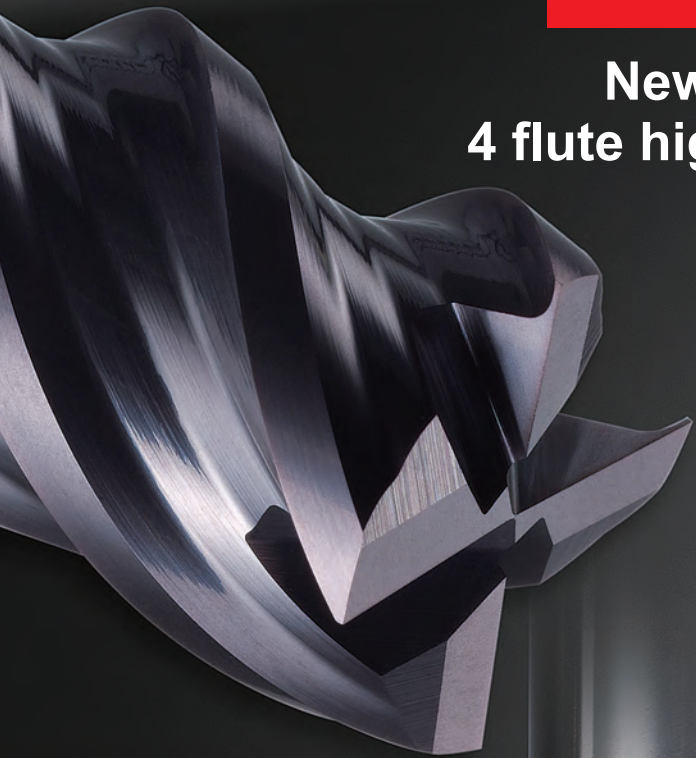


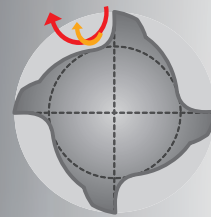
MSTAR 4 flute high power end mill

MSMHD

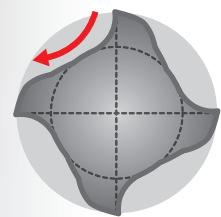
New addition to the **MSTAR** series.
4 flute high power end mills now available.



■ A new flute geometry for slotting,
for excellent chip disposability.

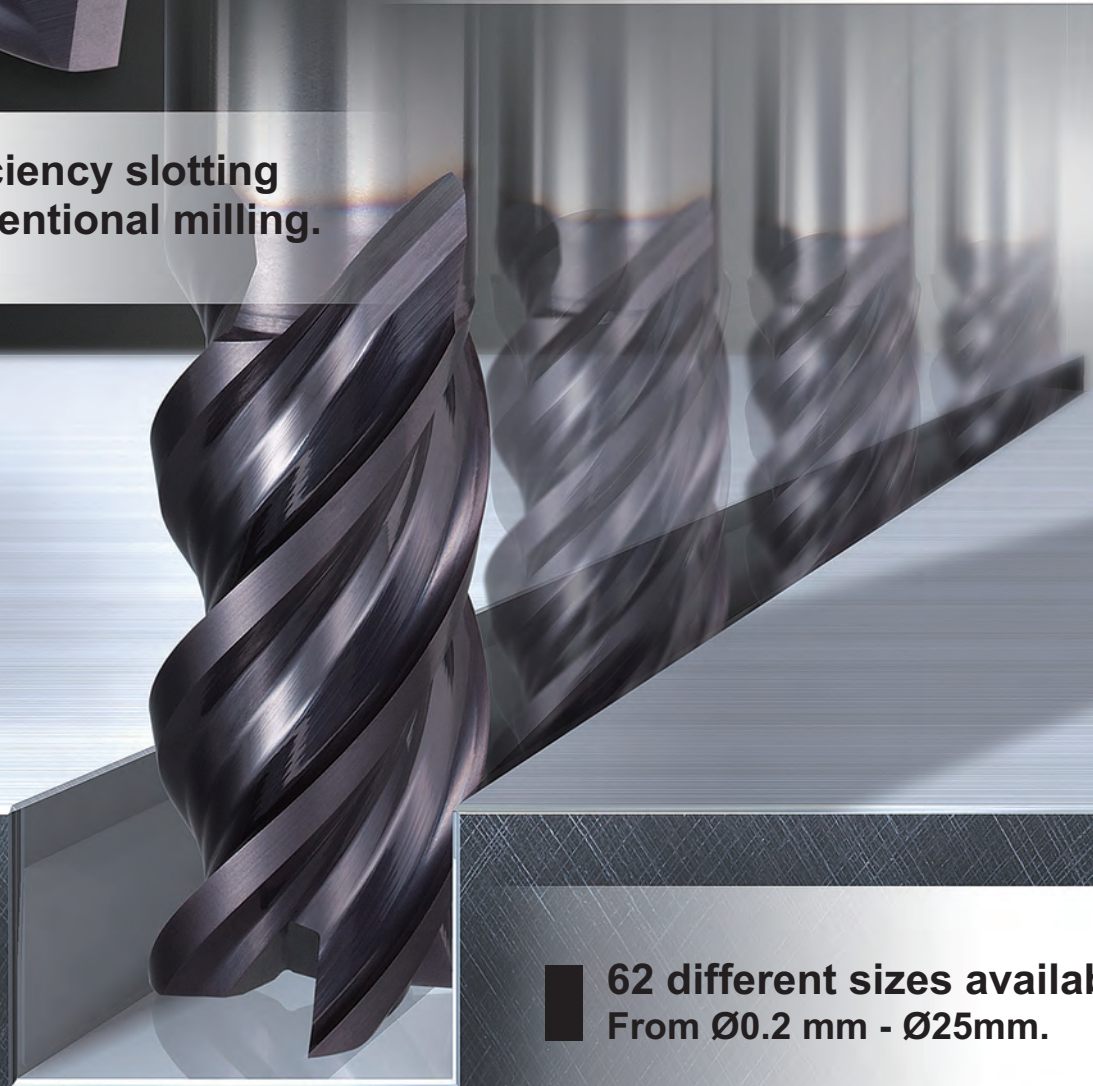


Conventional geometry



MSMHD

■ High efficiency slotting
and conventional milling.



■ 62 different sizes available.
From $\varnothing 0.2$ mm - $\varnothing 25$ mm.

MSTAR END MILL

MSMHD

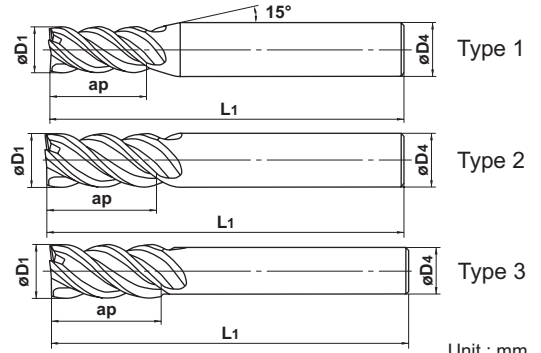
High power, Medium cut length, 4 flute



D1 ≤ 12 0 - -0.02
12 < D1 0 - -0.03



● 4 flute high helix end mill for heavy duty milling



Unit : mm

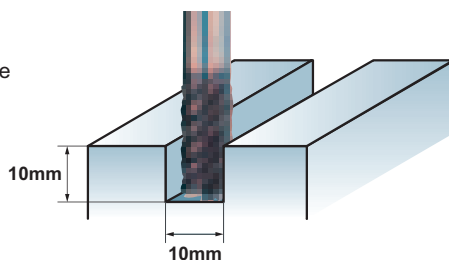
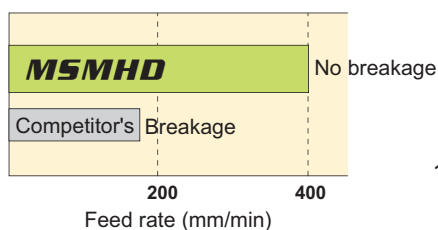
| Order Number | Dia. D1 | Length of Cut ap | Overall Length L1 | Shank Dia. D4 | No. of Flutes N | Stock | Type |
|--------------|------------|---------------------|----------------------|------------------|--------------------|-------|------|
| MSMHDD0200 | 2 | 4 | 45 | 4 | 4 | ● | 1 |
| D0210 | 2.1 | 5 | 45 | 4 | 4 | ● | 1 |
| D0220 | 2.2 | 5 | 45 | 4 | 4 | ● | 1 |
| D0230 | 2.3 | 5 | 45 | 4 | 4 | ● | 1 |
| D0240 | 2.4 | 5 | 45 | 4 | 4 | ● | 1 |
| D0250 | 2.5 | 5 | 45 | 4 | 4 | ● | 1 |
| D0260 | 2.6 | 6 | 45 | 4 | 4 | ● | 1 |
| D0270 | 2.7 | 6 | 45 | 4 | 4 | ● | 1 |
| D0280 | 2.8 | 6 | 45 | 4 | 4 | ● | 1 |
| D0290 | 2.9 | 6 | 45 | 4 | 4 | ● | 1 |
| D0300 | 3 | 8 | 45 | 6 | 4 | ● | 1 |
| D0310 | 3.1 | 8 | 45 | 6 | 4 | ● | 1 |
| D0320 | 3.2 | 8 | 45 | 6 | 4 | ● | 1 |
| D0330 | 3.3 | 8 | 45 | 6 | 4 | ● | 1 |
| D0340 | 3.4 | 8 | 45 | 6 | 4 | ● | 1 |
| D0350 | 3.5 | 8 | 45 | 6 | 4 | ● | 1 |
| D0360 | 3.6 | 11 | 45 | 6 | 4 | ● | 1 |
| D0370 | 3.7 | 11 | 45 | 6 | 4 | ● | 1 |
| D0380 | 3.8 | 11 | 45 | 6 | 4 | ● | 1 |
| D0390 | 3.9 | 11 | 45 | 6 | 4 | ● | 1 |
| D0400 | 4 | 11 | 45 | 6 | 4 | ● | 1 |
| D0410 | 4.1 | 12 | 45 | 6 | 4 | ● | 1 |
| D0420 | 4.2 | 12 | 45 | 6 | 4 | ● | 1 |
| D0430 | 4.3 | 12 | 45 | 6 | 4 | ● | 1 |
| D0440 | 4.4 | 12 | 45 | 6 | 4 | ● | 1 |
| D0450 | 4.5 | 12 | 45 | 6 | 4 | ● | 1 |
| D0460 | 4.6 | 13 | 50 | 6 | 4 | ● | 1 |
| D0470 | 4.7 | 13 | 50 | 6 | 4 | ● | 1 |
| D0480 | 4.8 | 13 | 50 | 6 | 4 | ● | 1 |
| D0490 | 4.9 | 13 | 50 | 6 | 4 | ● | 1 |
| D0500 | 5 | 13 | 50 | 6 | 4 | ● | 1 |
| D0510 | 5.1 | 13 | 50 | 6 | 4 | ● | 1 |
| D0520 | 5.2 | 13 | 50 | 6 | 4 | ● | 1 |
| D0530 | 5.3 | 13 | 50 | 6 | 4 | ● | 1 |
| D0540 | 5.4 | 13 | 50 | 6 | 4 | ● | 1 |
| D0550 | 5.5 | 13 | 50 | 6 | 4 | ● | 1 |
| D0560 | 5.6 | 13 | 50 | 6 | 4 | ● | 1 |
| D0570 | 5.7 | 13 | 50 | 6 | 4 | ● | 1 |

| Order Number | Dia. D1 | Length of Cut ap | Overall Length L1 | Shank Dia. D4 | No. of Flutes N | Stock | Type | |
|-------------------|------------|---------------------|----------------------|------------------|--------------------|-------|------|--|
| MSMHDD0580 | 5.8 | 13 | 50 | 6 | 4 | ● | 1 | |
| D0590 | 5.9 | 13 | 50 | 6 | 4 | ● | 1 | |
| D0600 | 6 | 13 | 50 | 6 | 4 | ● | 2 | |
| D0650 | 6.5 | 16 | 60 | 8 | 4 | ● | 1 | |
| D0700 | 7 | 19 | 60 | 8 | 4 | ● | 1 | |
| D0750 | 7.5 | 19 | 60 | 8 | 4 | ● | 1 | |
| D0800 | 8 | 19 | 60 | 8 | 4 | ● | 2 | |
| D0850 | 8.5 | 19 | 70 | 10 | 4 | ● | 1 | |
| D0900 | 9 | 22 | 70 | 10 | 4 | ● | 1 | |
| D0950 | 9.5 | 22 | 70 | 10 | 4 | ● | 1 | |
| D1000 | 10 | 22 | 70 | 10 | 4 | ● | 2 | |
| D1100 | 11 | 26 | 75 | 12 | 4 | ● | 1 | |
| D1200S10 | 12 | 26 | 75 | 10 | 4 | ● | 3 | |
| D1200 | 12 | 26 | 75 | 12 | 4 | ● | 2 | |
| D1300 | 13 | 26 | 75 | 12 | 4 | ● | 3 | |
| D1400 | 14 | 30 | 90 | 16 | 4 | ● | 1 | |
| D1500 | 15 | 35 | 90 | 16 | 4 | ● | 1 | |
| D1600 | 16 | 35 | 90 | 16 | 4 | ● | 2 | |
| D1700 | 17 | 35 | 100 | 16 | 4 | ● | 3 | |
| D1800 | 18 | 40 | 100 | 16 | 4 | ● | 3 | |
| D1900 | 19 | 40 | 110 | 20 | 4 | ● | 1 | |
| D2000 | 20 | 45 | 110 | 20 | 4 | ● | 2 | |
| D2200 | 22 | 50 | 125 | 20 | 4 | ● | 3 | |
| D2500 | 25 | 55 | 125 | 25 | 4 | ● | 2 | |

Machining Example

Slotting

Newly designed geometry for excellent chip disposability during slotting.



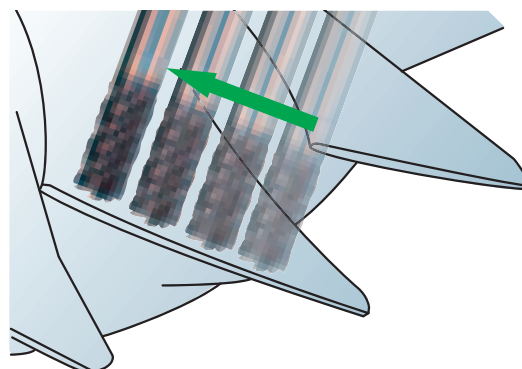
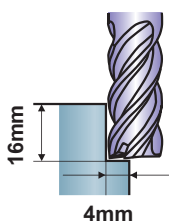
| | |
|----------------|----------------------------------|
| End mill | MSMHD $\phi 10$ |
| Work material | Stainless steel (SUS304) |
| Revolution | $1,600\text{min}^{-1}$ (50m/min) |
| Feed rate | 50—400mm/min |
| Cutting method | Slotting, Air blow |

Side milling of aircraft component

Higher efficiency than conventional end mills.

Feed rate: Increased x 1.7

| | | |
|----------------|------------------------------------|------------------------------------|
| End mill | MSMHD $\phi 16$ | Competitor's |
| Work material | Stainless steel (SUS304) | |
| Revolution | 600min^{-1} (30m/min) | 360min^{-1} (18m/min) |
| Feed rate | 85mm/min (0.035mm/tooth) | 50mm/min (0.035mm/tooth) |
| Cutting method | Climb cut, Emulsion | |



MSTAR END MILL

Side milling

| Work material | Carbon steel, Alloy steel (-30HRC) SS400, S50C, SCM Cast iron FC250 | | Alloy steel, Tool steel Pre-hardened steel (30-45HRC) SKD61, NAK | | Austenitic stainless steel SUS304, SU316 | | Hardened steel (45-55HRC) SKD61 | |
|---------------|---|---------------------------------|--|---------------------------------|---|---------------------------------|------------------------------------|---------------------------------|
| | Dia. (mm) | Revolution (min ⁻¹) | Feed rate (mm/min) | Revolution (min ⁻¹) | Feed rate (mm/min) | Revolution (min ⁻¹) | Feed rate (mm/min) | Revolution (min ⁻¹) |
| 2 | 15,000 | 550 | 10,000 | 340 | 10,000 | 320 | 6,400 | 160 |
| 3 | 11,000 | 800 | 7,400 | 500 | 7,400 | 480 | 4,800 | 250 |
| 4 | 8,000 | 900 | 5,600 | 540 | 5,600 | 520 | 3,600 | 270 |
| 5 | 6,400 | 1,000 | 4,500 | 600 | 4,500 | 580 | 2,900 | 300 |
| 6 | 5,800 | 1,100 | 3,700 | 640 | 3,700 | 600 | 2,400 | 320 |
| 8 | 4,400 | 1,100 | 2,800 | 660 | 2,800 | 600 | 1,800 | 330 |
| 10 | 3,500 | 1,000 | 2,200 | 640 | 2,200 | 560 | 1,400 | 320 |
| 12 | 2,900 | 1,000 | 1,900 | 640 | 1,900 | 530 | 1,200 | 320 |
| 16 | 2,200 | 800 | 1,400 | 500 | 1,400 | 450 | 900 | 250 |
| 20 | 1,800 | 750 | 1,100 | 460 | 1,100 | 440 | 720 | 230 |
| 25 | 1,400 | 600 | 900 | 400 | 900 | 380 | 570 | 200 |

| Depth of cut | 0.2D | | 0.1D | | 0.05D | |
|--------------|------|--|------|--|-------|--|
| | | | | | | |
| | 1.5D | | 1.5D | | 1.5D | |

D: Dia.

Slotting

| Work material | Carbon steel, Alloy steel (-30HRC) SS400, S50C, SCM Cast iron FC250 | | Alloy steel, Tool steel Pre-hardened steel (30-45HRC) SKD61, NAK | | Austenitic stainless steel SUS304, SU316 | | Hardened steel (45-55HRC) SKD61 | |
|---------------|---|---------------------------------|--|---------------------------------|---|---------------------------------|------------------------------------|---------------------------------|
| | Dia. (mm) | Revolution (min ⁻¹) | Feed rate (mm/min) | Revolution (min ⁻¹) | Feed rate (mm/min) | Revolution (min ⁻¹) | Feed rate (mm/min) | Revolution (min ⁻¹) |
| 2 | 12,000 | 400 | 7,000 | 200 | 7,000 | 100 | 4,200 | 80 |
| 3 | 9,000 | 600 | 5,300 | 300 | 5,300 | 150 | 3,200 | 130 |
| 4 | 7,200 | 720 | 4,000 | 360 | 4,000 | 180 | 2,400 | 140 |
| 5 | 5,800 | 720 | 3,200 | 360 | 3,200 | 180 | 1,900 | 150 |
| 6 | 5,000 | 800 | 2,700 | 400 | 2,700 | 200 | 1,600 | 160 |
| 8 | 3,700 | 800 | 2,000 | 400 | 2,000 | 200 | 1,200 | 170 |
| 10 | 3,000 | 720 | 1,600 | 360 | 1,600 | 180 | 960 | 160 |
| 12 | 2,500 | 720 | 1,300 | 360 | 1,300 | 180 | 800 | 160 |
| 16 | 2,000 | 600 | 1,000 | 280 | 1,000 | 150 | 600 | 130 |
| 20 | 1,600 | 540 | 800 | 250 | 800 | 130 | 480 | 120 |
| 25 | 1,300 | 480 | 640 | 220 | 640 | 120 | 380 | 100 |

| Depth of cut | 1D | | 0.5D | | 0.2D | |
|--------------|----------------|--|------|--|------|--|
| | | | | | | |
| | 1D (MAX. 12mm) | | 0.5D | | 0.2D | |

D: Dia.

- 1) When cutting austenitic steels, the use of water-soluble fluid is recommended.
- 2) If the depth of cut is shallow, the revolution and feed rate can be increased.
- 3) If the rigidity of the machine or the work material installation is very low, or chattering is generated, please reduce the revolution and feed rate proportionately, or set a smaller depth of cut.
- 4) For side milling, climb cutting is recommended.

MITSUBISHI MATERIALS KOBE TOOLS



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MITSUBISHI MATERIALS CORPORATION MARKETING DEPT.

KFC bldg., 8F, 1-6-1, Yokoami, Sumida-ku, Tokyo 130-0015, Japan
TEL 81-3-5819-8772 FAX 81-3-5819-8774

MMC HARTMETALL GmbH

Comeniusstr.2, 40670, Meerbusch GERMANY
TEL 49-2159-9189-0 FAX 49-2159-50462

MITSUBISHI MATERIALS U.S.A. CORPORATION Headquarters

17401, Eastman Street, Irvine, California, 92614, USA
TEL 1-949-862-5100 FAX 1-949-862-5180

MMC METAL SINGAPORE PTE LTD.

10, Arumugam Road, #04-00 Lion Industrial Bldg., 409957, SINGAPORE
TEL 65-6743-9370 FAX 65-6749-1469