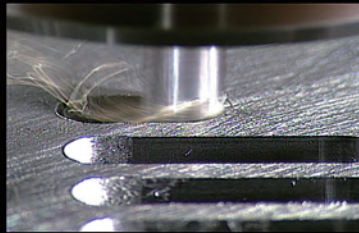
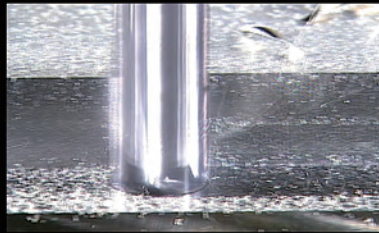
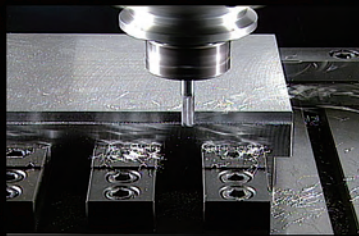
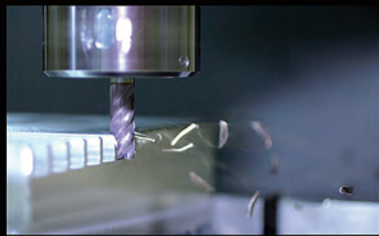
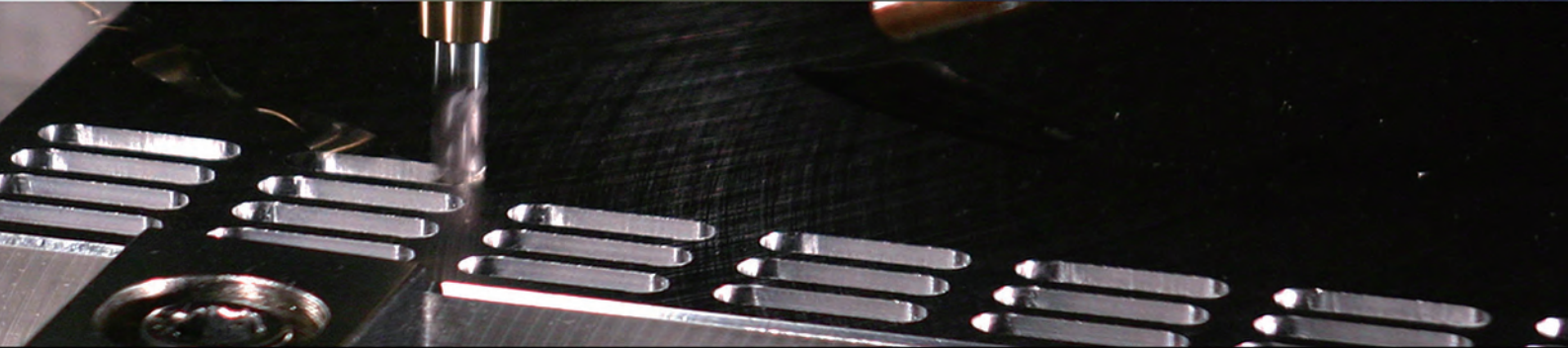
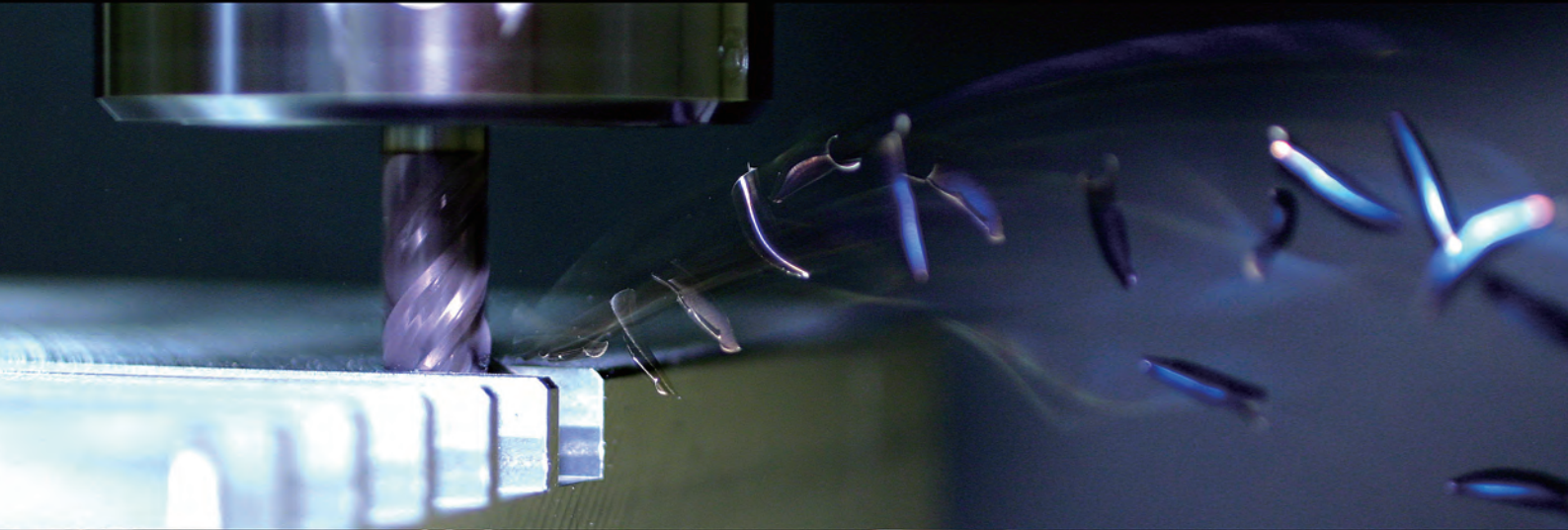


MSTAR

high helix end mill series

Possible to achieve high efficiency machining of a wide range of work materials, such as carbon and stainless steel and difficult to machine materials.

By using a special flute geometry that enables high chip disposal, it is possible to achieve high performance machining.



MSTAR high helix end mill series

MSSH D MSMHD
MSJHD MSMHDRB
MSMHZD

Realize high efficiency machining in Carbon steel, Stainless steel and difficult-to-cut materials.

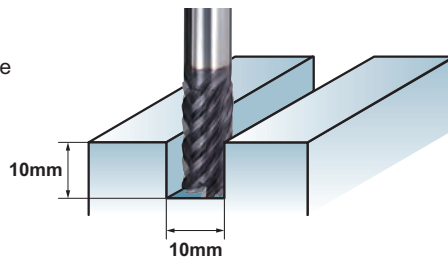
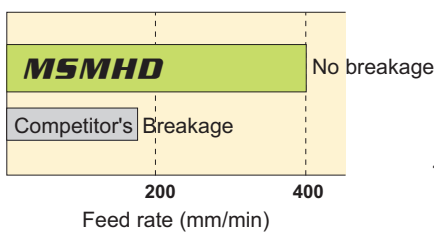
- A new flute geometry for slotting, with excellent chip disposability.
- For high efficiency slotting and conventional milling.
- 3 flute end mill series that can be used for non-step vertical feed and slotting.

| | | |
|---------|---|--|
| 4 flute | <p>Flute shape</p> <p>Special flute geometry for improved chip disposal.</p> <p>Conventional geometry MSTAR high power end mill</p> | <p>Close up of the flute geometry</p> <p>Poor chip disposal Chips are guided by the bump to improve chip disposal</p> <p>Conventional geometry MSTAR high power end mill</p> |
| | <p>Flute shape</p> <p>High rigidity and smooth chip flow is realized.</p> <p>A chip flow is smooth High rigidity Big care dia</p> <p>Wide relief width High rigidity</p> <p>MSMHZD Conventional</p> | <p>Gash geometry</p> <p>Smooth chip flow due to big chip pocket at plunging.</p> <p>Big chip pocket</p> <p>MSMHZD Conventional</p> |

Machining Example 1

Slotting

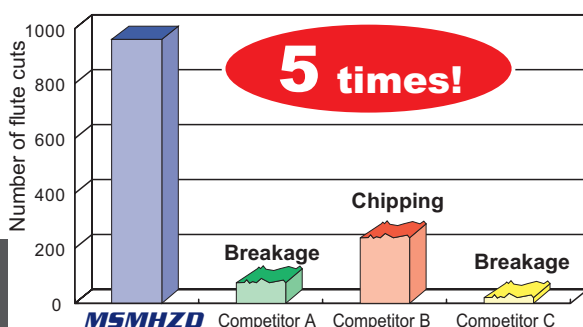
Newly designed geometry for excellent chip disposability during slotting.



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

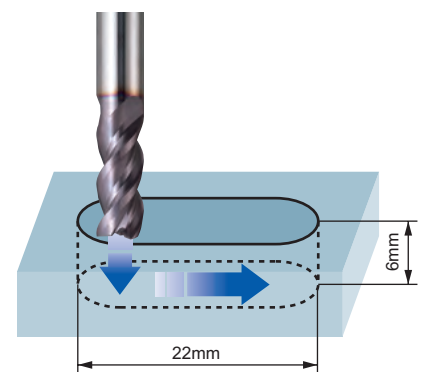
Machining Example 2

Slotting



Cutting conditions

| | |
|----------------|--|
| End mill | MSMHZD $\phi 6$ |
| Work material | S55C |
| Revolution | 4,800min ⁻¹ |
| Feed rate | Plunging 300mm/min Slotting 720mm/min |
| Cutting method | Air blow |



MSTAR END MILL

MSSHDD NEW

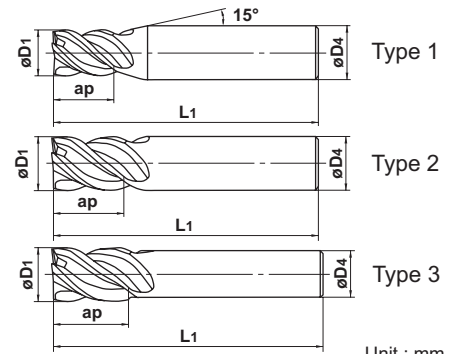
High power, Short cut length, 4 flute



D1 ≤ 12 0 - -0.02
12 < D1 0 - -0.03



● High rigidity short cut length type which adopted a new flute geometry and high helix.



Unit : mm

| Order Number | Dia. D1 | Length of Cut ap | Overall Length L1 | Shank Dia. D4 | No. of Flutes N | Stock | Type |
|--------------|------------|------------------------|-------------------------|------------------|-----------------------|-------|------|
| MSSHDD0300 | 3 | 4.5 | 45 | 6 | 4 | ● | 1 |
| D0350 | 3.5 | 5.3 | 45 | 6 | 4 | ● | 1 |
| D0400 | 4 | 6 | 45 | 6 | 4 | ● | 1 |
| D0450 | 4.5 | 6.8 | 45 | 6 | 4 | ● | 1 |
| D0500 | 5 | 7.5 | 50 | 6 | 4 | ● | 1 |
| D0550 | 5.5 | 8.3 | 50 | 6 | 4 | ● | 1 |
| D0600 | 6 | 9 | 50 | 6 | 4 | ● | 2 |
| D0650 | 6.5 | 9.8 | 60 | 8 | 4 | ● | 1 |
| D0700 | 7 | 10.5 | 60 | 8 | 4 | ● | 1 |
| D0750 | 7.5 | 11.3 | 60 | 8 | 4 | ● | 1 |
| D0800 | 8 | 12 | 60 | 8 | 4 | ● | 2 |
| D0850 | 8.5 | 12.8 | 70 | 10 | 4 | ● | 1 |
| D0900 | 9 | 13.5 | 70 | 10 | 4 | ● | 1 |
| D0950 | 9.5 | 14.3 | 70 | 10 | 4 | ● | 1 |
| D1000 | 10 | 15 | 70 | 10 | 4 | ● | 2 |
| D1100 | 11 | 16.5 | 75 | 12 | 4 | ● | 1 |
| D1200 | 12 | 18 | 75 | 12 | 4 | ● | 2 |
| D1300 | 13 | 19.5 | 75 | 12 | 4 | ● | 3 |
| D1400 | 14 | 21 | 90 | 16 | 4 | ● | 1 |
| D1500 | 15 | 22.5 | 90 | 16 | 4 | ● | 1 |
| D1600 | 16 | 24 | 90 | 16 | 4 | ● | 2 |
| D1700 | 17 | 25.5 | 100 | 16 | 4 | ● | 3 |
| D1800 | 18 | 27 | 100 | 16 | 4 | ● | 3 |
| D1900 | 19 | 28.5 | 110 | 20 | 4 | ● | 1 |
| D2000 | 20 | 30 | 110 | 20 | 4 | ● | 2 |

● : Inventory maintained.

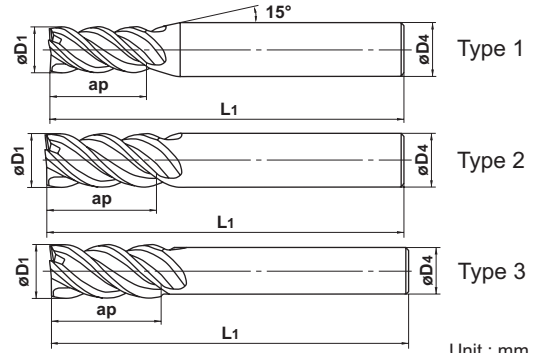
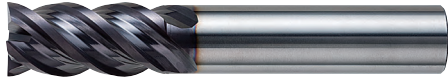
MSTAR END MILL

MSMHD

High power, Medium cut length, 4 flute



D1 ≤ 12 0 - -0.02
12 < D1 0 - -0.03



Unit : mm

● A new flute geometry and high helix allows heavy cutting in shoulder milling and slotting.

| 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 |

Unit : mm

| 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 | |

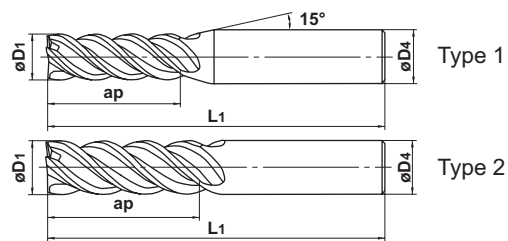
MSTAR END MILL

MSJHD NEW

High power, Semi long cut length, 4 flute



$D_1 \leq 12$ 0 - -0.02
 $12 < D_1$ 0 - -0.03



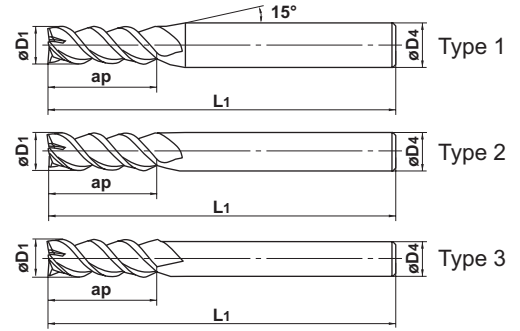
- Semi long cut length suitable for deep wall machining and adopted a new flute geometry and high helix.

Unit : mm

| Order Number | Dia. D1 | Length of Cut ap | Overall Length L1 | Shank Dia. D4 | No. of Flutes N | Stock | Type |
|--------------|------------|------------------------|-------------------------|------------------|-----------------------|-------|------|
| MSJHDD0200 | 2 | 8 | 60 | 6 | 4 | ● | 1 |
| D0250 | 2.5 | 10 | 60 | 6 | 4 | ● | 1 |
| D0300 | 3 | 12 | 60 | 6 | 4 | ● | 1 |
| D0350 | 3.5 | 14 | 60 | 6 | 4 | ● | 1 |
| D0400 | 4 | 16 | 60 | 6 | 4 | ● | 1 |
| D0450 | 4.5 | 18 | 60 | 6 | 4 | ● | 1 |
| D0500 | 5 | 20 | 60 | 6 | 4 | ● | 1 |
| D0600 | 6 | 24 | 60 | 6 | 4 | ● | 2 |
| D0700 | 7 | 25 | 80 | 8 | 4 | ● | 1 |
| D0800 | 8 | 28 | 80 | 8 | 4 | ● | 2 |
| D0900 | 9 | 32 | 90 | 10 | 4 | ● | 1 |
| D1000 | 10 | 35 | 90 | 10 | 4 | ● | 2 |
| D1100 | 11 | 35 | 100 | 12 | 4 | ● | 1 |
| D1200 | 12 | 36 | 100 | 12 | 4 | ● | 2 |
| D1400 | 14 | 42 | 110 | 16 | 4 | ● | 1 |
| D1500 | 15 | 45 | 110 | 16 | 4 | ● | 1 |
| D1600 | 16 | 48 | 125 | 16 | 4 | ● | 2 |
| D2000 | 20 | 55 | 140 | 20 | 4 | ● | 2 |



● The single end mill for both plunging and slotting.



Unit : mm

| Order Number | Dia. D1 | Length of Cut ap | Overall Length L1 | Shank Dia. D4 | No. of Flutes N | Stock | Type |
|---------------|------------|------------------------|-------------------------|------------------|-----------------------|-------|------|
| * MSMHZDD0100 | 1 | 2 | 45 | 4 | 3 | ● | 1 |
| * D0150 | 1.5 | 3 | 45 | 4 | 3 | ● | 1 |
| D0200 | 2 | 4 | 50 | 6 | 3 | ● | 1 |
| D0250 | 2.5 | 5 | 50 | 6 | 3 | ● | 1 |
| D0300 | 3 | 6 | 50 | 6 | 3 | ● | 1 |
| D0350 | 3.5 | 8 | 50 | 6 | 3 | ● | 1 |
| D0400 | 4 | 8 | 50 | 6 | 3 | ● | 1 |
| D0450 | 4.5 | 10 | 50 | 6 | 3 | ● | 1 |
| D0500 | 5 | 10 | 50 | 6 | 3 | ● | 1 |
| D0550 | 5.5 | 13 | 50 | 6 | 3 | ● | 1 |
| D0600 | 6 | 13 | 60 | 6 | 3 | ● | 2 |
| D0650 | 6.5 | 16 | 60 | 8 | 3 | ● | 1 |
| D0700 | 7 | 16 | 60 | 8 | 3 | ● | 1 |
| D0750 | 7.5 | 16 | 60 | 8 | 3 | ● | 1 |
| D0800 | 8 | 19 | 70 | 8 | 3 | ● | 2 |
| D0850 | 8.5 | 19 | 70 | 10 | 3 | ● | 1 |
| D0900 | 9 | 19 | 70 | 10 | 3 | ● | 1 |
| D0950 | 9.5 | 19 | 70 | 10 | 3 | ● | 1 |
| D1000 | 10 | 22 | 80 | 10 | 3 | ● | 2 |
| D1100 | 11 | 22 | 80 | 12 | 3 | ● | 1 |
| D1200 | 12 | 26 | 90 | 12 | 3 | ● | 2 |
| D1300 | 13 | 26 | 90 | 12 | 3 | ● | 3 |
| D1400 | 14 | 26 | 90 | 12 | 3 | ● | 3 |
| D1500 | 15 | 26 | 110 | 16 | 3 | ● | 1 |
| D1600 | 16 | 30 | 110 | 16 | 3 | ● | 2 |
| D2000 | 20 | 32 | 140 | 20 | 3 | ● | 2 |

* Expansion

MSTAR END MILL

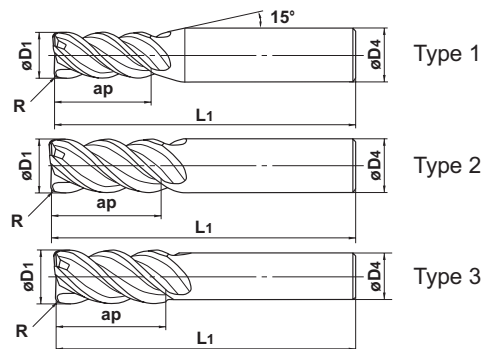
MSMHDRB



Corner radius end mill, High power, Medium cut length, 4 flute



$D_1 \leq 12$ 0 - -0.02
 $12 < D_1$ 0 - -0.03



Unit : mm

● Radius end mill which adopted a new flute geometry and high helix.

| Order Number | Dia. D1 | Length of Cut ap | Overall Length L1 | Shank Dia. D4 | Corner R R | No. of Flutes N | Stock | Type |
|------------------|------------|------------------------|-------------------------|------------------|---------------|-----------------------|-------|------|
| MSMHDRBD0200R020 | 2 | 4 | 45 | 4 | 0.2 | 4 | ● | 1 |
| D0200R030 | 2 | 4 | 45 | 4 | 0.3 | 4 | ● | 1 |
| D0300R020 | 3 | 8 | 45 | 6 | 0.2 | 4 | ● | 1 |
| D0300R030 | 3 | 8 | 45 | 6 | 0.3 | 4 | ● | 1 |
| D0300R050 | 3 | 8 | 45 | 6 | 0.5 | 4 | ● | 1 |
| D0400R020 | 4 | 11 | 45 | 6 | 0.2 | 4 | ● | 1 |
| D0400R030 | 4 | 11 | 45 | 6 | 0.3 | 4 | ● | 1 |
| D0400R050 | 4 | 11 | 45 | 6 | 0.5 | 4 | ● | 1 |
| D0500R020 | 5 | 13 | 50 | 6 | 0.2 | 4 | ● | 1 |
| D0500R030 | 5 | 13 | 50 | 6 | 0.3 | 4 | ● | 1 |
| D0500R050 | 5 | 13 | 50 | 6 | 0.5 | 4 | ● | 1 |
| D0500R100 | 5 | 13 | 50 | 6 | 1 | 4 | ● | 1 |
| D0600R030 | 6 | 13 | 50 | 6 | 0.3 | 4 | ● | 2 |
| D0600R050 | 6 | 13 | 50 | 6 | 0.5 | 4 | ● | 2 |
| D0600R100 | 6 | 13 | 50 | 6 | 1 | 4 | ● | 2 |
| D0800R030 | 8 | 19 | 60 | 8 | 0.3 | 4 | ● | 2 |
| D0800R050 | 8 | 19 | 60 | 8 | 0.5 | 4 | ● | 2 |
| D0800R100 | 8 | 19 | 60 | 8 | 1 | 4 | ● | 2 |
| D0800R150 | 8 | 19 | 60 | 8 | 1.5 | 4 | ● | 2 |
| D1000R030 | 10 | 22 | 70 | 10 | 0.3 | 4 | ● | 2 |
| D1000R050 | 10 | 22 | 70 | 10 | 0.5 | 4 | ● | 2 |
| D1000R100 | 10 | 22 | 70 | 10 | 1 | 4 | ● | 2 |
| D1000R150 | 10 | 22 | 70 | 10 | 1.5 | 4 | ● | 2 |
| D1000R200 | 10 | 22 | 70 | 10 | 2 | 4 | ● | 2 |
| D1200R050S10 | 12 | 26 | 75 | 10 | 0.5 | 4 | ● | 3 |
| D1200R100S10 | 12 | 26 | 75 | 10 | 1 | 4 | ● | 3 |
| D1200R150S10 | 12 | 26 | 75 | 10 | 1.5 | 4 | ● | 3 |
| D1200R200S10 | 12 | 26 | 75 | 10 | 2 | 4 | ● | 3 |
| D1200R300S10 | 12 | 26 | 75 | 10 | 3 | 4 | ● | 3 |
| D1200R050 | 12 | 26 | 75 | 12 | 0.5 | 4 | ● | 2 |
| D1200R100 | 12 | 26 | 75 | 12 | 1 | 4 | ● | 2 |
| D1200R150 | 12 | 26 | 75 | 12 | 1.5 | 4 | ● | 2 |
| D1200R200 | 12 | 26 | 75 | 12 | 2 | 4 | ● | 2 |
| D1200R300 | 12 | 26 | 75 | 12 | 3 | 4 | ● | 2 |
| D1600R100 | 16 | 35 | 90 | 16 | 1 | 4 | ● | 2 |
| D1600R150 | 16 | 35 | 90 | 16 | 1.5 | 4 | ● | 2 |
| D1600R200 | 16 | 35 | 90 | 16 | 2 | 4 | ● | 2 |
| D1600R300 | 16 | 35 | 90 | 16 | 3 | 4 | ● | 2 |

Unit : mm

| Order Number | Dia. D1 | Length of Cut ap | Overall Length L1 | Shank Dia. D4 | Corner R R | No. of Flutes N | Stock | Type | |
|-------------------------|------------|------------------------|-------------------------|------------------|---------------|-----------------------|-------|------|--|
| MSMHDRBD1800R100 | 18 | 40 | 100 | 16 | 1 | 4 | ● | 3 | |
| D1800R150 | 18 | 40 | 100 | 16 | 1.5 | 4 | ● | 3 | |
| D1800R200 | 18 | 40 | 100 | 16 | 2 | 4 | ● | 3 | |
| D1800R300 | 18 | 40 | 100 | 16 | 3 | 4 | ● | 3 | |
| D2000R100 | 20 | 45 | 110 | 20 | 1 | 4 | ● | 2 | |
| D2000R150 | 20 | 45 | 110 | 20 | 1.5 | 4 | ● | 2 | |
| D2000R200 | 20 | 45 | 110 | 20 | 2 | 4 | ● | 2 | |
| D2000R300 | 20 | 45 | 110 | 20 | 3 | 4 | ● | 2 | |

MSTAR END MILL

MSSH D

High power, Short cut length, 4 flute

MSMHD

High power, Medium cut length, 4 flute

Side milling

| Work material | Carbon steel, Alloy steel (-30HRC) Structural steel, AISI 1049, SCM, Cast iron AISI 35 | | Alloy steel, Tool steel Pre-hardened steel (30-45HRC) AISI H13, NAK | | Austenitic stainless steel AISI 304, AISI 316 | | Hardened steel (45-55HRC) AISI H13 | |
|---------------|---|---------------------------------|--|---------------------------------|--|---------------------------------|---------------------------------------|---------------------------------|
| | 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 |

0.2D
1.5D

0.1D
1.5D

0.05D
1.5D

D: Dia.

Slotting

| Work material | Carbon steel, Alloy steel (-30HRC) Structural steel, AISI 1049, SCM, Cast iron AISI 35 | | Alloy steel, Tool steel Pre-hardened steel (30-45HRC) AISI H13, NAK | | Austenitic stainless steel AISI 304, AISI 316 | | Hardened steel (45-55HRC) AISI H13 | |
|---------------|---|---------------------------------|--|---------------------------------|--|---------------------------------|---------------------------------------|---------------------------------|
| | 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 |

1D
1D (MAX. 12mm)

1D
0.5D

1D
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.

MSJHD

High power, Semi long cut length, 4 flute

Side milling

| Work material | Carbon steel, Alloy steel (-30HRC) Structural steel, AISI 1049, SCM, Cast iron AISI 35 | | Alloy steel, Tool steel Pre-hardened steel (30-45HRC) AISI H13, NAK | | Austenitic stainless steel AISI 304, AISI 316 | | Hardened steel (45-55HRC) AISI H13 | |
|---------------|---|---------------------------------|--|---------------------------------|--|---------------------------------|---------------------------------------|---------------------------------|
| | 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 | 11,000 | 370 | 7,000 | 230 | 7,000 | 210 | 5,000 | 100 |
| 3 | 8,000 | 550 | 5,100 | 320 | 5,100 | 300 | 3,800 | 190 |
| 4 | 6,200 | 620 | 4,000 | 350 | 4,000 | 340 | 3,000 | 210 |
| 5 | 5,000 | 670 | 3,200 | 370 | 3,200 | 360 | 2,400 | 220 |
| 6 | 4,200 | 750 | 2,600 | 400 | 2,600 | 390 | 2,000 | 220 |
| 8 | 3,200 | 780 | 2,000 | 420 | 2,000 | 400 | 1,500 | 230 |
| 10 | 2,500 | 690 | 1,600 | 410 | 1,600 | 380 | 1,200 | 210 |
| 12 | 2,100 | 670 | 1,300 | 380 | 1,300 | 340 | 1,000 | 190 |
| 16 | 1,600 | 570 | 1,000 | 320 | 1,000 | 280 | 750 | 170 |
| 20 | 1,200 | 470 | 800 | 290 | 800 | 260 | 600 | 150 |

0.05D
2.5D

0.02D
2.5D

D: Dia.

- 1) When cutting austenitic stainless steels and wear resistant alloys, the use of non-water-soluble cutting fluid is especially effective.
- 2) If the rigidity of the machine or the work piece installation is very low, or chattering and noise are generated, please reduce the revolution, and feed rate proportionately.
In addition, if the work pieces have bad surface finish, there is a possibility that chattering and noise are generated.
- 3) Climb cutting is recommended.

Side milling

| Work material | Carbon steel, Alloy steel (-30HRC) AISI 1049, SCM, SS | | Hardened steel (30-45HRC) AISI H13 | | Stainless steel AISI 304, AISI316 Titanium alloy | |
|---------------|--|---------------------------------|---------------------------------------|---------------------------------|---|---------------------------------|
| | Dia. (mm) | Revolution (min ⁻¹) | Feed rate (mm/min) | Revolution (min ⁻¹) | Feed rate (mm/min) | Revolution (min ⁻¹) |
| 1 | 19,000 | 600 | 13,000 | 310 | 10,000 | 200 |
| 1.5 | 14,000 | 600 | 9,000 | 310 | 7,500 | 210 |
| 2 | 11,000 | 600 | 7,200 | 310 | 6,000 | 210 |
| 3 | 8,500 | 770 | 5,300 | 380 | 4,400 | 220 |
| 4 | 7,200 | 850 | 4,400 | 480 | 3,700 | 250 |
| 6 | 5,300 | 940 | 3,200 | 490 | 2,700 | 270 |
| 8 | 4,000 | 1,010 | 2,400 | 560 | 2,000 | 280 |
| 10 | 3,200 | 1,000 | 1,900 | 480 | 1,600 | 300 |
| 12 | 2,700 | 950 | 1,600 | 440 | 1,300 | 300 |
| 16 | 2,000 | 720 | 1,200 | 350 | 1,000 | 260 |
| 20 | 1,600 | 600 | 1,000 | 290 | 800 | 240 |

Depth of cut

$\leq 0.2D$ ($D > \phi 3$)
 $\leq 0.1D$ ($D \leq \phi 3$)

Depth of cut

$\leq 0.2D$ ($D > \phi 3$)
 $\leq 0.1D$ ($D \leq \phi 3$)

D:Dia.

Slotting

| Work material | Carbon steel, Alloy steel (-30HRC) AISI 1049, SCM, SS | | Hardened steel (30-45HRC) AISI H13 | | Stainless steel AISI 304, AISI316 Titanium alloy | |
|---------------|--|---------------------------------|---------------------------------------|---------------------------------|---|---------------------------------|
| | Dia. (mm) | Revolution (min ⁻¹) | Feed rate (mm/min) | Revolution (min ⁻¹) | Feed rate (mm/min) | Revolution (min ⁻¹) |
| 1 | 13,000 | 130 | 10,000 | 80 | 6,000 | 30 |
| 1.5 | 12,000 | 250 | 8,000 | 150 | 6,000 | 60 |
| 2 | 11,000 | 500 | 7,200 | 260 | 6,000 | 130 |
| 3 | 8,500 | 640 | 5,300 | 320 | 4,200 | 130 |
| 4 | 7,200 | 650 | 4,400 | 370 | 3,300 | 140 |
| 6 | 5,300 | 720 | 3,200 | 380 | 2,200 | 140 |
| 8 | 4,000 | 780 | 2,400 | 430 | 1,600 | 140 |
| 10 | 3,200 | 770 | 1,900 | 370 | 1,300 | 150 |
| 12 | 2,700 | 730 | 1,600 | 340 | 1,100 | 150 |
| 16 | 2,000 | 600 | 1,200 | 290 | 800 | 130 |
| 20 | 1,600 | 500 | 1,000 | 240 | 640 | 120 |

Depth of cut

$\leq 1D$ ($D \geq \phi 2$)
 $\leq 0.5D$ ($D < \phi 2$)

Depth of cut

$\leq 0.5D$ ($D \geq \phi 2$)
 $\leq 0.2D$ ($D < \phi 2$)

D:Dia.

Plunging

| Work material | Carbon steel, Alloy steel (-30HRC) AISI 1049, SCM, SS | | Hardened steel (30-45HRC) AISI H13 | | Stainless steel AISI 304, AISI316 Titanium alloy | |
|---------------|--|---------------------------------|---------------------------------------|---------------------------------|---|---------------------------------|
| | Dia. (mm) | Revolution (min ⁻¹) | Feed rate (mm/min) | Revolution (min ⁻¹) | Feed rate (mm/min) | Revolution (min ⁻¹) |
| 1 | 13,000 | 80 | 10,000 | 50 | 6,000 | 10 |
| 1.5 | 12,000 | 120 | 8,000 | 80 | 6,000 | 20 |
| 2 | 11,000 | 200 | 7,200 | 140 | 6,000 | 30 |
| 3 | 8,500 | 250 | 5,300 | 180 | 4,200 | 50 |
| 4 | 7,200 | 300 | 4,400 | 210 | 3,300 | 60 |
| 6 | 5,300 | 300 | 3,200 | 210 | 2,200 | 70 |
| 8 | 4,000 | 320 | 2,400 | 220 | 1,600 | 80 |
| 10 | 3,200 | 340 | 1,900 | 240 | 1,300 | 70 |
| 12 | 2,700 | 320 | 1,600 | 220 | 1,100 | 70 |
| 16 | 2,000 | 250 | 1,200 | 180 | 800 | 55 |
| 20 | 1,600 | 200 | 1,000 | 140 | 640 | 55 |

Depth of cut

$\leq 1D$ ($D \geq \phi 2$)
 $\leq 0.5D$ ($D < \phi 2$)

Depth of cut

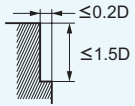
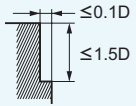
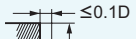
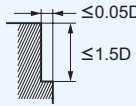
$\leq 0.5D$ ($D \geq \phi 2$)
 $\leq 0.2D$ ($D < \phi 2$)

D:Dia.

- 1) The above table shows for standard milling.
- 2) In slotting, plunging, cutting stainless steels, please use water-soluble cutting fluid.
- 3) We recommend the use of coolant e.g. emulsion or water soluble in slotting, plunging and cutting stainless steels.

Side milling

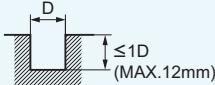
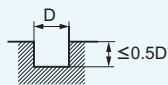
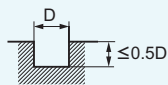
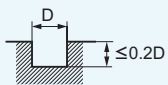
| Work material | Carbon steel, Alloy steel (-30HRC) Structural steel, AISI 1049, SCM, Cast iron AISI 35 | | Alloy steel, Tool steel Pre-hardened steel (30-45HRC) AISI H13, NAK | | Austenitic stainless steel AISI 304, AISI 316 | | Hardened steel (45-55HRC) AISI H13 | |
|---------------|---|---------------------------------|---|---------------------------------|--|---------------------------------|---------------------------------------|---------------------------------|
| | 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 | 5,900 | 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 | 2,300 | 640 | 2,300 | 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 |
| 18 | 2,000 | 800 | 1,250 | 480 | 1,250 | 450 | 800 | 240 |
| 20 | 1,800 | 750 | 1,100 | 460 | 1,100 | 440 | 720 | 230 |

| Depth of cut | Carbon steel, Alloy steel (-30HRC) Structural steel, AISI 1049, SCM, Cast iron AISI 35 | | Alloy steel, Tool steel Pre-hardened steel (30-45HRC) AISI H13, NAK | | Austenitic stainless steel AISI 304, AISI 316 | | Hardened steel (45-55HRC) AISI H13 | |
|--------------|---|---|---|---|--|---|---------------------------------------|---|
| | |  | |  | |  | |  |

D:Dia.

Slotting

| Work material | Carbon steel, Alloy steel (-30HRC) Structural steel, AISI 1049, SCM, Cast iron AISI 35 | | Alloy steel, Tool steel Pre-hardened steel (30-45HRC) AISI H13, NAK | | Austenitic stainless steel AISI 304, AISI 316 | | Hardened steel (45-55HRC) AISI H13 | |
|---------------|---|---------------------------------|---|---------------------------------|--|---------------------------------|---------------------------------------|---------------------------------|
| | 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 | 600 | 1,300 | 290 | 1,300 | 150 | 800 | 140 |
| 16 | 2,000 | 480 | 1,000 | 230 | 1,000 | 120 | 600 | 110 |
| 18 | 1,800 | 460 | 900 | 210 | 900 | 110 | 550 | 110 |
| 20 | 1,600 | 430 | 800 | 200 | 800 | 100 | 480 | 100 |

| Depth of cut | Carbon steel, Alloy steel (-30HRC) Structural steel, AISI 1049, SCM, Cast iron AISI 35 | | Alloy steel, Tool steel Pre-hardened steel (30-45HRC) AISI H13, NAK | | Austenitic stainless steel AISI 304, AISI 316 | | Hardened steel (45-55HRC) AISI H13 | |
|--------------|---|---|---|---|--|---|---------------------------------------|---|
| | |  | |  | |  | |  |

D:Dia.

- 1) When cutting austenitic stainless steels and wear resistant alloys, the use of non-water-soluble cutting fluid is especially effective.
- 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.



JQA-2522
JQA-EM0941

MITSUBISHI MATERIALS KOBE TOOLS

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