000 | **9011360030000** | **9011330030000** |
| 0.1575 | | | 4.00 | 55.00 | 12.00 | 4.000 | **9011360040000** | **9011330040000** |
| 0.1969 | | | 5.00 | 62.00 | 14.00 | 5.000 | **9011360050000** | **9011330050000** |
| 0.2362 | | | 6.00 | 66.00 | 16.00 | 6.000 | **9011360060000*** | **9011330060000*** |
| 0.3150 | | | 8.00 | 79.00 | 21.00 | 8.000 | **9011360080000*** | **9011330080000*** |
| 0.3937 | | | 10.00 | 89.00 | 25.00 | 10.000 | **9011360100000*** | **9011330100000*** |
| 0.4724 | | | 12.00 | 102.00 | 30.00 | 12.000 | **9011360120000*** | **9011330120000*** |
| 0.6299 | | | 16.00 | 115.00 | 37.50 | 16.000 | **9011360160000*** | **9011330160000*** |
| 0.7874 | | | 20.00 | 131.00 | 45.00 | 20.000 | **9011360200000*** | **9011330200000*** |

## 90° NC spot drills

| Series | 723 | 6027 |
|---|---|---|
| Tool material | Carbide | Carbide |
| Coating | Uncoated | FIREX |
| Shank form | cyl./flat | cyl./flat |



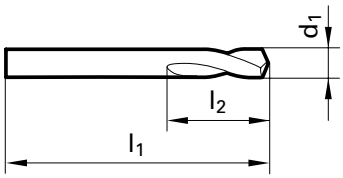

| Material | | Suitability uncoated | Suitability FIREX |
|---|---|---|---|
| P | Steel | ○ | ● |
| M | Stainless steel | ○ | ● |
| K | Cast iron | ○ | ● |
| N | Aluminum | ● | ○ |
| S | Ni / Ti alloys | ○ | ● |
| H | Hardened steel | ○ | ○ |

●=Optimal ○=Secondary

facet point grinding
only suitable for spotting
Shank diameter = cut diameter

* Weldon flat on drills ≥ 6mm diameter

*Operating parameters pg. 15*




NEW

| Diameter (d1) | | | | l1 | l2 | Code no. | EDP Number | EDP Number |
|---|---|---|---|---|---|---|---|---|
| inch | wire | ltr | mm | mm | mm | | | |
| 0.1575 | | | 4.00 | 55.00 | 12.00 | 4.000 | **9007230040000** | **9060270040000** |
| 0.1969 | | | 5.00 | 62.00 | 14.00 | 5.000 | **9007230050000** | **9060270050000** |
| 0.2362 | | | 6.00 | 66.00 | 16.00 | 6.000 | **9007230060000*** | **9060270060000*** |
| 0.2500 | 1/4 | E | 6.35 | 70.00 | 17.00 | 6.350 | **9007230063500*** | **9060270063500*** |
| 0.3150 | | | 8.00 | 79.00 | 21.00 | 8.000 | **9007230080000*** | **9060270080000*** |
| 0.3748 | 3/8 | | 9.52 | 89.00 | 25.00 | 9.520 | **9007230095200*** | **9060270095200*** |
| 0.3937 | | | 10.00 | 89.00 | 25.00 | 10.000 | **9007230100000*** | **9060270100000*** |
| 0.4724 | | | 12.00 | 102.00 | 30.00 | 12.000 | **9007230120000*** | **9060270120000*** |
| 0.5000 | 1/2 | | 12.70 | 102.00 | 30.00 | 12.700 | **9007230127000*** | **9060270127000*** |
| 0.6248 | 5/8 | | 15.87 | 115.00 | 37.50 | 15.870 | **9007230158700*** | **9060270158700*** |
| 0.6299 | | | 16.00 | 115.00 | 37.50 | 16.000 | **9007230160000*** | **9060270160000*** |
| 0.7500 | 3/4 | | 19.05 | 131.00 | 45.00 | 19.050 | **9007230190500*** | **9060270190500*** |
| 0.7874 | | | 20.00 | 131.00 | 45.00 | 20.000 | **9007230200000*** | **9060270200000*** |

## 120° NC spot drills

| Series | 556 | 567 |
|---|---|---|
| Tool material | HSS | HSS |
| Coating | Uncoated | TiN |
| Shank form | cyl. | cyl. |

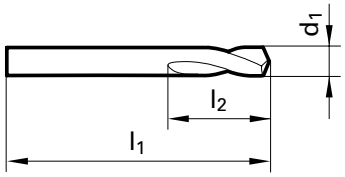
WN Guhring Std. | N Type | 120° Point angle | h6 Tolerance on Ø | R Cutting direction

| Material | | Suitability uncoated | Suitability TiN |
|---|---|---|---|
| P | Steel | ○ | ● |
| M | Stainless steel | ○ | ○ |
| K | Cast iron | ○ | ● |
| N | Aluminum | ● | ● |
| S | Ni / Ti alloys | | |
| H | Hardened steel | | |

●=Optimal ○=Secondary

relieved cone
only suitable for spotting
Shank diameter = cut diameter

*Operating parameters pg. 13*




| Diameter (d1) | | | | l1 | l2 | Code no. | EDP Number | EDP Number |
|---|---|---|---|---|---|---|---|---|
| inch | wire | ltr | mm | mm | mm | | | |
| 0.1181 | | | 3.00 | 46.00 | 12.00 | 3.000 | **9005560030000** | **9005670030000** |
| 0.1575 | | | 4.00 | 55.00 | 12.00 | 4.000 | **9005560040000** | **9005670040000** |
| 0.1969 | | | 5.00 | 62.00 | 14.00 | 5.000 | **9005560050000** | **9005670050000** |
| 0.2362 | | | 6.00 | 66.00 | 16.00 | 6.000 | **9005560060000** | **9005670060000** |
| 0.2500 | 1/4 | E | 6.35 | 70.00 | 17.00 | 6.350 | **9005560063500** | **9005670063500** |
| 0.2559 | | | 6.50 | 70.00 | 17.00 | 6.500 | **9005560065000** | |
| 0.3150 | | | 8.00 | 79.00 | 21.00 | 8.000 | **9005560080000** | **9005670080000** |
| 0.3748 | 3/8 | | 9.52 | 89.00 | 25.00 | 9.520 | **9005560095200** | **9005670095200** |
| 0.3937 | | | 10.00 | 89.00 | 25.00 | 10.000 | **9005560100000** | **9005670100000** |
| 0.4724 | | | 12.00 | 102.00 | 30.00 | 12.000 | **9005560120000** | **9005670120000** |
| 0.5000 | 1/2 | | 12.70 | 102.00 | 30.00 | 12.700 | **9005560127000** | **9005670127000** |
| 0.6248 | 5/8 | | 15.87 | 115.00 | 38.00 | 15.870 | **9005560158700** | **9005670158700** |
| 0.6299 | | | 16.00 | 115.00 | 38.00 | 16.000 | **9005560160000** | **9005670160000** |
| 0.7500 | 3/4 | | 19.05 | 131.00 | 45.00 | 19.050 | **9005560190500** | **9005670190500** |
| 0.7874 | | | 20.00 | 131.00 | 45.00 | 20.000 | **9005560200000** | **9005670200000** |
| 0.9843 | 63/64 | | 25.00 | 151.00 | 53.00 | 25.000 | **9005560250000** | **9005670250000** |
| 1.000 | 1 | | 25.40 | 156.00 | 53.00 | 25.400 | **9005560254000** | **9005670254000** |

## 120° NC spot drills

| Series | 1134 | 1135 |
|---|---|---|
| Tool material | HSCO | HSCO |
| Coating | Uncoated | FIREX |
| Shank form | cyl./flat | cyl./flat |

WN Guhring Std. | N Type | 120° Point angle | h6 Tolerance on Ø | R Cutting direction

| Material | | Suitability uncoated | Suitability FIREX |
|---|---|---|---|
| P | Steel | ○ | ● |
| M | Stainless steel | ○ | ● |
| K | Cast iron | ○ | ● |
| N | Aluminum | ● | ● |
| S | Ni / Ti alloys | ○ | ○ |
| H | Hardened steel | | |

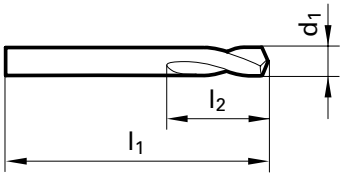
●=Optimal ○=Secondary

relieved cone
only suitable for spotting
Co-alloyed high speed steel
increased wear resistance

Shank diameter = cut diameter

* Weldon flat on drills ≥ 6mm diameter

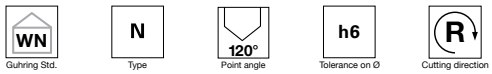
*Operating parameters pg. 14*




| Diameter (d1) | | | | l1 | l2 | Code no. | EDP Number | EDP Number |
|---|---|---|---|---|---|---|---|---|
| inch | wire | ltr | mm | mm | mm | | | |
| 0.1181 | | | 3.00 | 46.00 | 12.00 | 3.000 | **9011340030000** | **9011350030000** |
| 0.1575 | | | 4.00 | 55.00 | 12.00 | 4.000 | **9011340040000** | **9011350040000** |
| 0.1969 | | | 5.00 | 62.00 | 14.00 | 5.000 | **9011340050000** | **9011350050000** |
| 0.2362 | | | 6.00 | 66.00 | 16.00 | 6.000 | **9011340060000*** | **9011350060000*** |
| 0.3150 | | | 8.00 | 79.00 | 21.00 | 8.000 | **9011340080000*** | **9011350080000*** |
| 0.3937 | | | 10.00 | 89.00 | 25.00 | 10.000 | **9011340100000*** | **9011350100000*** |
| 0.4724 | | | 12.00 | 102.00 | 30.00 | 12.000 | **9011340120000*** | **9011350120000*** |
| 0.6299 | | | 16.00 | 115.00 | 37.50 | 16.000 | **9011340160000*** | **9011350160000*** |
| 0.7874 | | | 20.00 | 131.00 | 45.00 | 20.000 | **9011340200000*** | **9011350200000*** |

## 120° NC spot drills

| Series | 724 | 6028 |
|---|---|---|
| Tool material | Carbide | Carbide |
| Coating | Uncoated | FIREX |
| Shank form | cyl./flat | cyl./flat |




| Material | | Suitability ucoated | Suitability FIREX |
|---|---|---|---|
| P | Steel | ○ | ● |
| M | Stainless steel | ○ | ● |
| K | Cast iron | ○ | ● |
| N | Aluminum | ● | ○ |
| S | Ni / Ti alloys | ○ | ● |
| H | Hardened steel | ○ | ○ |

●=Optimal ○=Secondary

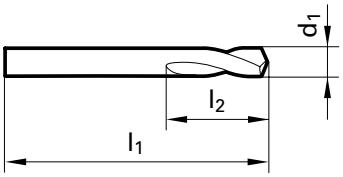
facet point grinding
only suitable for spotting

Shank diameter = cut diameter

* Weldon flat on drills ≥ 6mm diameter

NEW

*Operating parameters pg. 15*




| Diameter (d1) | | | | l1 | l2 | Code no. | EDP Number | EDP Number |
|---|---|---|---|---|---|---|---|---|
| inch | wire | ltr | mm | mm | mm | | | |
| 0.1181 | | | 3.00 | 46.00 | 12.00 | 3.000 | | 9060280030000 |
| 0.1969 | | | 5.00 | 62.00 | 14.00 | 5.000 | 9007240050000 | 9060280050000 |
| 0.2362 | | | 6.00 | 66.00 | 16.00 | 6.000 | 9007240060000* | 9060280060000* |
| 0.2500 | 1/4 | E | 6.35 | 70.00 | 17.00 | 6.350 | 9007240063500* | 9060280063500* |
| 0.3150 | | | 8.00 | 79.00 | 21.00 | 8.000 | 9007240080000* | 9060280080000* |
| 0.3748 | 3/8 | | 9.52 | 89.00 | 25.00 | 9.520 | 9007240095200* | 9060280095200* |
| 0.3937 | | | 10.00 | 89.00 | 25.00 | 10.000 | 9007240100000* | 9060280100000* |
| 0.4724 | | | 12.00 | 102.00 | 30.00 | 12.000 | 9007240120000* | 9060280120000* |
| 0.5000 | 1/2 | | 12.70 | 102.00 | 30.00 | 12.700 | 9007240127000* | 9060280127000* |
| 0.6248 | 5/8 | | 15.87 | 115.00 | 37.50 | 15.870 | 9007240158700* | 9060280158700* |
| 0.6299 | | | 16.00 | 115.00 | 37.50 | 16.000 | 9007240160000* | 9060280160000* |
| 0.7500 | 3/4 | | 19.05 | 131.00 | 45.00 | 19.050 | 9007240190500* | 9060280190500* |
| 0.7874 | | | 20.00 | 131.00 | 45.00 | 20.000 | 9007240200000* | 9060280200000* |

## 142° NC spot drills

| Series | 546 | 6029 |
|---|---|---|
| Tool material | Carbide | Carbide |
| Coating | Uncoated | FIREX |
| Shank form | cyl./flat | cyl./flat |

WN Guhring Std. | N Type | 142° Point angle | h6 Tolerance on Ø | R Cutting direction

| Material | | Suitability uncoated | Suitability FIREX |
|---|---|---|---|
| P | Steel | ○ | ● |
| M | Stainless steel | ○ | ● |
| K | Cast iron | ○ | ● |
| N | Aluminum | ● | ○ |
| S | Ni / Ti alloys | ○ | ● |
| H | Hardened steel | ○ | ○ |

●=Optimal ○=Secondary

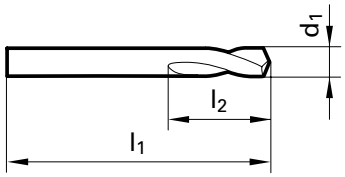
facet point grinding
only suitable for spotting

Shank diameter = cut diameter

* Weldon flat on drills ≥ 6mm diameter

NEW

*Operating parameters pg. 15*




| Diameter (d1) | | | | l1 | l2 | Code no. | EDP Number | EDP Number |
|---|---|---|---|---|---|---|---|---|
| inch | wire | ltr | mm | mm | mm | | | |
| 0.0364 | | | 1.00 | 50.00 | 3.00 | 1.000 | | **9060290010000** |
| 0.0787 | | | 2.00 | 50.00 | 6.00 | 2.000 | | **9060290020000** |
| 0.1181 | | | 3.00 | 50.00 | 9.00 | 3.000 | | **9060290030000** |
| 0.1575 | | | 4.00 | 55.00 | 12.00 | 4.000 | **9005460040000** | **9060290040000** |
| 0.1969 | | | 5.00 | 62.00 | 14.00 | 5.000 | **9005460050000** | **9060290050000** |
| 0.2362 | | | 6.00 | 66.00 | 16.00 | 6.000 | **9005460060000*** | **9060290060000*** |
| 0.3150 | | | 8.00 | 79.00 | 21.00 | 8.000 | **9005460080000*** | **9060290080000*** |
| 0.3937 | | | 10.00 | 89.00 | 25.00 | 10.000 | **9005460100000*** | **9060290100000*** |
| 0.4724 | | | 12.00 | 102.00 | 30.00 | 12.000 | **9005460120000*** | **9060290120000*** |
| 0.6299 | | | 16.00 | 115.00 | 37.50 | 16.000 | **9005460160000*** | **9060290160000*** |
| 0.7874 | | | 20.00 | 131.00 | 45.00 | 20.000 | **9005460200000*** | **9060290200000*** |

GUHRING

# Solid Carbide Thread Milling Cutters

- Thread milling cutters with and without chamfer
- Universal thread milling cutters
- Drill/thread milling cutters
- Micro thread milling cutters
- Thread milling cutters for hardened steels

*Featuring NEW micro thread mills:*

MTMH 3 Z – **Micro drill/thread milling**
Universally applicable in unhardened and hardened materials up to 66 Rc. No core hole necessary, machine with coolant or dry

MTM 3 SP – **Micro thread milling**
Thread size and pitch are predetermined

SC MTM3 SP – **Micro thread milling**
Applicable in unhardened and hardened materials up to 55 Rc

MTM 1 SP – **Micro thread milling**
Universal production of nominal thread diameters




NEW

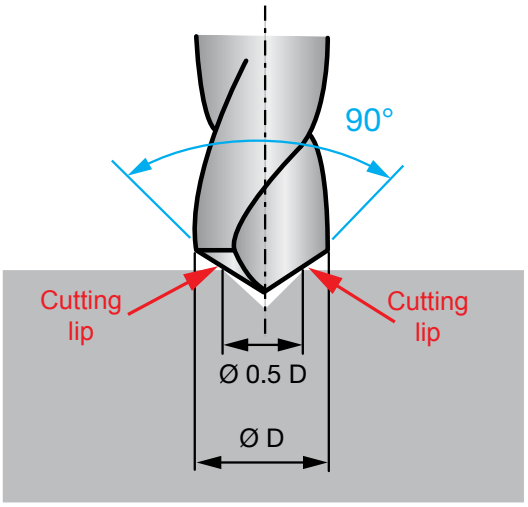
**Programming software**
for thread milling cutters and drill thread milling cutters

CNC Gühro ThreadMill

# Tips and technical information - NC Spot Drills

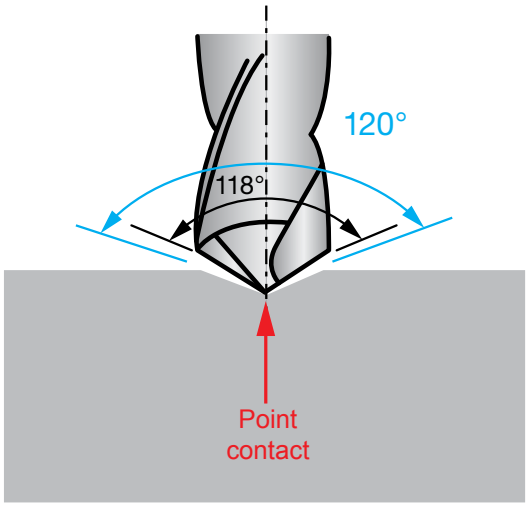
*Note: A spot drill is designed without any margin on the drill, therefore it is not meant to be used to drill deeper than the height of the point angle.*

## When to use a 90° spot drill



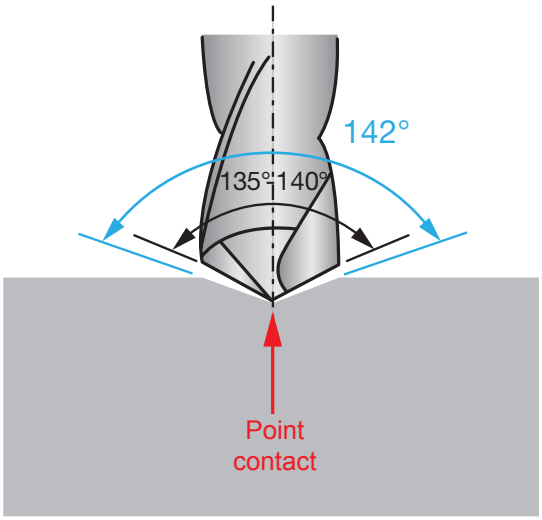

*For use with **HSS, HSCO, or PM** subsequent drills. Ensures subsequent drill makes contact with cutting lip first. Generally not suitable for carbide drills due to small point angle.*

## When to use a 120° spot drill




*Ideal if subsequent drill has a smaller chisel edge, and has a **point angle smaller than 120°**. Ensures subsequent drill makes contact with point first (not cutting lip) and is guided on-center.*

## When to use a 140° spot drill




*Ideal if subsequent drill has point angle smaller than 142°. Ensures subsequent drill makes contact with point first (not cutting lip) and is guided on-center. **This is especially important for carbide drills.** If corners or cutting lip of carbide drill contact part first, there is increased risk of premature wear/breakage.*

## Uncoated vs. Coated:

Guhring thin film PVD coatings can improve productivity. They increase surface hardness, lower the friction coefficient and thermal conductivity and provide a chemically inert surface.

TiN coating provides effective protection against abrasive and adhesive wear. TiN is also good as a wear indicator.

FIREX® proprietary hard coating combines the heat and wear resistance of TiAlN with the universal applicability of TiN coating, all in one multi-layer structure.

## HSS Series # 556, 557, 559

| Material group | Hardness HRC | Hardness BHN | SFM | Feed Rate - IPR 1/16 in. 1.590 mm | 1/8 in. 3.170 mm | 1/4 in. 6.350 mm | 3/8 in. 9.520 mm | 1/2 in. 12.700 mm | 5/8 in. 15.870 mm | 3/4 in. 19.050 mm | 1 in. 25.400 mm |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Common structural steels | - | ≤ 150 | 100 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| | ≤ 32 | ≤ 301 | 80 | | 0.0031 | 0.0049 | 0.0079 | 0.0079 | 0.0098 | 0.0124 | 0.0157 |
| Free-cutting steels | ≤ 25 | ≤ 255 | 105 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| | ≤ 32 | ≤ 301 | 100 | | 0.0031 | 0.0049 | 0.0079 | 0.0079 | 0.0098 | 0.0124 | 0.0157 |
| Unalloyed heat-treatable steels | ≤ 20 | ≤ 220 | 80 | | 0.0031 | 0.0049 | 0.0079 | 0.0079 | 0.0098 | 0.0124 | 0.0157 |
| | ≤ 25 | ≤ 255 | 80 | | 0.0031 | 0.0049 | 0.0079 | 0.0079 | 0.0098 | 0.0124 | 0.0157 |
| | ≤ 32 | ≤ 301 | 65 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| Alloyed heat-treatable steels | ≤ 32 | ≤ 301 | 50 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| | ≤ 43 | ≤ 402 | 40 | | 0.0020 | 0.0031 | 0.0049 | 0.0049 | 0.0063 | 0.0079 | 0.0098 |
| Unalloyed case hardened steels | ≤ 25 | ≤ 255 | 100 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| Alloyed case hardened steels | ≤ 32 | ≤ 301 | 50 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| | ≤ 43 | ≤ 402 | 25 | | 0.0020 | 0.0031 | 0.0049 | 0.0049 | 0.0063 | 0.0079 | 0.0098 |
| Nitriding steels | ≤ 32 | ≤ 301 | | | | | | | | | |
| | ≤ 43 | ≤ 402 | | | | | | | | | |
| Tool steels | ≤ 25 | ≤ 255 | 50 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| | ≤ 43 | ≤ 402 | | | | | | | | | |
| High speed steels | ≤ 43 | ≤ 402 | | | | | | | | | |
| Spring steels | ≤ 38 | ≤ 354 | | | | | | | | | |
| Hardened steels | ≤ 48 | ≤ 460 | | | | | | | | | |
| | ≤ 66 | - | | | | | | | | | |
| Stainless steels, sulphured | ≤ 28 | ≤ 273 | 35 | | 0.0020 | 0.0031 | 0.0049 | 0.0049 | 0.0063 | 0.0079 | 0.0098 |
| austenitic | ≤ 36 | ≤ 337 | 20 | | 0.0020 | 0.0031 | 0.0049 | 0.0049 | 0.0063 | 0.0079 | 0.0098 |
| martensitic | ≤ 46 | ≤ 435 | 25 | | 0.0020 | 0.0031 | 0.0049 | 0.0049 | 0.0063 | 0.0079 | 0.0098 |
| Cast iron | ≤ 23 | ≤ 242 | 100 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| | ≤ 38 | ≤ 354 | 100 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| Spheroidal graphite iron and malleable cast iron | ≤ 23 | ≤ 242 | 80 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| | ≤ 38 | ≤ 354 | 65 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| Chilled cast iron | ≤ 38 | ≤ 354 | | | | | | | | | |
| New cast materials GGV | ≤ 20 | ≤ 220 | | | | | | | | | |
| | ≤ 32 | ≤ 301 | | | | | | | | | |
| New cast materials ADI | ≤ 32 | ≤ 301 | | | | | | | | | |
| | ≤ 43 | ≤ 402 | | | | | | | | | |
| Special alloys | ≤ 54 | ≤ 549 | | | | | | | | | |
| Ti and Ti-alloys | ≤ 25 | ≤ 255 | | | | | | | | | |
| | ≤ 43 | ≤ 402 | | | | | | | | | |
| Aluminium and Al-alloys | - | ≤ 120 | 230 | | 0.0049 | 0.0079 | 0.0124 | 0.0124 | 0.0157 | 0.0197 | 0.0248 |
| Al wrought alloys | - | ≤ 200 | 230 | | 0.0049 | 0.0079 | 0.0124 | 0.0124 | 0.0157 | 0.0197 | 0.0248 |
| Al cast alloys ≤ 10 % Si | - | ≤ 180 | 165 | | 0.0049 | 0.0079 | 0.0124 | 0.0124 | 0.0157 | 0.0197 | 0.0248 |
| ≤ 24 % Si | - | ≤ 180 | 165 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| Magnesium alloys | - | ≤ 120 | 230 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| Copper, low-alloyed | - | ≤ 150 | 195 | | 0.0031 | 0.0049 | 0.0079 | 0.0079 | 0.0098 | 0.0124 | 0.0157 |
| Brass, short-chipping | - | ≤ 180 | 195 | | 0.0031 | 0.0049 | 0.0079 | 0.0079 | 0.0098 | 0.0124 | 0.0157 |
| long-chipping | - | ≤ 180 | 130 | | 0.0031 | 0.0049 | 0.0079 | 0.0079 | 0.0098 | 0.0124 | 0.0157 |
| Bronze, short-chipping | - | ≤ 180 | 100 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| | ≤ 25 | ≤ 255 | 80 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| Bronze, long-chipping | ≤ 25 | ≤ 255 | 50 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| | ≤ 32 | ≤ 301 | 40 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| Duroplastics | | | 60 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| Thermoplastics | | | 90 | | 0.0031 | 0.0049 | 0.0079 | 0.0079 | 0.0098 | 0.0124 | 0.0157 |

## HSS Series # 567, 568

| Material group | Hardness HRC | Hardness BHN | SFM | Feed Rate - IPR 1/16 in. 1.590 mm | 1/8 in. 3.170 mm | 1/4 in. 6.350 mm | 3/8 in. 9.520 mm | 1/2 in. 12.700 mm | 5/8 in. 15.870 mm | 3/4 in. 19.050 mm | 1 in. 25.400 mm |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Common structural steels | - | ≤ 150 | 105 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| | ≤ 32 | ≤ 301 | 85 | | 0.0031 | 0.0049 | 0.0079 | 0.0079 | 0.0098 | 0.0124 | 0.0157 |
| Free-cutting steels | ≤ 25 | ≤ 255 | 115 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| | ≤ 32 | ≤ 301 | 110 | | 0.0031 | 0.0049 | 0.0079 | 0.0079 | 0.0098 | 0.0124 | 0.0157 |
| Unalloyed heat-treatable steels | ≤ 20 | ≤ 220 | 90 | | 0.0031 | 0.0049 | 0.0079 | 0.0079 | 0.0098 | 0.0124 | 0.0157 |
| | ≤ 25 | ≤ 255 | 90 | | 0.0031 | 0.0049 | 0.0079 | 0.0079 | 0.0098 | 0.0124 | 0.0157 |
| | ≤ 32 | ≤ 301 | 80 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| Alloyed heat-treatable steels | ≤ 32 | ≤ 301 | 70 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| | ≤ 43 | ≤ 402 | 55 | | 0.0020 | 0.0031 | 0.0049 | 0.0049 | 0.0063 | 0.0079 | 0.0098 |
| Unalloyed case hardened steels | ≤ 25 | ≤ 255 | 110 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| Alloyed case hardened steels | ≤ 32 | ≤ 301 | 65 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| | ≤ 43 | ≤ 402 | 40 | | 0.0020 | 0.0031 | 0.0049 | 0.0049 | 0.0063 | 0.0079 | 0.0098 |
| Nitriding steels | ≤ 32 | ≤ 301 | 45 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| | ≤ 43 | ≤ 402 | | | | | | | | | |
| Tool steels | ≤ 25 | ≤ 255 | 60 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| | ≤ 43 | ≤ 402 | | | | | | | | | |
| High speed steels | ≤ 43 | ≤ 402 | | | | | | | | | |
| Spring steels | ≤ 38 | ≤ 354 | | | | | | | | | |
| Hardened steels | ≤ 48 | ≤ 460 | | | | | | | | | |
| | ≤ 66 | - | | | | | | | | | |
| Stainless steels, sulphured | ≤ 28 | ≤ 273 | 40 | | 0.0020 | 0.0031 | 0.0049 | 0.0049 | 0.0063 | 0.0079 | 0.0098 |
| austenitic | ≤ 36 | ≤ 337 | 25 | | 0.0020 | 0.0031 | 0.0049 | 0.0049 | 0.0063 | 0.0079 | 0.0098 |
| martensitic | ≤ 46 | ≤ 435 | 35 | | 0.0020 | 0.0031 | 0.0049 | 0.0049 | 0.0063 | 0.0079 | 0.0098 |
| Cast iron | ≤ 23 | ≤ 242 | 110 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| | ≤ 38 | ≤ 354 | 110 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| Spheroidal graphite iron and malleable cast iron | ≤ 23 | ≤ 242 | 90 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| | ≤ 38 | ≤ 354 | 70 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| Chilled cast iron | ≤ 38 | ≤ 354 | | | | | | | | | |
| New cast materials GGV | ≤ 20 | ≤ 220 | | | | | | | | | |
| | ≤ 32 | ≤ 301 | | | | | | | | | |
| New cast materials ADI | ≤ 32 | ≤ 301 | | | | | | | | | |
| | ≤ 43 | ≤ 402 | | | | | | | | | |
| Special alloys | ≤ 54 | ≤ 549 | | | | | | | | | |
| Ti and Ti-alloys | ≤ 25 | ≤ 255 | | | | | | | | | |
| | ≤ 43 | ≤ 402 | | | | | | | | | |
| Aluminium and Al-alloys | - | ≤ 120 | | | | | | | | | |
| Al wrought alloys | - | ≤ 200 | | | | | | | | | |
| Al cast alloys ≤ 10 % Si | - | ≤ 180 | | | | | | | | | |
| ≤ 24 % Si | - | ≤ 180 | 195 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| Magnesium alloys | - | ≤ 120 | 260 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| Copper, low-alloyed | - | ≤ 150 | 215 | | 0.0031 | 0.0049 | 0.0079 | 0.0079 | 0.0098 | 0.0124 | 0.0157 |
| Brass, short-chipping | - | ≤ 180 | 230 | | 0.0031 | 0.0049 | 0.0079 | 0.0079 | 0.0098 | 0.0124 | 0.0157 |
| long-chipping | - | ≤ 180 | 150 | | 0.0031 | 0.0049 | 0.0079 | 0.0079 | 0.0098 | 0.0124 | 0.0157 |
| Bronze, short-chipping | - | ≤ 180 | 110 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| | ≤ 25 | ≤ 255 | 90 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| Bronze, long-chipping | ≤ 25 | ≤ 255 | 50 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| | ≤ 32 | ≤ 301 | 50 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| Duroplastics | | | 70 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| Thermoplastics | | | 120 | | 0.0031 | 0.0049 | 0.0079 | 0.0079 | 0.0098 | 0.0124 | 0.0157 |

## HSCO Series # 1134, 1136

| Material group | Hardness HRC | Hardness BHN | SFM | Feed Rate - IPR 1/16 in. 1.590 mm | 1/8 in. 3.170 mm | 1/4 in. 6.350 mm | 3/8 in. 9.520 mm | 1/2 in. 12.700 mm | 5/8 in. 15.870 mm | 3/4 in. 19.050 mm | 1 in. 25.400 mm |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Common structural steels | - | ≤ 150 | 115 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| | ≤ 32 | ≤ 301 | 100 | | 0.0031 | 0.0049 | 0.0079 | 0.0079 | 0.0098 | 0.0124 | 0.0157 |
| Free-cutting steels | ≤ 25 | ≤ 255 | 130 | | 0.0031 | 0.0049 | 0.0079 | 0.0079 | 0.0098 | 0.0124 | 0.0157 |
| | ≤ 32 | ≤ 301 | 130 | | 0.0031 | 0.0049 | 0.0079 | 0.0079 | 0.0098 | 0.0124 | 0.0157 |
| Unalloyed heat-treatable steels | ≤ 20 | ≤ 220 | 115 | | 0.0031 | 0.0049 | 0.0079 | 0.0079 | 0.0098 | 0.0124 | 0.0157 |
| | ≤ 25 | ≤ 255 | 115 | | 0.0031 | 0.0049 | 0.0079 | 0.0079 | 0.0098 | 0.0124 | 0.0157 |
| | ≤ 32 | ≤ 301 | 100 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| Alloyed heat-treatable steels | ≤ 32 | ≤ 301 | 70 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| | ≤ 43 | ≤ 402 | 55 | | 0.0020 | 0.0031 | 0.0049 | 0.0049 | 0.0063 | 0.0079 | 0.0098 |
| Unalloyed case hardened steels | ≤ 25 | ≤ 255 | 110 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| Alloyed case hardened steels | ≤ 32 | ≤ 301 | 65 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| | ≤ 43 | ≤ 402 | 50 | | 0.0020 | 0.0031 | 0.0049 | 0.0049 | 0.0063 | 0.0079 | 0.0098 |
| Nitriding steels | ≤ 32 | ≤ 301 | 45 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| | ≤ 43 | ≤ 402 | 40 | | 0.0020 | 0.0031 | 0.0049 | 0.0049 | 0.0063 | 0.0079 | 0.0098 |
| Tool steels | ≤ 25 | ≤ 255 | 60 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| | ≤ 43 | ≤ 402 | 40 | | 0.0020 | 0.0031 | 0.0049 | 0.0049 | 0.0063 | 0.0079 | 0.0098 |
| High speed steels | ≤ 43 | ≤ 402 | 25 | | 0.0020 | 0.0031 | 0.0049 | 0.0049 | 0.0063 | 0.0079 | 0.0098 |
| Spring steels | ≤ 38 | ≤ 354 | 25 | | 0.0016 | 0.0025 | 0.0039 | 0.0039 | 0.0049 | 0.0063 | 0.0079 |
| Hardened steels | ≤ 48 | ≤ 460 | | | | | | | | | |
| | ≤ 66 | - | | | | | | | | | |
| Stainless steels, sulphured | ≤ 28 | ≤ 273 | 40 | | 0.0020 | 0.0031 | 0.0049 | 0.0049 | 0.0063 | 0.0079 | 0.0098 |
| austenitic | ≤ 36 | ≤ 337 | 35 | | 0.0020 | 0.0031 | 0.0049 | 0.0049 | 0.0063 | 0.0079 | 0.0098 |
| martensitic | ≤ 46 | ≤ 435 | 35 | | 0.0020 | 0.0031 | 0.0049 | 0.0049 | 0.0063 | 0.0079 | 0.0098 |
| Cast iron | ≤ 23 | ≤ 242 | 110 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| | ≤ 38 | ≤ 354 | 110 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| Spheroidal graphite iron and | ≤ 23 | ≤ 242 | 100 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| malleable cast iron | ≤ 38 | ≤ 354 | 80 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| Chilled cast iron | ≤ 38 | ≤ 354 | | | | | | | | | |
| New cast materials GGV | ≤ 20 | ≤ 220 | | | | | | | | | |
| | ≤ 32 | ≤ 301 | | | | | | | | | |
| New cast materials ADI | ≤ 32 | ≤ 301 | | | | | | | | | |
| | ≤ 43 | ≤ 402 | | | | | | | | | |
| Special alloys | ≤ 54 | ≤ 549 | 20 | | 0.0013 | 0.0020 | 0.0031 | 0.0031 | 0.0039 | 0.0049 | 0.0063 |
| Ti and Ti-alloys | ≤ 25 | ≤ 255 | 25 | | 0.0016 | 0.0025 | 0.0039 | 0.0039 | 0.0049 | 0.0063 | 0.0079 |
| | ≤ 402 | | 20 | | 0.0016 | 0.0025 | 0.0039 | 0.0039 | 0.0049 | 0.0063 | 0.0079 |
| Aluminium and Al-alloys | - | ≤ 120 | 260 | | 0.0049 | 0.0079 | 0.0124 | 0.0124 | 0.0157 | 0.0197 | 0.0248 |
| Al wrought alloys | - | ≤ 200 | 260 | | 0.0049 | 0.0079 | 0.0124 | 0.0124 | 0.0157 | 0.0197 | 0.0248 |
| Al cast alloys ≤ 10 % Si | - | ≤ 180 | 195 | | 0.0049 | 0.0079 | 0.0124 | 0.0124 | 0.0157 | 0.0197 | 0.0248 |
| ≤ 24 % Si | - | ≤ 180 | 195 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| Magnesium alloys | - | ≤ 120 | 230 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| Copper, low-alloyed | - | ≤ 150 | 215 | | 0.0031 | 0.0049 | 0.0079 | 0.0079 | 0.0098 | 0.0124 | 0.0157 |
| Brass, short-chipping | - | ≤ 180 | 230 | | 0.0031 | 0.0049 | 0.0079 | 0.0079 | 0.0098 | 0.0124 | 0.0157 |
| long-chipping | - | ≤ 180 | 150 | | 0.0031 | 0.0049 | 0.0079 | 0.0079 | 0.0098 | 0.0124 | 0.0157 |
| Bronze, short-chipping | - | ≤ 180 | 115 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| | ≤ 25 | ≤ 255 | 110 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| Bronze, long-chipping | ≤ 25 | ≤ 255 | 65 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| | ≤ 32 | ≤ 301 | 50 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| Duroplastics | | | 70 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| Thermoplastics | | | 120 | | 0.0031 | 0.0049 | 0.0079 | 0.0079 | 0.0098 | 0.0124 | 0.0157 |

## HSCO Series # 1133, 1135

| Material group | Hardness HRC | Hardness BHN | SFM | Feed Rate - IPR 1/16 in. 1.590 mm | 1/8 in. 3.170 mm | 1/4 in. 6.350 mm | 3/8 in. 9.520 mm | 1/2 in. 12.700 mm | 5/8 in. 15.870 mm | 3/4 in. 19.050 mm | 1 in. 25.400 mm |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Common structural steels | - | ≤ 150 | 140 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| | ≤ 32 | ≤ 301 | 120 | | 0.0031 | 0.0049 | 0.0079 | 0.0079 | 0.0098 | 0.0124 | 0.0157 |
| Free-cutting steels | ≤ 25 | ≤ 255 | 155 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| | ≤ 32 | ≤ 301 | 140 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| Unalloyed heat-treatable steels | ≤ 20 | ≤ 220 | 145 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| | ≤ 25 | ≤ 255 | 145 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| | ≤ 32 | ≤ 301 | 130 | | 0.0031 | 0.0049 | 0.0079 | 0.0079 | 0.0098 | 0.0124 | 0.0157 |
| Alloyed heat-treatable steels | ≤ 32 | ≤ 301 | 90 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| | ≤ 43 | ≤ 402 | 70 | | 0.0020 | 0.0031 | 0.0049 | 0.0049 | 0.0063 | 0.0079 | 0.0098 |
| Unalloyed case hardened steels | ≤ 25 | ≤ 255 | 120 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| Alloyed case hardened steels | ≤ 32 | ≤ 301 | 70 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| | ≤ 43 | ≤ 402 | 60 | | 0.0020 | 0.0031 | 0.0049 | 0.0049 | 0.0063 | 0.0079 | 0.0098 |
| Nitriding steels | ≤ 32 | ≤ 301 | 60 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| | ≤ 43 | ≤ 402 | 50 | | 0.0020 | 0.0031 | 0.0049 | 0.0049 | 0.0063 | 0.0079 | 0.0098 |
| Tool steels | ≤ 25 | ≤ 255 | 70 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| | ≤ 43 | ≤ 402 | 50 | | 0.0020 | 0.0031 | 0.0049 | 0.0049 | 0.0063 | 0.0079 | 0.0098 |
| High speed steels | ≤ 43 | ≤ 402 | 40 | | 0.0020 | 0.0031 | 0.0049 | 0.0049 | 0.0063 | 0.0079 | 0.0098 |
| Spring steels | ≤ 38 | ≤ 354 | 35 | | 0.0016 | 0.0025 | 0.0039 | 0.0039 | 0.0049 | 0.0063 | 0.0079 |
| Hardened steels | ≤ 48 | ≤ 460 | | | | | | | | | |
| | ≤ 66 | - | | | | | | | | | |
| Stainless steels, sulphured | ≤ 28 | ≤ 273 | 60 | | 0.0020 | 0.0030 | 0.0050 | 0.0050 | 0.0065 | 0.0080 | 0.0100 |
| austenitic | ≤ 36 | ≤ 337 | 50 | | 0.0020 | 0.0030 | 0.0050 | 0.0050 | 0.0065 | 0.0080 | 0.0100 |
| martensitic | ≤ 46 | ≤ 435 | 40 | | 0.0020 | 0.0030 | 0.0050 | 0.0050 | 0.0065 | 0.0080 | 0.0100 |
| Cast iron | ≤ 23 | ≤ 242 | 125 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| | ≤ 38 | ≤ 354 | 115 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| Spheroidal graphite iron and | ≤ 23 | ≤ 242 | 110 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| malleable cast iron | ≤ 38 | ≤ 354 | 90 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| Chilled cast iron | ≤ 38 | ≤ 354 | | | | | | | | | |
| New cast materials GGV | ≤ 20 | ≤ 220 | | | | | | | | | |
| | ≤ 32 | ≤ 301 | | | | | | | | | |
| New cast materials ADI | ≤ 32 | ≤ 301 | | | | | | | | | |
| | ≤ 43 | ≤ 402 | | | | | | | | | |
| Special alloys | ≤ 54 | ≤ 549 | 25 | | 0.0013 | 0.0020 | 0.0031 | 0.0031 | 0.0039 | 0.0049 | 0.0063 |
| Ti and Ti-alloys | ≤ 25 | ≤ 255 | 35 | | 0.0016 | 0.0025 | 0.0039 | 0.0039 | 0.0049 | 0.0063 | 0.0079 |
| | ≤ 43 | ≤ 402 | 25 | | 0.0016 | 0.0025 | 0.0039 | 0.0039 | 0.0049 | 0.0063 | 0.0079 |
| Aluminium and Al-alloys | - | ≤ 120 | | | | | | | | | |
| Al wrought alloys | - | ≤ 200 | 280 | | 0.0049 | 0.0079 | 0.0124 | 0.0124 | 0.0157 | 0.0197 | 0.0248 |
| Al cast alloys ≤ 10 % Si | - | ≤ 180 | 215 | | 0.0049 | 0.0079 | 0.0124 | 0.0124 | 0.0157 | 0.0197 | 0.0248 |
| ≤ 24 % Si | - | ≤ 180 | 215 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| Magnesium alloys | - | ≤ 120 | 260 | | 0.0039 | 0.0063 | 0.0098 | 0.0098 | 0.0124 | 0.0157 | 0.0197 |
| Copper, low-alloyed | - | ≤ 150 | 230 | | 0.0031 | 0.0049 | 0.0079 | 0.0079 | 0.0098 | 0.0124 | 0.0157 |
| Brass, short-chipping | - | ≤ 180 | 245 | | 0.0031 | 0.0049 | 0.0079 | 0.0079 | 0.0098 | 0.0124 | 0.0157 |
| long-chipping | - | ≤ 180 | 165 | | 0.0031 | 0.0049 | 0.0079 | 0.0079 | 0.0098 | 0.0124 | 0.0157 |
| Bronze, short-chipping | - | ≤ 180 | 150 | | 0.0031 | 0.0049 | 0.0079 | 0.0079 | 0.0098 | 0.0124 | 0.0157 |
| | ≤ 25 | ≤ 255 | 130 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| Bronze, long-chipping | ≤ 25 | ≤ 255 | 80 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| | ≤ 32 | ≤ 301 | 65 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| Duroplastics | | | 80 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |
| Thermoplastics | | | 130 | | 0.0025 | 0.0039 | 0.0063 | 0.0063 | 0.0079 | 0.0098 | 0.0124 |

## Carbide Series # 546, 723, 724

| Material group | Hardness HRC | Hardness BHN | SFM | Feed Rate - IPR 1/64 in. 0.500 mm | 1/16 in. 1.590 mm | 1/8 in. 3.170 mm | 1/4 in. 6.350 mm | 3/8 in. 9.520 mm | 1/2 in. 12.700 mm | 5/8 in. 15.870 mm | 3/4 in. 19.050 mm | 1 in. 25.400 mm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Common structural steels | - | ≤ 150 | 245 | | | 0.0040 | 0.0065 | 0.0100 | 0.0100 | 0.0125 | 0.0155 | 0.0195 |
| | ≤ 32 | ≤ 301 | 205 | | | 0.0030 | 0.0050 | 0.0080 | 0.0080 | 0.0100 | 0.0125 | 0.0155 |
| Free-cutting steels | ≤ 25 | ≤ 255 | 260 | | | 0.0040 | 0.0065 | 0.0100 | 0.0100 | 0.0125 | 0.0155 | 0.0195 |
| | ≤ 32 | ≤ 301 | 245 | | | 0.0030 | 0.0050 | 0.0080 | 0.0080 | 0.0100 | 0.0125 | 0.0155 |
| Unalloyed heat-treatable steels | ≤ 20 | ≤ 220 | 205 | | | 0.0030 | 0.0050 | 0.0080 | 0.0080 | 0.0100 | 0.0125 | 0.0155 |
| | ≤ 25 | ≤ 255 | 205 | | | 0.0030 | 0.0050 | 0.0080 | 0.0080 | 0.0100 | 0.0125 | 0.0155 |
| | ≤ 32 | ≤ 301 | 165 | | | 0.0025 | 0.0040 | 0.0065 | 0.0065 | 0.0080 | 0.0100 | 0.0125 |
| Alloyed heat-treatable steels | ≤ 32 | ≤ 301 | 125 | | | 0.0025 | 0.0040 | 0.0065 | 0.0065 | 0.0080 | 0.0100 | 0.0125 |
| | ≤ 43 | ≤ 402 | 100 | | | 0.0020 | 0.0030 | 0.0050 | 0.0050 | 0.0065 | 0.0080 | 0.0100 |
| Unalloyed case hardened steels | ≤ 25 | ≤ 255 | 245 | | | 0.0040 | 0.0065 | 0.0100 | 0.0100 | 0.0125 | 0.0155 | 0.0195 |
| Alloyed case hardened steels | ≤ 32 | ≤ 301 | 125 | | | 0.0025 | 0.0040 | 0.0065 | 0.0065 | 0.0080 | 0.0100 | 0.0125 |
| | ≤ 43 | ≤ 402 | 65 | | | 0.0020 | 0.0030 | 0.0050 | 0.0050 | 0.0065 | 0.0080 | 0.0100 |
| Nitriding steels | ≤ 32 | ≤ 301 | | | | | | | | | | |
| | ≤ 43 | ≤ 402 | | | | | | | | | | |
| Tool steels | ≤ 25 | ≤ 255 | 130 | | | 0.0025 | 0.0040 | 0.0065 | 0.0065 | 0.0080 | 0.0100 | 0.0125 |
| | ≤ 43 | ≤ 402 | | | | | | | | | | |
| High speed steels | ≤ 43 | ≤ 402 | | | | | | | | | | |
| Spring steels | ≤ 38 | ≤ 354 | | | | | | | | | | |
| Hardened steels | ≤ 48 | ≤ 460 | 65 | | | 0.0015 | 0.0025 | 0.0040 | 0.0040 | 0.0050 | 0.0065 | 0.0080 |
| | ≤ 66 | - | | | | | | | | | | |
| Stainless steels, sulphured | ≤ 28 | ≤ 273 | 80 | | | 0.0020 | 0.0030 | 0.0050 | 0.0050 | 0.0065 | 0.0080 | 0.0100 |
| austenitic | ≤ 36 | ≤ 337 | 50 | | | 0.0020 | 0.0030 | 0.0050 | 0.0050 | 0.0065 | 0.0080 | 0.0100 |
| martensitic | ≤ 46 | ≤ 435 | 65 | | | 0.0020 | 0.0030 | 0.0050 | 0.0050 | 0.0065 | 0.0080 | 0.0100 |
| Cast iron | ≤ 23 | ≤ 242 | 245 | | | 0.0040 | 0.0065 | 0.0100 | 0.0100 | 0.0125 | 0.0155 | 0.0195 |
| | ≤ 38 | ≤ 354 | 245 | | | 0.0040 | 0.0065 | 0.0100 | 0.0100 | 0.0125 | 0.0155 | 0.0195 |
| Spheroidal graphite iron and | ≤ 23 | ≤ 242 | 205 | | | 0.0040 | 0.0065 | 0.0100 | 0.0100 | 0.0125 | 0.0155 | 0.0195 |
| malleable cast iron | ≤ 38 | ≤ 354 | 165 | | | 0.0040 | 0.0065 | 0.0100 | 0.0100 | 0.0125 | 0.0155 | 0.0195 |
| Chilled cast iron | ≤ 38 | ≤ 354 | | | | | | | | | | |
| New cast materials GGV | ≤ 20 | ≤ 220 | | | | | | | | | | |
| | ≤ 32 | ≤ 301 | | | | | | | | | | |
| New cast materials ADI | ≤ 32 | ≤ 301 | | | | | | | | | | |
| | ≤ 43 | ≤ 402 | | | | | | | | | | |
| Special alloys | ≤ 54 | ≤ 549 | 50 | | | 0.0015 | 0.0025 | 0.0040 | 0.0040 | 0.0050 | 0.0065 | 0.0080 |
| Ti and Ti-alloys | ≤ 25 | ≤ 255 | 50 | | | 0.0015 | 0.0020 | 0.0030 | 0.0030 | 0.0040 | 0.0050 | 0.0065 |
| | ≤ 43 | ≤ 402 | 50 | | | 0.0015 | 0.0020 | 0.0030 | 0.0030 | 0.0040 | 0.0050 | 0.0065 |
| Aluminium and Al-alloys | - | ≤ 120 | 575 | | | 0.0050 | 0.0080 | 0.0125 | 0.0125 | 0.0155 | 0.0195 | 0.0250 |
| Al wrought alloys | - | ≤ 200 | 575 | | | 0.0050 | 0.0080 | 0.0125 | 0.0125 | 0.0155 | 0.0195 | 0.0250 |
| Al cast alloys ≤ 10 % Si | - | ≤ 180 | 410 | | | 0.0050 | 0.0080 | 0.0125 | 0.0125 | 0.0155 | 0.0195 | 0.0250 |
| ≤ 24 % Si | - | ≤ 180 | 410 | | | 0.0040 | 0.0065 | 0.0100 | 0.0100 | 0.0125 | 0.0155 | 0.0195 |
| Magnesium alloys | - | ≤ 120 | 575 | | | 0.0040 | 0.0065 | 0.0100 | 0.0100 | 0.0125 | 0.0155 | 0.0195 |
| Copper, low-alloyed | - | ≤ 150 | 490 | | | 0.0030 | 0.0050 | 0.0080 | 0.0080 | 0.0100 | 0.0125 | 0.0155 |
| Brass, short-chipping | - | ≤ 180 | 490 | | | 0.0030 | 0.0050 | 0.0080 | 0.0080 | 0.0100 | 0.0125 | 0.0155 |
| long-chipping | - | ≤ 180 | 330 | | | 0.0030 | 0.0050 | 0.0080 | 0.0080 | 0.0100 | 0.0125 | 0.0155 |
| Bronze, short-chipping | - | ≤ 180 | 245 | | | 0.0025 | 0.0040 | 0.0065 | 0.0065 | 0.0080 | 0.0100 | 0.0125 |
| | ≤ 25 | ≤ 255 | 205 | | | 0.0025 | 0.0040 | 0.0065 | 0.0065 | 0.0080 | 0.0100 | 0.0125 |
| Bronze, long-chipping | ≤ 25 | ≤ 255 | 125 | | | 0.0025 | 0.0040 | 0.0065 | 0.0065 | 0.0080 | 0.0100 | 0.0125 |
| | ≤ 32 | ≤ 301 | 100 | | | 0.0025 | 0.0040 | 0.0065 | 0.0065 | 0.0080 | 0.0100 | 0.0125 |
| Duroplastics | | | 150 | | | 0.0025 | 0.0040 | 0.0065 | 0.0065 | 0.0080 | 0.0100 | 0.0125 |
| Thermoplastics | | | 230 | | | 0.0030 | 0.0050 | 0.0080 | 0.0080 | 0.0100 | 0.0125 | 0.0155 |

## Carbide Series # 6027, 6028, 6029

| Material group | Hardness HRC | Hardness BHN | SFM | Feed Rate - IPR 1/64 in. 0.500 mm | 1/16 in. 1.590 mm | 1/8 in. 3.170 mm | 1/4 in. 6.350 mm | 3/8 in. 9.520 mm | 1/2 in. 12.700 mm | 5/8 in. 15.870 mm | 3/4 in. 19.050 mm | 1 in. 25.400 mm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Common structural steels | - | ≤ 150 | 330 | 0.0005 | 0.0005 | 0.0040 | 0.0065 | 0.0100 | 0.0100 | 0.0125 | 0.0155 | 0.0195 |
| | ≤ 32 | ≤ 301 | 280 | 0.0005 | 0.0005 | 0.0030 | 0.0050 | 0.0080 | 0.0080 | 0.0100 | 0.0125 | 0.0155 |
| Free-cutting steels | ≤ 25 | ≤ 255 | 345 | 0.0005 | 0.0005 | 0.0040 | 0.0065 | 0.0100 | 0.0100 | 0.0125 | 0.0155 | 0.0195 |
| | ≤ 32 | ≤ 301 | 330 | 0.0005 | 0.0005 | 0.0030 | 0.0050 | 0.0080 | 0.0080 | 0.0100 | 0.0125 | 0.0155 |
| Unalloyed heat-treatable steels | ≤ 20 | ≤ 220 | 280 | 0.0005 | 0.0005 | 0.0030 | 0.0050 | 0.0080 | 0.0080 | 0.0100 | 0.0125 | 0.0155 |
| | ≤ 25 | ≤ 255 | 280 | 0.0005 | 0.0005 | 0.0030 | 0.0050 | 0.0080 | 0.0080 | 0.0100 | 0.0125 | 0.0155 |
| | ≤ 32 | ≤ 301 | 230 | 0.0005 | 0.0005 | 0.0025 | 0.0040 | 0.0065 | 0.0065 | 0.0080 | 0.0100 | 0.0125 |
| Alloyed heat-treatable steels | ≤ 32 | ≤ 301 | 180 | 0.0005 | 0.0005 | 0.0025 | 0.0040 | 0.0065 | 0.0065 | 0.0080 | 0.0100 | 0.0125 |
| | ≤ 43 | ≤ 402 | 150 | 0.0005 | 0.0005 | 0.0020 | 0.0030 | 0.0050 | 0.0050 | 0.0065 | 0.0080 | 0.0100 |
| Unalloyed case hardened steels | ≤ 25 | ≤ 255 | 330 | 0.0005 | 0.0005 | 0.0040 | 0.0065 | 0.0100 | 0.0100 | 0.0125 | 0.0155 | 0.0195 |
| Alloyed case hardened steels | ≤ 32 | ≤ 301 | 180 | 0.0005 | 0.0005 | 0.0025 | 0.0040 | 0.0065 | 0.0065 | 0.0080 | 0.0100 | 0.0125 |
| | ≤ 43 | ≤ 402 | 100 | 0.0005 | 0.0005 | 0.0020 | 0.0030 | 0.0050 | 0.0050 | 0.0065 | 0.0080 | 0.0100 |
| Nitriding steels | ≤ 32 | ≤ 301 | | | | | | | | | | |
| | ≤ 43 | ≤ 402 | | | | | | | | | | |
| Tool steels | ≤ 25 | ≤ 255 | 180 | 0.0005 | 0.0005 | 0.0025 | 0.0040 | 0.0065 | 0.0065 | 0.0080 | 0.0100 | 0.0125 |
| | ≤ 43 | ≤ 402 | | | | | | | | | | |
| High speed steels | ≤ 43 | ≤ 402 | | | | | | | | | | |
| Spring steels | ≤ 38 | ≤ 354 | | | | | | | | | | |
| Hardened steels | ≤ 48 | ≤ 460 | 100 | 0.0005 | 0.0005 | 0.0015 | 0.0025 | 0.0040 | 0.0040 | 0.0050 | 0.0065 | 0.0080 |
| | ≤ 66 | - | | | | | | | | | | |
| Stainless steels, sulphured | ≤ 28 | ≤ 273 | 115 | 0.0005 | 0.0005 | 0.0020 | 0.0030 | 0.0050 | 0.0050 | 0.0065 | 0.0080 | 0.0100 |
| austenitic | ≤ 36 | ≤ 337 | 80 | 0.0005 | 0.0005 | 0.0020 | 0.0030 | 0.0050 | 0.0050 | 0.0065 | 0.0080 | 0.0100 |
| martensitic | ≤ 46 | ≤ 435 | 100 | 0.0005 | 0.0005 | 0.0020 | 0.0030 | 0.0050 | 0.0050 | 0.0065 | 0.0080 | 0.0100 |
| Cast iron | ≤ 23 | ≤ 242 | 330 | 0.0005 | 0.0005 | 0.0040 | 0.0065 | 0.0100 | 0.0100 | 0.0125 | 0.0155 | 0.0195 |
| | ≤ 38 | ≤ 354 | 330 | 0.0005 | 0.0005 | 0.0040 | 0.0065 | 0.0100 | 0.0100 | 0.0125 | 0.0155 | 0.0195 |
| Spheroidal graphite iron and | ≤ 23 | ≤ 242 | 280 | 0.0005 | 0.0005 | 0.0040 | 0.0065 | 0.0100 | 0.0100 | 0.0125 | 0.0155 | 0.0195 |
| malleable cast iron | ≤ 38 | ≤ 354 | 230 | 0.0005 | 0.0005 | 0.0040 | 0.0065 | 0.0100 | 0.0100 | 0.0125 | 0.0155 | 0.0195 |
| Chilled cast iron | ≤ 38 | ≤ 354 | | | | | | | | | | |
| New cast materials GGV | ≤ 20 | ≤ 220 | | | | | | | | | | |
| | ≤ 32 | ≤ 301 | | | | | | | | | | |
| New cast materials ADI | ≤ 32 | ≤ 301 | | | | | | | | | | |
| | ≤ 43 | ≤ 402 | | | | | | | | | | |
| Special alloys | ≤ 54 | ≤ 549 | 80 | 0.0005 | 0.0005 | 0.0015 | 0.0025 | 0.0040 | 0.0040 | 0.0050 | 0.0065 | 0.0080 |
| Ti and Ti-alloys | ≤ 25 | ≤ 255 | 80 | 0.0005 | 0.0005 | 0.0015 | 0.0020 | 0.0030 | 0.0030 | 0.0040 | 0.0050 | 0.0065 |
| | ≤ 43 | ≤ 402 | 80 | 0.0005 | 0.0005 | 0.0015 | 0.0020 | 0.0030 | 0.0030 | 0.0040 | 0.0050 | 0.0065 |
| Aluminium and Al-alloys | - | ≤ 120 | 755 | 0.0005 | 0.0010 | 0.0050 | 0.0080 | 0.0125 | 0.0125 | 0.0155 | 0.0195 | 0.0250 |
| Al wrought alloys | - | ≤ 200 | 755 | 0.0005 | 0.0010 | 0.0050 | 0.0080 | 0.0125 | 0.0125 | 0.0155 | 0.0195 | 0.0250 |
| Al cast alloys ≤ 10 % Si | - | ≤ 180 | 540 | 0.0005 | 0.0010 | 0.0050 | 0.0080 | 0.0125 | 0.0125 | 0.0155 | 0.0195 | 0.0250 |
| ≤ 24 % Si | - | ≤ 180 | 540 | 0.0005 | 0.0005 | 0.0040 | 0.0065 | 0.0100 | 0.0100 | 0.0125 | 0.0155 | 0.0195 |
| Magnesium alloys | - | ≤ 120 | 755 | 0.0005 | 0.0005 | 0.0040 | 0.0065 | 0.0100 | 0.0100 | 0.0125 | 0.0155 | 0.0195 |
| Copper, low-alloyed | - | ≤ 150 | 655 | 0.0005 | 0.0005 | 0.0030 | 0.0050 | 0.0080 | 0.0080 | 0.0100 | 0.0125 | 0.0155 |
| Brass, short-chipping | - | ≤ 180 | 655 | 0.0005 | 0.0005 | 0.0030 | 0.0050 | 0.0080 | 0.0080 | 0.0100 | 0.0125 | 0.0155 |
| long-chipping | - | ≤ 180 | 445 | 0.0005 | 0.0005 | 0.0030 | 0.0050 | 0.0080 | 0.0080 | 0.0100 | 0.0125 | 0.0155 |
| Bronze, short-chipping | - | ≤ 180 | 330 | 0.0005 | 0.0005 | 0.0025 | 0.0040 | 0.0065 | 0.0065 | 0.0080 | 0.0100 | 0.0125 |
| | ≤ 25 | ≤ 255 | 280 | 0.0005 | 0.0005 | 0.0025 | 0.0040 | 0.0065 | 0.0065 | 0.0080 | 0.0100 | 0.0125 |
| Bronze, long-chipping | ≤ 25 | ≤ 255 | 180 | 0.0005 | 0.0005 | 0.0025 | 0.0040 | 0.0065 | 0.0065 | 0.0080 | 0.0100 | 0.0125 |
| | ≤ 32 | ≤ 301 | 150 | 0.0005 | 0.0005 | 0.0025 | 0.0040 | 0.0065 | 0.0065 | 0.0080 | 0.0100 | 0.0125 |
| Duroplastics | | | 215 | 0.0005 | 0.0005 | 0.0025 | 0.0040 | 0.0065 | 0.0065 | 0.0080 | 0.0100 | 0.0125 |
| Thermoplastics | | | 310 | 0.0005 | 0.0005 | 0.0030 | 0.0050 | 0.0080 | 0.0080 | 0.0100 | 0.0125 | 0.0155 |


Item #400001283

**Guhring, Inc. Main Office**
1445 Commerce Avenue
Brookfield, WI 53045
Tel (262) 784-6730 (800) 776-6170
Fax (262) 784-9096

**Michigan Manufacturing and Reconditioning Facility**
24975 Trans-X Road
Novi, MI 48375

**Guhring Corp. (Canada)**
20 Steckle Place, Unit #14
Kitchener, ON N2E 2C3
Tel (519) 748-9664 (800) 463-5555
Fax (519) 748-2954