



# Super Power Drill >>>

Deep Hole Drilling Up To 12xD!

**5xD & 10xD Ø19mm ~ Ø40mm**

- It is no doubt that deep hole drilling by indexable drill is always a challenge of the drill makers.
- Nine9 "Super Power Drill", featuring by patented indexable center pilot insert design, which is the first time in the world, helping to achieve the cost-effective and good performance.
- Customized deep hole drills on request.  
Max. diameter 50mm ; Max drilling depth (T) 450mm.

**P M K H**



## Features >>>



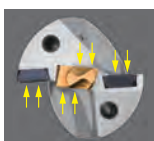
### ► Indexable Drills With Carbide Center Pilot Insert

- Better surface finish.
- Better straightness.
- Better roundness.



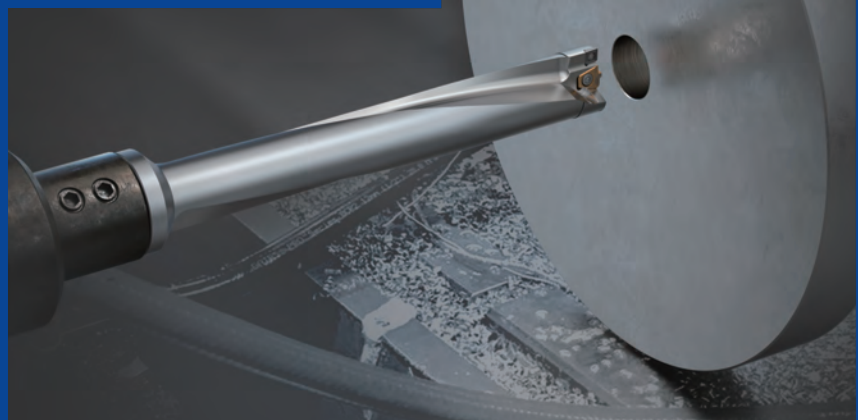
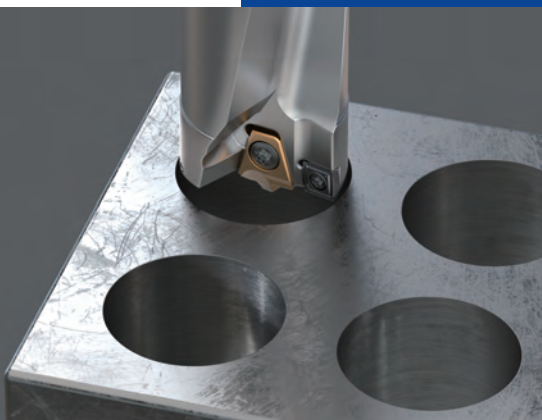
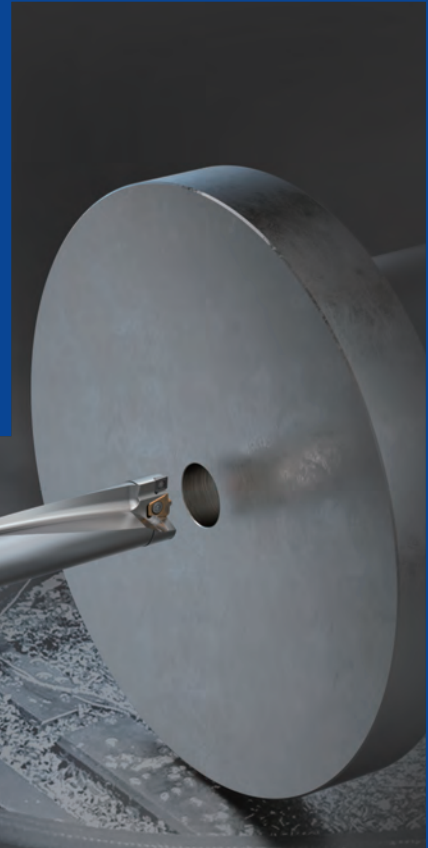
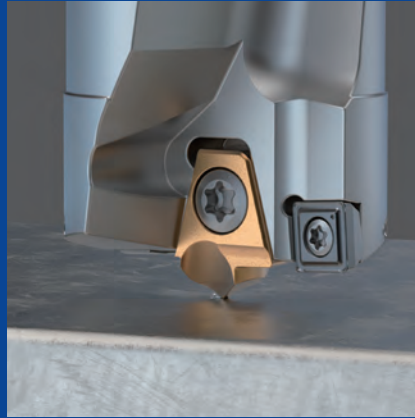
### ► Patented Pocket Design

- Lateral cutting forces can be absorbed by center insert due to a patented pocket design.
- The unique design of insert pocket provides the best accuracy and rigidity of center insert.
- The center and peripheral inserts are positioned in order to divide the cutting chips into smaller spiral shape.
- It designed for optimum chip breaking and good edge preparation for longer tool life.





## Applications



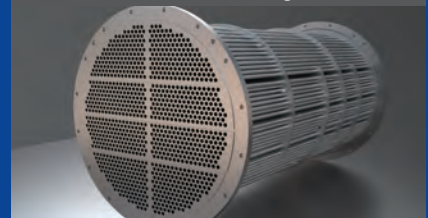
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- With patented center pilot insert which aids accurate and steady deep hole drilling.
- Better finished surface, potentially reducing boring time.

”

## Performance

Heat-Exchanger



Semi-Finished Product



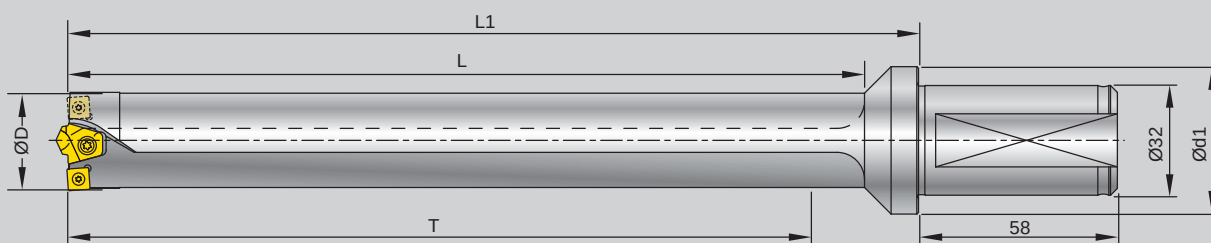
Continuous Track



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Super Power Drill

# Holder 19mm~40mm



| Parts No.      | ØD<br>±0.2mm<br>(±0.0079") | T   | L   | L1  | Ød1 | Insert / Screw / Key        |                    |
|----------------|----------------------------|-----|-----|-----|-----|-----------------------------|--------------------|
|                |                            |     |     |     |     | Center                      | Periphery          |
| 00-99307-19100 | 19<br>(0.748")             | 100 | 119 | 134 | 39  |                             | N9GX04T002 x 1 pc. |
| 00-99307-19150 |                            | 150 | 169 | 184 |     |                             | *NS-18037 / 0.6Nm  |
| 00-99307-19200 |                            | 200 | 219 | 239 |     |                             | NK-T6              |
| 00-99307-20100 | 20<br>(0.787")             | 100 | 120 | 134 | 39  |                             | N9GX05T103 x 1 pc. |
| 00-99307-20150 |                            | 150 | 170 | 184 |     |                             | *NS-20045 / 0.6Nm  |
| 00-99307-20200 |                            | 200 | 220 | 239 |     |                             | NK-T6              |
| 00-99307-21100 | 21<br>(0.827")             | 100 | 120 | 134 | 39  |                             |                    |
| 00-99307-21150 |                            | 150 | 170 | 184 |     |                             |                    |
| 00-99307-21200 |                            | 200 | 220 | 239 |     |                             |                    |
| 00-99307-22100 | 22<br>(0.866")             | 100 | 125 | 139 | 39  | 99307-CD6 x 1 pc.           |                    |
| 00-99307-22150 |                            | 150 | 175 | 189 |     |                             |                    |
| 00-99307-22200 |                            | 200 | 225 | 239 |     |                             |                    |
| 00-99307-23100 | 23<br>(0.905")             | 100 | 125 | 139 | 39  | NS-35080<br>2.5Nm<br>NK-T15 |                    |
| 00-99307-23150 |                            | 150 | 175 | 189 |     |                             |                    |
| 00-99307-23200 |                            | 200 | 225 | 239 |     |                             |                    |
| 00-99307-24100 | 24<br>(0.945")             | 100 | 126 | 139 | 39  |                             | N9GX060204 x 1 pc. |
| 00-99307-24150 |                            | 150 | 176 | 189 |     |                             | *NS-22062 / 0.9Nm  |
| 00-99307-24200 |                            | 200 | 226 | 239 |     |                             | NK-T7              |
| 00-99307-24250 |                            | 250 | 276 | 289 |     |                             |                    |
| 00-99307-25100 | 25<br>(0.984")             | 100 | 126 | 139 | 39  |                             |                    |
| 00-99307-25150 |                            | 150 | 176 | 189 |     |                             |                    |
| 00-99307-25200 |                            | 200 | 226 | 239 |     |                             |                    |
| 00-99307-25250 |                            | 250 | 276 | 289 |     |                             |                    |
| 00-99307-26150 | 26<br>(1.024")             | 150 | 176 | 189 | 39  |                             |                    |
| 00-99307-26200 |                            | 200 | 226 | 239 |     |                             |                    |
| 00-99307-26250 |                            | 250 | 276 | 289 |     |                             |                    |
| 00-99307-27150 | 27<br>(1.630")             | 150 | 181 | 198 | 43  | 99307-CD8 x 1 pc.           |                    |
| 00-99307-27200 |                            | 200 | 231 | 248 |     |                             |                    |
| 00-99307-27250 |                            | 250 | 281 | 298 |     |                             |                    |
| 00-99307-28150 | 28<br>(1.102")             | 150 | 181 | 198 | 43  | NS-35120<br>2.5Nm<br>NK-T15 |                    |
| 00-99307-28200 |                            | 200 | 231 | 248 |     |                             |                    |
| 00-99307-28250 |                            | 250 | 281 | 298 |     |                             |                    |
| 00-99307-29150 | 29<br>(1.142")             | 150 | 182 | 198 | 43  |                             |                    |
| 00-99307-29200 |                            | 200 | 232 | 248 |     |                             |                    |
| 00-99307-29250 |                            | 250 | 282 | 298 |     |                             |                    |
| 00-99307-29300 |                            | 300 | 332 | 348 |     |                             |                    |

\*Torque screwdriver is recommended.



| Parts No.      | ØD<br>±0.2mm<br>(±0.0079") | T   | L   | L1  | Ød1 | Insert / Screw / Key                                                                                                                             |           |
|----------------|----------------------------|-----|-----|-----|-----|--------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
|                |                            |     |     |     |     | Center                                                                                                                                           | Periphery |
| 00-99307-30150 | 30<br>(1.181")             | 150 | 182 | 198 | 43  | <br>N9GX060204 x 2 pcs.<br><br>*NS-22055 / 0.9Nm<br><br>NK-T7 |           |
| 00-99307-30200 |                            | 200 | 232 | 248 |     |                                                                                                                                                  |           |
| 00-99307-30250 |                            | 250 | 282 | 298 |     |                                                                                                                                                  |           |
| 00-99307-30300 |                            | 300 | 332 | 348 |     |                                                                                                                                                  |           |
| 00-99307-31150 | 31<br>(1.220")             | 150 | 188 | 198 | 43  |                                                                                                                                                  |           |
| 00-99307-31200 |                            | 200 | 238 | 248 |     |                                                                                                                                                  |           |
| 00-99307-31250 |                            | 250 | 288 | 298 |     |                                                                                                                                                  |           |
| 00-99307-31300 |                            | 300 | 338 | 348 |     |                                                                                                                                                  |           |
| 00-99307-32150 | 32<br>(1.260")             | 150 | 188 | 203 | 43  |                                                                                                                                                  |           |
| 00-99307-32200 |                            | 200 | 238 | 253 |     |                                                                                                                                                  |           |
| 00-99307-32250 |                            | 250 | 288 | 303 |     |                                                                                                                                                  |           |
| 00-99307-32300 |                            | 300 | 338 | 353 |     |                                                                                                                                                  |           |
| 00-99307-33150 | 33<br>(1.300")             | 150 | 189 | 203 | 43  |                                                                                                                                                  |           |
| 00-99307-33200 |                            | 200 | 239 | 253 |     |                                                                                                                                                  |           |
| 00-99307-33250 |                            | 250 | 289 | 303 |     |                                                                                                                                                  |           |
| 00-99307-33300 |                            | 300 | 339 | 353 |     |                                                                                                                                                  |           |
| 00-99307-34150 | 34<br>(1.339")             | 150 | 189 | 203 | 43  |                                                                                                                                                  |           |
| 00-99307-34200 |                            | 200 | 239 | 253 |     |                                                                                                                                                  |           |
| 00-99307-34250 |                            | 250 | 289 | 303 |     |                                                                                                                                                  |           |
| 00-99307-34300 |                            | 300 | 339 | 353 |     |                                                                                                                                                  |           |
| 00-99307-34350 | 35<br>(1.378")             | 350 | 389 | 403 | 43  |                                                                                                                                                  |           |
| 00-99307-35200 |                            | 200 | 245 | 258 |     |                                                                                                                                                  |           |
| 00-99307-35250 |                            | 250 | 295 | 308 |     |                                                                                                                                                  |           |
| 00-99307-35300 |                            | 300 | 345 | 358 |     |                                                                                                                                                  |           |
| 00-99307-35350 | 36<br>(1.417")             | 350 | 395 | 408 | 43  |                                                                                                                                                  |           |
| 00-99307-36200 |                            | 200 | 245 | 258 |     |                                                                                                                                                  |           |
| 00-99307-36250 |                            | 250 | 295 | 308 |     |                                                                                                                                                  |           |
| 00-99307-36300 |                            | 300 | 345 | 358 |     |                                                                                                                                                  |           |
| 00-99307-36350 | 37<br>(1.457")             | 350 | 395 | 408 | 43  |                                                                                                                                                  |           |
| 00-99307-37200 |                            | 200 | 246 | 258 |     |                                                                                                                                                  |           |
| 00-99307-37250 |                            | 250 | 296 | 308 |     |                                                                                                                                                  |           |
| 00-99307-37300 |                            | 300 | 346 | 358 |     |                                                                                                                                                  |           |
| 00-99307-37350 | 38<br>(1.496")             | 350 | 396 | 408 | 43  |                                                                                                                                                  |           |
| 00-99307-38200 |                            | 200 | 246 | 258 |     |                                                                                                                                                  |           |
| 00-99307-38250 |                            | 250 | 296 | 308 |     |                                                                                                                                                  |           |
| 00-99307-38300 |                            | 300 | 346 | 358 |     |                                                                                                                                                  |           |
| 00-99307-38350 | 39<br>(1.535")             | 350 | 396 | 408 | 43  |                                                                                                                                                  |           |
| 00-99307-39200 |                            | 200 | 247 | 258 |     |                                                                                                                                                  |           |
| 00-99307-39250 |                            | 250 | 297 | 308 |     |                                                                                                                                                  |           |
| 00-99307-39300 |                            | 300 | 346 | 358 |     |                                                                                                                                                  |           |
| 00-99307-39350 | 40<br>(1.575")             | 350 | 397 | 408 | 43  |                                                                                                                                                  |           |
| 00-99307-40200 |                            | 200 | 247 | 258 |     |                                                                                                                                                  |           |
| 00-99307-40250 |                            | 250 | 297 | 308 |     |                                                                                                                                                  |           |
| 00-99307-40300 |                            | 300 | 347 | 358 |     |                                                                                                                                                  |           |
| 00-99307-40350 |                            | 350 | 397 | 408 |     |                                                                                                                                                  |           |



Super Power Drill

# Insert

## ► Featuring by patented indexable center pilot insert design

- High precision fully ground and edge honing to increase tool life and surface finish.
- Special geometry design delivers the benefits of the center drill in guiding position and eliminates the defects caused by the chip flow from the gap between the center drill and insert.

## ► Center Pilot Insert >>

- NC2032** : • K20F grade, AlTiN coated, fully ground, honed cutting edge.  
 • For carbon steel & alloy steel C<0.3% and stainless steel.
- NC40** : • P35 grade, TiN coated, fully ground, honed cutting edge.  
 • For carbon steel & alloy steel C>0.3% and stainless steel.



| Parts No. |        | Coating | Grade |  | Dimensions |   | Screw             | Key    |
|-----------|--------|---------|-------|--|------------|---|-------------------|--------|
|           |        |         |       |  | Ød         | S |                   |        |
| 99307-CD6 | NC2032 | AlTiN   | K20F  |  | 6          | 4 | NS-35080<br>2.5Nm | NK-T15 |
|           | NC40   | TiN     | P35   |  |            |   |                   |        |
| 99307-CD8 | NC2032 | AlTiN   | K20F  |  | 8          | 6 | NS-35120<br>2.5Nm | NK-T15 |
|           | NC40   | TiN     | P35   |  |            |   |                   |        |

## ► Periphery Insert >>

- Fully ground carbide insert
- Each insert has 4 cutting edges.
- Patented Dual-relief angle insert are designed for optimum chip breaking and good edge preparation for longer tool life.



- NC2032**: • K20F grade, AlTiN coated, honed cutting edge for carbon steel, alloy steel, casting iron, stainless steel and hardened steel up to HRC 50.
- NC40**: • P35 grade, tougher insert with special chip breaker, TiN coated, for low carbon steel and stainless steel.  
 • Only available for insert N9GX06020431 and N9GX09030831.

| Parts No.    |        | Coating | Grade |  | Dimensions |      |     | Screw              | Key   |
|--------------|--------|---------|-------|--|------------|------|-----|--------------------|-------|
|              |        |         |       |  | L          | S    | re  |                    |       |
| N9GX04T002   | NC2032 | AlTiN   | K20F  |  | 4.07       | 1.8  | 0.2 | *NS-18037<br>0.6Nm | NK-T6 |
| N9GX05T103   | NC2032 | AlTiN   | K20F  |  | 5.07       | 2.0  | 0.3 | *NS-20045<br>0.6Nm |       |
| N9GX060204   | NC2032 | AlTiN   | K20F  |  | 6.35       | 2.38 | 0.4 | *NS-22062<br>0.9Nm | NK-T7 |
| N9GX06020431 | NC40   | TiN     | P35   |  | 6.35       | 2.38 | 0.4 |                    |       |
| N9GX090308   | NC2032 | AlTiN   | K20F  |  | 9.52       | 3.18 | 0.8 | NS-30072<br>2.0Nm  | NK-T9 |
| N9GX09030831 | NC40   | TiN     | P35   |  | 9.52       | 3.18 | 0.8 |                    |       |

\*Torque screwdriver is recommended.



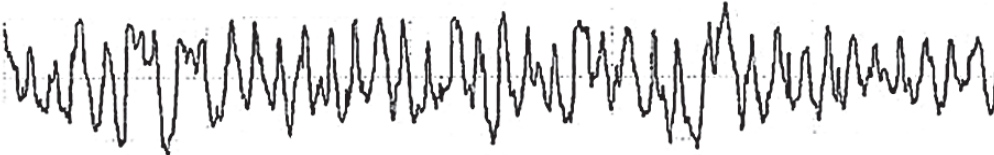
# Performance

## ► NC Spot Drill + Super Power Drill Apply on Stationary Machine Tool >>

To get better position accuracy and diameter tolerance first, and make sure the size of the spot according to following.

|                  |                                                |                                                                                   |                                                                                                                                |                                          |                                                                                      |
|------------------|------------------------------------------------|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|--------------------------------------------------------------------------------------|
| Step 1           | Tool: 99616-14-12-02S<br>to make a spot.       |  | Pilot Insert                                                                                                                   | 99307-CD6                                | 99307-CD8                                                                            |
|                  |                                                |                                                                                   | Spotting Diameter                                                                                                              | ø5 mm                                    | ø7 mm                                                                                |
|                  |                                                |                                                                                   | Spotting Depth                                                                                                                 | 2.8 mm                                   | 3.8 mm                                                                               |
| Step 2           | Tool: 99307-20200<br>to make a 10xD deep hole. |  | Then the spot hole will guide the pilot insert at the beginning and stablized the drill to get the perfect drilling operation. |                                          |                                                                                      |
| Result           | Cutting Speed                                  | Feed rate                                                                         | Surface                                                                                                                        |                                          |                                                                                      |
| Without spotting | Vc= 80 m/min.                                  | f = 0.1 mm/rev.                                                                   |                                              |                                          |                                                                                      |
| With spotting    | Vc= 120 m/min. ↑                               | f = 0.1 mm/rev.                                                                   |                                            | Finished surface is better and accurate. |  |

## ► Good surface finish >>

| Center Pilot Insert                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |      | Material: Carbon steel (S45C) |         |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------------------------------|---------|--------------------------------------------------------------------------------------|
| 99307-CD8-NC40<br>N9GX060204-NC2032                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Vc   | 80                            | m/min.  |                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | S    | 880                           | r.p.m.  |                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | f    | 0.10                          | mm/rev. |                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | F    | 88.0                          | mm/min. |                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Ra   | 2.139                         | μm      |                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Rmax | 11.8                          | μm      |                                                                                      |
| <div> <div>Perthometer M1</div> <div> <div>bject</div> <div>ame</div> </div> <div> <div>t</div> <div>Standard</div> <div>5.600 mm</div> </div> <div> <div>c</div> <div>Standard</div> <div>2.5 μm</div> </div> <div> <div>a</div> <div>Standard</div> <div>0.800 mm</div> </div> <div> <div>z</div> <div>Standard</div> <div>2.139 μm</div> </div> <div> <div>max</div> <div>Standard</div> <div>10.6 μm</div> </div> <div> <div>Pc(0.5,-0.5)</div> <div>Standard</div> <div>103 /c</div> </div> <div> <div>Profile</div> <div>Standard</div> <div>0.800 mm</div> </div> <div> <div>ER</div> <div>Standard</div> <div>5.00 μm</div> </div> </div> <div>  </div> |      |                               |         |  |

# Technical Guide

## Machining Power Requirement for Drilling

### Material Classification for Calculation

There are an extremely wide range of materials and different machining operations in the metal cutting industry. We follow the ISO material group and color to make brief information for calculation of the required power for super power drill, the main effective parameter is “specified cutting force”, please use following table and formula.

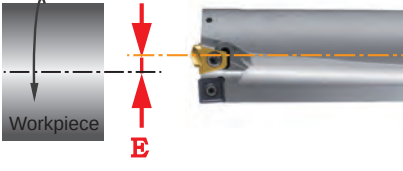
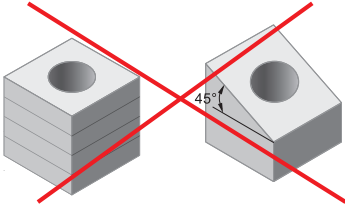
|   | Material Group | Material Type and description                                           | Hardness ( HB ) | Strength (N/mm <sup>2</sup> ) | Specified cutting force Kc (N/mm <sup>2</sup> ) |
|---|----------------|-------------------------------------------------------------------------|-----------------|-------------------------------|-------------------------------------------------|
| P | 1.10           | Carbon steel C<0.3%, free cutting steels                                | ~125            | 500-850                       | 1900                                            |
|   | 1.20           | Carbon steel C>0.3%                                                     | ~150            | 850-1000                      | 2100                                            |
|   | 1.30           | Low alloy steel C<0.3%                                                  | 180             | Up to 750                     | 2100                                            |
|   | 1.40           | Low alloy steel C>0.3%                                                  | 200             | 750-1200                      | 2600                                            |
|   | 1.50           | High alloy steel                                                        | 200             | 800-1200                      | 2600                                            |
|   | 1.60           | Tool steel, harder steels for toughening. Martensitic stainless steels. | <230            | 850-1100                      | 2200                                            |
|   | 1.70           | Casting steel                                                           |                 |                               | 2900                                            |
| M | 2.10           | Free cutting Stainless steel Austenitic stainless steels                | 200             | 490-700                       | 2300                                            |
|   | 2.20           | Difficult Stainless steel Austenitic stainless steels and duplex        | 175             | 650-850                       | 2450                                            |
| K | 3.10           | Grey casting Iron                                                       | 180             | 250-350                       | 1100                                            |
|   | 3.20           | Malleable casting iron                                                  | 230             | Up to 600                     | 1200                                            |
|   | 3.30           | Nodular casting iron                                                    | 250             | Up to 800                     | 1800                                            |
| N | 4.10           | Al- alloys(Si<12%)                                                      | 60              | 230-310                       | 500                                             |
|   | 4.20           | Al-alloys(Si>12%)                                                       | 75              | 150-200                       | 750                                             |
|   | 4.30           | Non-ferrous materials, Zirconium, Magnesium, Copper alloys, etc.        | 100             | 150-200                       | 800                                             |
|   | 4.40           | Carbon and graphite composites, plastics, wood, rubbers, etc.           | —               | —                             | —                                               |
| S | 5.10           | Nickel-based heat-resistant alloys                                      | 250             |                               | 3500                                            |
|   | 5.20           | Cobalt-based heat resistant alloys                                      | 350             |                               | 4150                                            |
|   | 5.30           | Iron-based heat resistant alloys                                        | 250             |                               | 3050                                            |
| H | 6.10           | Tool steels and hardened steels                                         | 55HRC           |                               | 4500                                            |
|   | 6.20           | Hardened cast iron                                                      | —               | —                             | —                                               |

### Formulas for Calculation

|                                           |                                                                  |                              |                   |
|-------------------------------------------|------------------------------------------------------------------|------------------------------|-------------------|
| feed force(KN) Ff                         | Drilling torque (Md)<br>torque=(Nm)                              | f = feed rate                | mm/rev.           |
| $Ff = \frac{ap \times f \times Kc}{2000}$ | $Md = \frac{f \times \pi \times D^2 \times Kc}{4000} \text{ Nm}$ | Vc = cutting speed           | m/min.            |
|                                           |                                                                  | D = drill diameter           | mm                |
|                                           |                                                                  | Kc = specified cutting force | N/mm <sup>2</sup> |

# Technical Guide

► Please pay attention to following conditions before you start.

| Center misalignment                                                                                                    | Internal coolant                                                                                                                                                       | Application of drilling                                                                                                                              |
|------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>E</b> must be &lt; 0.05mm.</p>  | <p>High volume is recommended.<br/>Minimum coolant pressure is 10 bar. (150 psi)</p>  | <p>Not apply for stack drilling and angled surface drilling.</p>  |

- Recommend to make a spot hole first by spot drill. See page 133 for detail.
- The cutting speed relates to the periphery inserts, The feed rate depends on the load of the center pilot insert.
- The best condition will create short cutting chips. The feed rate can be applied  $\pm 25\%$  of the recommended value depended on the shape of the cutting chips.
- Be careful to monitor the spindle power consumption !  
When the spindle load is 15% higher than starting power consumption, please change the periphery insert to next new cutting edge and change a new center pilot insert.
- Increase 20% of the cutting speed and the feed rate for horizontal spindle machine.

## Cutting Data

| Work piece material                                                                                                                                                                                                                   | T= Length/ Dia. | Vc (m/min.) | f (mm/rev.) |            |            |            | Grade of Insert |           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------|-------------|------------|------------|------------|-----------------|-----------|
|                                                                                                                                                                                                                                       |                 |             | N9GX04T002  | N9GX05T103 | N9GX060204 | N9GX090308 | Center          | Periphery |
|                                                                                                                                                                                                                                       |                 |             | Dia.19      | Dia.20-21  | Dia.22-34  | Dia.35-40  |                 |           |
| <b>P</b><br>Carbon steel<br>C<0.3%<br>Ex.:S25C, SS41<br><br>Carbon steel<br>C>0.3%<br>Ex.:S50C, P5<br><br>Low alloy steel<br>C<0.3%<br>Ex.:SCM415<br><br>Low alloy steel<br>C>0.3%<br>Ex.:SCM440<br><br>High alloy steel<br>Ex.:SKD11 | T<7D            | 80~150      | 0.03~0.07   | 0.04~0.08  | 0.06~0.10  | 0.08~0.12  | NC2032          | NC2032    |
|                                                                                                                                                                                                                                       | T>7D            | 60~120      | 0.03~0.07   | 0.04~0.08  | 0.06~0.10  | 0.08~0.12  |                 |           |
|                                                                                                                                                                                                                                       | T<7D            | 80~130      | —           | —          | 0.06~0.10  | 0.08~0.12  | NC40            | NC40      |
|                                                                                                                                                                                                                                       | T>7D            | 60~100      | —           | —          | 0.06~0.10  | 0.08~0.12  |                 |           |
|                                                                                                                                                                                                                                       | T<7D            | 80~150      | 0.04~0.08   | 0.04~0.10  | 0.06~0.12  | 0.08~0.15  | NC40            | NC2032    |
|                                                                                                                                                                                                                                       | T>7D            | 60~120      | 0.04~0.08   | 0.04~0.10  | 0.06~0.12  | 0.08~0.15  |                 |           |
|                                                                                                                                                                                                                                       | T<7D            | 60~150      | 0.04~0.08   | 0.04~0.10  | 0.06~0.10  | 0.08~0.12  | NC2032          | NC2032    |
|                                                                                                                                                                                                                                       | T>7D            | 40~120      | 0.04~0.08   | 0.04~0.10  | 0.06~0.10  | 0.08~0.12  |                 |           |
| <b>M</b><br>Stainless steel<br>Ex.:SUS304                                                                                                                                                                                             | T<7D            | 60~120      | 0.03~0.06   | 0.04~0.07  | 0.05~0.08  | 0.06~0.10  | NC2032          | NC2032    |
|                                                                                                                                                                                                                                       | T>7D            | 40~100      | 0.03~0.06   | 0.04~0.07  | 0.05~0.08  | 0.06~0.10  |                 |           |
|                                                                                                                                                                                                                                       | T<7D            | 60~120      | —           | —          | 0.05~0.08  | 0.06~0.10  | NC40            | NC40      |
|                                                                                                                                                                                                                                       | T>7D            | 40~100      | —           | —          | 0.05~0.08  | 0.06~0.10  |                 |           |
| <b>K</b><br>Cast Iron<br>Ex.:FC25                                                                                                                                                                                                     | T<7D            | 60~120      | 0.04~0.08   | 0.04~0.10  | 0.06~0.10  | 0.08~0.12  | NC40            | NC2032    |
|                                                                                                                                                                                                                                       | T>7D            | 40~100      | 0.04~0.08   | 0.04~0.10  | 0.06~0.10  | 0.08~0.12  |                 |           |
| <b>N</b><br>Non-ferrous metal<br>Ex.:A6061                                                                                                                                                                                            | —               | —           | —           | —          | —          | —          | —               | —         |
|                                                                                                                                                                                                                                       | —               | —           | —           | —          | —          | —          | —               | —         |
| <b>H</b><br>Hardened steel<br>< HRC50<br>Ex.:SKD61                                                                                                                                                                                    | T<7D            | 50~80       | 0.03~0.06   | 0.04~0.07  | 0.05~0.08  | 0.06~0.10  | NC40            | NC2032    |
|                                                                                                                                                                                                                                       | T>7D            | 40~60       | 0.03~0.06   | 0.04~0.07  | 0.05~0.08  | 0.06~0.10  |                 |           |