



Where **high performance**  
is the **standard**<sup>®</sup>



**M.A. FORD** **MAX**  
RANGE

Indexable Milling



Where **high performance** is the **standard**\*



Innovation is what drives us. Actively searching for fresh solutions to new technical and manufacturing challenges that enable our customers to improve productivity, accuracy and performance by relying on M.A.Ford® to deliver.

Our extensive range of tooling and 'Integrated Manufacturing Solutions' has developed and evolved to become a virtual byword for precision and performance. The principles of high precision and high quality extend beyond our tooling and are present in every aspect of M.A.Ford® Europe to ensure customer demands are consistently met at all levels.



# Indexable Milling

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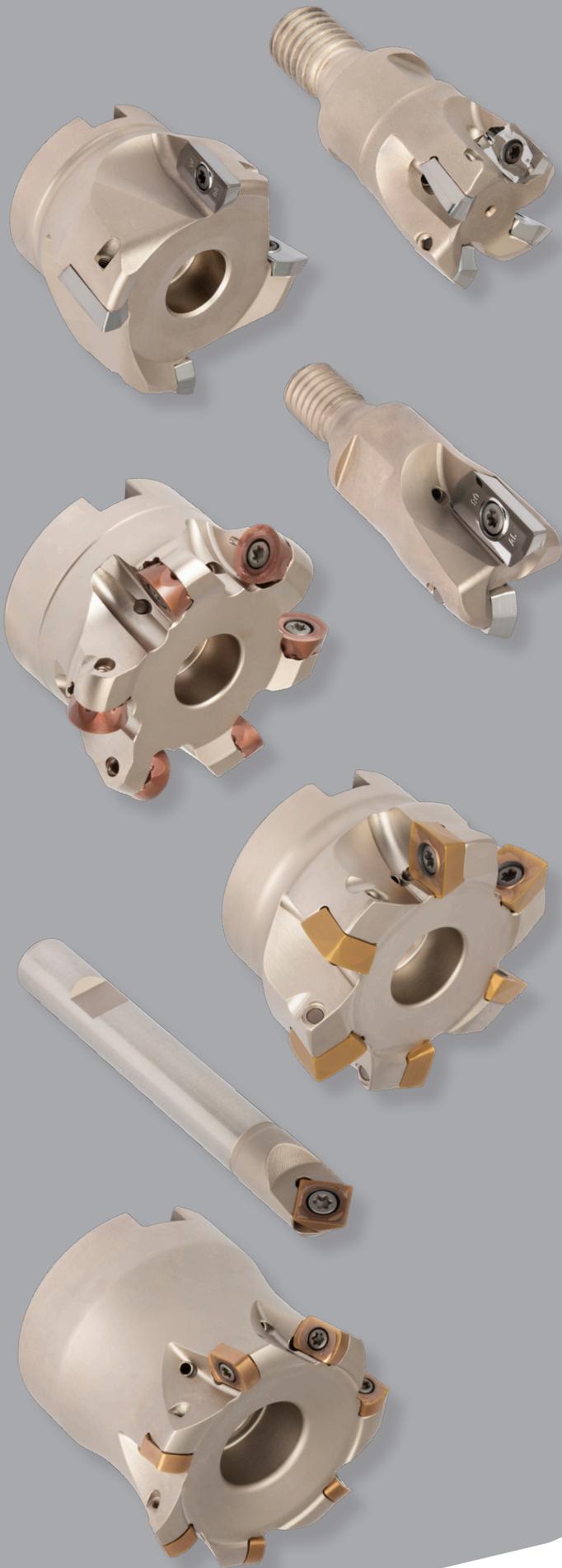
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|                          | Series    | Mounting    | Tool Illustration | Application Area | Material Group | Page |
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|                                 | Series        | Mounting  | Tool Illustration | Application Area | Material Group | Page |
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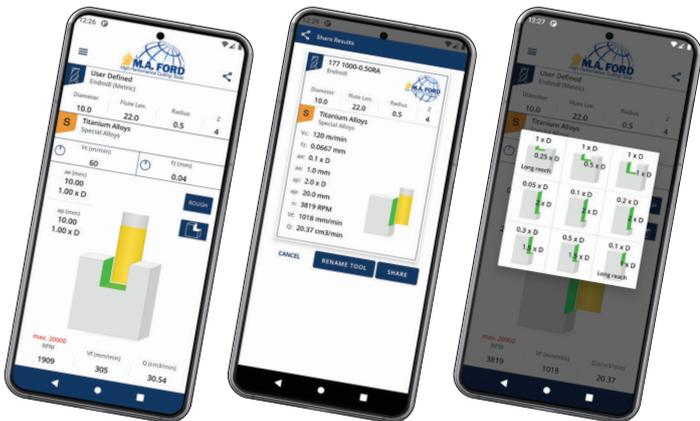
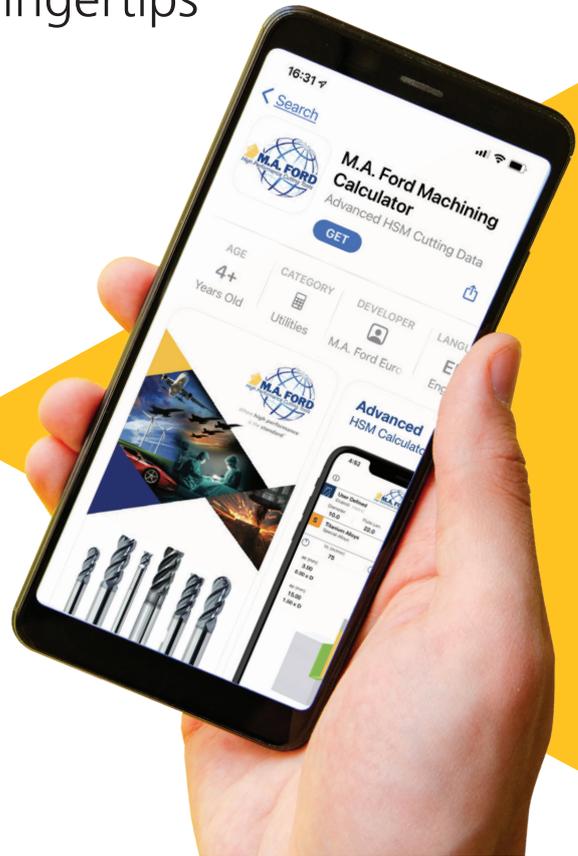
# The M.A. Ford interactive cutting data app

## - Everything you need at your fingertips

Our interactive app for iOS and Android devices makes tool cutting data calculations simpler and faster by minimising text input and using 3D graphics that respond instantly to changing cutting parameters, using smart-phone or tablet touch screens.

Developed around our proven cutting data, the app supports a wide range of ISO materials including steel, aluminium alloys, stainless steel and titanium, as well as cast iron, hardened steels and exotic alloys.

Once basic information has been selected from 'drop down' menus, such as tool type, diameter and material, the app allows you to 'drag' the tool graphic display to change the radial engagement and depth of cut, which instantly calculates speeds and feeds.



Radial chip thinning data is also calculated for use with high-speed machining (HSM) strategies, which can significantly reduce cycle times and improve tool life.

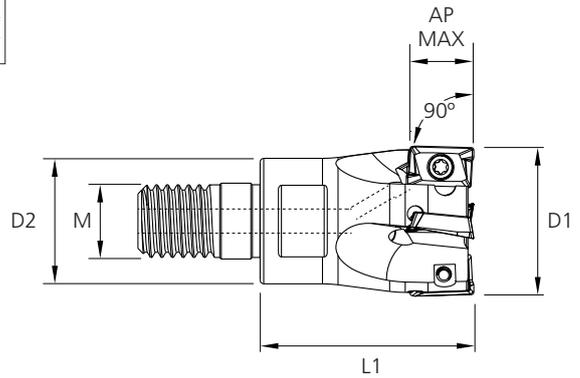
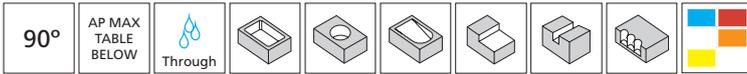
Colour coded feedback guides you toward the recommended cutting conditions based on the chosen input parameters. User over-ride controls allow cutting data to be fine-tuned for individual applications, as well as enabling calculations to be made that compare multiple scenarios instantly.

Proven cutting data can be stored via the 'Save' feature for future reference or shared with other app users. A hyperlink to M.A. Ford Europe's website also allows immediate access to online information and downloads.



For further information please contact our support team on: 01332 267960

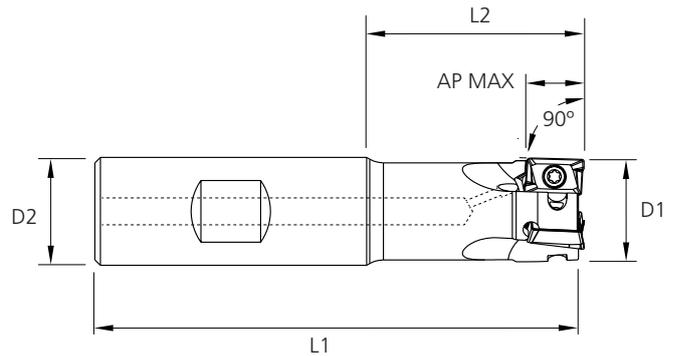
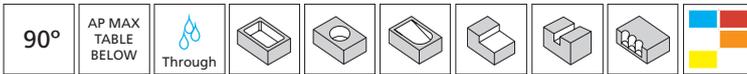
## MSM-AP11 & 16 Screw-On Shank End Mills



| EDP    | Tool Number        | Dimensions (mm) |    |    |     |        |        | Coolant | AP MAX (mm) | Insert   |
|--------|--------------------|-----------------|----|----|-----|--------|--------|---------|-------------|----------|
|        |                    | D1              | D2 | L1 | M   | Flutes | Wrench |         |             |          |
| FH1118 | MSMM-1602-AP11-M8  | 16              | 16 | 26 | M8  | 2      | 12     | N       | 9           | APKT1135 |
| FH1119 | MSMM-2003-AP11-M10 | 20              | 18 | 31 | M10 | 3      | 13.4   | Y       | 9           | APKT1135 |
| FH1120 | MSMM-2504-AP11-M12 | 25              | 21 | 35 | M12 | 4      | 17     | Y       | 9           | APKT1135 |
| FH1121 | MSMM-3205-AP11-M16 | 32              | 29 | 43 | M16 | 5      | 22     | Y       | 9           | APKT1135 |
| FH1123 | MSMM-2502-AP16-M12 | 25              | 21 | 35 | M12 | 2      | 17     | Y       | 14          | APKT1604 |
| FH1124 | MSMM-3203-AP16-M16 | 32              | 29 | 43 | M16 | 3      | 22     | Y       | 14          | APKT1604 |



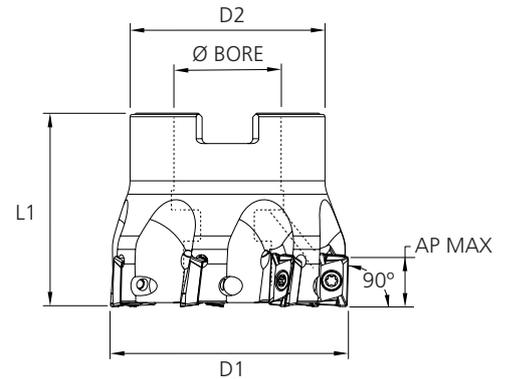
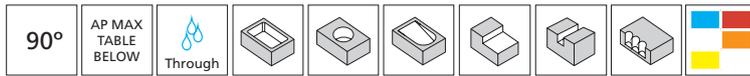
## MSM-AP11 & 16 Weldon Shank End Mills



| EDP    | Tool Number       | Dimensions (mm) |    |     |    |        | Coolant | AP MAX (mm) | Insert   |
|--------|-------------------|-----------------|----|-----|----|--------|---------|-------------|----------|
|        |                   | D1              | D2 | L1  | L2 | Flutes |         |             |          |
| FH1115 | MSMW-1602-AP11-16 | 16              | 16 | 130 | 25 | 2      | N       | 9           | APKT1135 |
| FH1116 | MSMW-2003-AP11-20 | 20              | 20 | 130 | 25 | 3      | Y       | 9           | APKT1135 |
| FH1569 | MSMW-2503-AP11-25 | 25              | 25 | 130 | 30 | 3      | Y       | 9           | APKT1135 |
| FH1117 | MSMW-2504-AP11-25 | 25              | 25 | 130 | 30 | 4      | Y       | 9           | APKT1135 |



# MSM-AP11 & 16 Bore Type Face Mills



| EDP    | Tool Number       | Dimensions (mm) |    |    |      |        | Coolant | AP MAX (mm) | Insert   |
|--------|-------------------|-----------------|----|----|------|--------|---------|-------------|----------|
|        |                   | D1              | D2 | L1 | Bore | Flutes |         |             |          |
| FH1526 | MSMB-4005-AP11-16 | 40              | 34 | 40 | 16   | 5      | Y       | 9           | APKT1135 |
| FH1122 | MSMB-5007-AP11-22 | 50              | 48 | 40 | 22   | 7      | Y       | 9           | APKT1135 |
| FH1542 | MSMB-6307-AP11-22 | 63              | 48 | 40 | 22   | 7      | N       | 9           | APKT1135 |
| FH1125 | MSMB-5004-AP16-22 | 50              | 48 | 40 | 22   | 4      | Y       | 14          | APKT1604 |
| FH1126 | MSMB-6305-AP16-22 | 63              | 48 | 40 | 22   | 5      | Y       | 14          | APKT1604 |
| FH1127 | MSMB-8007-AP16-27 | 80              | 50 | 50 | 27   | 7      | Y       | 14          | APKT1604 |



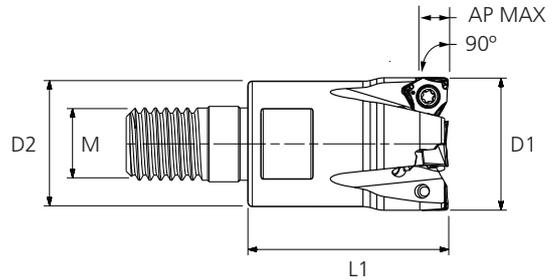
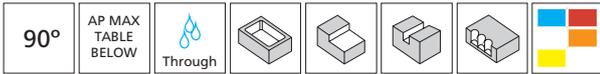
## Inserts

| Insert Number | R   | Grades |        |        |        |        |        |        |        |        |  |
|---------------|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--|
|               |     | FA6225 | FA6230 | FP6115 | FP6125 | FM6140 | FM6235 | FS6030 | FK6015 | FK6125 |  |
|               |     | EDP    |        |        |        |        |        |        |        |        |  |
| APKT113504-MS | 0.4 | FW1310 | FW1311 | FW4054 | FW1419 | FW1314 | -      | FW1315 | FW1312 | FW1313 |  |
| APKT113508-MS | 0.8 | FW1322 | FW1323 | FW4055 | FW1425 | FW4053 | -      | FW1326 | FW1324 | FW1325 |  |
| APKT113504-MM | 0.4 | FW1316 | FW1317 | FW4056 | FW1418 | FW1320 | -      | FW1321 | FW1318 | FW1319 |  |
| APKT113508-MM | 0.8 | FW1327 | FW1328 | FW4057 | FW1420 | FW1331 | FW4051 | FW1332 | FW1329 | FW1330 |  |
| APKT113532-MM | 3.2 | FW1339 | FW1340 | FW4058 | FW1422 | FW1343 | -      | FW1344 | FW1341 | FW1342 |  |
| APKT160408-MM | 0.8 | FW1345 | FW1346 | FW4059 | FW1423 | FW1349 | -      | FW1350 | FW1347 | FW1348 |  |
| APKT160412-MM | 1.2 | FW1351 | FW1356 | FW4060 | FW4036 | FW1355 | -      | -      | FW1353 | FW1354 |  |
| APKT160416-MM | 1.6 | FW1357 | FW1358 | FW4061 | FW4037 | FW1361 | -      | FW1362 | FW1359 | FW1360 |  |
| APKT160432-MM | 3.2 | FW1363 | FW1364 | FW4062 | FW4038 | FW1367 | -      | FW1368 | FW1365 | FW1366 |  |
| APKT113516-MH | 1.6 | FW1333 | FW1334 | -      | FW1421 | FW1336 | -      | FW1337 | -      | FW1335 |  |
| APKT160416-MH | 1.6 | -      | -      | FW4063 | -      | -      | -      | -      | -      | -      |  |

## Spare Parts

| Insert   | Nm  | Insert Screw |                   | Torx Driver |             | Torx T-Handle |             | Torque Driver |             | Torque Blade |             |
|----------|-----|--------------|-------------------|-------------|-------------|---------------|-------------|---------------|-------------|--------------|-------------|
|          |     | EDP          | Part No.          | EDP         | Part Number | EDP           | Part Number | EDP           | Part Number | EDP          | Part Number |
| APKT1135 | T9  | 1.4          | FS1186 MS30072ATX | FS1075      | SD110-T9    | -             | -           | FS1105        | TD140-1.4NM | FS1117       | TB160-T9    |
| APKT1604 | T15 | 3.0          | FS1187 MS35080ATX | FS1077      | SD110-T15   | FS1088        | TH120-T15   | FS1108        | TD140-3.0NM | FS1119       | TB160-T15   |

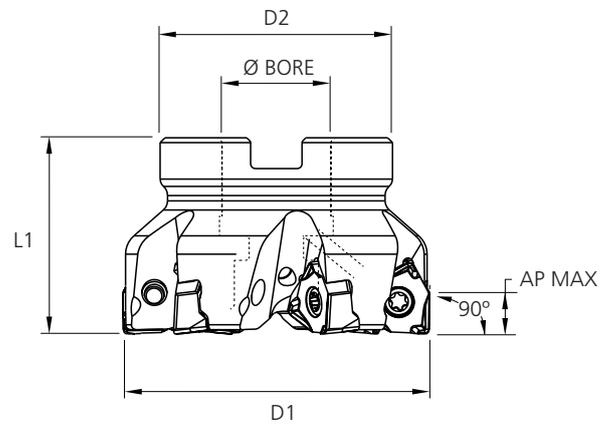
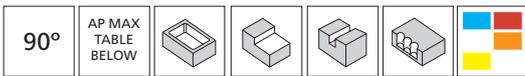
## MSM-WN04 & 08 Screw-On Shank End Mills



| EDP    | Tool Number        | Dimensions (mm) |    |    |     |        |        | Coolant | AP MAX (mm) | Insert |
|--------|--------------------|-----------------|----|----|-----|--------|--------|---------|-------------|--------|
|        |                    | D1              | D2 | L1 | M   | Flutes | Wrench |         |             |        |
| FH1128 | MSMM-2003-WN04-M10 | 20              | 18 | 31 | M10 | 3      | 14     | Y       | 4           | WNGU04 |
| FH1129 | MSMM-2504-WN04-M12 | 25              | 21 | 35 | M12 | 4      | 17     | Y       | 4           | WNGU04 |
| FH2248 | MSMM-3205-WN04-M16 | 32              | 26 | 40 | M16 | 5      | 24     | Y       | 4           | WNGU04 |



## MSM-WN04 & 08 Bore Type Face Mills



| EDP    | Tool Number       | Dimensions (mm) |    |    |      |        | Coolant | AP MAX (mm) | Insert |
|--------|-------------------|-----------------|----|----|------|--------|---------|-------------|--------|
|        |                   | D1              | D2 | L1 | Bore | Flutes |         |             |        |
| FH2249 | MSMB-4006-WN04-16 | 40              | 30 | 40 | 16   | 6      | Y       | 4           | WNGU04 |
| FH1130 | MSMB-5007-WN04-22 | 50              | 48 | 40 | 22   | 7      | Y       | 4           | WNGU04 |
| FH2250 | MSMB-6309-WN04-22 | 63              | 48 | 40 | 22   | 9      | Y       | 4           | WNGU04 |
| FH1131 | MSMB-5005-WN08-22 | 50              | 48 | 40 | 22   | 5      | Y       | 7.5         | WNGU08 |
| FH1132 | MSMB-6306-WN08-22 | 63              | 48 | 40 | 22   | 6      | N       | 7.5         | WNGU08 |
| FH1133 | MSMB-8007-WN08-27 | 80              | 58 | 50 | 27   | 7      | N       | 7.5         | WNGU08 |

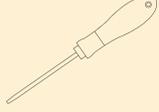
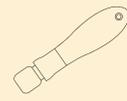


## MSM-WN04 & 08 Inserts & Spare parts

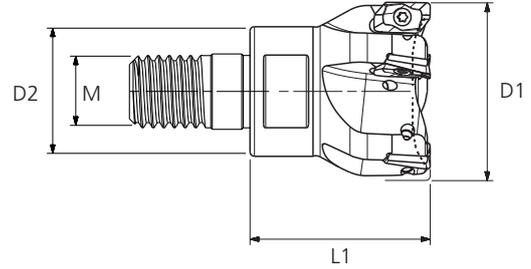
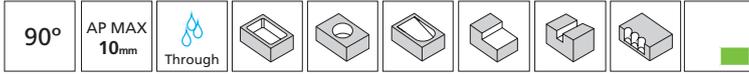
### Inserts

| Insert Number  | R   | Grades |        |        |        |        |        |        |        |
|---|-----|--------|--------|--------|--------|--------|--------|--------|--------|
|   |     | FA6225 | FA6230 | FP6115 | FP6125 | FM6140 | FS6030 | FK6015 | FK6125 |
|   |     | EDP    |        |        |        |        |        |        |        |
| WNGU040304-MM   | 0.4 | -      | FW1370 | FW4064 | FW1369 | -      | FW4065 | -      | FW4066 |
| WNGU040308-MM   | 0.8 | -      | FW1372 | FW4067 | FW1371 | FW4069 | FW4068 | FW4070 | FW4071 |
| WNGU080608-MM   | 0.8 | -      | FW1374 | FW4072 | FW1373 | FW4073 | FW1376 | FW4074 | FW1375 |
| WNGU080608-MH   | 0.8 | FW4076 | FW4075 | FW4077 | -      | -      | FW4078 | FW4079 | FW4080 |

### Spare Parts

|          |   |     | Insert Screw   |             | Torx Driver  |             | Torx T-Handle   |             | Torque Driver  |             | Torque Blade   |             |
|----------|---|-----|--|-------------|--|-------------|---|-------------|--|-------------|--|-------------|
|          |   |     |  |             |  |             |  |             |  |             |  |             |
| Insert   |  | Nm  | EDP  | Part Number | EDP  | Part Number | EDP   | Part Number | EDP  | Part Number | EDP  | Part Number |
| WNGU0403 | 7IP   | 1.2 | FS1212   | MS25063AIP  | FS1081   | SD110-7IP   | -   | -           | FS1104   | TD140-1.2NM | FS1123   | TB160-7IP   |
| WNGU0806 | 15IP  | 4.0 | FS1131   | MS40118AIP  | FS1085   | SD110-15IP  | FS1094  | TH120-15IP  | FS1110   | TD140-4.0NM | FS1127   | TB160-15IP  |

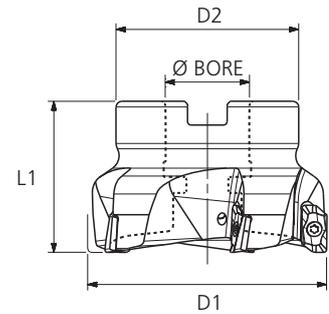
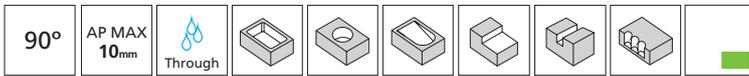
## MSM-XD11 Screw-On Shank End Mills



| EDP    | Tool Number        | Dimensions (mm) |      |    |    |        |        | Coolant | Insert   |
|--------|--------------------|-----------------|------|----|----|--------|--------|---------|----------|
|        |                    | D1              | D2   | L1 | M  | Flutes | Wrench |         |          |
| FH1582 | MSMM-1602-XD11-M8  | 16              | 14.5 | 25 | 8  | 2      | 11     | Y       | XDGT1135 |
| FH1583 | MSMM-2003-XD11-M10 | 20              | 18   | 30 | 10 | 3      | 15     | Y       | XDGT1135 |
| FH1584 | MSMM-2504-XD11-M12 | 25              | 21   | 35 | 12 | 4      | 17     | Y       | XDGT1135 |
| FH1585 | MSMM-3205-XD11-M16 | 32              | 29   | 40 | 16 | 5      | 24     | Y       | XDGT1135 |
| FH1586 | MSMM-4005-XD11-M16 | 40              | 29   | 40 | 16 | 5      | 24     | Y       | XDGT1135 |



## MSM-XD11 Bore Type Face Mills



| EDP    | Tool Number       | Dimensions (mm) |    |    |      |        | Coolant | Insert   |
|--------|-------------------|-----------------|----|----|------|--------|---------|----------|
|        |                   | D1              | D2 | L1 | Bore | Flutes |         |          |
| FH1587 | MSMB-5005-XD11-22 | 50              | 48 | 40 | 22   | 5      | Y       | XDGT1135 |
| FH1588 | MSMB-6305-XD11-22 | 63              | 48 | 40 | 22   | 5      | Y       | XDGT1135 |
| FH1589 | MSMB-8005-XD11-27 | 80              | 58 | 40 | 27   | 5      | Y       | XDGT1135 |



# MSM-XD11 Inserts & Spare parts

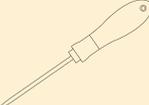
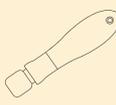
## Inserts

| Insert Number |  | R | Grades |
|---------------|---|---|--------|
|               |   |   | FN6125 |
|               |   |   | EDP    |

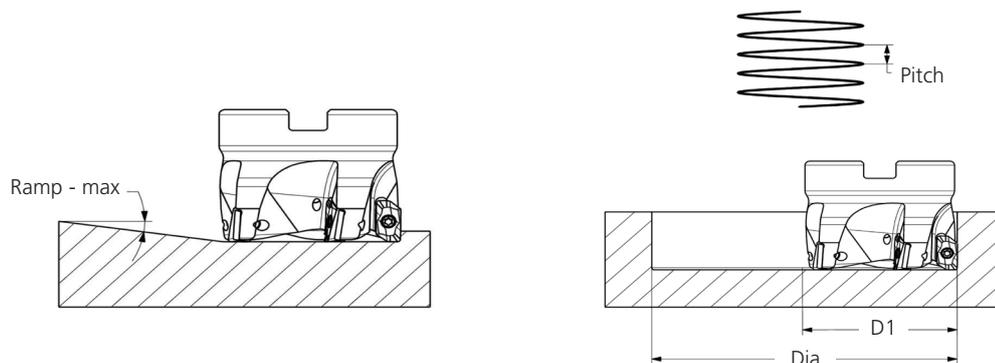
|               |     |        |
|---------------|-----|--------|
| XDGT113508-AL | 0.8 | FW4365 |
|---------------|-----|--------|

## Spare Parts

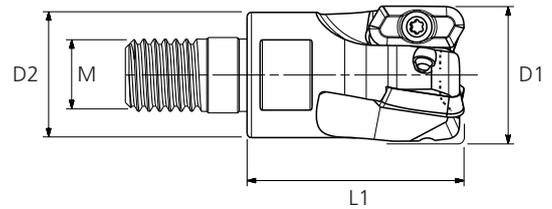
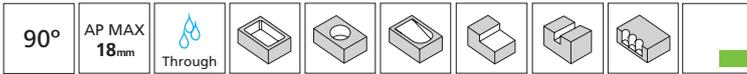
|          |  |     | Insert Screw  |             | Torx Plus Driver  |             | Torque Driver   |             | Torque Blade  |             |
|----------|--|-----|---|-------------|---|-------------|---|-------------|---|-------------|
|          |  |     |  |             |  |             |  |             |  |             |
| Insert   |  | Nm  | EDP   | Part Number | EDP   | Part Number | EDP   | Part Number | EDP   | Part Number |
| XDGT1135 | 7IP  | 0.9 | FS1134  | MS25055DIP  | FS1081  | SD110-7IP   | FS1102  | TD140-0.9NM | FS1123  | TB160-7IP   |

## Ramping Data

| Tool D1 | Ramp - max | Dia-min | Dia-max | Pitch max (mm) |
|---------|------------|---------|---------|----------------|
| 16      | 20.5°      | 20.0    | 29.0    | 10.0           |
| 20      | 12.7°      | 28.0    | 37.0    | 8.2            |
| 25      | 9.3°       | 38.0    | 47.0    | 6.5            |
| 32      | 6.3°       | 52.0    | 61.0    | 4.7            |
| 40      | 4.7°       | 68.0    | 77.0    | 3.3            |
| 50      | 3.5°       | 88.0    | 97.0    | 2.4            |
| 63      | 2.5°       | 114.0   | 123.0   | 1.7            |
| 80      | 1.8°       | 148.0   | 157.0   | 1.1            |



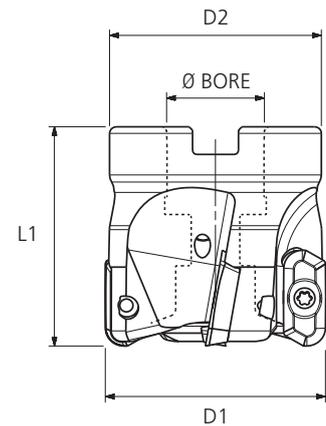
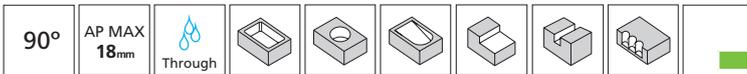
## MSM-XD19 Screw-On Shank End Mills



| EDP    | Tool Number        | Dimensions (mm) |    |    |     |        |        | Coolant | Insert |
|--------|--------------------|-----------------|----|----|-----|--------|--------|---------|--------|
|        |                    | D1              | D2 | L1 | M   | Flutes | Wrench |         |        |
| FH1134 | MSMM-2502-XD19-M12 | 25              | 21 | 45 | M12 | 2      | 17     | Y       | XDHT19 |
| FH1135 | MSMM-3203-XD19-M16 | 32              | 29 | 52 | M16 | 3      | 24     | Y       | XDHT19 |
| FH1136 | MSMM-4003-XD19-M16 | 40              | 29 | 52 | M16 | 3      | 24     | Y       | XDHT19 |



## MSM-XD19 Bore Type Face Mills



| EDP    | Tool Number       | Dimensions (mm) |    |    |      |        | Coolant | Insert |
|--------|-------------------|-----------------|----|----|------|--------|---------|--------|
|        |                   | D1              | D2 | L1 | Bore | Flutes |         |        |
| FH1525 | MSMB-4003-XD19-16 | 40              | 38 | 50 | 16   | 3      | Y       | XDHT19 |
| FH1137 | MSMB-5004-XD19-22 | 50              | 43 | 50 | 22   | 4      | Y       | XDHT19 |
| FH1146 | MSMB-6304-XD19-22 | 63              | 48 | 50 | 22   | 4      | Y       | XDHT19 |
| FH1575 | MSMB-8005-XD19-27 | 80              | 58 | 50 | 27   | 5      | Y       | XDHT19 |

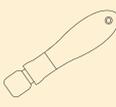


## MSM-XD19 Inserts & Spare parts

### Inserts

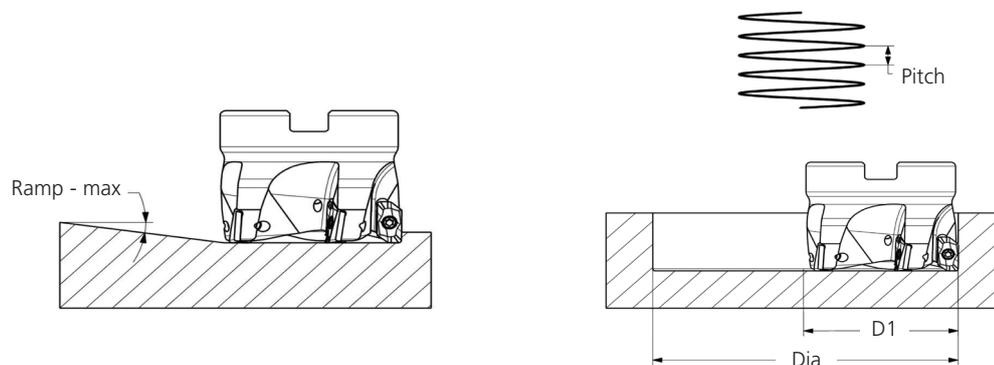
| Insert Number |  | R   | Grades |
|---------------|---|-----|--------|
|               |   |     | FN6125 |
|               |   |     | EDP    |
| XDHT190402-AL |   | 0.2 | FW1110 |
| XDHT190408-AL |   | 0.8 | FW1111 |
| XDHT190420-AL |   | 2.0 | FW1112 |
| XDHT190432-AL |   | 3.2 | FW1113 |
| XDHT190440-AL |   | 4.0 | FW1114 |
| XDHT190450-AL |   | 5.0 | FW1115 |

### Spare Parts

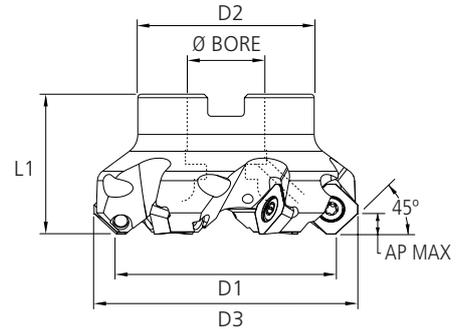
|          |   |     | Insert Screw   |             | Torx Plus Driver   |             | Torx Plus T-Handle  |             | Torque Driver  |             | Torque Blade   |             |
|----------|---|-----|--|-------------|--|-------------|---|-------------|--|-------------|--|-------------|
|          |   |     |  |             |  |             |  |             |  |             |  |             |
| Insert   |  | Nm  | EDP  | Part Number | EDP  | Part Number | EDP   | Part Number | EDP  | Part Number | EDP  | Part Number |
| XDHT1904 | 15IP  | 3.0 | FS1136   | MS40095AIP  | FS1085   | SD110-15IP  | FS1094  | TH120-15IP  | FS1108   | TD140-3.0NM | FS1127   | TB160-15IP  |

### Ramping Data

| Tool D1 | Ramp - max | Dia-min | Dia-max | Pitch max (mm) |
|---------|------------|---------|---------|----------------|
| 25      | 6.8°       | 32.0    | 47.0    | 6.8            |
| 32      | 3.9°       | 46.0    | 61.0    | 3.9            |
| 40      | 3.3°       | 62.0    | 77.0    | 3.3            |
| 50      | 2.2°       | 81.0    | 97.0    | 2.2            |
| 63      | 1.8°       | 107.0   | 123.0   | 1.8            |
| 80      | 1.1°       | 135.0   | 157.0   | 1.0            |



## MFM-SE13 Bore Type Face Mills



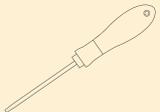
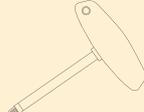
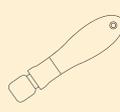
| EDP    | Tool Number        | Dimensions (mm) |     |    |      |        | Coolant | Insert |
|--------|--------------------|-----------------|-----|----|------|--------|---------|--------|
|        |                    | D1              | D2  | L1 | Bore | Flutes |         |        |
| FH1138 | MFMB-5004-SE13-22  | 50              | 63  | 40 | 22   | 4      | N       | SE*T13 |
| FH1139 | MFMB-6305-SE13-22  | 63              | 76  | 40 | 22   | 5      | N       | SE*T13 |
| FH1140 | MFMB-8006-SE13-27  | 80              | 93  | 50 | 27   | 6      | N       | SE*T13 |
| FH1141 | MFMB-10007-SE13-32 | 100             | 113 | 50 | 32   | 7      | N       | SE*T13 |



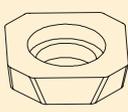
### Inserts

| Insert Number  | Grades |        |        |        |        |        |        |        |        |
|---|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|   | FA6225 | FA6230 | FP6115 | FP6125 | FM6140 | FS6030 | FK6015 | FK6125 | FN6125 |
|   | EDP    |        |        |        |        |        |        |        |        |
| SEET13T3AG-MS   | -      | -      | -      | FW1424 | -      | FW1378 | -      | -      | -      |
| SEET13T3AG-MM   | FW1379 | FW1380 | FW4085 | FW4039 | FW1381 | FW1382 | -      | FW4086 | -      |
| SEMT13T3AG-MM   | FW4106 | FW1383 | FW4105 | -      | FW4104 | FW4107 | -      | FW4103 | -      |
| SEET13T3AG-MH   | FW4091 | FW4090 | FW4092 | -      | FW4093 | FW4094 | -      | FW4087 | -      |
| SEMT13T3AG-MH   | FW4112 | FW1384 | FW4111 | -      | FW4110 | FW4113 | -      | FW4109 | -      |
| SEET13T3AG-AL   | -      | -      | -      | -      | -      | -      | -      | -      | FW1377 |
| SEET13T3AG-WB   | FW4097 | FW1385 | FW4096 | -      | FW4101 | FW4098 | FW4099 | FW4100 | -      |

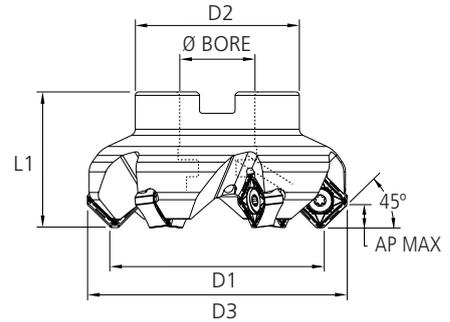
### MFM-SE13 - Spare Parts

|                   |  | Insert Screw  |             | Torx (Plus) Driver  |             | Torx (Plus) T-Handle  |             | Torque Driver   |             | Torque Blade  |             |
|-------------------|--|---|-------------|---|-------------|---|-------------|---|-------------|---|-------------|
|                   |  |  |             |  |             |  |             |  |             |  |             |
| Insert            |  Nm | EDP   | Part Number | EDP   | Part Number | EDP   | Part Number | EDP   | Part Number | EDP   | Part Number |
| SE*T13 Ø50 & Ø63  | T15 3.0  | FS1190  | MS035080ATX | FS1077  | SD110-T15   | FS1088  | TH120-T15   | FS1108  | TD140-3.0NM | FS1119  | TB160-T15   |
| SE*T13 Ø80 & Ø100 | 15IP 3.0   | FS1191  | MS35116AIP  | FS1085  | SD110-15IP  | FS1094  | TH120-15IP  | -   | -           | FS1127  | TB160-15IP  |

### MFM-SE13 - Ø80 & Ø100 Spare Parts

|          |  | Carbide Shim  |             | Shim Screw  |             | Shim Screw Wrench  |             |
|----------|--|---|-------------|---|-------------|--|-------------|
|          |  |  |             |  |             |  |             |
| Insert   |  | EDP   | Part Number | EDP   | Part Number | EDP  | Part Number |
| SE*T13T3 |  | FS1166  | MSH1300SE   | FS1167  | MS5070HHX   | FS1168   | LW180-3.5   |

## MFM-SN12 Bore Type Face Mills



| EDP    | Tool Number        | Dimensions (mm) |     |    |      |        | Coolant | Insert |
|--------|--------------------|-----------------|-----|----|------|--------|---------|--------|
|        |                    | D1              | D2  | L1 | Bore | Flutes |         |        |
| FH1142 | MFMB-5005-SN12-22  | 50              | 66  | 40 | 22   | 5      | Y       | SN*U12 |
| FH1143 | MFMB-6306-SN12-22  | 63              | 79  | 40 | 22   | 6      | Y       | SN*U12 |
| FH1144 | MFMB-8008-SN12-27  | 80              | 96  | 50 | 27   | 8      | Y       | SN*U12 |
| FH1145 | MFMB-10010-SN12-32 | 100             | 116 | 50 | 32   | 10     | N       | SN*U12 |



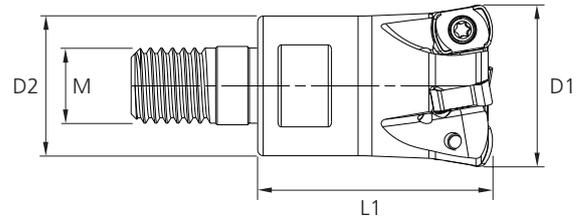
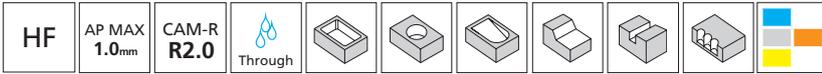
## Inserts

| Insert Number | Image | Grades |        |        |        |        |        |        |        |        |
|---------------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|               |       | FA6225 | FA6230 | FP6115 | FP6125 | FM6140 | FS6030 | FK6015 | FK6125 | FN6125 |
| EDP           |       |        |        |        |        |        |        |        |        |        |
| SNEU1206AN-MS |       | FW1386 | FW1387 | FW4114 | FW4040 | FW4117 | FW1388 | FW4115 | FW4116 | -      |
| SNEU1206AN-MM |       | FW1392 | FW1393 | FW4118 | FW4041 | FW1391 | FW4052 | FW1389 | FW1390 | -      |
| SNMU1206AN-MM |       | FW4130 | FW1396 | FW4129 | -      | FW1397 | FW4131 | FW4127 | FW4128 | -      |
| SNEU1206AN-MH |       | FW4123 | FW1394 | FW4122 | -      | FW4121 | FW4124 | FW4120 | FW1395 | -      |
| SNMU1206AN-MH |       | FW4136 | FW1398 | FW4135 | -      | FW1399 | FW4137 | FW4133 | FW4134 | -      |
| SNEU1206AN-AL |       | -      | -      | -      | -      | -      | -      | -      | -      | FW4125 |
| SNEU1206AN-MW |       | FW4144 | FW4139 | FW4143 | -      | FW4142 | FW4145 | FW4140 | FW4141 | -      |

## Spare Parts

|          |  |      | Insert Screw |             | Torx Plus Driver |             | Torx Plus T-Handle |             | Torque Driver |             | Torque Blade |             |            |
|----------|--|------|--------------|-------------|------------------|-------------|--------------------|-------------|---------------|-------------|--------------|-------------|------------|
|          |  |      |              |             |                  |             |                    |             |               |             |              |             |            |
| Insert   |  | Nm   | EDP          | Part Number | EDP              | Part Number | EDP                | Part Number | EDP           | Part Number | EDP          | Part Number |            |
| SN*U1206 |  | 15IP | 4.0          | FS1137      | MS40100CIP       | FS1085      | SD110-15IP         | FS1094      | TH120-15IP    | FS1110      | TD140-4.0NM  | FS1127      | TB160-15IP |

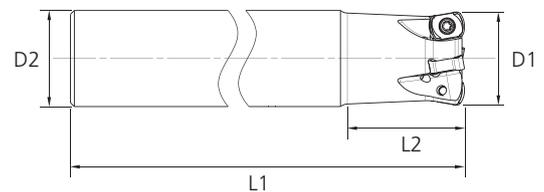
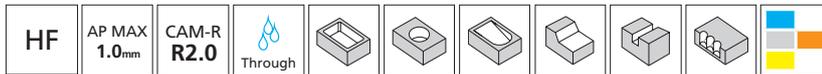
## MHF-BN06 Screw-On Shank End Mills



| EDP    | Tool Number       | Dimensions (mm) |    |    |     |        |        | Coolant | Insert |
|--------|-------------------|-----------------|----|----|-----|--------|--------|---------|--------|
|        |                   | D1              | D2 | L1 | M   | Flutes | Wrench |         |        |
| FH1001 | MHFBM-1602-06-M08 | 16              | 14 | 25 | M8  | 2      | 10     | Y       | BNMT06 |
| FH1002 | MHFBM-2003-06-M10 | 20              | 18 | 30 | M10 | 3      | 15     | Y       | BNMT06 |
| FH1003 | MHFBM-2504-06-M12 | 25              | 21 | 35 | M12 | 4      | 17     | Y       | BNMT06 |
| FH1004 | MHFBM-3205-06-M16 | 32              | 29 | 43 | M16 | 5      | 24     | Y       | BNMT06 |
| FH1005 | MHFBM-3505-06-M16 | 35              | 29 | 43 | M16 | 5      | 24     | Y       | BNMT06 |
| FH1006 | MHFBM-4006-06-M16 | 40              | 29 | 43 | M16 | 6      | 24     | Y       | BNMT06 |



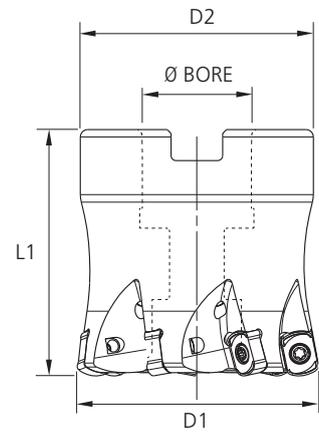
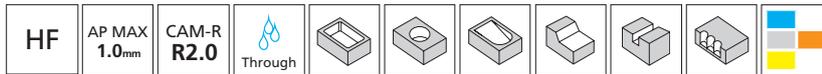
## MHF-BN06 Cylindrical Shank End Mills



| EDP    | Tool Number      | Dimensions (mm) |    |     |    |        | Coolant | Insert |
|--------|------------------|-----------------|----|-----|----|--------|---------|--------|
|        |                  | D1              | D2 | L1  | L2 | Flutes |         |        |
| FH1007 | MHFBC-1602-06-16 | 16              | 16 | 130 | 30 | 2      | Y       | BNMT06 |
| FH1008 | MHFBC-2003-06-20 | 20              | 20 | 140 | 30 | 3      | Y       | BNMT06 |
| FH1009 | MHFBC-2504-06-25 | 25              | 25 | 150 | 32 | 4      | Y       | BNMT06 |



## MHF-BN06 Bore Type Face Mills



| EDP    | Tool Number      | Dimensions (mm) |    |    |      |        | Coolant | Insert |
|--------|------------------|-----------------|----|----|------|--------|---------|--------|
|        |                  | D1              | D2 | L1 | Bore | Flutes |         |        |
| FH1010 | MHFBB-5007-06-22 | 50              | 47 | 50 | 22   | 7      | Y       | BNMT06 |
| FH1011 | MHFBB-5207-06-22 | 52              | 47 | 50 | 22   | 7      | Y       | BNMT06 |



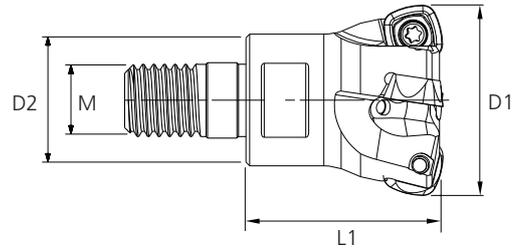
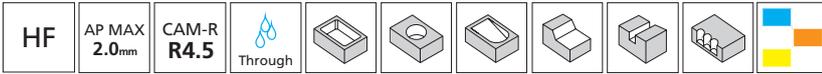
## Inserts

| Insert Number | Grades |        |        |        |        |
|---------------|--------|--------|--------|--------|--------|
|               | FS5130 | FX6030 | FA5040 | FX6040 | FS5120 |
|               | EDP    |        |        |        |        |
| BNMT0603-MS   | FW4292 | FW4372 | -      | FW4373 | FW4291 |
| BNMT0603-MM   | FW4043 | FW4374 | FW1121 | FW4371 | -      |
| BNMT0603-MR   | FW4042 | FW4369 | -      | -      | FW4290 |

## Spare Parts

|        |    |     | Insert Screw |             | Torx Plus Driver |             | Torque Driver |             | Torque Blade |             |
|--------|----|-----|--------------|-------------|------------------|-------------|---------------|-------------|--------------|-------------|
|        |    |     |              |             |                  |             |               |             |              |             |
| Insert |    | Nm  | EDP          | Part Number | EDP              | Part Number | EDP           | Part Number | EDP          | Part Number |
| BNMT06 | T8 | 1.2 | FS1001       | MS2506E     | FS1074           | SD110-T8    | FS1104        | TD140-1.2NM | FS1116       | TB160-T8    |

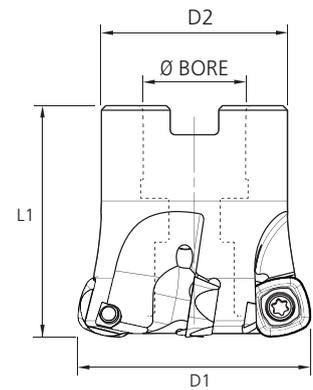
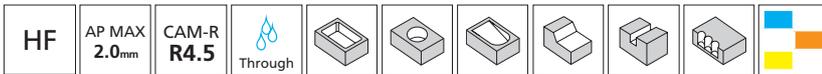
## MHF-SD12 Screw-On Shank End Mills



| EDP    | Tool Number       | Dimensions (mm) |    |    |     |        |        | Coolant | Insert |
|--------|-------------------|-----------------|----|----|-----|--------|--------|---------|--------|
|        |                   | D1              | D2 | L1 | M   | Flutes | Wrench |         |        |
| FH1100 | MHFSM-3503-12-M16 | 35              | 29 | 43 | M16 | 3      | 24     | Y       | SDMT12 |
| FH1101 | MHFSM-4204-12-M16 | 42              | 29 | 43 | M16 | 4      | 24     | Y       | SDMT12 |



## MHF-SD12 Bore Type Face Mills



| EDP    | Tool Number      | Dimensions (mm) |    |    |      |        | Coolant | Insert |
|--------|------------------|-----------------|----|----|------|--------|---------|--------|
|        |                  | D1              | D2 | L1 | Bore | Flutes |         |        |
| FH1105 | MHFSB-5004-12-22 | 50              | 48 | 50 | 22   | 4      | Y       | SDMT12 |
| FH1102 | MHFSB-5205-12-22 | 52              | 48 | 50 | 22   | 5      | Y       | SDMT12 |
| FH1103 | MHFSB-6606-12-27 | 66              | 58 | 50 | 27   | 6      | Y       | SDMT12 |
| FH1104 | MHFSB-8006-12-27 | 80              | 58 | 50 | 27   | 6      | Y       | SDMT12 |



# MHF-SD12 Inserts

## Inserts

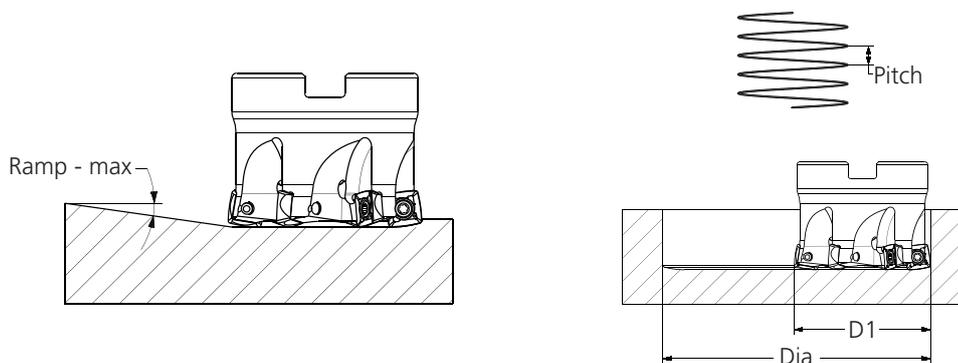
| Insert Number  | Grades |        |        |        |        |        |        |
|---|--------|--------|--------|--------|--------|--------|--------|
|   | FS5130 | FX6030 | FA6225 | FA6230 | FX6040 | FM6140 | FS6030 |
|   | EDP    |        |        |        |        |        |        |
| SDMT1205-MM   | FW4376 | FW4386 | -      | -      | -      | -      | -      |
| SDMT1205-MS   | -      | -      | -      | -      | FW4385 | -      | -      |
| SDMT1205-SM   | -      | -      | FW1105 | FW1106 | -      | FW1107 | FW1104 |
| SDNW1205-MM   | FW4379 | -      | -      | -      | -      | -      | -      |

## Spare Parts

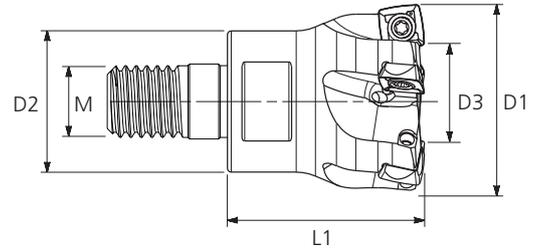
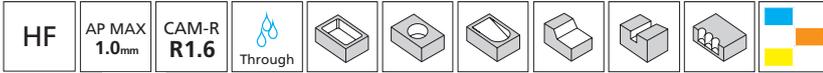
|        |   |     | Insert Screw  |             | Torx Driver   |             | Torx T-Handle  |             | Torque Driver   |             | Torque Blade  |             |
|--------|---|-----|---|-------------|---|-------------|--|-------------|---|-------------|---|-------------|
|        |   |     |  |             |  |             |  |             |  |             |  |             |
| Insert |  | Nm  | EDP   | Part Number | EDP   | Part Number | EDP  | Part Number | EDP   | Part Number | EDP   | Part Number |
| SDMT12 | T15   | 3.0 | FS1002  | MS4011G     | FS1077  | SD110-T15   | FS1088   | TH120-T15   | FS1108  | TD140-3.0NM | FS1119  | TB160-T15   |

## Ramping Data

| Tool D1 | Ramp - max | Dia-min | Dia-max | Pitch max (mm) |
|---------|------------|---------|---------|----------------|
| 35      | 5.5        | 48.0    | 66.0    | 1.2            |
| 42      | 4.0        | 63.0    | 80.0    | 1.2            |
| 50      | 2.5        | 81.0    | 98.0    | 1.2            |
| 52      | 2.5        | 83.0    | 100.0   | 1.1            |
| 66      | 2.5        | 112.0   | 128.0   | 1.0            |
| 80      | 1.0        | 142.0   | 156.0   | 1.0            |



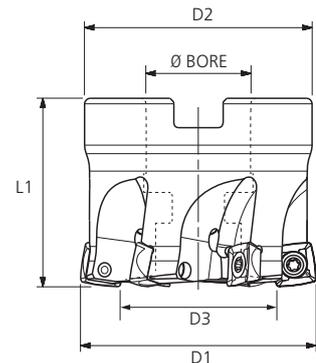
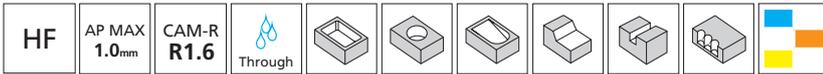
## MAHF-XD09 Screw-On Shank End Mills



| EDP    | Tool Number         | Dimensions (mm) |    |      |    |     |        |        | Coolant | Insert    |
|--------|---------------------|-----------------|----|------|----|-----|--------|--------|---------|-----------|
|        |                     | D1              | D2 | D3   | L1 | M   | Flutes | Wrench |         |           |
| FH1538 | MAHFM-2503-XD09-M12 | 25              | 21 | 9.5  | 35 | M12 | 3      | 17     | Y       | XDMT09-SM |
| FH1539 | MAHFM-3204-XD09-M16 | 32              | 29 | 16.5 | 40 | M16 | 4      | 24     | Y       | XDMT09-SM |
| FH1540 | MAHFM-3505-XD09-M16 | 35              | 29 | 19.5 | 40 | M16 | 5      | 24     | Y       | XDMT09-SM |
| FH1541 | MAHFM-4005-XD09-M16 | 40              | 29 | 24.4 | 40 | M16 | 5      | 24     | Y       | XDMT09-SM |



## MAHF-XD09 Bore Type Face Mills



| EDP    | Tool Number        | Dimensions (mm) |    |      |    |      |        | Coolant | Insert    |
|--------|--------------------|-----------------|----|------|----|------|--------|---------|-----------|
|        |                    | D1              | D2 | D3   | L1 | Bore | Flutes |         |           |
| FH1527 | MAHFB-5006-XD09-22 | 50              | 48 | 34.4 | 40 | 22   | 6      | Y       | XDMT09-SM |
| FH1573 | MAHFB-6308-XD09-22 | 63              | 48 | 47.4 | 40 | 22   | 8      | Y       | XDMT09-SM |

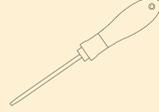
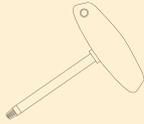
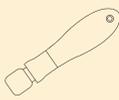


## MAHF-XD09 Inserts

### Inserts

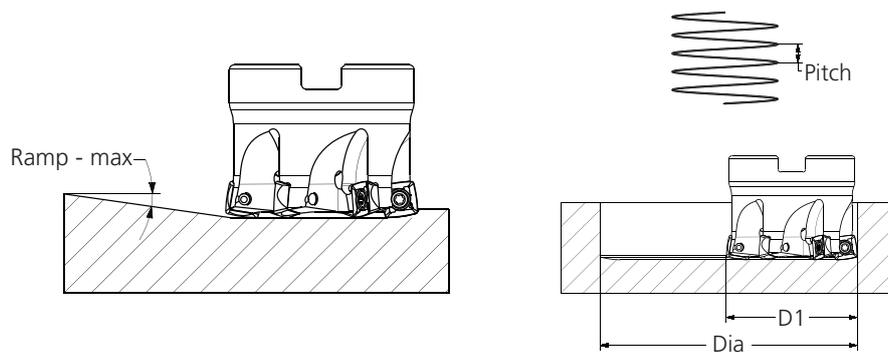
| Insert Number  | Grades |        |        |        |
|---|--------|--------|--------|--------|
|   | FA6230 | FM6140 | FM6235 | FS6030 |
| EDP   |        |        |        |        |
| XDMT09T307-SM   | FW4319 | FW1426 | FW1427 | FW1428 |

### Spare Parts

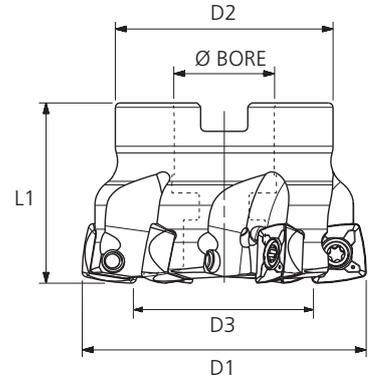
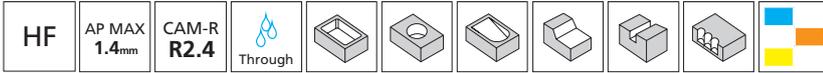
|        |  |     | Insert Screw  |             | Torx Plus Driver  |             | Torx Plus T-Handle   |             | Torque Driver   |             | Torque Blade  |             |
|--------|--|-----|---|-------------|---|-------------|--|-------------|---|-------------|---|-------------|
|        |  |     |  |             |  |             |  |             |  |             |  |             |
| Insert |  | Nm  | EDP   | Part Number | EDP   | Part Number | EDP  | Part Number | EDP   | Part Number | EDP   | Part Number |
| XDMT09 | 9IP  | 1.4 | FS1130  | MS30072AIP  | FS1083  | SD110-9IP   | FS1132   | TH120-9IP   | FS1105  | TD140-1.4NM | FS1125  | TB160-9IP   |

### Ramping Data

| Tool D1 | Ramp - max | Dia-min | Dia-max | Pitch max (mm) |
|---------|------------|---------|---------|----------------|
| 25      | 7.1°       | 34.5    | 48.9    | 1.0            |
| 32      | 4.3°       | 48.5    | 62.9    | 1.0            |
| 35      | 3.7°       | 54.5    | 68.9    | 1.0            |
| 40      | 3.0°       | 64.4    | 78.9    | 1.0            |
| 50      | 2.1°       | 84.4    | 98.9    | 1.0            |
| 63      | 1.5°       | 110.4   | 124.9   | 1.0            |



## MAHF-XD12 Bore Type Face Mills



| EDP    | Tool Number        | Dimensions (mm) |    |      |    |    |        | Coolant | Insert    |
|--------|--------------------|-----------------|----|------|----|----|--------|---------|-----------|
|        |                    | D1              | D2 | D3   | L1 | M  | Flutes |         |           |
| FH1529 | MAHFB-5005-XD12-22 | 50              | 48 | 28.5 | 40 | 22 | 5      | Y       | XDMT12-SM |
| FH1531 | MAHFB-5205-XD12-22 | 52              | 48 | 30.5 | 40 | 22 | 5      | Y       | XDMT12-SM |
| FH1533 | MAHFB-6306-XD12-22 | 63              | 48 | 41.5 | 40 | 22 | 6      | Y       | XDMT12-SM |
| FH1537 | MAHFB-8006-XD12-27 | 80              | 58 | 58.5 | 50 | 27 | 6      | Y       | XDMT12-SM |



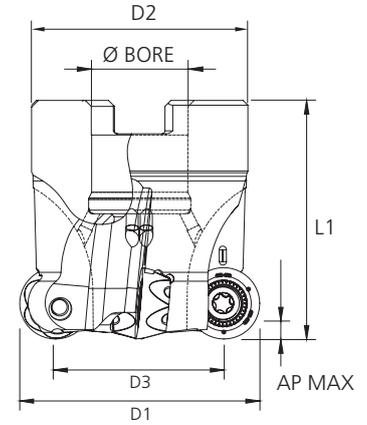
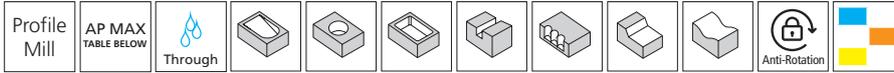
## Inserts

| Insert Number | Grades |        |        |        |
|---------------|--------|--------|--------|--------|
|               | FA6230 | FM6140 | FM6235 | FS6030 |
| EDP           |        |        |        |        |
| XDMT120512-SM | FW4320 | FW1429 | FW1430 | FW1431 |

## Spare Parts

|           |          |        | Insert Screw |        | Torx Plus Driver |        | Torx Plus T-Handle |        | Torque Driver |        | Torque Blade |  |
|-----------|----------|--------|--------------|--------|------------------|--------|--------------------|--------|---------------|--------|--------------|--|
| Insert    | Nm       | EDP    | Part Number  | EDP    | Part Number      | EDP    | Part Number        | EDP    | Part Number   | EDP    | Part Number  |  |
| XDMT12-SM | 15IP 3.0 | FS1131 | MS40118AIP   | FS1085 | SD110-15IP       | FS1094 | TH120-15IP         | FS1108 | TD140-3.0NM   | FS1127 | TB160-15IP   |  |

## MAPM-RP12 Bore Type Face Mills



| EDP    | Tool Number        | Dimensions (mm) |    |    |    |      |        | Coolant | Insert |
|--------|--------------------|-----------------|----|----|----|------|--------|---------|--------|
|        |                    | D1              | D2 | D3 | L1 | Bore | Flutes |         |        |
| FH1906 | MAPMB-4004-RP12-16 | 40              | 36 | 28 | 40 | 16   | 4      | Y       | RPHT12 |
| FH1907 | MAPMB-5205-RP12-22 | 52              | 42 | 40 | 40 | 22   | 5      | Y       | RPHT12 |
| FH1908 | MAPMB-6306-RP12-22 | 63              | 48 | 51 | 40 | 22   | 6      | Y       | RPHT12 |
| FH1909 | MAPMB-8007-RP12-27 | 80              | 60 | 68 | 50 | 27   | 7      | Y       | RPHT12 |



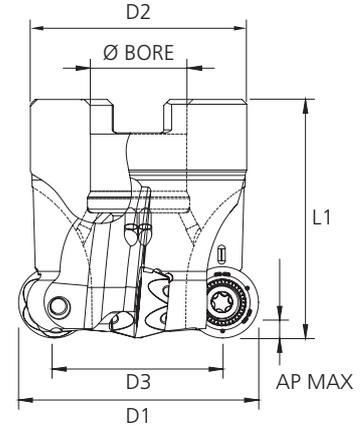
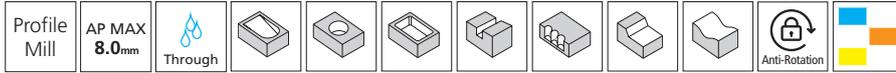
## Inserts

| Insert Number | AP MAX (mm) | R   | Grades |        |        |        |
|---------------|-------------|-----|--------|--------|--------|--------|
|               |             |     | FA5130 | FA5140 | FP8030 | FS8030 |
| EDP           |             |     |        |        |        |        |
| RPHT1204-6MS  | 2.9         | 6.0 | -      | -      | FW4890 | FW4383 |
| RPHT1204-4MS  | 5.9         | 6.0 | -      | -      | FW4892 | FW4893 |

## Spare Parts

|        |        |     | Insert Screw |             | Torx Plus Driver |             | Torx Plus T-Handle |             | Torque Driver |             | Torque Blade |             |
|--------|--------|-----|--------------|-------------|------------------|-------------|--------------------|-------------|---------------|-------------|--------------|-------------|
| Insert | Torque | Nm  | EDP          | Part Number | EDP              | Part Number | EDP                | Part Number | EDP           | Part Number | EDP          | Part Number |
| RPHT12 | T15    | 3.0 | FS1169       | MS35080ATX  | FS1077           | SD110-T15   | FS1088             | TH120-T15   | FS1108        | TD140-3.0NM | FS1119       | TB160-T15   |

## MAPM-RP16 Bore Type Face Mills



| EDP    | Tool Number         | Dimensions (mm) |     |    |    |      |        | Coolant | Insert |
|--------|---------------------|-----------------|-----|----|----|------|--------|---------|--------|
|        |                     | D1              | D2  | D3 | L1 | Bore | Flutes |         |        |
| FH1910 | MAPMB-6305-RP16-22  | 63              | 47  | 48 | 40 | 22   | 5      | Y       | RPHT16 |
| FH1911 | MAPMB-8006-RP16-27  | 80              | 64  | 60 | 52 | 27   | 6      | Y       | RPHT16 |
| FH1912 | MAPMB-10007-RP16-32 | 100             | 84  | 80 | 52 | 32   | 7      | Y       | RPHT16 |
| FH1913 | MAPMB-12508-RP16-40 | 125             | 109 | 90 | 52 | 40   | 8      | Y       | RPHT16 |



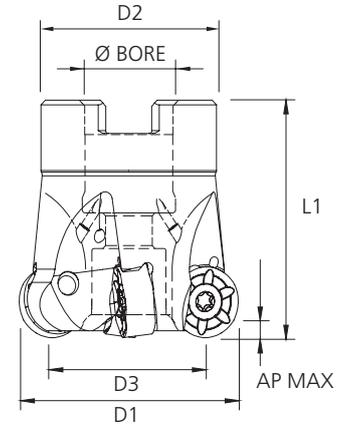
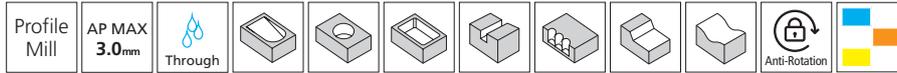
## Inserts

| Insert Number | R   | Grades |        |        |        |
|---------------|-----|--------|--------|--------|--------|
|               |     | FA5130 | FS5140 | FP8030 | FS8030 |
| EDP           |     |        |        |        |        |
| RPHT1605-6MM  | 8.0 | FW4894 | FW4895 | -      | -      |
| RPHT1605-6MS  | 8.0 | -      | -      | -      | FW4890 |

## Spare Parts

|        |     |     | Insert Screw |             | Torx Plus Driver |             | Torx Plus T-Handle |             | Torque Driver |             | Torque Blade |             |
|--------|-----|-----|--------------|-------------|------------------|-------------|--------------------|-------------|---------------|-------------|--------------|-------------|
| Insert |     | Nm  | EDP          | Part Number | EDP              | Part Number | EDP                | Part Number | EDP           | Part Number | EDP          | Part Number |
| RPHT16 | T20 | 5.0 | F51170       | MS45110ATX  | F51078           | SD110-T20   | F51089             | TH120-T20   | F51112        | TD140-5.0NM | F51120       | TB160-T20   |

## MAPM-RN12 Bore Type Face Mills



| EDP    | Tool Number        | Dimensions (mm) |    |    |    |      |        | Coolant | Insert |
|--------|--------------------|-----------------|----|----|----|------|--------|---------|--------|
|        |                    | D1              | D2 | D3 | L1 | Bore | Flutes |         |        |
| FH1914 | MAPMB-5005-RN12-22 | 50              | 42 | 38 | 40 | 22   | 5      | Y       | RNHT12 |
| FH1915 | MAPMB-6306-RN12-22 | 63              | 49 | 51 | 50 | 22   | 6      | Y       | RNHT12 |
| FH1916 | MAPMB-8007-RN12-27 | 80              | 60 | 68 | 50 | 27   | 7      | Y       | RNHT12 |



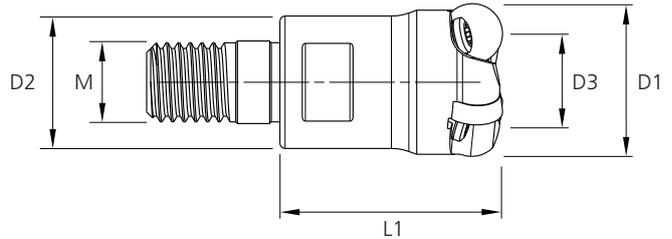
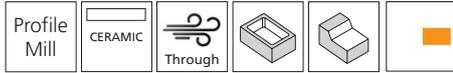
## Inserts

| Insert Number | R   | Grades |        |        |        |
|---------------|-----|--------|--------|--------|--------|
|               |     | FA5130 | FA5140 | FP8030 | FS8030 |
|               |     | EDP    |        |        |        |
| RNHT1204-12MM | 6.0 | FW4898 | FW4899 | -      | -      |
| RNHT1204-12MS | 6.0 | FW4897 | -      | FW5716 | FW4896 |

## Spare Parts

|        |        |     | Insert Screw |             | Torx Driver |             | Torx T-Handle |             | Torque Driver |             | Torque Blade |             |
|--------|--------|-----|--------------|-------------|-------------|-------------|---------------|-------------|---------------|-------------|--------------|-------------|
| Insert | Torque | Nm  | EDP          | Part Number | EDP         | Part Number | EDP           | Part Number | EDP           | Part Number | EDP          | Part Number |
| RNHT12 | T15    | 3.0 | FS1171       | MS40106ATX  | FS1077      | SD110-T15   | FS1088        | TH120-T15   | FS1108        | TD140-3.0NM | FS1119       | TB160-T15   |

## MPM-RP06 & RP09 Screw-On Shank End-Mills



| EDP    | Tool Number        | Dimensions (mm) |      |    |    |     |        |        | Coolant | AP MAX (mm) | Insert |
|--------|--------------------|-----------------|------|----|----|-----|--------|--------|---------|-------------|--------|
|        |                    | D1              | D2   | D3 | L1 | M   | Flutes | Wrench |         |             |        |
| FH2022 | MPMM-1602-RP06-M8  | 16              | 14.5 | 10 | 25 | M8  | 2      | 11     | Y       | 3           | RPGN06 |
| FH2023 | MPMM-2003-RP06-M10 | 20              | 18   | 14 | 30 | M10 | 3      | 15     | Y       | 3           | RPGN06 |
| FH2024 | MPMM-2503-RP09-M12 | 25              | 21   | 16 | 35 | M12 | 3      | 17     | Y       | 4.5         | RPGN09 |
| FH2025 | MPMM-3204-RP09-M16 | 32              | 29   | 23 | 43 | M16 | 4      | 24     | Y       | 4.5         | RPGN09 |



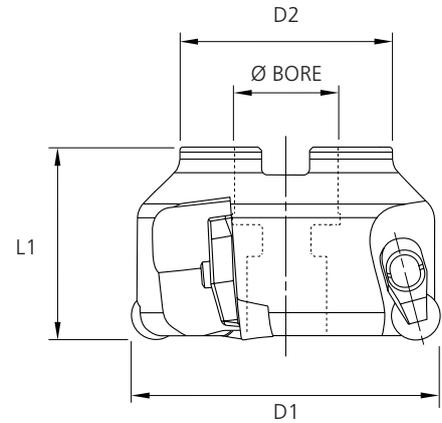
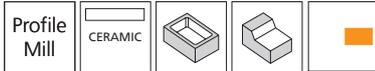
### Inserts

| Insert Number    | R   | Grades |        |
|------------------|-----|--------|--------|
|                  |     | SX9    | WA1    |
|                  |     | EDP    |        |
| RPGN060200E004   | 3.0 | NC0002 | -      |
| RPGN090300E002   | 4.5 | -      | -      |
| RPGN090300T00520 | 4.5 | NC0005 | NC0006 |

### Spare Parts

|          |      |     | Insert Screw |             | Torx Driver |             | Torx T-Handle |             | Torque Driver |             | Torque Blade |             |
|----------|------|-----|--------------|-------------|-------------|-------------|---------------|-------------|---------------|-------------|--------------|-------------|
|          |      |     |              |             |             |             |               |             |               |             |              |             |
| Insert   |      | Nm  | EDP          | Part Number | EDP         | Part Number | EDP           | Part Number | EDP           | Part Number | EDP          | Part Number |
| RPGN0602 | 15IP | 3.0 | FS1192       | MS35095AIP  | FS1085      | SD110-15IP  | FS1094        | TH120-15IP  | FS1108        | TD140-3.0NM | FS1127       | TB160-15IP  |
| RPGN0903 | 15IP | 3.0 | FS1193       | MS40125AIP  | FS1085      | SD110-15IP  | FS1094        | TH120-15IP  | FS1108        | TD140-3.0NM | FS1127       | TB160-15IP  |

## MPM-RP12 Bore Type Face Mills



| EDP    | Tool Number       | Dimensions (mm) |    |    |      |        | Coolant | Insert   |
|--------|-------------------|-----------------|----|----|------|--------|---------|----------|
|        |                   | D1              | D2 | L1 | Bore | Flutes |         |          |
| FH1577 | MPMB-5004-RP12-22 | 50              | 38 | 50 | 22   | 4      | N       | RPGN1204 |
| FH1579 | MPMB-6304-RP12-22 | 63              | 51 | 50 | 22   | 4      | N       | RPGN1204 |
| FH1581 | MPMB-8005-RP12-27 | 80              | 68 | 50 | 27   | 5      | N       | RPGN1204 |



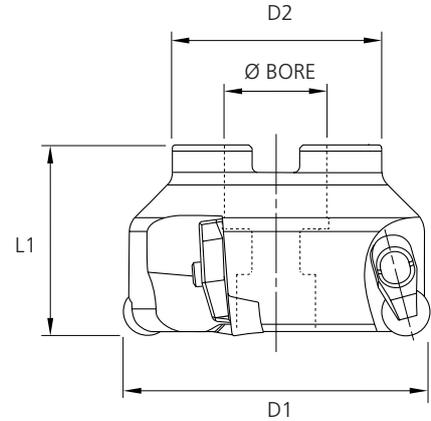
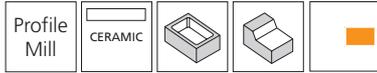
## Inserts

| Insert Number    | R    | Grades |     |
|------------------|------|--------|-----|
|                  |      | SX9    | WA1 |
|                  |      | EDP    |     |
| RPGN120400T00520 | 6.35 | -      | -   |
| RPGN120400T01020 | 6.35 | NC0008 | -   |

## Spare Parts

|          |     |     | Insert Clamp |             | Clamp Spring |             | Clamp Screw |             | Hex T-Handle |             |
|----------|-----|-----|--------------|-------------|--------------|-------------|-------------|-------------|--------------|-------------|
|          |     |     |              |             |              |             |             |             |              |             |
| Insert   |     | Nm  | EDP          | Part Number | EDP          | Part Number | EDP         | Part Number | EDP          | Part Number |
| RPGN1204 | 3.0 | 3.0 | FS1069       | MCL0600S    | FS1070       | MSP0500S    | FS1071      | MSR0600S    | FS1164       | TH120-3.0   |

## MPM-RN12 Bore Type Face Mills



| EDP    | Tool Number       | Dimensions (mm) |    |    |      |        | Coolant | Insert   |
|--------|-------------------|-----------------|----|----|------|--------|---------|----------|
|        |                   | D1              | D2 | L1 | Bore | Flutes |         |          |
| FH1576 | MPMB-5004-RN12-22 | 50              | 38 | 50 | 22   | 4      | N       | RNGN1207 |
| FH1580 | MPMB-6304-RN12-22 | 63              | 51 | 50 | 22   | 4      | N       | RNGN1207 |
| FH1581 | MPMB-8005-RN12-27 | 80              | 68 | 50 | 27   | 5      | N       | RNGN1207 |



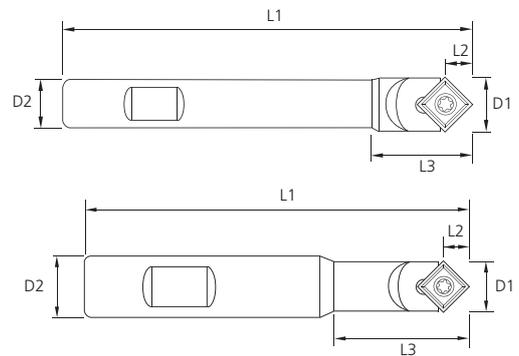
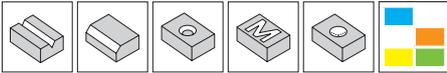
### Inserts

| Insert Number    | R    | Grades |        |
|------------------|------|--------|--------|
|                  |      | SX9    | WA1    |
|                  |      | EDP    |        |
| RNGN120700T00520 | 6.35 | NC0009 | NC0012 |
| RNGN120700T01020 | 6.35 | NC0010 | -      |

### Spare Parts

|          |     |     | Insert Clamp |             | Clamp Screw |             | Clamp Spring |             | Hex T-Handle |             |
|----------|-----|-----|--------------|-------------|-------------|-------------|--------------|-------------|--------------|-------------|
|          |     |     |              |             |             |             |              |             |              |             |
| Insert   |     | Nm  | EDP          | Part Number | EDP         | Part Number | EDP          | Part Number | EDP          | Part Number |
| RNGN1207 | 3.0 | 3.0 | FS1069       | MCL0600S    | FS1070      | MSP0500S    | FS1071       | MSR0600S    | FS1164       | TH120-3.0   |

## MSD-SC09 Indexable 90° Spotting and Chamfer Tool



| EDP    | Tool Number         | Dimensions (mm) |    |     |     |    |        | Insert   |
|--------|---------------------|-----------------|----|-----|-----|----|--------|----------|
|        |                     | D1              | D2 | L1  | L2  | L3 | Degree |          |
| FH1521 | MSD-10-100-90D-SC09 | 2 - 11          | 10 | 100 | 5.2 | 29 | 90°    | SCMX09T3 |
| FH1522 | MSD-12-100-90D-SC09 | 2 - 11          | 12 | 100 | 5.2 | 29 | 90°    | SCMX09T3 |
| FH1523 | MSD-16-100-90D-SC09 | 2 - 11          | 16 | 100 | 5.2 | 29 | 90°    | SCMX09T3 |
| FH1524 | MSD-16-130-90D-SC09 | 2 - 11          | 16 | 130 | 5.2 | 29 | 90°    | SCMX09T3 |



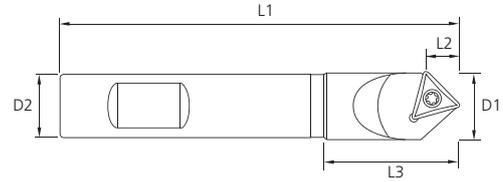
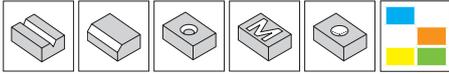
### Inserts

| Insert Number | R   | Grades |        |        |
|---------------|-----|--------|--------|--------|
|               |     | FS5130 | FN1010 | FS5110 |
| EDP           |     |        |        |        |
| SCGX09T304-AL | 0.4 | -      | FW5705 | -      |
| SCGX09T304-MS | 0.4 | -      | -      | FW5706 |
| SCMX09T304-MM | 0.4 | FW5707 | -      | -      |

### Spare Parts

|             |     |     | Insert Screw |            | Torx Driver |             | Torx T-Handle |             | Torque Driver |             | Torque Blade |             |
|-------------|-----|-----|--------------|------------|-------------|-------------|---------------|-------------|---------------|-------------|--------------|-------------|
|             |     |     |              |            |             |             |               |             |               |             |              |             |
| Insert      | ⚙️  | Nm  | EDP          | Part No.   | EDP         | Part Number | EDP           | Part Number | EDP           | Part Number | EDP          | Part Number |
| SCGX/SCMX09 | T15 | 3.0 | FS1135       | MS35074ATX | FS1077      | SD110-T15   | FS1088        | TH120-T15   | FS1108        | TD140-3.0NM | FS1119       | TB160-T15   |

## MSD-TC16 Indexable 90° Spotting and Chamfer Tool



| EDP    | Tool Number         | Dimensions (mm) |    |     |     |    |        | Insert   |
|--------|---------------------|-----------------|----|-----|-----|----|--------|----------|
|        |                     | D1              | D2 | L1  | L2  | L3 | Degree |          |
| FH1570 | MSD-20-120-90D-TC16 | 3-20            | 20 | 120 | 9.6 | 42 | 90°    | TCMX16T3 |



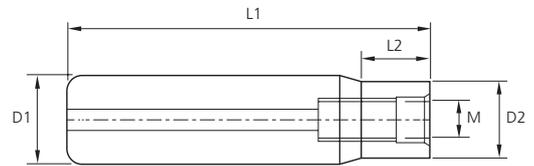
### Inserts

| Insert Number | R   | Grades |        |        |
|---------------|-----|--------|--------|--------|
|               |     | FS5130 | FN1010 | FS5110 |
| EDP           |     |        |        |        |
| TCGX16T308-AL | 0.8 | -      | FW5708 | -      |
| TCGX16T308-MS | 0.8 | -      | -      | FW5709 |
| TCMX16T308-MM | 0.8 | FW5710 | -      | -      |

### Spare Parts

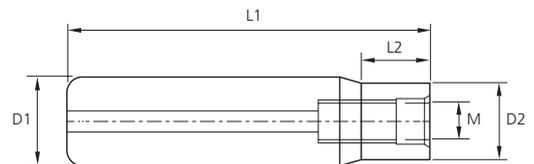
|        |     |     | Insert Screw |            | Torx Driver |             | Torx T-Handle |             | Torque Driver |             | Torque Blade |             |
|--------|-----|-----|--------------|------------|-------------|-------------|---------------|-------------|---------------|-------------|--------------|-------------|
|        |     |     |              |            |             |             |               |             |               |             |              |             |
| Insert |     | Nm  | EDP          | Part No.   | EDP         | Part Number | EDP           | Part Number | EDP           | Part Number | EDP          | Part Number |
| TCX16  | T15 | 3.0 | FS1135       | MS35074ATX | FS1077      | SD110-T15   | FS1088        | TH120-T15   | FS1108        | TD140-3.0NM | FS1119       | TB160-T15   |

## MSS Screw-On Tool Holders Steel Straight Shanks



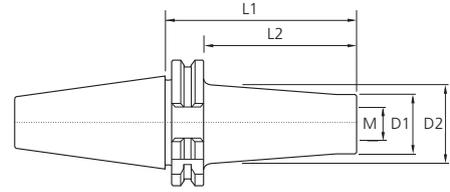
| EDP    | Part Number         | D1 | D2   | L1  | L2 | M   |
|--------|---------------------|----|------|-----|----|-----|
| FC1217 | MSS-D16-M8-90-20T   | 16 | 14.5 | 90  | 20 | M8  |
| FC1218 | MSS-D16-M8-150-30T  | 16 | 14.5 | 150 | 30 | M8  |
| FC1210 | MSS-D20-M10-150-40T | 20 | 17.7 | 150 | 40 | M10 |
| FC1212 | MSS-D25-M12-150-40T | 25 | 20.7 | 150 | 40 | M12 |
| FC1213 | MSS-D32-M16-170-40T | 32 | 28.7 | 170 | 40 | M16 |

## MCS Screw-On Tool Holders Carbide Straight Shanks



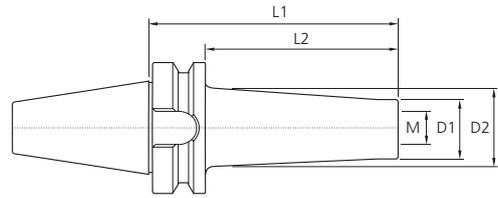
| EDP    | Part Number         | D1 | D2   | L1  | L2  | M   |
|--------|---------------------|----|------|-----|-----|-----|
| FC1001 | MCS-D16-M8-100-30   | 16 | 15.5 | 100 | 30  | M8  |
| FC1002 | MCS-D16-M8-150-50   | 16 | 15.5 | 150 | 50  | M8  |
| FC1013 | MCS-D16-M8-150-95   | 16 | 15.5 | 150 | 95  | M8  |
| FC1003 | MCS-D16-M8-200-100  | 16 | 15.5 | 200 | 100 | M8  |
| FC1305 | MCS-D20-M10-100-50  | 20 | 19   | 100 | 50  | M10 |
| FC1306 | MCS-D20-M10-150-100 | 20 | 19   | 150 | 100 | M10 |
| FC1004 | MCS-D20-M10-200-50  | 20 | 18.5 | 200 | 50  | M10 |
| FC1005 | MCS-D20-M10-250-100 | 20 | 18.5 | 250 | 100 | M10 |
| FC1006 | MCS-D20-M10-300-150 | 20 | 18.5 | 300 | 150 | M10 |
| FC1007 | MCS-D25-M12-200-50  | 25 | 23   | 200 | 50  | M12 |
| FC1008 | MCS-D25-M12-250-100 | 25 | 23   | 250 | 100 | M12 |
| FC1009 | MCS-D25-M12-300-150 | 25 | 23   | 300 | 150 | M12 |
| FC1010 | MCS-D32-M16-250-100 | 32 | 28   | 250 | 100 | M16 |
| FC1011 | MCS-D32-M16-300-150 | 32 | 28   | 300 | 150 | M16 |
| FC1012 | MCS-D32-M16-350-200 | 32 | 28   | 350 | 200 | M16 |

## SOM Screw-On Tool Holders SK (DIN 69871) Taper Adapters



| EDP     | Part Number       | SK | D1   | D2   | L1    | L2  | M   |
|---------|-------------------|----|------|------|-------|-----|-----|
| FA11642 | SK40-MCA08-050ADB | 40 | 14.5 | 23   | 69.1  | 50  | M8  |
| FA11643 | SK40-MCA08-075ADB | 40 | 14.5 | 23   | 94.1  | 75  | M8  |
| FA11644 | SK40-MCA08-100ADB | 40 | 14.5 | 25   | 119.1 | 100 | M8  |
| FA11646 | SK40-MCA10-050ADB | 40 | 18   | 23   | 69.1  | 50  | M10 |
| FA11647 | SK40-MCA10-075ADB | 40 | 18   | 28   | 94.1  | 75  | M10 |
| FA11648 | SK40-MCA10-100ADB | 40 | 18   | 32   | 119.1 | 100 | M10 |
| FA11650 | SK40-MCA12-050ADB | 40 | 21   | 24   | 69.1  | 50  | M12 |
| FA11651 | SK40-MCA12-075ADB | 40 | 21   | 31   | 94.1  | 75  | M12 |
| FA11652 | SK40-MCA12-100ADB | 40 | 21   | 33   | 119.1 | 100 | M12 |
| FA11653 | SK40-MCA12-125ADB | 40 | 21   | 36   | 144.1 | 125 | M12 |
| FA11655 | SK40-MCA16-050ADB | 40 | 29   | 34   | 69.1  | 50  | M16 |
| FA11656 | SK40-MCA16-075ADB | 40 | 29   | 34   | 94.1  | 75  | M16 |
| FA11657 | SK40-MCA16-100ADB | 40 | 29   | 36   | 119.1 | 100 | M16 |
| FA11658 | SK40-MCA16-125ADB | 40 | 29   | 40   | 144.1 | 125 | M16 |
| FA11659 | SK40-MCA16-150ADB | 40 | 29   | 42.5 | 169.1 | 150 | M16 |
| FA11666 | SK50-MCA12-050ADB | 50 | 21   | 24   | 69.1  | 50  | M12 |
| FA11667 | SK50-MCA12-100ADB | 50 | 21   | 33   | 119.1 | 100 | M12 |
| FA11668 | SK50-MCA12-150ADB | 50 | 21   | 40   | 169.1 | 150 | M12 |
| FA11669 | SK50-MCA16-050ADB | 50 | 29   | 34   | 69.1  | 50  | M16 |
| FA11670 | SK50-MCA16-100ADB | 50 | 29   | 36   | 119.1 | 100 | M16 |
| FA11671 | SK50-MCA16-150ADB | 50 | 29   | 42.5 | 169.1 | 150 | M16 |

## SOM Screw-On Tool Holders BT (MAS 403) Taper Adapters



| EDP     | Part Number       | ISO | D1   | D2   | L1  | L2  | M   |
|---------|-------------------|-----|------|------|-----|-----|-----|
| FA10374 | BT40-MCA08-050ADB | 40  | 14.5 | 23   | 77  | 50  | M8  |
| FA10375 | BT40-MCA08-075ADB | 40  | 14.5 | 23   | 102 | 75  | M8  |
| FA10376 | BT40-MCA08-100ADB | 40  | 14.5 | 25   | 127 | 100 | M8  |
| FA10378 | BT40-MCA10-050ADB | 40  | 18   | 23   | 77  | 50  | M10 |
| FA10379 | BT40-MCA10-075ADB | 40  | 18   | 28   | 102 | 75  | M10 |
| FA10380 | BT40-MCA10-100ADB | 40  | 18   | 32   | 127 | 100 | M10 |
| FA10382 | BT40-MCA12-050ADB | 40  | 21   | 24   | 77  | 50  | M12 |
| FA10383 | BT40-MCA12-075ADB | 40  | 21   | 31   | 102 | 75  | M12 |
| FA10384 | BT40-MCA12-100ADB | 40  | 21   | 33   | 127 | 100 | M12 |
| FA10385 | BT40-MCA12-125ADB | 40  | 21   | 36   | 154 | 125 | M12 |
| FA10387 | BT40-MCA16-050ADB | 40  | 29   | 34   | 77  | 50  | M16 |
| FA10388 | BT40-MCA16-075ADB | 40  | 29   | 34   | 102 | 75  | M16 |
| FA10389 | BT40-MCA16-100ADB | 40  | 29   | 36   | 127 | 100 | M16 |
| FA10390 | BT40-MCA16-125ADB | 40  | 29   | 40   | 154 | 125 | M16 |
| FA10391 | BT40-MCA16-150ADB | 40  | 29   | 42.5 | 177 | 150 | M16 |
| FA10398 | BT50-MCA12-050ADB | 50  | 21   | 24   | 88  | 50  | M12 |
| FA10399 | BT50-MCA12-100ADB | 50  | 21   | 33   | 138 | 100 | M12 |
| FA10400 | BT50-MCA12-150ADB | 50  | 21   | 40   | 188 | 150 | M12 |
| FA10401 | BT50-MCA16-050ADB | 50  | 29   | 34   | 88  | 50  | M16 |
| FA10402 | BT50-MCA16-100ADB | 50  | 29   | 36   | 138 | 100 | M16 |
| FA10403 | BT50-MCA16-150ADB | 50  | 29   | 42.5 | 188 | 150 | M16 |

## Grade & Applications

| Grade  | Type     | Application  |
|--------|----------|--|
| FA6225 | PVD      | General machining of steel, tool-steel and cast iron   |
| FA6230 | PVD      | Multi application grade that can work in wide range of materials   |
| FP6115 | PVD      | Semi-finishing, finishing and light cutting of steel   |
| FP6125 | PVD      | Semi-finishing to roughing of steel  |
| FP8030 | PVD      | Machining of high alloyed steels. Increased heat resistant grade   |
| FS5130 | PVD      | Rough machining of steels and pre-hardened tool steels   |
| FX6030 | PVD      | Rough machining of steels and pre-hardened tool steels. Improved surface quality for increased tool-life |
| FM6140 | CVD      | Stainless steel and interrupted applications   |
| FM6235 | PVD      | Stainless steels and titanium  |
| FX6040 | PVD      | Rough machining of stainless steels. Improved surface quality for increased tool-life                    |
| FS5110 | PVD      | Chamfer tool insert grade for steel and stainless steels   |
| FS6030 | PVD      | Titanium and high temperature alloys   |
| FS8030 | PVD      | Titanium and high temperature alloys. Increased heat resistance grade                                    |
| FK6015 | PVD      | Wet and dry machining of cast iron   |
| FK6125 | CVD      | High toughness grade for rough and interrupted machining of cast iron and ductile iron                   |
| FS5120 | PVD      | High hard grade for hardened steel   |
| FN1010 | Uncoated | Chamfer tool inserts grade for aluminium   |
| FN6125 | Uncoated | Ultra fine grain carbide with high wear resistance and toughness for machining aluminium and copper      |
| SX9    | Ceramic  | SiAlON ceramic grade for high speed machining of heat resistant alloys                                   |
| WA1    | Ceramic  | Whisker ceramic grade for heat resistant alloys. High toughness and wear resistance                      |

## Geometries & Applications

| Geometry | Application   |
|----------|---|
| AL       | High positive geometry for general cutting of aluminium and non ferrous materials   |
| MS       | Sharp geometry for stainless steel, low force and extreme long overhangs to reduce vibration. Also for small depths of cut when shoulder milling. |
| MM       | First choice for general milling and roughing when continuous cutting in wide range of materials  |
| MR       | Roughing geometry for strong and hardened steels. Additional edge strength.   |
| MH       | Improved edge strength for heavy roughing or interrupted cutting  |
| MW       | Wiper geometry insert for improving surface finish.   |
| SM       | High feed geometry for reduced cutting force when machining steels and stainless steels   |
| WB       | Wiper geometry for improving surface finish   |

## Series MSM-AP, MSM-WN, MSM-XD11 & MSM-XD19

### Recommended Speeds by Material Group

| Workpiece Material Group |   | Material Type                       | Coolant |     |     | Vc-m/min |            |      |
|--------------------------|---|-------------------------------------|---------|-----|-----|----------|------------|------|
|                          |   |                                     | Max     | Air | MMS | Low      | Mid        | High |
| Steels                   | P | Low Carbon Steels $\leq$ 180HB      | ○       | ●   | ●   | 150      | <b>180</b> | 220  |
|                          |   | Med Carbon / Alloy Steels 180-350HB | ○       | ●   | ●   | 120      | <b>150</b> | 200  |
|                          |   | Pre-Hardened Steels 35-45HRC        | ○       | ●   | ●   | 120      | <b>150</b> | 200  |
| Stainless Steels         | M | Free Machining Stainless            | ●       | X   | ○   | 120      | <b>160</b> | 180  |
|                          |   | Austenitic Stainless                | ●       | X   | ○   | 100      | <b>140</b> | 160  |
|                          |   | Difficult Stainless                 | ●       | X   | ○   | 80       | <b>120</b> | 140  |
| Special Alloys           | S | High Temp Alloys                    | ●       | X   | X   | 20       | <b>25</b>  | 30   |
|                          |   | Titanium Alloys                     | ●       | X   | X   | 70       | <b>90</b>  | 100  |
| Cast Irons               | K | Grey Cast Iron                      | ●       | ○   | ○   | 150      | <b>180</b> | 220  |
|                          |   | Ductile Cast Iron                   | ●       | ○   | ○   | 100      | <b>120</b> | 180  |
| Hardened Steels          | H | Hardened Steels 45 - 50HRC          | X       | ●   | ●   | 60       | <b>80</b>  | 100  |
| Non Ferrous              | N | Aluminium Alloys                    | ●       | ○   | ○   | 300      | <b>600</b> | 900  |
|                          |   | Brass / Bronze / Copper             | ●       | ○   | ○   | 200      | <b>400</b> | 600  |

### Recommended Feed per Tooth by Material Group

| Workpiece Material Group |   | Material Type                       | Geometry    |             |      |      |             |      |      |             |      |      |             |      |
|--------------------------|---|-------------------------------------|-------------|-------------|------|------|-------------|------|------|-------------|------|------|-------------|------|
|                          |   |                                     | ML          |             |      | MM   |             |      | MH   |             |      | AL   |             |      |
|                          |   |                                     | fz-mm/tooth |             |      |      |             |      |      |             |      |      |             |      |
|                          |   |                                     | Low         | Mid         | High | Low  | Mid         | High | Low  | Mid         | High | Low  | Mid         | High |
| Steels                   | P | Low Carbon Steels $\leq$ 180HB      | 0.05        | <b>0.10</b> | 0.15 | 0.10 | <b>0.15</b> | 0.20 | 0.10 | <b>0.20</b> | 0.25 | -    | -           | -    |
|                          |   | Med Carbon / Alloy Steels 180-350HB | 0.05        | <b>0.10</b> | 0.15 | 0.10 | <b>0.15</b> | 0.20 | 0.10 | <b>0.20</b> | 0.25 | -    | -           | -    |
|                          |   | Pre-Hardened Steels 35-45HRC        | 0.05        | <b>0.10</b> | 0.15 | 0.10 | <b>0.15</b> | 0.20 | 0.10 | <b>0.20</b> | 0.25 | -    | -           | -    |
| Stainless Steels         | M | Free Machining Stainless            | 0.05        | <b>0.10</b> | 0.15 | 0.10 | <b>0.15</b> | 0.20 | -    | -           | -    | -    | -           | -    |
|                          |   | Austenitic Stainless                | 0.05        | <b>0.10</b> | 0.15 | 0.10 | <b>0.15</b> | 0.20 | -    | -           | -    | -    | -           | -    |
|                          |   | Difficult Stainless                 | 0.05        | <b>0.10</b> | 0.15 | 0.10 | <b>0.15</b> | 0.20 | -    | -           | -    | -    | -           | -    |
| Special Alloys           | S | High Temp Alloys                    | 0.05        | <b>0.10</b> | 0.15 | 0.10 | <b>0.15</b> | 0.20 | -    | -           | -    | -    | -           | -    |
|                          |   | Titanium Alloys                     | 0.05        | <b>0.10</b> | 0.15 | 0.10 | <b>0.15</b> | 0.20 | -    | -           | -    | -    | -           | -    |
| Cast Irons               | K | Grey Cast Iron                      | -           | -           | -    | 0.10 | <b>0.15</b> | 0.20 | 0.10 | <b>0.20</b> | 0.25 | -    | -           | -    |
|                          |   | Ductile Cast Iron                   | -           | -           | -    | 0.10 | <b>0.15</b> | 0.20 | 0.10 | <b>0.20</b> | 0.25 | -    | -           | -    |
| Hardened Steels          | H | Hardened Steels 45 - 50HRC          | 0.05        | <b>0.10</b> | 0.15 | 0.10 | <b>0.15</b> | 0.20 | 0.10 | <b>0.20</b> | 0.25 | -    | -           | -    |
| Non Ferrous              | N | Aluminium Alloys                    | -           | -           | -    | -    | -           | -    | -    | -           | -    | 0.10 | <b>0.15</b> | 0.20 |
|                          |   | Brass / Bronze / Copper             | -           | -           | -    | -    | -           | -    | -    | -           | -    | 0.10 | <b>0.15</b> | 0.20 |

## Series MFM-SE13 & MFM-SN12

### Recommended Speeds by Material Group

| Workpiece Material Group | Material Type | Coolant                             |     |     | Vc-m/min |     |      |     |
|--------------------------|---------------|-------------------------------------|-----|-----|----------|-----|------|-----|
|                          |               | Max                                 | Air | MMS | Low      | Mid | High |     |
| Steels                   | P             | Low Carbon Steels ≤180HB            | ●   | ●   | ●        | 210 | 250  | 350 |
|                          |               | Med Carbon / Alloy Steels 180-350HB | ●   | ●   | ●        | 170 | 220  | 270 |
|                          |               | Pre-Hardened Steels 35-45HRC        | ●   | ●   | ●        | 100 | 140  | 180 |
| Stainless Steels         | M             | Free Machining Stainless            | ●   | X   | ○        | 130 | 180  | 250 |
|                          |               | Austenitic Stainless                | ●   | X   | ○        | 120 | 160  | 180 |
|                          |               | Difficult Stainless                 | ●   | X   | ○        | 100 | 140  | 160 |
| Special Alloys           | S             | High Temp Alloys                    | ●   | X   | X        | 20  | 30   | 40  |
|                          |               | Titanium Alloys                     | ●   | X   | X        | 90  | 100  | 120 |
| Cast Irons               | K             | Grey Cast Iron                      | ●   | ○   | ○        | 150 | 180  | 220 |
|                          |               | Ductile Cast Iron                   | ●   | ○   | ○        | 100 | 120  | 180 |
| Hardened Steels          | H             | Hardened Steels 45 - 50HRC          | X   | ●   | ●        | 80  | 100  | 140 |
| Non Ferrous              | N             | Aluminium Alloys                    | ●   | ○   | ○        | 300 | 600  | 900 |
|                          |               | Brass / Bronze / Copper             | ●   | ○   | ○        | 200 | 400  | 600 |

### Recommended Feed per Tooth by Material Group

| Workpiece Material Group | Material Type | Geometry                            |      |      |      |      |      |      |      |      |      |      |      |      |
|--------------------------|---------------|-------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
|                          |               | ML                                  |      |      | MM   |      |      | MH   |      |      | AL   |      |      |      |
|                          |               | fz-mm/tooth                         |      |      |      |      |      |      |      |      |      |      |      |      |
|                          |               | Low                                 | Mid  | High | Low  | Mid  | High | Low  | Mid  | High | Low  | Mid  | High |      |
| Steels                   | P             | Low Carbon Steels ≤180HB            | 0.10 | 0.15 | 0.20 | 0.10 | 0.15 | 0.20 | 0.10 | 0.20 | 0.30 | -    | -    | -    |
|                          |               | Med Carbon / Alloy Steels 180-350HB | 0.10 | 0.15 | 0.20 | 0.10 | 0.15 | 0.20 | 0.10 | 0.20 | 0.30 | -    | -    | -    |
|                          |               | Pre-Hardened Steels 35-45HRC        | 0.10 | 0.15 | 0.20 | 0.10 | 0.15 | 0.20 | 0.10 | 0.20 | 0.30 | -    | -    | -    |
| Stainless Steels         | M             | Free Machining Stainless            | 0.10 | 0.15 | 0.20 | 0.10 | 0.15 | 0.20 | 0.10 | 0.20 | 0.30 | -    | -    | -    |
|                          |               | Austenitic Stainless                | 0.10 | 0.15 | 0.20 | 0.10 | 0.15 | 0.20 | -    | -    | -    | -    | -    | -    |
|                          |               | Difficult Stainless                 | 0.10 | 0.15 | 0.20 | 0.10 | 0.15 | 0.20 | -    | -    | -    | -    | -    | -    |
| Special Alloys           | S             | High Temp Alloys                    | 0.10 | 0.15 | 0.20 | 0.10 | 0.15 | 0.20 | -    | -    | -    | -    | -    | -    |
|                          |               | Titanium Alloys                     | 0.10 | 0.15 | 0.20 | 0.10 | 0.15 | 0.20 | -    | -    | -    | -    | -    | -    |
| Cast Irons               | K             | Grey Cast Iron                      | -    | -    | -    | 0.10 | 0.15 | 0.20 | 0.10 | 0.20 | 0.30 | -    | -    | -    |
|                          |               | Ductile Cast Iron                   | -    | -    | -    | 0.10 | 0.15 | 0.20 | 0.10 | 0.20 | 0.30 | -    | -    | -    |
| Hardened Steels          | H             | Hardened Steels 45 - 50HRC          | 0.10 | 0.15 | 0.20 | 0.10 | 0.15 | 0.20 | 0.10 | 0.20 | 0.30 | -    | -    | -    |
| Non Ferrous              | N             | Aluminium Alloys                    | -    | -    | -    | -    | -    | -    | -    | -    | -    | 0.10 | 0.15 | 0.20 |
|                          |               | Brass / Bronze / Copper             | -    | -    | -    | -    | -    | -    | -    | -    | -    | 0.10 | 0.15 | 0.20 |

## Series MHF-BN06

### Recommended Speeds by Material Group

| Workpiece Material Group | Material Type | Coolant                           |          | 3D                     | 3D-5D | 5D-7D | >7D |     |
|--------------------------|---------------|-----------------------------------|----------|------------------------|-------|-------|-----|-----|
|                          |               | Air                               | Emulsion | Carbide Shank          |       |       |     |     |
|                          |               |                                   |          | Vc-m/min Cutting Speed |       |       |     |     |
| Steels                   | P             | Carbon Steels                     | ●        | -                      | 200   | 150   | 120 | 100 |
|                          |               | Alloy Steels                      | ●        | -                      | 180   | 140   | 100 | 80  |
|                          |               | Tool Steels Below 260HB           | ●        | -                      | 180   | 140   | 100 | 80  |
|                          |               | Pre-Hardened Tool Steels 30-40HRC | ●        | -                      | 150   | 120   | 100 | 80  |
| Stainless Steels         | M             | Stainless Steels 400 Series       | ●        | -                      | 110   | 90    | 80  | 70  |
|                          |               | Stainless Steels 300 Series       | ●        | ●                      | 100   | 80    | 70  | 60  |
|                          |               | Stainless Steels PH Series        | -        | -                      | 110   | 90    | 80  | 70  |
| Special Alloys           | S             | High Temp Alloys                  | -        | ●                      | 25    | 20    | 15  | 12  |
|                          |               | Titanium Alloys                   | -        | ●                      | 80    | 70    | 50  | 40  |
| Cast Irons               | K             | Grey Cast Iron                    | -        | ●                      | 180   | 140   | 100 | 80  |
|                          |               | Ductile Cast Iron                 | -        | ●                      | 150   | 120   | 80  | 65  |
| Hardened Steels          | H             | Hardened Steels 45-50HRC          | ●        | -                      | 120   | 90    | 70  | 60  |
|                          |               | Hardened Steels 50-55HRC          | ●        | -                      | 80    | 70    | 60  | 50  |

### Recommended Feed per Tooth by Material Group

| Workpiece Material Group | Material Type |                                   |          | 3D            | 3D-5D | 5D-7D | >7D |     |
|--------------------------|---------------|-----------------------------------|----------|---------------|-------|-------|-----|-----|
|                          |               | fz-mm                             | Ae-mm    | Carbide Shank |       |       |     |     |
|                          |               |                                   |          | Ap-mm         |       |       |     |     |
|                          |               | Feed/tooth                        | Stepover | Depth of Cut  |       |       |     |     |
| Steels                   | P             | Carbon Steels                     | 1.2      | 70%           | 0.8   | 0.6   | 0.5 | 0.4 |
|                          |               | Alloy Steels                      | 1.2      | 70%           | 0.8   | 0.6   | 0.5 | 0.4 |
|                          |               | Tool Steels Below 260HB           | 1.1      | 70%           | 0.8   | 0.6   | 0.5 | 0.4 |
|                          |               | Pre-Hardened Tool Steels 30-40HRC | 1.0      | 70%           | 0.7   | 0.5   | 0.4 | 0.3 |
| Stainless Steels         | M             | Stainless Steels 400 Series       | 0.8      | 70%           | 0.7   | 0.5   | 0.4 | 0.3 |
|                          |               | Stainless Steels 300 Series       | 0.6      | 60%           | 0.6   | 0.4   | 0.3 | 0.2 |
|                          |               | Stainless Steels PH Series        | 0.8      | 60%           | 0.7   | 0.5   | 0.4 | 0.3 |
| Special Alloys           | S             | High Temp Alloys                  | 0.5      | 30%           | 0.6   | 0.4   | 0.3 | 0.2 |
|                          |               | Titanium Alloys                   | 0.5      | 30%           | 0.6   | 0.4   | 0.3 | 0.2 |
| Cast Irons               | K             | Grey Cast Iron                    | 1.2      | 70%           | 0.8   | 0.6   | 0.5 | 0.4 |
|                          |               | Ductile Cast Iron                 | 1.2      | 70%           | 0.8   | 0.6   | 0.5 | 0.4 |
| Hardened Steels          | H             | Hardened Steels 45-50HRC          | 0.8      | 70%           | 0.6   | 0.5   | 0.4 | 0.3 |
|                          |               | Hardened Steels 50-55HRC          | 0.4      | 60%           | 0.6   | 0.5   | 0.4 | 0.3 |

### Ramping Data

| Tool D1 | Ramp - max | Dia-min | Dia-max | Pitch max (mm) |
|---------|------------|---------|---------|----------------|
| 16      | 3.0        | 23.0    | 32.0    | 0.7            |
| 20      | 1.5        | 31.0    | 40.0    | 0.8            |
| 25      | 1.4        | 41.0    | 50.0    | 1.0            |
| 32      | 1.0        | 55.0    | 64.0    | 1.0            |
| 35      | 1.0        | 60.0    | 70.0    | 1.0            |
| 40      | 0.9        | 71.0    | 80.0    | 1.0            |
| 50      | 0.6        | 91.0    | 100.0   | 1.0            |
| 52      | 0.6        | 95.0    | 104.0   | 1.0            |

## Series MHF-SD12

### Recommended Speeds by Material Group

| Workpiece Material Group | Material Type | Coolant                           |          | 3D                     | 3D-5D |     |
|--------------------------|---------------|-----------------------------------|----------|------------------------|-------|-----|
|                          |               | Air                               | Emulsion | Vc-m/min Cutting Speed |       |     |
|                          |               |                                   |          |                        |       |     |
| Steels                   | P             | Carbon Steels                     | ●        | -                      | 200   | 150 |
|                          |               | Alloy Steels                      | ●        | -                      | 180   | 140 |
|                          |               | Tool Steels Below 260HB           | ●        | -                      | 180   | 140 |
|                          |               | Pre-Hardened Tool Steels 30-40HRC | ●        | -                      | 150   | 120 |
| Stainless Steels         | M             | Stainless Steels 400 Series       | ●        | -                      | 110   | 90  |
|                          |               | Stainless Steels 300 Series       | ●        | ●                      | 100   | 80  |
|                          |               | Stainless Steels PH Series        | -        | -                      | 110   | 90  |
| Special Alloys           | S             | High Temp Alloys                  | -        | ●                      | 25    | 20  |
|                          |               | Titanium Alloys                   | -        | ●                      | 70    | 50  |
| Cast Irons               | K             | Grey Cast Iron                    | -        | ●                      | 180   | 140 |
|                          |               | Ductile Cast Iron                 | -        | ●                      | 150   | 120 |

### Recommended Feed per Tooth by Material Group

| Workpiece Material Group | Material Type |                                   |          | 3D           | 3D-5D |     |
|--------------------------|---------------|-----------------------------------|----------|--------------|-------|-----|
|                          |               | fz-mm                             | Ae-mm    | Ap-mm        |       |     |
|                          |               | Feed/tooth                        | Stepover | Depth of Cut |       |     |
|                          |               |                                   |          |              |       |     |
| Steels                   | P             | Carbon Steels                     | 2.0      | 70%          | 0.8   | 0.6 |
|                          |               | Alloy Steels                      | 1.6      | 70%          | 0.8   | 0.6 |
|                          |               | Tool Steels Below 260HB           | 1.2      | 70%          | 0.8   | 0.6 |
|                          |               | Pre-Hardened Tool Steels 30-40HRC | 1.1      | 70%          | 0.7   | 0.5 |
| Stainless Steels         | M             | Stainless Steels 400 Series       | 0.8      | 70%          | 0.7   | 0.5 |
|                          |               | Stainless Steels 300 Series       | 0.6      | 60%          | 0.6   | 0.4 |
|                          |               | Stainless Steels PH Series        | 0.8      | 60%          | 0.7   | 0.5 |
| Special Alloys           | S             | High Temp Alloys                  | 0.5      | 30%          | 0.6   | 0.4 |
|                          |               | Titanium Alloys                   | 0.5      | 30%          | 0.6   | 0.4 |
| Cast Irons               | K             | Grey Cast Iron                    | 2.0      | 70%          | 0.8   | 0.6 |
|                          |               | Ductile Cast Iron                 | 2.0      | 70%          | 0.8   | 0.6 |

## Series MAHF-XD09

### Recommended Speeds by Material Group

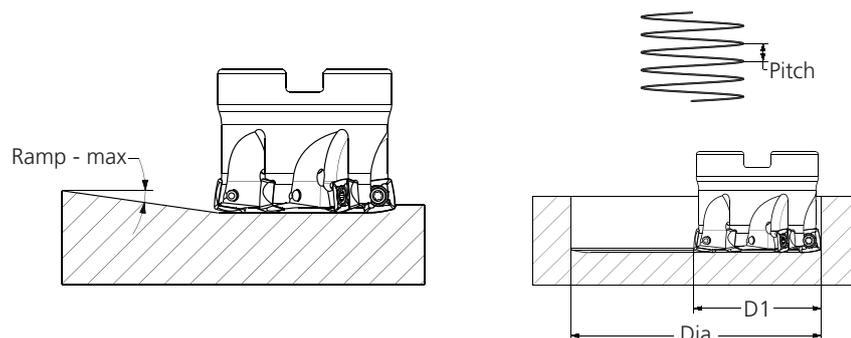
| Workpiece Material Group |   | Material Type                       | Coolant |          | Overhang - D x Ø |     |     |
|--------------------------|---|-------------------------------------|---------|----------|------------------|-----|-----|
|                          |   |                                     | Air     | Emulsion | 3D               | 4D  | 5D  |
|                          |   |                                     |         | Vc-m/min |                  |     |     |
| Steels                   | P | Low Carbon Steels ≤180HB            | ●       | ○        | 200              | 150 | 120 |
|                          |   | Med Carbon / Alloy Steels 180-350HB | ●       | ○        | 180              | 140 | 100 |
|                          |   | Pre-Hardened Steels 35-45HRC        | ●       | ○        | 150              | 120 | 100 |
| Stainless Steels         | M | Free Machining Stainless            | ●       | ○        | 110              | 90  | 80  |
|                          |   | Austenitic Stainless                | ●       | ●        | 100              | 80  | 70  |
|                          |   | Difficult Stainless                 | ●       | ○        | 110              | 90  | 80  |
| Special Alloys           | S | High Temp Alloys                    | X       | ●        | 25               | 20  | 15  |
|                          |   | Titanium Alloys                     | X       | ●        | 80               | 70  | 50  |

### Recommended Feed per Tooth by Material Group

| Workpiece Material Group |   | Material Type                       |       |        | Overhang - D x Ø |     |     |
|--------------------------|---|-------------------------------------|-------|--------|------------------|-----|-----|
|                          |   |                                     | fz-mm | Ae-mm  | 3D               | 4D  | 5D  |
|                          |   |                                     |       | Ap-mm  |                  |     |     |
| Steels                   | P | Low Carbon Steels ≤180HB            | 1.2   | 70-80% | 0.8              | 0.6 | 0.5 |
|                          |   | Med Carbon / Alloy Steels 180-350HB | 1.1   | 70-80% | 0.8              | 0.6 | 0.5 |
|                          |   | Pre-Hardened Steels 35-45HRC        | 1.0   | 70-80% | 0.7              | 0.5 | 0.4 |
| Stainless Steels         | M | Free Machining Stainless            | 0.8   | 70-80% | 0.7              | 0.5 | 0.4 |
|                          |   | Austenitic Stainless                | 0.6   | 60-70% | 0.6              | 0.4 | 0.3 |
|                          |   | Difficult Stainless                 | 0.8   | 60-70% | 0.7              | 0.5 | 0.4 |
| Special Alloys           | S | High Temp Alloys                    | 0.5   | 30-50% | 0.6              | 0.4 | 0.3 |
|                          |   | Titanium Alloys                     | 0.5   | 30-50% | 0.6              | 0.4 | 0.3 |

## Ramping Data

| Tool D1 | Ramp - max | Dia-min | Dia-max | Pitch max (mm) |
|---------|------------|---------|---------|----------------|
| 25      | 7.1°       | 34.5    | 48.9    | 1.0            |
| 32      | 4.3°       | 48.5    | 62.9    | 1.0            |
| 35      | 3.7°       | 54.5    | 68.9    | 1.0            |
| 40      | 3.0°       | 64.4    | 78.9    | 1.0            |
| 50      | 2.1°       | 84.4    | 98.9    | 1.0            |
| 63      | 1.5°       | 110.4   | 124.9   | 1.0            |



## Series MAHF-XD12

### Recommended Speeds by Material Group

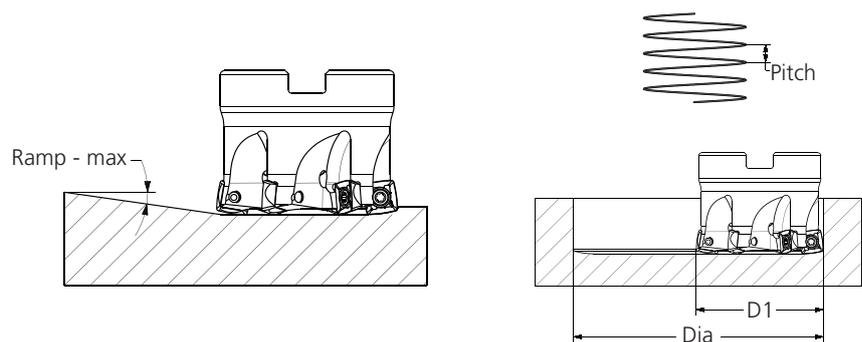
| Workpiece Material Group | Material Type | Coolant                             |          | Overhang - D x Ø |     |     |     |
|--------------------------|---------------|-------------------------------------|----------|------------------|-----|-----|-----|
|                          |               | Air                                 | Emulsion | 3D               | 4D  | 5D  |     |
|                          |               |                                     |          | Vc-m/min         |     |     |     |
| Steels                   | P             | Low Carbon Steels ≤180HB            | ●        | ○                | 200 | 150 | 120 |
|                          |               | Med Carbon / Alloy Steels 180-350HB | ●        | ○                | 180 | 140 | 100 |
|                          |               | Pre-Hardened Steels 35-45HRC        | ●        | ○                | 150 | 120 | 100 |
| Stainless Steels         | M             | Free Machining Stainless            | ●        | ○                | 110 | 90  | 80  |
|                          |               | Austenitic Stainless                | ●        | ●                | 100 | 80  | 70  |
|                          |               | Difficult Stainless                 | ●        | ○                | 110 | 90  | 80  |
| Special Alloys           | S             | High Temp Alloys                    | X        | ●                | 25  | 20  | 15  |
|                          |               | Titanium Alloys                     | X        | ●                | 80  | 70  | 50  |

### Recommended Feed per Tooth by Material Group

| Workpiece Material Group | Material Type |                                     |       | Overhang - D x Ø |     |     |     |
|--------------------------|---------------|-------------------------------------|-------|------------------|-----|-----|-----|
|                          |               | fz-mm                               | Ae-mm | 3D               | 4D  | 5D  |     |
|                          |               |                                     |       | Ap-mm            |     |     |     |
| Steels                   | P             | Low Carbon Steels ≤180HB            | 1.6   | 70-80%           | 1.4 | 1.0 | 0.8 |
|                          |               | Med Carbon / Alloy Steels 180-350HB | 1.2   | 70-80%           | 1.0 | 0.8 | 0.7 |
|                          |               | Pre-Hardened Steels 35-45HRC        | 1.1   | 70-80%           | 1.0 | 0.8 | 0.7 |
| Stainless Steels         | M             | Free Machining Stainless            | 1.0   | 70-80%           | 1.0 | 0.8 | 0.7 |
|                          |               | Austenitic Stainless                | 0.7   | 60-70%           | 0.7 | 0.6 | 0.4 |
|                          |               | Difficult Stainless                 | 0.8   | 60-70%           | 0.8 | 0.7 | 0.6 |
| Special Alloys           | S             | High Temp Alloys                    | 0.5   | 30-50%           | 0.6 | 0.4 | 0.3 |
|                          |               | Titanium Alloys                     | 0.5   | 30-50%           | 0.6 | 0.4 | 0.3 |

### Ramping Data

| Tool D1 | Ramp - max | Dia-min | Dia-max | Pitch max (mm) |
|---------|------------|---------|---------|----------------|
| Ø50     | 3.3°       | 78.5    | 98.3    | 1.4            |
| Ø52     | 3.1°       | 82.5    | 102.3   | 1.4            |
| Ø63     | 2.2°       | 104.5   | 124.3   | 1.4            |
| Ø80     | 1.5°       | 142.5   | 157.8   | 1.4            |



## Series MAPM-RP12, RP16, RN12

### Recommended Speeds by Material Group

| Workpiece Material Group | Material Type | Coolant                             |     |     | Low      | Mid | High |     |
|--------------------------|---------------|-------------------------------------|-----|-----|----------|-----|------|-----|
|                          |               | Max                                 | Air | MMS | Vc-m/min |     |      |     |
| Steels                   | P             | Low Carbon Steels ≤180HB            | ●   | ●   | ●        | 200 | 250  | 300 |
|                          |               | Med Carbon / Alloy Steels 180-350HB | ●   | ●   | ●        | 170 | 200  | 250 |
|                          |               | Pre-Hardened Steels 35-45HRC        | ●   | ●   | ●        | 120 | 150  | 180 |
| Stainless Steels         | M             | Free Machining Stainless            | ●   | X   | ○        | 130 | 180  | 200 |
|                          |               | Austenitic Stainless                | ●   | X   | ○        | 120 | 150  | 160 |
|                          |               | Difficult Stainless                 | ●   | X   | ○        | 100 | 120  | 140 |
| Special Alloys           | S             | High Temp Alloys                    | ●   | X   | X        | 20  | 30   | 40  |
|                          |               | Titanium Alloys                     | ●   | X   | X        | 90  | 100  | 120 |
| Cast Irons               | K             | Grey Cast Iron                      | ●   | ○   | ○        | 150 | 180  | 220 |
|                          |               | Ductile Cast Iron                   | ●   | ○   | ○        | 100 | 120  | 180 |
| Hardened Steels          | H             | Hardened Steels 45 - 50HRC          | X   | ●   | ●        | 80  | 100  | 140 |

### Recommended Feed per Tooth by Material Group

| Workpiece Material Group | Material Type | Geometry                            |      |             |      |      |             |      |
|--------------------------|---------------|-------------------------------------|------|-------------|------|------|-------------|------|
|                          |               | MS                                  |      |             | MM   |      |             |      |
|                          |               | fz-mm/tooth                         |      |             |      |      |             |      |
| Steels                   | P             | Low Carbon Steels ≤180HB            | 0.10 | <b>0.25</b> | 0.40 | 0.15 | <b>0.30</b> | 0.50 |
|                          |               | Med Carbon / Alloy Steels 180-350HB | 0.10 | <b>0.25</b> | 0.40 | 0.15 | <b>0.30</b> | 0.50 |
|                          |               | Pre-Hardened Steels 35-45HRC        | 0.10 | <b>0.15</b> | 0.20 | 0.10 | <b>0.20</b> | 0.25 |
| Stainless Steels         | M             | Free Machining Stainless            | 0.10 | <b>0.15</b> | 0.20 | 0.10 | <b>0.20</b> | 0.25 |
|                          |               | Austenitic Stainless                | 0.10 | <b>0.15</b> | 0.20 | 0.10 | <b>0.20</b> | 0.25 |
|                          |               | Difficult Stainless                 | 0.10 | <b>0.15</b> | 0.20 | 0.10 | <b>0.20</b> | 0.25 |
| Special Alloys           | S             | High Temp Alloys                    | 0.05 | <b>0.10</b> | 0.15 | 0.05 | <b>0.10</b> | 0.15 |
|                          |               | Titanium Alloys                     | 0.05 | <b>0.10</b> | 0.15 | 0.05 | <b>0.10</b> | 0.15 |
| Cast Irons               | K             | Grey Cast Iron                      | -    | -           | -    | 0.15 | <b>0.30</b> | 0.50 |
|                          |               | Ductile Cast Iron                   | -    | -           | -    | 0.10 | <b>0.20</b> | 0.25 |
| Hardened Steels          | H             | Hardened Steels 45 - 50HRC          | 0.05 | <b>0.10</b> | 0.15 | 0.10 | <b>0.15</b> | 0.20 |

## Ramping Data

### MAPM-RP12

| Tool D1 | Ramp - max | Dia-min | Dia-max | Pitch max (mm) |
|---------|------------|---------|---------|----------------|
| 40      | 8.0        | 68.0    | 80.0    | 12.0           |
| 52      | 3.0        | 92.0    | 100.0   | 6.0            |
| 63      | 2.5        | 114.0   | 126.0   | 6.0            |
| 80      | 2.0        | 148.0   | 160.0   | 7.0            |

### MAPM-RP16

| Tool D1 | Ramp - max | Dia-min | Dia-max | Pitch max (mm) |
|---------|------------|---------|---------|----------------|
| 63      | 7.0        | 110.0   | 126.0   | 18.0           |
| 80      | 3.0        | 144.0   | 160.0   | 10.0           |
| 100     | 3.0        | 184.0   | 200.0   | 13.0           |
| 125     | 2.5        | 234.0   | 250.0   | 14.0           |

### MAPM-RN12

| Tool D1 | Ramp - max | Dia-min | Dia-max | Pitch max (mm) |
|---------|------------|---------|---------|----------------|
| 50      | 0.8        | 88.0    | 100.0   | 1.0            |
| 63      | 0.6        | 114.0   | 126.0   | 1.0            |
| 80      | 0.5        | 148.0   | 160.0   | 1.0            |

## Series MPM-RP06, RP09, RP12, RN12

### Recommended Speeds by Material Group

| Workpiece Material Group |   | Material Type    | Coolant |     |     | Low      | Mid | High |
|--------------------------|---|------------------|---------|-----|-----|----------|-----|------|
|                          |   |                  | Max     | Air | MMS | Vc-m/min |     |      |
| Special Alloys           | S | High Temp Alloys | X       | ●   | X   | 500      | 800 | 1000 |

### Recommended Feed per Tooth by Material Group

| Workpiece Material Group |   | Material Type    | fz-mm/toot |      |      |
|--------------------------|---|------------------|------------|------|------|
| Special Alloys           | S | High Temp Alloys | 0.07       | 0.10 | 0.12 |

## Series MSD-SC09 & TC16

### Recommended Speeds by Material Group

| Workpiece Material Group |   | Material Type                       | Spotting  | Chamfer   | Grooving  |
|--------------------------|---|-------------------------------------|-----------|-----------|-----------|
|                          |   |                                     | Vc-m/min  |           |           |
| Steels                   | P | Low Carbon Steels ≤180HB            | 60 - 200  | 70 - 250  | 40 - 140  |
|                          |   | Med Carbon / Alloy Steels 180-350HB | 50 - 100  | 60 - 220  | 35 - 120  |
| Stainless Steels         | M | Austenitic Stainless                | 30 - 100  | 40 - 120  | 25 - 70   |
| Cast Irons               | K | Grey Cast Iron                      | 40 - 120  | 60 - 200  | 30 - 100  |
| Hardened Steels          | H | Hardened Steels 45 - 50HRC          | 20 - 60   | 20 - 60   | 20 - 50   |
| Non Ferrous              | N | Aluminium Alloys                    | 200 - 300 | 300 - 600 | 300 - 400 |
|                          |   | Brass / Bronze / Copper             | 150 - 200 | 200 - 400 | 150 - 300 |

### Recommended Feed per Tooth by Material Group

| Workpiece Material Group |   | Material Type                       | Spotting    | Chamfer     | Grooving    |
|--------------------------|---|-------------------------------------|-------------|-------------|-------------|
|                          |   |                                     | Fr-mm/min   |             |             |
| Steels                   | P | Low Carbon Steels ≤180HB            | 0.04 - 0.10 | 0.1 - 0.2   | 0.1 - 0.15  |
|                          |   | Med Carbon / Alloy Steels 180-350HB | 0.03 - 0.08 | 0.1 - 0.2   | 0.08 - 0.15 |
| Stainless Steels         | M | Austenitic Stainless                | 0.02 - 0.06 | 0.1 - 0.2   | 0.08 - 0.15 |
| Cast Irons               | K | Grey Cast Iron                      | 0.04 - 0.10 | 0.1 - 0.2   | 0.1 - 0.15  |
| Hardened Steels          | H | Hardened Steels 45 - 50HRC          | 0.02 - 0.06 | 0.03 - 0.08 | 0.02 - 0.04 |
| Non Ferrous              | N | Aluminium Alloys                    | 0.05 - 0.10 | 0.15 - 0.25 | 0.1 - 0.15  |
|                          |   | Brass / Bronze / Copper             | 0.04 - 0.10 | 0.1 - 0.2   | 0.08 - 0.15 |



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