

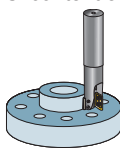
## GRADE CHARACTERISTICS

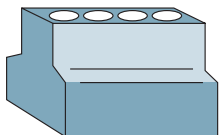
| Grade         | Substrate      |             | Coating Layer                                    |           |
|---------------|----------------|-------------|--------------------------------------------------|-----------|
|               | Hardness (HRA) | T.R.S (GPa) | Composition                                      | Thickness |
| <b>MC5020</b> | 91.0           | 2.2         | TiCN-Al <sub>2</sub> O <sub>3</sub> -Ti Compound | Thick     |
| <b>FH7020</b> | 88.8           | 2.8         | TiCN-Al <sub>2</sub> O <sub>3</sub> -Ti Compound | Thick     |
| <b>F7030</b>  | 88.8           | 2.8         | TiCN-Al <sub>2</sub> O <sub>3</sub> -TiN         | Thin      |
| <b>MP6120</b> | 91.5           | 2.5         | (Al,Ti,Cr)N                                      | Thin      |
| <b>MP6130</b> | 90.5           | 2.5         | (Al,Ti,Cr)N                                      | Thin      |
| <b>MP7030</b> | 90.5           | 2.5         | (Al,Ti)N-Ti Compound                             | Thin      |
| <b>MP7130</b> | 90.5           | 2.5         | (Al,Ti,Cr)N                                      | Thin      |
| <b>MP7140</b> | 88.8           | 2.8         | (Al,Ti,Cr)N                                      | Thin      |

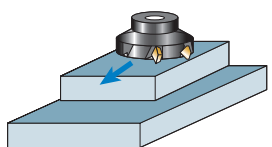
| Grade         | Substrate      |             | Coating Layer        |           |
|---------------|----------------|-------------|----------------------|-----------|
|               | Hardness (HRA) | T.R.S (GPa) | Composition          | Thickness |
| <b>MP8010</b> | 93.5           | 2.3         | (Al,Ti,Si)N          | Thin      |
| <b>MP9120</b> | 91.5           | 2.5         | (Al,Ti,Cr)N          | Thin      |
| <b>MP9030</b> | 90.5           | 2.5         | (Al,Ti)N-Ti Compound | Thin      |
| <b>MP9130</b> | 90.5           | 2.7         | (Al,Ti,Cr)N          | Thin      |
| <b>VP15TF</b> | 91.5           | 2.5         | (Al,Ti)N             | Thin      |
| <b>VP20RT</b> | 90.5           | 2.5         | (Al,Ti)N             | Thin      |
| <b>VP30RT</b> | 88.8           | 2.8         | (Al,Ti)N             | Thin      |
| <b>UP20M</b>  | 90.5           | 2.0         | TiN                  | Thin      |

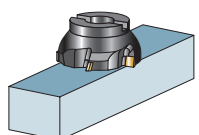
\*1GPa=102kg/mm<sup>2</sup>

## APPLICATION EXAMPLES

|                    |                                    |                                                                                                                                             |
|--------------------|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Tool               |                                    | <b>AXD4000R252SA25SA</b>                                                                                                                    |
| Insert (Grade)     |                                    | <b>XDGX175008PDER-GM (MP9120)</b>                                                                                                           |
| Workpiece          |                                    | JIS AC4A: Si content 8-10%                                |
| Cutting Conditions | Spindle speed (min <sup>-1</sup> ) | 8790                                                                                                                                        |
|                    | Cutting Speed (m/min)              | 690                                                                                                                                         |
|                    | Feed per Tooth (mm/tooth)          | 0.46                                                                                                                                        |
|                    | Depth of Cut (mm)                  | 2.5                                                                                                                                         |
|                    | Width of Cut (mm)                  | 25                                                                                                                                          |
| Coolant            |                                    | External coolant                                                                                                                            |
| Machine Type       |                                    | Vertical                                                                                                                                    |
| Results            |                                    | Aluminium alloy containing Si tends to cause tool damage, but the MP9120 inserts gave double the tool life compared to conventional grades. |

|                    |                         |                                                                                                        |
|--------------------|-------------------------|--------------------------------------------------------------------------------------------------------|
| Tool               |                         | <b>AHX640WR16016F</b>                                                                                  |
| Insert (Grade)     |                         | <b>NNMU200608ZEN-MK (MC5020)</b>                                                                       |
| Workpiece          |                         | DIN GG25 (scaled)  |
| Component          |                         | Cylinder block                                                                                         |
| Cutting Conditions | Cutting Speed (m/min)   | 155                                                                                                    |
|                    | Feed per Tooth (mm/rev) | 0.32                                                                                                   |
|                    | Depth of Cut (mm)       | 3 – 5                                                                                                  |
|                    | Coolant                 | Dry cutting                                                                                            |
| Results            |                         | MC5020 showed 3 times longer tool life than the competitor's grade without chipping occurring.         |

|                    |                       |                                                                                                                         |
|--------------------|-----------------------|-------------------------------------------------------------------------------------------------------------------------|
| Cutter Body        |                       | <b>ASX445R12508E</b>                                                                                                    |
| Insert (Grade)     |                       | <b>SEMT13T3AGSN-JM (MP6120)</b>                                                                                         |
| Workpiece          |                       | JIS SCM440H                          |
| Component          |                       | Machine parts                                                                                                           |
| Cutting Conditions | Cutting Speed (m/min) | 250                                                                                                                     |
|                    | Feed (mm/tooth)       | 0.1-0.2                                                                                                                 |
|                    | Depth of Cut (mm)     | 2.0-5.0                                                                                                                 |
|                    | Coolant               | Dry cutting                                                                                                             |
| Results            |                       | MP6120 shows only a small amount of wear thereby achieving 1.5 times longer tool life compared to conventional cutters. |

|                    |                          |                                                                                                  |
|--------------------|--------------------------|--------------------------------------------------------------------------------------------------|
| Cutter Body        |                          | <b>ASX400-050A04R</b>                                                                            |
| Insert (Grade)     |                          | <b>SOMT12T308PEER-JM (MP7130)</b>                                                                |
| Workpiece          |                          | JIS SUS316  |
| Component          |                          | Structural component                                                                             |
| Cutting Conditions | Cutting Speed (m/min)    | 88                                                                                               |
|                    | Feed (mm/tooth)          | 0.1                                                                                              |
|                    | Axial depth of cut (mm)  | ≤2                                                                                               |
|                    | Radial depth of cut (mm) | —                                                                                                |
| Coolant            |                          | Wet cutting                                                                                      |
| Results            |                          | MP7130 can continue machining without fracture.                                                  |