



INFO

CARBIDE
DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

ALU

NON-FERROUS MATERIALS

✚ Uncoated micrograin carbide and cutting geometry specifically developed for non-ferrous machining. Lapped cutting edges and ad-hoc profile of the chip pocket for low cutting forces and outstanding finishing quality. Also available in the HF ALU version with unequal pitch (UP) with a specific design allowing mirror finishing and DxD machining, even in the 4-flutes version.

🇮🇹 Micrograna non rivestita e geometria di taglio sviluppata specificamente per la lavorazione di materiali non-ferrosi. Taglienti lappati e particolare profilo del vano truciolo per bassi sforzi di taglio e un'eccellente finitura superficiale. Disponibile anche la versione HF Alu con passo differenziato (UP) con un particolare design che permette finiture a specchio e lavorazioni DxD, anche nella versione a 4 taglienti.

🇩🇪 Unbeschichtete Mikrokörnung und eigens für die Bearbeitung von NE-Metallen entwickelte Schnittgeometrie. Dank der geläpften Schneiden und der besonderen Form der Nuten ist die aufzubringende Schnittkraft gering, bei gleichzeitig ausgezeichnetem Oberflächenfinish. Auch in der Version HF Alu mit ungleicher Teilung (UP) und besonderer Form erhältlich, die auch in der Version mit 4 Schneiden ein spiegelblankes Oberflächenfinish und DxD-Bearbeitungen ermöglicht.

🇫🇷 Micrograin non revêtu et géométrie de coupe développée spécifiquement pour l'usinage de matériaux non ferreux. Arêtes de coupe polies et profil particulier de la goujure pour de faibles efforts de coupe et une excellente finition superficielle. Également disponible la version HF Alu à pas décalé(UP), avec un design particulier qui permet des finitions glacées et des usinages DxD, aussi dans la version à 4 arêtes de coupe.

🇪🇸 Micrograna no revestida y geometría de corte desarrollada específicamente para la elaboración de materiales no ferrosos. Filos de corte lapeados y perfil especial del compartimento de virutas, para bajos esfuerzos de corte y un excelente acabado de la superficie. También está disponible la versión HF Alu con paso diferenciado (UP) con un diseño especial que permite acabados a espejo y elaboraciones D x D, incluso en la versión de 4 filos.

🇷🇺 Мелкозернистый твердый сплав без покрытия со специально разработанной геометрией для обработки цветных металлов. Доведенные режущие кромки и специальный профиль стружечных канавок снижают силы резания и улучшают качество обработанной поверхности. Также доступна версия HF Alu с неравномерным шагом (UP) и специальной геометрией, позволяющая получать зеркальную поверхность и работать в режиме DxD, в том числе для версии с 4-мя зубьями.

HSS
DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE
END-MILLS

G2
MDTA
HF-VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS
END-MILLS

CARBIDE
BURRS

INFO

HFAL4

cylindrical shank, 4 flutes



CARBIDE DRILLS

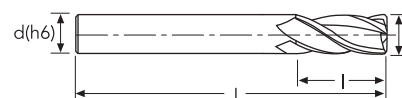
PU-HPU
TA-4HTA

SUH
ALH
HRC

SUH MINI
HL
HSD
C-SD-TA

| | | | | | |
|---|---|---|---|---|---|
| P | M | K | N | S | H |
|---|---|---|---|---|---|

★ 1st choice ☆ suitable



| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|----|----------|---|--------|-------|----|----|-----|---|----------|-------|
| 3 | 0/-0.025 | | | 6 | 9 | | 57 | 4 | HFAL4030 | ● |
| 4 | 0/-0.025 | | | 6 | 12 | | 57 | 4 | HFAL4040 | ● |
| 5 | 0/-0.025 | | | 6 | 13 | | 57 | 4 | HFAL4050 | ● |
| 6 | 0/-0.025 | | | 6 | 13 | | 57 | 4 | HFAL4060 | ● |
| 8 | 0/-0.030 | | | 8 | 20 | | 64 | 4 | HFAL4080 | ● |
| 10 | 0/-0.030 | | | 10 | 22 | | 72 | 4 | HFAL4100 | ● |
| 12 | 0/-0.030 | | | 12 | 26 | | 83 | 4 | HFAL4120 | ● |
| 14 | 0/-0.030 | | | 14 | 32 | | 90 | 4 | HFAL4140 | ● |
| 16 | 0/-0.030 | | | 16 | 32 | | 92 | 4 | HFAL4160 | ● |
| 20 | 0/-0.030 | | | 20 | 38 | | 104 | 4 | HFAL4200 | ● |

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

INFO

HFAL4

| | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|----|------------------------|----------------|----------------|----------------|-----------------|
| | Hardness/Rm | | | | |
| | ap x ae | D x D | D x D | D x D | D x D |
| | Vc (m/min) | 300+500 | 200+400 | 150+350 | 600+1000 |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 3 | 0.030 | 0.025 | 0.021 | 0.033 |
| | 4 | 0.040 | 0.034 | 0.028 | 0.044 |
| | 5 | 0.050 | 0.042 | 0.035 | 0.054 |
| | 6 | 0.059 | 0.050 | 0.041 | 0.064 |
| | 8 | 0.077 | 0.066 | 0.054 | 0.085 |
| | 10 | 0.095 | 0.080 | 0.066 | 0.104 |
| | 12 | 0.108 | 0.092 | 0.076 | 0.119 |
| | 14 | 0.126 | 0.107 | 0.088 | 0.139 |
| | 16 | 0.144 | 0.122 | 0.101 | 0.158 |
| 18 | 0.158 | 0.135 | 0.111 | 0.174 | |
| 20 | 0.176 | 0.149 | 0.123 | 0.193 | |

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

| | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|----|------------------------|--------------------|--------------------|--------------------|--------------------|
| | Hardness/Rm | | | | |
| | ap x ae | 1.5D x 0.5D | 1.5D x 0.5D | 1.5D x 0.5D | 1.5D x 0.5D |
| | Vc (m/min) | 300+600 | 200+500 | 200+400 | 600+1000 |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 3 | 0.036 | 0.032 | 0.029 | 0.039 |
| | 4 | 0.048 | 0.043 | 0.038 | 0.052 |
| | 5 | 0.059 | 0.053 | 0.048 | 0.065 |
| | 6 | 0.070 | 0.063 | 0.056 | 0.077 |
| | 8 | 0.093 | 0.084 | 0.074 | 0.102 |
| | 10 | 0.113 | 0.102 | 0.091 | 0.125 |
| | 12 | 0.130 | 0.117 | 0.104 | 0.143 |
| | 14 | 0.151 | 0.136 | 0.121 | 0.166 |
| | 16 | 0.173 | 0.156 | 0.138 | 0.190 |
| 18 | 0.190 | 0.171 | 0.152 | 0.209 | |
| 20 | 0.211 | 0.190 | 0.168 | 0.232 | |

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF-VH/UP
MEF
ALU
MEX/MH
UH/MH

| | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|----|------------------------|------------------|------------------|------------------|------------------|
| | Hardness/Rm | | | | |
| | ap x ae | 8° x 0.5D | 5° x 0.5D | 5° x 0.5D | 8° x 0.5D |
| | Vc (m/min) | 300+600 | 200+500 | 200+400 | 600+1000 |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 3 | 0.021 | 0.018 | 0.015 | 0.023 |
| | 4 | 0.027 | 0.025 | 0.020 | 0.030 |
| | 5 | 0.034 | 0.031 | 0.025 | 0.038 |
| | 6 | 0.040 | 0.036 | 0.030 | 0.044 |
| | 8 | 0.054 | 0.048 | 0.039 | 0.059 |
| | 10 | 0.065 | 0.058 | 0.048 | 0.072 |
| | 12 | 0.075 | 0.067 | 0.055 | 0.082 |
| | 14 | 0.087 | 0.078 | 0.064 | 0.096 |
| | 16 | 0.100 | 0.089 | 0.073 | 0.110 |
| 18 | 0.110 | 0.098 | 0.081 | 0.120 | |
| 20 | 0.121 | 0.109 | 0.089 | 0.133 | |

HSS END-MILLS

CARBIDE BURRS

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

INFO

HFAL4

CARBIDE
DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA



| Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---------------------------|--------------|--------------|--------------|--------------|
| Hardness/Rm | | | | |
| ap x ae | 15° x D | 10° x D | 7° x D | 15° x D |
| Vc (m/min) | 300+500 | 200+400 | 200+300 | 600+1000 |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 3 | 0.020 | 0.017 | 0.015 | 0.022 |
| 4 | 0.026 | 0.023 | 0.019 | 0.029 |
| 5 | 0.033 | 0.029 | 0.024 | 0.036 |
| 6 | 0.039 | 0.034 | 0.029 | 0.043 |
| 8 | 0.051 | 0.045 | 0.038 | 0.057 |
| 10 | 0.063 | 0.055 | 0.046 | 0.069 |
| 12 | 0.072 | 0.062 | 0.053 | 0.079 |
| 14 | 0.084 | 0.073 | 0.062 | 0.092 |
| 16 | 0.096 | 0.083 | 0.071 | 0.105 |
| 18 | 0.105 | 0.092 | 0.078 | 0.116 |
| 20 | 0.117 | 0.101 | 0.086 | 0.128 |

HSS
DRILLS

LFTA
SUTA
HSS-HSS/CO



| Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---------------------------|--------------|--------------|--------------|--------------|
| Hardness/Rm | | | | |
| ap x ae | D x 0.4D | D x 0.4D | D x 0.4D | D x 0.4D |
| Vc (m/min) | 300+500 | 200+400 | 150+350 | 600+1000 |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 3 | 0.030 | 0.027 | 0.024 | 0.033 |
| 4 | 0.040 | 0.036 | 0.032 | 0.044 |
| 5 | 0.050 | 0.045 | 0.040 | 0.054 |
| 6 | 0.059 | 0.053 | 0.047 | 0.064 |
| 8 | 0.077 | 0.070 | 0.062 | 0.085 |
| 10 | 0.095 | 0.085 | 0.076 | 0.104 |
| 12 | 0.108 | 0.097 | 0.086 | 0.119 |
| 14 | 0.126 | 0.113 | 0.101 | 0.139 |
| 16 | 0.144 | 0.130 | 0.115 | 0.158 |
| 18 | 0.158 | 0.143 | 0.127 | 0.174 |
| 20 | 0.176 | 0.158 | 0.140 | 0.193 |

CARBIDE
END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH



| Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---------------------------|--------------|--------------|--------------|--------------|
| Hardness/Rm | | | | |
| ap x ae | D x D | D x D | 0.5D x D | 0.5D x D |
| Vc (m/min) | 300+500 | 200+400 | 150+350 | 600+1000 |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 3 | 0.015 | 0.013 | 0.012 | 0.016 |
| 4 | 0.020 | 0.018 | 0.016 | 0.022 |
| 5 | 0.025 | 0.022 | 0.020 | 0.027 |
| 6 | 0.029 | 0.026 | 0.023 | 0.032 |
| 8 | 0.039 | 0.035 | 0.031 | 0.043 |
| 10 | 0.047 | 0.043 | 0.038 | 0.052 |
| 12 | 0.054 | 0.049 | 0.043 | 0.059 |
| 14 | 0.063 | 0.057 | 0.050 | 0.069 |
| 16 | 0.072 | 0.065 | 0.058 | 0.079 |
| 18 | 0.079 | 0.071 | 0.063 | 0.087 |
| 20 | 0.088 | 0.079 | 0.070 | 0.097 |

HSS
END-MILLS

CARBIDE
BURRS

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

HFAL3

cylindrical shank, 3 flutes, corner radius



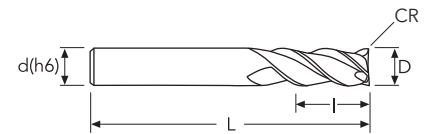
| | | | | | |
|---------------|-----|----------------|-----|--------|-------|
| OSAWA NORM | ALU | MG POLISHED | 30° | RADIUS | Z3 UP |
|---------------|-----|----------------|-----|--------|-------|

INFO

| | | | | | |
|---|---|---|---|---|---|
| P | M | K | N | S | H |
| | | | ★ | | |

★ 1st choice ☆ suitable

| | | | | | |
|---------|--------------|---------|---------|----------|----------|
| SLOTING | SIDE MILLING | HELICAL | RAMPING | VERTICAL | DRILLING |
|---------|--------------|---------|---------|----------|----------|



CARBIDE
DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|----|----------|------|----------|-------|-----|----|-----|---|------------|-------|
| 2 | 0/-0.030 | 0.10 | +/-0.010 | 6 | 6.5 | | 50 | 3 | HFAL301020 | ● |
| 3 | 0/-0.030 | 0.10 | +/-0.010 | 6 | 9 | | 50 | 3 | HFAL301030 | ● |
| 4 | 0/-0.030 | 0.10 | +/-0.010 | 6 | 12 | | 50 | 3 | HFAL301040 | ● |
| 5 | 0/-0.030 | 0.10 | +/-0.010 | 6 | 15 | | 50 | 3 | HFAL301050 | ● |
| 6 | 0/-0.030 | 0.10 | +/-0.010 | 6 | 20 | | 60 | 3 | HFAL301060 | ● |
| 8 | 0/-0.030 | 0.10 | +/-0.010 | 8 | 20 | | 64 | 3 | HFAL301080 | ● |
| 10 | 0/-0.030 | 0.10 | +/-0.010 | 10 | 22 | | 75 | 3 | HFAL301100 | ● |
| 12 | 0/-0.030 | 0.10 | +/-0.010 | 12 | 25 | | 75 | 3 | HFAL301120 | ● |
| 14 | 0/-0.030 | 0.10 | +/-0.010 | 14 | 32 | | 90 | 3 | HFAL301140 | ● |
| 16 | 0/-0.030 | 0.10 | +/-0.010 | 16 | 32 | | 90 | 3 | HFAL301160 | ● |
| 20 | 0/-0.030 | 0.10 | +/-0.010 | 20 | 38 | | 100 | 3 | HFAL301200 | ● |

HSS
DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE
END-MILLS

G2
MDTA
HF-VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS
END-MILLS

CARBIDE
BURRS

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

HFAL3

CARBIDE
DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA



| Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---------------------------|--------------|--------------|--------------|--------------|
| Hardness/Rm | | | | |
| ap x ae | D x D | D x D | D x D | D x D |
| Vc (m/min) | 300÷500 | 200÷400 | 150÷350 | 600÷900 |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 2 | 0.022 | 0.019 | 0.015 | 0.024 |
| 3 | 0.033 | 0.028 | 0.023 | 0.036 |
| 4 | 0.044 | 0.037 | 0.031 | 0.048 |
| 5 | 0.055 | 0.047 | 0.039 | 0.061 |
| 6 | 0.065 | 0.055 | 0.046 | 0.072 |
| 8 | 0.086 | 0.073 | 0.060 | 0.095 |
| 10 | 0.105 | 0.089 | 0.074 | 0.116 |
| 12 | 0.120 | 0.102 | 0.084 | 0.132 |
| 14 | 0.140 | 0.119 | 0.098 | 0.154 |
| 16 | 0.160 | 0.136 | 0.112 | 0.176 |
| 18 | 0.176 | 0.150 | 0.123 | 0.194 |
| 20 | 0.195 | 0.166 | 0.137 | 0.215 |

HSS
DRILLS

LFTA
SUTA
HSS-HSS/CO



| Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---------------------------|--------------|--------------|--------------|--------------|
| Hardness/Rm | | | | |
| ap x ae | 1.5D x 0.5D | 1.5D x 0.5D | 1.5D x 0.5D | 1.5D x 0.5D |
| Vc (m/min) | 300÷600 | 200÷500 | 200÷400 | 600÷1000 |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 2 | 0.026 | 0.024 | 0.021 | 0.029 |
| 3 | 0.040 | 0.036 | 0.032 | 0.044 |
| 4 | 0.053 | 0.048 | 0.042 | 0.058 |
| 5 | 0.066 | 0.059 | 0.053 | 0.073 |
| 6 | 0.078 | 0.070 | 0.062 | 0.086 |
| 8 | 0.103 | 0.093 | 0.083 | 0.114 |
| 10 | 0.126 | 0.113 | 0.101 | 0.139 |
| 12 | 0.144 | 0.130 | 0.115 | 0.158 |
| 14 | 0.168 | 0.151 | 0.134 | 0.185 |
| 16 | 0.192 | 0.173 | 0.154 | 0.211 |
| 18 | 0.211 | 0.190 | 0.169 | 0.232 |
| 20 | 0.234 | 0.211 | 0.187 | 0.257 |

CARBIDE
END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH



| Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---------------------------|--------------|--------------|--------------|--------------|
| Hardness/Rm | | | | |
| ap x ae | 8° x 0.5D | 5° x 0.5D | 5° x 0.5D | 8° x 0.5D |
| Vc (m/min) | 300÷500 | 200÷400 | 150÷350 | 600÷900 |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 2 | 0.015 | 0.014 | 0.011 | 0.017 |
| 3 | 0.023 | 0.020 | 0.017 | 0.025 |
| 4 | 0.030 | 0.027 | 0.022 | 0.033 |
| 5 | 0.038 | 0.034 | 0.028 | 0.042 |
| 6 | 0.045 | 0.040 | 0.033 | 0.049 |
| 8 | 0.059 | 0.053 | 0.044 | 0.065 |
| 10 | 0.073 | 0.065 | 0.054 | 0.080 |
| 12 | 0.083 | 0.074 | 0.061 | 0.091 |
| 14 | 0.097 | 0.087 | 0.071 | 0.106 |
| 16 | 0.111 | 0.099 | 0.082 | 0.122 |
| 18 | 0.122 | 0.109 | 0.090 | 0.134 |
| 20 | 0.135 | 0.121 | 0.099 | 0.148 |

HSS
END-MILLS

CARBIDE
BURRS

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

CUTTING PARAMETERS

INFO

HFAL3

| | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|----|------------------------|-----------|-----------|-----------|-----------|
| | Hardness/Rm | | | | |
| | ap x ae | 15° x D | 10° x D | 7° x D | 15° x D |
| | Vc (m/min) | 300÷500 | 200÷400 | 150÷350 | 600÷900 |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 2 | 0.015 | 0.013 | 0.011 | 0.016 |
| | 3 | 0.022 | 0.019 | 0.016 | 0.024 |
| | 4 | 0.029 | 0.025 | 0.022 | 0.032 |
| | 5 | 0.037 | 0.032 | 0.027 | 0.040 |
| | 6 | 0.043 | 0.038 | 0.032 | 0.048 |
| | 8 | 0.057 | 0.050 | 0.042 | 0.063 |
| | 10 | 0.070 | 0.061 | 0.051 | 0.077 |
| | 12 | 0.080 | 0.069 | 0.059 | 0.088 |
| | 14 | 0.093 | 0.081 | 0.069 | 0.102 |
| 16 | 0.106 | 0.092 | 0.078 | 0.117 | |
| 18 | 0.117 | 0.102 | 0.086 | 0.129 | |
| 20 | 0.130 | 0.113 | 0.096 | 0.143 | |

CARBIDE DRILLS

PU-HPU
TA-4HTA
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C-SD-TA

| | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|----|------------------------|-----------|-----------|-----------|-----------|
| | Hardness/Rm | | | | |
| | ap x ae | D x 0.4D | D x 0.4D | D x 0.4D | D x 0.4D |
| | Vc (m/min) | 300÷500 | 200÷400 | 150÷350 | 600÷900 |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 2 | 0.022 | 0.020 | 0.018 | 0.024 |
| | 3 | 0.033 | 0.030 | 0.026 | 0.036 |
| | 4 | 0.044 | 0.040 | 0.035 | 0.048 |
| | 5 | 0.055 | 0.050 | 0.044 | 0.061 |
| | 6 | 0.065 | 0.059 | 0.052 | 0.072 |
| | 8 | 0.086 | 0.077 | 0.069 | 0.095 |
| | 10 | 0.105 | 0.095 | 0.084 | 0.116 |
| | 12 | 0.120 | 0.108 | 0.096 | 0.132 |
| | 14 | 0.140 | 0.126 | 0.112 | 0.154 |
| 16 | 0.160 | 0.144 | 0.128 | 0.176 | |
| 18 | 0.176 | 0.158 | 0.141 | 0.194 | |
| 20 | 0.195 | 0.176 | 0.156 | 0.215 | |

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF-VH/UP
MEF
ALU
MEX/MH
UH/MH

| | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|----|------------------------|-----------|-----------|-----------|-----------|
| | Hardness/Rm | | | | |
| | ap x ae | D x D | D x D | 0.5D x D | 0.5D x D |
| | Vc (m/min) | 270÷370 | 190÷290 | 150÷250 | 500÷700 |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 2 | 0.011 | 0.010 | 0.009 | 0.012 |
| | 3 | 0.017 | 0.015 | 0.013 | 0.018 |
| | 4 | 0.022 | 0.020 | 0.018 | 0.024 |
| | 5 | 0.028 | 0.025 | 0.022 | 0.030 |
| | 6 | 0.033 | 0.029 | 0.026 | 0.036 |
| | 8 | 0.043 | 0.039 | 0.034 | 0.047 |
| | 10 | 0.053 | 0.047 | 0.042 | 0.058 |
| | 12 | 0.060 | 0.054 | 0.048 | 0.066 |
| | 14 | 0.070 | 0.063 | 0.056 | 0.077 |
| 16 | 0.080 | 0.072 | 0.064 | 0.088 | |
| 18 | 0.088 | 0.079 | 0.070 | 0.097 | |
| 20 | 0.098 | 0.088 | 0.078 | 0.107 | |

HSS END-MILLS

CARBIDE BURRS

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

INFO

HFA53

cylindrical shank, reduced neck, 3 flutes, long reach, corner radius



CARBIDE DRILLS

PU-HPU

TA-4HTA

SUH

ALH

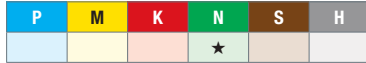
HRC

SUH MINI

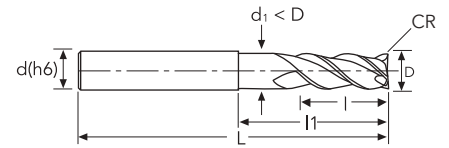
HL

HSD

C-SD-TA



★ 1st choice ☆ suitable



| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | d1 | L | z | EDP No. | Stock |
|----|----------|-----|----------|-------|----|-----|-------|-----|---|------------|-------|
| 3 | 0/-0.030 | 0.2 | +/-0.010 | 6 | 5 | 18 | 2.80 | 60 | 3 | HFA5302030 | ● |
| 3 | 0/-0.030 | 0.5 | +/-0.010 | 6 | 5 | 18 | 2.80 | 60 | 3 | HFA5305030 | ● |
| 4 | 0/-0.030 | 0.5 | +/-0.010 | 6 | 6 | 22 | 3.80 | 60 | 3 | HFA5305040 | ● |
| 4 | 0/-0.030 | 1.0 | +/-0.010 | 6 | 6 | 22 | 3.80 | 60 | 3 | HFA5310040 | ● |
| 5 | 0/-0.030 | 0.5 | +/-0.010 | 6 | 8 | 24 | 4.80 | 60 | 3 | HFA5305050 | ● |
| 5 | 0/-0.030 | 1.0 | +/-0.010 | 6 | 8 | 24 | 4.80 | 60 | 3 | HFA5310050 | ● |
| 6 | 0/-0.030 | 0.5 | +/-0.010 | 6 | 9 | 29 | 5.80 | 65 | 3 | HFA5305060 | ● |
| 6 | 0/-0.030 | 1.0 | +/-0.010 | 6 | 9 | 29 | 5.80 | 65 | 3 | HFA5310060 | ● |
| 6 | 0/-0.030 | 2.0 | +/-0.010 | 6 | 9 | 29 | 5.80 | 65 | 3 | HFA5320060 | ● |
| 8 | 0/-0.030 | 0.5 | +/-0.010 | 8 | 12 | 39 | 7.80 | 75 | 3 | HFA5305080 | ● |
| 8 | 0/-0.030 | 1.0 | +/-0.010 | 8 | 12 | 39 | 7.80 | 75 | 3 | HFA5310080 | ● |
| 8 | 0/-0.030 | 2.0 | +/-0.010 | 8 | 12 | 39 | 7.80 | 75 | 3 | HFA5320080 | ● |
| 8 | 0/-0.030 | 3.0 | +/-0.010 | 8 | 12 | 39 | 7.80 | 75 | 3 | HFA5330080 | ● |
| 10 | 0/-0.030 | 0.5 | +/-0.010 | 10 | 15 | 52 | 9.80 | 100 | 3 | HFA5305100 | ● |
| 10 | 0/-0.030 | 1.0 | +/-0.010 | 10 | 15 | 52 | 9.80 | 100 | 3 | HFA5310100 | ● |
| 10 | 0/-0.030 | 2.0 | +/-0.010 | 10 | 15 | 52 | 9.80 | 100 | 3 | HFA5320100 | ● |
| 10 | 0/-0.030 | 3.0 | +/-0.010 | 10 | 15 | 52 | 9.80 | 100 | 3 | HFA5330100 | ● |
| 10 | 0/-0.030 | 4.0 | +/-0.010 | 10 | 15 | 52 | 9.80 | 100 | 3 | HFA5340100 | ● |
| 12 | 0/-0.030 | 0.5 | +/-0.010 | 12 | 18 | 62 | 11.80 | 120 | 3 | HFA5305120 | ● |
| 12 | 0/-0.030 | 1.0 | +/-0.010 | 12 | 18 | 62 | 11.80 | 120 | 3 | HFA5310120 | ● |
| 12 | 0/-0.030 | 2.0 | +/-0.010 | 12 | 18 | 62 | 11.80 | 120 | 3 | HFA5320120 | ● |
| 12 | 0/-0.030 | 3.0 | +/-0.010 | 12 | 18 | 62 | 11.80 | 120 | 3 | HFA5330120 | ● |
| 12 | 0/-0.030 | 4.0 | +/-0.010 | 12 | 18 | 62 | 11.80 | 120 | 3 | HFA5340120 | ● |
| 16 | 0/-0.030 | 0.5 | +/-0.010 | 16 | 24 | 82 | 15.70 | 130 | 3 | HFA5305160 | ● |
| 16 | 0/-0.030 | 1.0 | +/-0.010 | 16 | 24 | 82 | 15.70 | 130 | 3 | HFA5310160 | ● |
| 16 | 0/-0.030 | 2.0 | +/-0.010 | 16 | 24 | 82 | 15.70 | 130 | 3 | HFA5320160 | ● |
| 16 | 0/-0.030 | 3.0 | +/-0.010 | 16 | 24 | 82 | 15.70 | 130 | 3 | HFA5330160 | ● |
| 16 | 0/-0.030 | 4.0 | +/-0.010 | 16 | 24 | 82 | 15.70 | 130 | 3 | HFA5340160 | ● |
| 20 | 0/-0.030 | 0.5 | +/-0.010 | 20 | 30 | 100 | 19.70 | 150 | 3 | HFA5305200 | ● |
| 20 | 0/-0.030 | 1.0 | +/-0.010 | 20 | 30 | 100 | 19.70 | 150 | 3 | HFA5310200 | ● |
| 20 | 0/-0.030 | 2.0 | +/-0.010 | 20 | 30 | 100 | 19.70 | 150 | 3 | HFA5320200 | ● |
| 20 | 0/-0.030 | 3.0 | +/-0.010 | 20 | 30 | 100 | 19.70 | 150 | 3 | HFA5330200 | ● |
| 20 | 0/-0.030 | 4.0 | +/-0.010 | 20 | 30 | 100 | 19.70 | 150 | 3 | HFA5340200 | ● |

● stock standard ○ non-standard stock ▽ stock exhaustion

CARBIDE END-MILLS

G2

MDTA

HFVH/UP

MEF

ALU

MEX/MH

UH/MH

HSS END-MILLS

CARBIDE BURRS

CUTTING PARAMETERS

HFA53

| | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|----|------------------------|-----------|-----------|-----------|-----------|
| | Hardness/Rm | | | | |
| | ap x ae | 0.5D x D | 0.5D x D | 0.5D x D | 0.5D x D |
| | Vc (m/min) | 200+500 | 150+350 | 150+250 | 500+900 |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 3 | 0.026 | 0.022 | 0.018 | 0.029 | |
| 4 | 0.035 | 0.030 | 0.025 | 0.039 | |
| 5 | 0.044 | 0.037 | 0.031 | 0.048 | |
| 6 | 0.052 | 0.044 | 0.036 | 0.057 | |
| 8 | 0.069 | 0.058 | 0.048 | 0.076 | |
| 10 | 0.084 | 0.071 | 0.059 | 0.092 | |
| 12 | 0.096 | 0.082 | 0.067 | 0.106 | |
| 14 | 0.112 | 0.095 | 0.078 | 0.123 | |
| 16 | 0.128 | 0.109 | 0.090 | 0.141 | |
| 18 | 0.141 | 0.120 | 0.099 | 0.155 | |
| 20 | 0.156 | 0.133 | 0.109 | 0.172 | |

| | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|----|------------------------|-------------|-------------|-------------|-------------|
| | Hardness/Rm | | | | |
| | ap x ae | 1.5D x 0.5D | 1.5D x 0.5D | 1.5D x 0.5D | 1.5D x 0.5D |
| | Vc (m/min) | 300+500 | 200+400 | 150+350 | 600+900 |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 3 | 0.032 | 0.029 | 0.025 | 0.035 | |
| 4 | 0.042 | 0.038 | 0.034 | 0.046 | |
| 5 | 0.053 | 0.048 | 0.042 | 0.058 | |
| 6 | 0.062 | 0.056 | 0.050 | 0.069 | |
| 8 | 0.083 | 0.074 | 0.066 | 0.091 | |
| 10 | 0.101 | 0.091 | 0.081 | 0.111 | |
| 12 | 0.115 | 0.104 | 0.092 | 0.127 | |
| 14 | 0.134 | 0.121 | 0.108 | 0.148 | |
| 16 | 0.154 | 0.138 | 0.123 | 0.169 | |
| 18 | 0.169 | 0.152 | 0.135 | 0.186 | |
| 20 | 0.187 | 0.168 | 0.150 | 0.206 | |

| | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|----|------------------------|-----------|-----------|-----------|-----------|
| | Hardness/Rm | | | | |
| | ap x ae | 8° x 0.5D | 5° x 0.5D | 5° x 0.5D | 8° x 0.5D |
| | Vc (m/min) | 200+500 | 150+350 | 200+400 | 500+900 |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 3 | 0.018 | 0.016 | 0.013 | 0.020 | |
| 4 | 0.024 | 0.022 | 0.018 | 0.027 | |
| 5 | 0.030 | 0.027 | 0.022 | 0.033 | |
| 6 | 0.036 | 0.032 | 0.027 | 0.040 | |
| 8 | 0.048 | 0.043 | 0.035 | 0.052 | |
| 10 | 0.058 | 0.052 | 0.043 | 0.064 | |
| 12 | 0.066 | 0.059 | 0.049 | 0.073 | |
| 14 | 0.077 | 0.069 | 0.057 | 0.085 | |
| 16 | 0.088 | 0.079 | 0.065 | 0.097 | |
| 18 | 0.097 | 0.087 | 0.072 | 0.107 | |
| 20 | 0.108 | 0.097 | 0.080 | 0.119 | |

INFO

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF-VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

INFO

HFA53

CARBIDE
DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA



| Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---------------------------|--------------|--------------|--------------|--------------|
| Hardness/Rm | | | | |
| ap x ae | 15° x D | 10° x D | 7° x D | 15° x D |
| Vc (m/min) | 200+500 | 150+350 | 200+400 | 500+900 |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 3 | 0.018 | 0.014 | 0.013 | 0.019 |
| 4 | 0.023 | 0.018 | 0.017 | 0.026 |
| 5 | 0.029 | 0.023 | 0.022 | 0.032 |
| 6 | 0.035 | 0.027 | 0.025 | 0.038 |
| 8 | 0.046 | 0.036 | 0.034 | 0.050 |
| 10 | 0.056 | 0.044 | 0.041 | 0.061 |
| 12 | 0.064 | 0.050 | 0.047 | 0.070 |
| 14 | 0.074 | 0.058 | 0.055 | 0.082 |
| 16 | 0.085 | 0.067 | 0.063 | 0.094 |
| 18 | 0.094 | 0.073 | 0.069 | 0.103 |
| 20 | 0.104 | 0.081 | 0.076 | 0.114 |

HSS
DRILLS

LFTA
SUTA
HSS-HSS/CO



| Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---------------------------|--------------|--------------|--------------|--------------|
| Hardness/Rm | | | | |
| ap x ae | D x 0.4D | D x 0.4D | D x 0.4D | D x 0.4D |
| Vc (m/min) | 200+500 | 150+350 | 150+250 | 500+900 |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 3 | 0.026 | 0.024 | 0.021 | 0.029 |
| 4 | 0.035 | 0.032 | 0.028 | 0.039 |
| 5 | 0.044 | 0.040 | 0.035 | 0.048 |
| 6 | 0.052 | 0.047 | 0.042 | 0.057 |
| 8 | 0.069 | 0.062 | 0.055 | 0.076 |
| 10 | 0.084 | 0.076 | 0.067 | 0.092 |
| 12 | 0.096 | 0.086 | 0.077 | 0.106 |
| 14 | 0.112 | 0.101 | 0.090 | 0.123 |
| 16 | 0.128 | 0.115 | 0.102 | 0.141 |
| 18 | 0.141 | 0.127 | 0.113 | 0.155 |
| 20 | 0.156 | 0.140 | 0.125 | 0.172 |

CARBIDE
END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH



| Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---------------------------|--------------|--------------|--------------|--------------|
| Hardness/Rm | | | | |
| ap x ae | 0.5D x D | 0.5D x D | 0.5D x D | 0.5D x D |
| Vc (m/min) | 230+330 | 150+250 | 110+210 | 510+610 |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 3 | 0.013 | 0.012 | 0.011 | 0.015 |
| 4 | 0.018 | 0.016 | 0.014 | 0.019 |
| 5 | 0.022 | 0.020 | 0.018 | 0.024 |
| 6 | 0.026 | 0.023 | 0.021 | 0.029 |
| 8 | 0.034 | 0.031 | 0.028 | 0.038 |
| 10 | 0.042 | 0.038 | 0.034 | 0.046 |
| 12 | 0.048 | 0.043 | 0.038 | 0.053 |
| 14 | 0.056 | 0.050 | 0.045 | 0.062 |
| 16 | 0.064 | 0.058 | 0.051 | 0.070 |
| 18 | 0.070 | 0.063 | 0.056 | 0.077 |
| 20 | 0.078 | 0.070 | 0.062 | 0.086 |

HSS
END-MILLS

CARBIDE
BURRS

PARAMETERS SUGGESTED WITH HIGH POWER MILLING CHUCK AND STABLE MACHINING CONDITION

MDCSA1

cylindrical shank, 1 flute, polished



OSAWA NORM | **ALU** | MG POLISHED | 25° | SQUARE | Z1

INFO

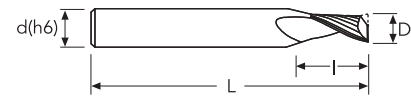
CARBIDE
DRILLS

- PU-HPU
- TA-4HTA
- SUH
- ALH
- HRC
- SUH MINI
- HL
- HSD
- C-SD-TA

| | | | | | |
|---|---|---|---|---|---|
| P | M | K | N | S | H |
| | | | ★ | | |

★ 1st choice ☆ suitable

SLOTTING |
 SIDE MILLING |
 DRILLING



| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|-----------|----------|---|--------|-------|----|----|----|---|-----------|-------|
| 2 | 0/-0.015 | | | 2 | 10 | | 40 | 1 | MDCSA1020 | ● |
| 3 | 0/-0.020 | | | 3 | 12 | | 40 | 1 | MDCSA1030 | ● |
| 4 | 0/-0.020 | | | 4 | 15 | | 50 | 1 | MDCSA1040 | ● |
| 5 | 0/-0.020 | | | 5 | 16 | | 50 | 1 | MDCSA1050 | ● |
| 6 | 0/-0.020 | | | 6 | 20 | | 60 | 1 | MDCSA1060 | ● |
| 8 | 0/-0.020 | | | 8 | 22 | | 63 | 1 | MDCSA1080 | ● |
| 10 | 0/-0.020 | | | 10 | 25 | | 72 | 1 | MDCSA1100 | ● |
| 12 | 0/-0.020 | | | 12 | 30 | | 83 | 1 | MDCSA1120 | ● |
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HSS
DRILLS

- LFTA
- SUTA
- HSS-HSS/CO

CARBIDE
END-MILLS

- G2
- MDTA
- HF-VH/UP
- MEF
- ALU**
- MEX/MH
- UH/MH

HSS
END-MILLS

CARBIDE
BURRS

INFO

MDCSA1

CARBIDE
DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA



| Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---------------------------|--------------|--------------|--------------|--------------|
| Hardness/Rm | | | | |
| ap x ae | 0.5D x D | 0.5D x D | 0.5D x D | 0.5D x D |
| Vc (m/min) | 300+500 | 200+400 | 150+350 | 400+600 |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 2 | 0.023 | 0.019 | 0.016 | 0.023 |
| 3 | 0.030 | 0.026 | 0.021 | 0.030 |
| 4 | 0.039 | 0.033 | 0.027 | 0.039 |
| 5 | 0.049 | 0.041 | 0.034 | 0.049 |
| 6 | 0.058 | 0.049 | 0.040 | 0.058 |
| 8 | 0.079 | 0.067 | 0.055 | 0.079 |
| 10 | 0.098 | 0.083 | 0.068 | 0.098 |
| 12 | 0.116 | 0.099 | 0.081 | 0.116 |

< D3 ap x ae D x 0.25D

HSS
DRILLS

LFTA
SUTA
HSS-HSS/CO



| Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---------------------------|--------------|--------------|--------------|--------------|
| Hardness/Rm | | | | |
| ap x ae | D x 0.5D | D x 0.5D | D x 0.5D | D x 0.5D |
| Vc (m/min) | 300+600 | 200+500 | 200+400 | 400+800 |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 2 | 0.030 | 0.026 | 0.021 | 0.030 |
| 3 | 0.040 | 0.034 | 0.028 | 0.040 |
| 4 | 0.052 | 0.044 | 0.036 | 0.052 |
| 5 | 0.065 | 0.055 | 0.046 | 0.065 |
| 6 | 0.077 | 0.065 | 0.054 | 0.077 |
| 8 | 0.105 | 0.089 | 0.074 | 0.105 |
| 10 | 0.130 | 0.111 | 0.091 | 0.130 |
| 12 | 0.155 | 0.132 | 0.109 | 0.155 |

< D3 ap x ae D x 0.25D

CARBIDE
END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH



| Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---------------------------|--------------|--------------|--------------|--------------|
| Hardness/Rm | | | | |
| ap x ae | D x D | D x D | D x D | 0.5D x D |
| Vc (m/min) | 300+400 | 150+350 | 100+300 | 300+500 |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 2 | 0.011 | 0.010 | 0.008 | 0.011 |
| 3 | 0.015 | 0.013 | 0.011 | 0.015 |
| 4 | 0.020 | 0.017 | 0.014 | 0.020 |
| 5 | 0.024 | 0.021 | 0.017 | 0.024 |
| 6 | 0.029 | 0.025 | 0.020 | 0.029 |
| 8 | 0.039 | 0.033 | 0.028 | 0.039 |
| 10 | 0.049 | 0.041 | 0.034 | 0.049 |
| 12 | 0.058 | 0.049 | 0.041 | 0.058 |

< D3 ap x ae 0.5D x D

HSS
END-MILLS

CARBIDE
BURRS

MDCSA2

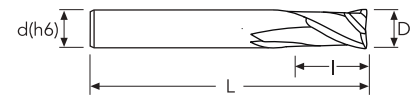
cylindrical shank, 2 flutes, polished



INFO



★ 1st choice ☆ suitable



| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|-----|----------|---|--------|-------|-----|----|-----|---|-----------|-------|
| 1 | 0/-0.015 | | | 4 | 3 | | 40 | 2 | MDCSA2010 | ● |
| 1.5 | 0/-0.015 | | | 4 | 4.5 | | 40 | 2 | MDCSA2015 | ● |
| 2 | 0/-0.015 | | | 4 | 6.5 | | 40 | 2 | MDCSA2020 | ● |
| 2.5 | 0/-0.020 | | | 4 | 6.5 | | 40 | 2 | MDCSA2025 | ● |
| 3 | 0/-0.030 | | | 6 | 8 | | 57 | 2 | MDCSA2030 | ● |
| 4 | 0/-0.030 | | | 6 | 11 | | 57 | 2 | MDCSA2040 | ● |
| 5 | 0/-0.030 | | | 6 | 13 | | 57 | 2 | MDCSA2050 | ● |
| 6 | 0/-0.030 | | | 6 | 13 | | 57 | 2 | MDCSA2060 | ● |
| 8 | 0/-0.030 | | | 8 | 19 | | 63 | 2 | MDCSA2080 | ● |
| 10 | 0/-0.030 | | | 10 | 22 | | 72 | 2 | MDCSA2100 | ● |
| 12 | 0/-0.030 | | | 12 | 26 | | 83 | 2 | MDCSA2120 | ● |
| 14 | 0/-0.030 | | | 14 | 26 | | 83 | 2 | MDCSA2140 | ● |
| 16 | 0/-0.030 | | | 16 | 32 | | 92 | 2 | MDCSA2160 | ● |
| 18 | 0/-0.030 | | | 18 | 32 | | 92 | 2 | MDCSA2180 | ● |
| 20 | 0/-0.030 | | | 20 | 38 | | 104 | 2 | MDCSA2200 | ● |

CARBIDE DRILLS
PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS
LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS
G2
MDTA
HF-VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

MDCSA2

CARBIDE
DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA



| Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---------------------------|--------------|--------------|--------------|--------------|
| Hardness/Rm | | | | |
| ap x ae | 0.5D x D | 0.5D x D | 0.5D x D | 0.5D x D |
| Vc (m/min) | 300÷600 | 150÷350 | 150÷250 | 500÷900 |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 1 | 0.011 | 0.010 | 0.008 | 0.011 |
| 1.5 | 0.017 | 0.014 | 0.012 | 0.017 |
| 2 | 0.022 | 0.019 | 0.016 | 0.022 |
| 3 | 0.028 | 0.024 | 0.020 | 0.028 |
| 4 | 0.038 | 0.032 | 0.026 | 0.038 |
| 5 | 0.047 | 0.040 | 0.033 | 0.047 |
| 6 | 0.056 | 0.048 | 0.039 | 0.056 |
| 8 | 0.075 | 0.064 | 0.052 | 0.075 |
| 10 | 0.094 | 0.080 | 0.066 | 0.094 |
| 12 | 0.112 | 0.095 | 0.078 | 0.112 |
| 14 | 0.130 | 0.111 | 0.091 | 0.130 |
| 16 | 0.148 | 0.126 | 0.103 | 0.148 |
| 18 | 0.166 | 0.141 | 0.116 | 0.166 |
| 20 | 0.185 | 0.157 | 0.129 | 0.185 |

< D3 ap x ae 0.25D x D

HSS
DRILLS

LFTA
SUTA
HSS-HSS/CO



| Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---------------------------|--------------|--------------|--------------|--------------|
| Hardness/Rm | | | | |
| ap x ae | D x 0.5D | D x 0.5D | D x 0.5D | D x 0.5D |
| Vc (m/min) | 300÷500 | 200÷400 | 150÷350 | 600÷1000 |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 1 | 0.013 | 0.011 | 0.009 | 0.013 |
| 1.5 | 0.020 | 0.017 | 0.014 | 0.020 |
| 2 | 0.027 | 0.023 | 0.019 | 0.027 |
| 3 | 0.034 | 0.029 | 0.024 | 0.034 |
| 4 | 0.045 | 0.038 | 0.032 | 0.045 |
| 5 | 0.056 | 0.048 | 0.040 | 0.056 |
| 6 | 0.068 | 0.057 | 0.047 | 0.068 |
| 8 | 0.090 | 0.076 | 0.063 | 0.090 |
| 10 | 0.112 | 0.096 | 0.079 | 0.112 |
| 12 | 0.134 | 0.114 | 0.094 | 0.134 |
| 14 | 0.157 | 0.133 | 0.110 | 0.157 |
| 16 | 0.177 | 0.151 | 0.124 | 0.177 |
| 18 | 0.200 | 0.170 | 0.140 | 0.200 |
| 20 | 0.222 | 0.188 | 0.155 | 0.222 |

< D3 ap x ae D x 0.5D

HSS
END-MILLS

CARBIDE
BURRS

CUTTING PARAMETERS

INFO

MDCSA2

| Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---------------------------|-------------|-----------|-----------|-----------|
| | Hardness/Rm | | | |
| ap x ae | 0.5D x D | 0.5D x D | 0.5D x D | 0.5D x D |
| Vc (m/min) | 200÷400 | 150÷350 | 150÷350 | 500÷900 |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 1 | 0.006 | 0.005 | 0.004 | 0.006 |
| 1.5 | 0.008 | 0.007 | 0.006 | 0.008 |
| 2 | 0.011 | 0.010 | 0.008 | 0.011 |
| 3 | 0.014 | 0.012 | 0.010 | 0.014 |
| 4 | 0.019 | 0.016 | 0.013 | 0.019 |
| 5 | 0.024 | 0.020 | 0.016 | 0.024 |
| 6 | 0.028 | 0.024 | 0.020 | 0.028 |
| 8 | 0.037 | 0.032 | 0.026 | 0.037 |
| 10 | 0.047 | 0.040 | 0.033 | 0.047 |
| 12 | 0.056 | 0.048 | 0.039 | 0.056 |
| 14 | 0.065 | 0.055 | 0.046 | 0.065 |
| 16 | 0.074 | 0.063 | 0.052 | 0.074 |
| 18 | 0.083 | 0.071 | 0.058 | 0.083 |
| 20 | 0.092 | 0.079 | 0.065 | 0.092 |



< D3 ap x ae 0.25D x D

CARBIDE
DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS
DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE
END-MILLS

G2
MDTA
HF-VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS
END-MILLS

CARBIDE
BURRS

CUTTING PARAMETERS

INFO

MDCSA3

| | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|----|------------------------|-----------|-----------|-----------|-----------|
| | Hardness/Rm | | | | |
| | ap x ae | 0.5D x D | 0.5D x D | 0.5D x D | 0.5D x D |
| | Vc (m/min) | 200÷600 | 150÷350 | 150÷250 | 500÷900 |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 1 | 0.010 | 0.009 | 0.007 | 0.010 |
| | 1.5 | 0.015 | 0.013 | 0.011 | 0.015 |
| | 2 | 0.020 | 0.017 | 0.014 | 0.020 |
| | 3 | 0.025 | 0.022 | 0.018 | 0.025 |
| | 4 | 0.034 | 0.029 | 0.024 | 0.034 |
| | 5 | 0.042 | 0.036 | 0.030 | 0.042 |
| | 6 | 0.051 | 0.043 | 0.035 | 0.051 |
| | 8 | 0.067 | 0.057 | 0.047 | 0.067 |
| | 10 | 0.084 | 0.072 | 0.059 | 0.084 |
| | 12 | 0.101 | 0.086 | 0.071 | 0.101 |
| | 14 | 0.117 | 0.100 | 0.082 | 0.117 |
| | 16 | 0.133 | 0.113 | 0.093 | 0.133 |
| 18 | 0.150 | 0.127 | 0.105 | 0.150 | |
| 20 | 0.166 | 0.141 | 0.116 | 0.166 | |

< D3 ap x ae 0.25D x D

| | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|----|------------------------|-------------|-------------|-------------|-------------|
| | Hardness/Rm | | | | |
| | ap x ae | 1.5D x 0.3D | 1.5D x 0.3D | 1.5D x 0.3D | 1.5D x 0.3D |
| | Vc (m/min) | 300÷500 | 200÷400 | 150÷350 | 600÷1000 |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 1 | 0.012 | 0.010 | 0.008 | 0.012 |
| | 1.5 | 0.018 | 0.015 | 0.013 | 0.018 |
| | 2 | 0.024 | 0.021 | 0.017 | 0.024 |
| | 3 | 0.030 | 0.026 | 0.021 | 0.030 |
| | 4 | 0.041 | 0.034 | 0.028 | 0.041 |
| | 5 | 0.051 | 0.043 | 0.036 | 0.051 |
| | 6 | 0.061 | 0.052 | 0.043 | 0.061 |
| | 8 | 0.081 | 0.069 | 0.057 | 0.081 |
| | 10 | 0.101 | 0.086 | 0.071 | 0.101 |
| | 12 | 0.121 | 0.103 | 0.085 | 0.121 |
| | 14 | 0.141 | 0.120 | 0.099 | 0.141 |
| | 16 | 0.160 | 0.136 | 0.112 | 0.160 |
| 18 | 0.180 | 0.153 | 0.126 | 0.180 | |
| 20 | 0.200 | 0.170 | 0.140 | 0.200 | |

< D3 ap x ae D x 0.1D

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF-VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

INFO

MDA310-11-12

cylindrical shank, 3 flutes polished, long



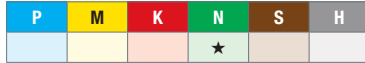
MDA310



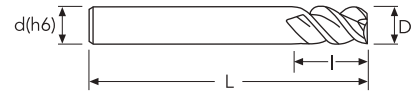
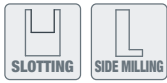
MDA311 - MDA312

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA



★ 1st choice ☆ suitable



| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|----|----------|---|--------|-------|----|----|-----|---|-----------|-------|
| 3 | 0/-0.030 | | | 6 | 12 | | 75 | 3 | MDA310030 | ● |
| 4 | 0/-0.030 | | | 6 | 16 | | 75 | 3 | MDA310040 | ● |
| 5 | 0/-0.030 | | | 6 | 20 | | 75 | 3 | MDA310050 | ● |
| 6 | 0/-0.030 | | | 6 | 25 | | 75 | 3 | MDA310060 | ● |
| 3 | 0/-0.030 | | | 6 | 15 | | 100 | 3 | MDA311030 | ● |
| 4 | 0/-0.030 | | | 6 | 20 | | 100 | 3 | MDA311040 | ● |
| 5 | 0/-0.030 | | | 6 | 25 | | 100 | 3 | MDA311050 | ● |
| 6 | 0/-0.030 | | | 6 | 30 | | 100 | 3 | MDA311060 | ● |
| 8 | 0/-0.035 | | | 8 | 35 | | 100 | 3 | MDA311080 | ● |
| 10 | 0/-0.035 | | | 10 | 40 | | 100 | 3 | MDA311100 | ● |
| 12 | 0/-0.035 | | | 12 | 45 | | 100 | 3 | MDA311120 | ● |
| 8 | 0/-0.035 | | | 8 | 40 | | 150 | 3 | MDA312080 | ● |
| 10 | 0/-0.035 | | | 10 | 50 | | 150 | 3 | MDA312100 | ● |
| 12 | 0/-0.035 | | | 12 | 50 | | 150 | 3 | MDA312120 | ● |
| 16 | 0/-0.040 | | | 16 | 70 | | 150 | 3 | MDA312160 | ● |
| 20 | 0/-0.040 | | | 20 | 80 | | 150 | 3 | MDA312200 | ● |

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS END-MILLS

CARBIDE BURRS

● stock standard ○ non-standard stock ▽ stock exhaustion

CUTTING PARAMETERS

INFO

MDA310

| | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|------------------------|-----------|-----------|-----------|-----------|
| | Hardness/Rm | | | | |
| | ap x ae | 0.3D x D | 0.3D x D | 0.3D x D | 0.3D x D |
| | Vc (m/min) | 220+340 | 150+250 | 100+200 | 400+700 |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 3 | 0.023 | 0.019 | 0.016 | 0.023 |
| | 4 | 0.030 | 0.026 | 0.021 | 0.030 |
| | 5 | 0.038 | 0.032 | 0.027 | 0.038 |
| 6 | 0.046 | 0.039 | 0.032 | 0.046 | |

CARBIDE DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA

| | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---|------------------------|-------------|-------------|-------------|-------------|
| | Hardness/Rm | | | | |
| | ap x ae | 1.5D x 0.1D | 1.5D x 0.1D | 1.5D x 0.1D | 1.5D x 0.1D |
| | Vc (m/min) | 270+370 | 200+300 | 150+250 | 500+800 |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 3 | 0.027 | 0.023 | 0.019 | 0.027 |
| | 4 | 0.036 | 0.031 | 0.026 | 0.036 |
| | 5 | 0.046 | 0.039 | 0.032 | 0.046 |
| 6 | 0.055 | 0.047 | 0.038 | 0.055 | |

HSS DRILLS

LFTA
SUTA
HSS-HSS/CO

MDA311

| | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|----|------------------------|-----------|-----------|-----------|-----------|
| | Hardness/Rm | | | | |
| | ap x ae | 0.3D x D | 0.3D x D | 0.3D x D | 0.3D x D |
| | Vc (m/min) | 180+280 | 110+210 | 100+160 | 350+550 |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 3 | 0.019 | 0.016 | 0.013 | 0.019 |
| | 4 | 0.025 | 0.022 | 0.018 | 0.025 |
| | 5 | 0.032 | 0.027 | 0.022 | 0.032 |
| | 6 | 0.038 | 0.032 | 0.027 | 0.038 |
| | 8 | 0.051 | 0.043 | 0.035 | 0.051 |
| 10 | 0.063 | 0.054 | 0.044 | 0.063 | |
| 12 | 0.076 | 0.064 | 0.053 | 0.076 | |

CARBIDE END-MILLS

G2
MDTA
HF-VH/UP
MEF
ALU
MEX/MH
UH/MH

| | Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|----|------------------------|------------|------------|------------|------------|
| | Hardness/Rm | | | | |
| | ap x ae | 2D x 0.05D | 2D x 0.05D | 2D x 0.05D | 2D x 0.05D |
| | Vc (m/min) | 210+310 | 150+250 | 110+210 | 420+620 |
| | D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| | 3 | 0.023 | 0.019 | 0.016 | 0.023 |
| | 4 | 0.030 | 0.026 | 0.021 | 0.030 |
| | 5 | 0.038 | 0.032 | 0.027 | 0.038 |
| | 6 | 0.046 | 0.039 | 0.032 | 0.046 |
| | 8 | 0.061 | 0.052 | 0.042 | 0.061 |
| 10 | 0.076 | 0.064 | 0.053 | 0.076 | |
| 12 | 0.091 | 0.077 | 0.064 | 0.091 | |

HSS END-MILLS

CARBIDE BURRS



INFO

MDA312

CARBIDE
DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA



| Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|------------------------|-----------|-----------|-----------|-----------|
| Hardness/Rm | | | | |
| ap x ae | 0.1D x D | 0.1D x D | 0.1D x D | 0.1D x D |
| Vc (m/min) | 130÷230 | 100÷160 | 80÷120 | 250÷450 |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 8 | 0.040 | 0.034 | 0.028 | 0.040 |
| 10 | 0.051 | 0.043 | 0.035 | 0.051 |
| 12 | 0.060 | 0.051 | 0.042 | 0.060 |
| 16 | 0.080 | 0.068 | 0.056 | 0.080 |
| 20 | 0.100 | 0.085 | 0.070 | 0.100 |



| Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|------------------------|--------------|--------------|--------------|--------------|
| Hardness/Rm | | | | |
| ap x ae | 2.5D x 0.05D | 2.5D x 0.05D | 2.5D x 0.05D | 2.5D x 0.05D |
| Vc (m/min) | 150÷250 | 100÷200 | 100÷160 | 300÷500 |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 8 | 0.048 | 0.041 | 0.034 | 0.048 |
| 10 | 0.061 | 0.052 | 0.042 | 0.061 |
| 12 | 0.073 | 0.062 | 0.051 | 0.073 |
| 16 | 0.096 | 0.081 | 0.067 | 0.096 |
| 20 | 0.120 | 0.102 | 0.084 | 0.120 |

HSS
DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE
END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS
END-MILLS

CARBIDE
BURRS

MDCSAM

cylindrical shank, 6F, polished

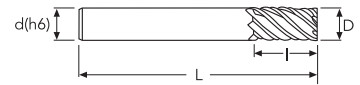


OSAWA NORM
ALU
MG POLISHED
50°
SQUARE
26

INFO

| | | | | | |
|---|---|---|---|---|---|
| P | M | K | N | S | H |
|---|---|---|---|---|---|

★ 1st choice ☆ suitable



| D | D Tol. | C | C Tol. | d(h6) | l | l1 | L | z | EDP No. | Stock |
|----|----------|---|--------|-------|----|----|----|---|-----------|-------|
| 6 | 0/-0.020 | | | 6 | 15 | | 57 | 6 | MDCSAM060 | ● |
| 8 | 0/-0.020 | | | 8 | 20 | | 64 | 6 | MDCSAM080 | ● |
| 10 | 0/-0.020 | | | 10 | 22 | | 75 | 6 | MDCSAM100 | ● |
| 12 | 0/-0.020 | | | 12 | 25 | | 75 | 6 | MDCSAM120 | ● |
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CARBIDE DRILLS
 PU-HPU
 TA-4HTA
 SUH
 ALH
 HRC
 SUH MINI
 HL
 HSD
 C-SD-TA

HSS DRILLS
 LFTA
 SUTA
 HSS-HSS/CO

CARBIDE END-MILLS
 G2
 MDTA
 HF-VH/UP
 MEF
 ALU
 MEX/MH
 UH/MH

HSS END-MILLS

CARBIDE BURRS

● stock standard ○ non-standard stock ▽ stock exhaustion

INFO

MDCSAM

CARBIDE
DRILLS

PU-HPU
TA-4HTA
SUH
ALH
HRC
SUH MINI
HL
HSD
C-SD-TA



| Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|---------------------------|---------------------|---------------------|---------------------|---------------------|
| | Hardness/Rm | | | |
| ap x ae | 1.5D x 0.05D | 1.5D x 0.05D | 1.5D x 0.05D | 1.5D x 0.05D |
| Vc (m/min) | 600÷1000 | 400÷800 | 300÷700 | 900÷1300 |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 6 | 0.050 | 0.043 | 0.035 | 0.050 |
| 8 | 0.067 | 0.057 | 0.047 | 0.067 |
| 10 | 0.084 | 0.071 | 0.059 | 0.084 |
| 12 | 0.100 | 0.085 | 0.070 | 0.100 |
| 20 | 0.120 | 0.102 | 0.084 | 0.120 |

HSS
DRILLS

LFTA
SUTA
HSS-HSS/CO

CARBIDE
END-MILLS

G2
MDTA
HF VH/UP
MEF
ALU
MEX/MH
UH/MH

HSS
END-MILLS

CARBIDE
BURRS

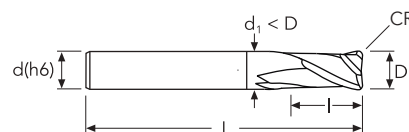
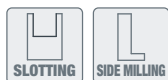
MCA212R

cylindrical shank, 2 flutes, corner radius

OSAWA NORM
ALU
MG PV200
25°
RADIUS
ZZ



★ 1st choice ☆ suitable



| D | D Tol. | CR | CR Tol. | d(h6) | l | l1 | d1 | L | z | EDP No. | Stock |
|----|----------|------|----------|-------|----|----|-------|----|---|--------------|-------|
| 2 | 0/-0.030 | 0.20 | +/-0.020 | 3 | 3 | 6 | 1.90 | 40 | 2 | MCA212R02020 | ● |
| 3 | 0/-0.030 | 0.20 | +/-0.020 | 3 | 4 | 8 | 2.80 | 40 | 2 | MCA212R02030 | ● |
| 4 | 0/-0.030 | 0.20 | +/-0.020 | 4 | 5 | 12 | 3.70 | 50 | 2 | MCA212R02040 | ● |
| 5 | 0/-0.030 | 0.20 | +/-0.020 | 5 | 8 | 14 | 4.80 | 50 | 2 | MCA212R02050 | ● |
| 6 | 0/-0.030 | 0.20 | +/-0.020 | 6 | 8 | 18 | 5.50 | 65 | 2 | MCA212R02060 | ● |
| 8 | 0/-0.030 | 0.20 | +/-0.020 | 8 | 10 | 22 | 7.40 | 70 | 2 | MCA212R02080 | ● |
| 10 | 0/-0.030 | 0.20 | +/-0.020 | 10 | 14 | 28 | 9.70 | 80 | 2 | MCA212R02100 | ● |
| 12 | 0/-0.030 | 0.20 | +/-0.020 | 12 | 16 | 35 | 11.00 | 90 | 2 | MCA212R02120 | ● |

INFO

CARBIDE DRILLS

- PU-HPU
- TA-4HTA
- SUH
- ALH
- HRC
- SUH MINI
- HL
- HSD
- C-SD-TA

HSS DRILLS

- LFTA
- SUTA
- HSS-HSS/CO

CARBIDE END-MILLS

- G2
- MDTA
- HF-VH/UP
- MEF
- ALU
- MEX/MH
- UH/MH

HSS END-MILLS

CARBIDE BURRS

INFO

MCA212R

CARBIDE DRILLS

- PU-HPU
- TA-4HTA
- SUH
- ALH
- HRC
- SUH MINI
- HL
- HSD
- C-SD-TA



| Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|------------------------|-----------|-----------|-----------|-----------|
| Hardness/Rm | | | | |
| ap x ae | 0.5D x D | 0.5D x D | 0.5D x D | 0.5D x D |
| Vc (m/min) | 200÷600 | 200÷400 | 150÷350 | 600÷1000 |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 2 | 0.030 | 0.025 | 0.021 | 0.033 |
| 3 | 0.040 | 0.034 | 0.028 | 0.044 |
| 4 | 0.050 | 0.042 | 0.035 | 0.054 |
| 5 | 0.059 | 0.050 | 0.041 | 0.064 |
| 6 | 0.077 | 0.066 | 0.054 | 0.085 |
| 8 | 0.095 | 0.080 | 0.066 | 0.104 |
| 10 | 0.108 | 0.092 | 0.076 | 0.119 |
| 12 | 0.126 | 0.107 | 0.088 | 0.139 |

< D3 ap x ae 0.25D x D

HSS DRILLS

- LFTA
- SUTA
- HSS-HSS/CO



| Material Group ISO 513 | N1 | N2 N3 | N4 | N5 |
|------------------------|-----------|-----------|-----------|-----------|
| Hardness/Rm | | | | |
| ap x ae | D x 0.5D | D x 0.5D | D x 0.5D | D x 0.5D |
| Vc (m/min) | 300÷600 | 250÷450 | 200÷400 | 600÷1000 |
| D (mm) | fz (mm/z) | fz (mm/z) | fz (mm/z) | fz (mm/z) |
| 2 | 0.027 | 0.023 | 0.019 | 0.027 |
| 3 | 0.034 | 0.029 | 0.024 | 0.034 |
| 4 | 0.045 | 0.038 | 0.032 | 0.045 |
| 5 | 0.056 | 0.048 | 0.040 | 0.056 |
| 6 | 0.068 | 0.057 | 0.047 | 0.068 |
| 8 | 0.090 | 0.076 | 0.063 | 0.090 |
| 10 | 0.112 | 0.096 | 0.079 | 0.112 |
| 12 | 0.134 | 0.114 | 0.094 | 0.134 |

< D3 ap x ae D x 0.5D

CARBIDE END-MILLS

- G2
- MDTA
- HF VH/UP
- MEF
- ALU**
- MEX/MH
- UH/MH

HSS END-MILLS

CARBIDE BURRS