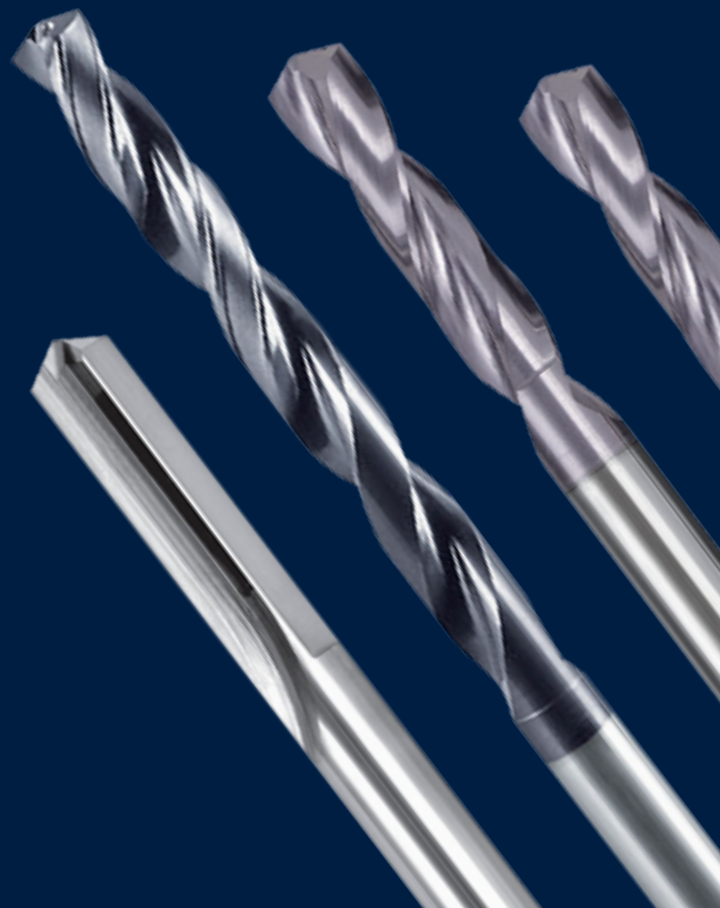


CATÁLOGO
BROCAS
E ALARGADORES



Sua máquina com maior produtividade em **menor tempo**

A VR Tools é especialista em produzir ferramentas com novas tecnologias, que te permitem usinar com melhor desempenho, gerando economia e elevando a qualidade da sua produção.

- ◊ **Fresas de alto avanço**
- ◊ **Fresas de desbaste e acabamento**
- ◊ **Brocas para furação de 3xD a 12xD**
- ◊ **Alargadores**

Projetos especiais: ferramentas adaptadas à sua necessidade

Cada negócio é único. Por isso, também trabalhamos com projetos especiais, desenvolvendo ferramentas únicas, adaptadas às necessidades do seu negócio.

Reafiação e **reconstrução**

Redução de custos de forma inteligente e sustentável. Possuímos o melhor e mais completo serviço de reafiação e reconstrução do mercado.

Logística eficiente e qualidade certificada

Quando a ferramenta retorna ela vem com uma identificação própria, com a marca ECCO e também identifica de qual família ela pertence;



4 Brocas 3xD, 5xD e 8xD

5 Brocas 10xD e 12xD

6 Dados de Corte

8 Brocas 5xD, 10xD e 15xD

9 Dados de Corte CR - Broca de Canal Reto

10 Alargador de Canal Reto

11 Dados Técnicos para Alargador



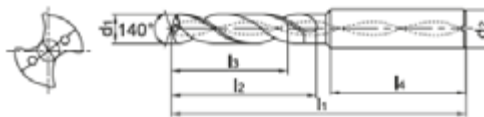
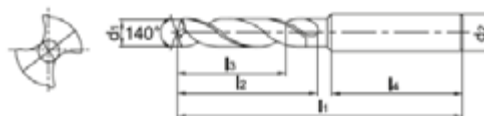
BROCAS 3xD, 5xD e 8xD



External coolant



Internal coolant



| 3xD | d1 (m7) | | d2 (h6) | l1 | l2 | l3 | l4 | Sem refrigeração interna | Com refrigeração interna |
|-----|---------|--------|---------|-----|----|----|----|--------------------------|--------------------------|
| | 3,7 | a 2 | 6 | 62 | 20 | 14 | 36 | x | x |
| | 4,7 | a 3,8 | 6 | 66 | 24 | 17 | 36 | x | x |
| | 6 | a 4,8 | 6 | 66 | 28 | 20 | 36 | x | x |
| | 7 | a 6,1 | 8 | 79 | 34 | 24 | 36 | x | x |
| | 8 | a 7,1 | 8 | 79 | 41 | 29 | 36 | x | x |
| | 10 | a 8,1 | 10 | 89 | 47 | 35 | 40 | x | x |
| | 12 | a 10,1 | 12 | 102 | 55 | 40 | 45 | x | x |
| | 14 | a 12,1 | 14 | 107 | 60 | 43 | 45 | x | x |
| | 16 | a 14,1 | 16 | 115 | 65 | 45 | 48 | x | x |
| 18 | a 16,1 | 18 | 123 | 73 | 51 | 48 | x | x | |
| 20 | a 18,1 | 20 | 131 | 79 | 55 | 50 | x | x | |

| 5xD | d1 (m7) | | d2 (h6) | l1 | l2 | l3 | l4 | Sem refrigeração interna | Com refrigeração interna |
|-----|---------|--------|---------|-----|----|----|----|--------------------------|--------------------------|
| | 3,7 | a 2 | 6 | 66 | 28 | 23 | 36 | x | x |
| | 4,7 | a 3,8 | 6 | 74 | 36 | 29 | 36 | x | x |
| | 6 | a 4,8 | 6 | 82 | 44 | 35 | 36 | x | x |
| | 8 | a 7,1 | 8 | 91 | 53 | 43 | 36 | x | x |
| | 10 | a 8,1 | 10 | 103 | 61 | 49 | 40 | x | x |
| | 12 | a 10,1 | 12 | 118 | 71 | 56 | 45 | x | x |
| | 14 | a 12,1 | 14 | 124 | 77 | 60 | 45 | x | x |
| | 16 | a 14,1 | 16 | 133 | 83 | 63 | 48 | x | x |
| | 18 | a 16,1 | 18 | 143 | 93 | 71 | 48 | x | x |
| 20 | a 18,1 | 20 | 153 | 101 | 77 | 50 | x | x | |

| 8xD | d1 (m7) | | d2 (h6) | l1 | l2 | l3 | l4 | Sem refrigeração interna | Com refrigeração interna |
|-----|---------|--------|---------|-----|-----|-----|----|--------------------------|--------------------------|
| | 3,7 | a 3 | 6 | 72 | 34 | 29 | 36 | x | x |
| | 4,7 | a 3,8 | 6 | 81 | 43 | 36 | 36 | x | x |
| | 6 | a 4,8 | 6 | 95 | 57 | 48 | 36 | x | x |
| | 8 | a 7,1 | 8 | 116 | 76 | 66 | 36 | x | x |
| | 10 | a 8,1 | 10 | 142 | 95 | 83 | 40 | x | x |
| | 12 | a 10,1 | 12 | 162 | 114 | 99 | 45 | x | x |
| | 14 | a 12,1 | 14 | 178 | 133 | 116 | 45 | x | x |
| | 16 | a 14,1 | 16 | 204 | 152 | 132 | 48 | x | x |
| 18 | a 16,1 | 18 | 223 | 171 | 149 | 48 | x | x | |

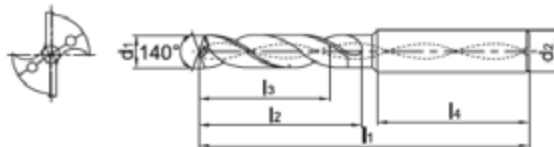
| PLUS | | GOLD | | GOLD Vulcan | | ALUMINUM | | VISION | |
|-----------|--------|-----------|--------|-------------|--------|-----------|--------|-----------|--------|
| Cobertura | Classe | Cobertura | Classe | Cobertura | Classe | Cobertura | Classe | Cobertura | Classe |
| Griza | VR 20 | Griza | VR 22R | Skia | VR 22R | SEM | VR 20 | Griza | VR 12 |

BROCAS 10xD e 12xD



Internal Coolant
Interne Kühlung

Straight shank
Zylinderschaft



| 10xD | d1 (m7) | d2 (h6) | l1 | l2 | l3 | l4 | Com refrigeração interna |
|-----------|-----------|---------|-----|-----|-----|----|--------------------------|
| | 3 a 3,9 | 6 | 80 | 43 | 39 | 36 | x |
| | 4 a 4,9 | 6 | 92 | 55 | 50 | 36 | x |
| | 5 a 6 | 6 | 104 | 68 | 61 | 36 | x |
| | 7 a 6,1 | 8 | 117 | 80 | 71 | 36 | x |
| | 8 a 7,1 | 8 | 130 | 94 | 84 | 36 | x |
| | 9 a 8,1 | 10 | 148 | 105 | 94 | 40 | x |
| | 10 a 9,1 | 10 | 158 | 115 | 103 | 40 | x |
| | 12 a 10,1 | 12 | 183 | 135 | 121 | 45 | x |
| 14 a 12,1 | 14 | 209 | 160 | 144 | 45 | x | |

| 12xD | d1 (m7) | d2 (h6) | l1 | l2 | l3 | l4 | Com refrigeração interna |
|-----------|-----------|---------|-----|-----|-----|----|--------------------------|
| | 4 | 6 | 102 | 64 | 56 | 36 | x |
| | 6 a 5 | 6 | 116 | 78 | 72 | 36 | x |
| | 7 a 6,1 | 8 | 131 | 93 | 84 | 36 | x |
| | 8 a 7,1 | 8 | 146 | 108 | 96 | 36 | x |
| | 9 a 8,1 | 10 | 162 | 120 | 108 | 40 | x |
| | 10 a 9,1 | 10 | 174 | 132 | 120 | 40 | x |
| | 12 a 10,1 | 12 | 204 | 156 | 144 | 45 | x |
| | 14 a 12,1 | 14 | 230 | 182 | 168 | 45 | x |
| 16 a 14,1 | 16 | 260 | 208 | 194 | 48 | x | |

*Será necessário a utilização de broca piloto, ela terá o diâmetro 0,03mm maior que o diâmetro da boca.

| PLUS | | GOLD | | GOLD Vulcan | | ALUMINUM | | VISION | |
|-----------|--------|-----------|--------|-------------|--------|-----------|--------|-----------|--------|
| Cobertura | Classe | Cobertura | Classe | Cobertura | Classe | Cobertura | Classe | Cobertura | Classe |
| Griza | VR 20 | Griza | VR 22R | Skia | VR 22R | SEM | VR 20 | Griza | VR 12 |

DADOS DE CORTE

Brocas sem refrigeração interna

3xD / 5xD / 8xD

| Diâmetro da broca | Aço carbono HB ≤ 180 | | Aço carbono ligas de aço -30 HRC | | Aço pré endurecido -40HRC | | Aço inoxidável | | Ferro fundido | | Ferro fundido nodular GGG | | Liga de alumínio | | Ligas resistentes ao calor | |
|-------------------|------------------------|---------------|----------------------------------|---------------|---------------------------|--------------|------------------------|--------------|------------------------|---------------|---------------------------|---------------|------------------------|---------------|----------------------------|--------------|
| | Vc | 60 - 120m/min | 60 - 120m/min | 60 - 120m/min | 40 - 70m/min | 40 - 70m/min | 25 - 40m/min | 25 - 40m/min | 60 - 120m/min | 60 - 120m/min | 50 - 100m/min | 50 - 100m/min | 60 - 140m/min | 60 - 140m/min | 15 - 25m/min | 15 - 25m/min |
| Ø (mm) | n (min ⁻¹) | f (mm/r) | n (min ⁻¹) | f (mm/r) | n (min ⁻¹) | f (mm/r) | n (min ⁻¹) | f (mm/r) | n (min ⁻¹) | f (mm/r) | n (min ⁻¹) | f (mm/r) | n (min ⁻¹) | f (mm/r) | n (min ⁻¹) | f (mm/r) |
| 2 | 14000 | 0.06-0.08 | 14000 | 0.06-0.08 | 9500 | 0.06-0.08 | 5500 | 0.02-0.05 | 14000 | 0.06-0.08 | 11000 | 0.06-0.08 | 16000 | 0.06-0.08 | 3200 | 0.02-0.04 |
| 3 | 9500 | 0.09-0.12 | 9500 | 0.09-0.12 | 6300 | 0.09-0.12 | 3700 | 0.03-0.07 | 9500 | 0.09-0.12 | 7400 | 0.09-0.12 | 10600 | 0.09-0.12 | 2100 | 0.03-0.06 |
| 4 | 7000 | 0.10-0.15 | 7000 | 0.10-0.15 | 4700 | 0.10-0.15 | 2700 | 0.04-0.08 | 7000 | 0.10-0.15 | 5600 | 0.10-0.15 | 8000 | 0.10-0.15 | 1600 | 0.04-0.07 |
| 5 | 5700 | 0.12-0.18 | 5700 | 0.12-0.18 | 3800 | 0.12-0.18 | 2200 | 0.05-0.10 | 5700 | 0.12-0.18 | 4500 | 0.12-0.18 | 6400 | 0.12-0.18 | 1250 | 0.05-0.09 |
| 6 | 4700 | 0.14-0.20 | 4700 | 0.14-0.20 | 3100 | 0.14-0.20 | 1850 | 0.06-0.12 | 4700 | 0.14-0.20 | 3700 | 0.14-0.20 | 5300 | 0.14-0.20 | 1050 | 0.06-0.11 |
| 8 | 3600 | 0.16-0.24 | 3600 | 0.16-0.24 | 2400 | 0.16-0.24 | 1400 | 0.08-0.16 | 3600 | 0.16-0.24 | 2800 | 0.16-0.24 | 4000 | 0.16-0.24 | 800 | 0.08-0.14 |
| 10 | 2800 | 0.18-0.27 | 2800 | 0.18-0.27 | 1900 | 0.18-0.27 | 1100 | 0.10-0.18 | 2800 | 0.18-0.27 | 2200 | 0.18-0.27 | 3200 | 0.18-0.27 | 600 | 0.10-0.16 |
| 12 | 2400 | 0.20-0.30 | 2400 | 0.20-0.30 | 1600 | 0.20-0.30 | 930 | 0.12-0.20 | 2400 | 0.20-0.30 | 1900 | 0.20-0.30 | 2700 | 0.20-0.30 | 500 | 0.12-0.18 |
| 14 | 2100 | 0.22-0.35 | 2100 | 0.22-0.35 | 1400 | 0.22-0.35 | 800 | 0.13-0.22 | 2100 | 0.22-0.35 | 1600 | 0.22-0.35 | 2300 | 0.22-0.35 | 450 | 0.13-0.20 |
| 16 | 1800 | 0.25-0.36 | 1800 | 0.25-0.36 | 1200 | 0.25-0.36 | 700 | 0.14-0.25 | 1800 | 0.25-0.36 | 1400 | 0.25-0.36 | 2000 | 0.25-0.36 | 400 | 0.14-0.23 |
| 18 | 1600 | 0.28-0.38 | 1600 | 0.28-0.38 | 1100 | 0.28-0.38 | 620 | 0.15-0.28 | 1600 | 0.28-0.38 | 1200 | 0.28-0.38 | 1800 | 0.28-0.38 | 350 | 0.15-0.25 |
| 20 | 1400 | 0.30-0.40 | 1400 | 0.30-0.40 | 950 | 0.30-0.40 | 550 | 0.16-0.30 | 1400 | 0.30-0.40 | 1100 | 0.30-0.40 | 1600 | 0.30-0.40 | 320 | 0.16-0.28 |

Brocas com refrigeração interna

3xD / 5xD / 8xD

| Diâmetro da broca | Aço carbono HB ≤ 180 | | Aço carbono ligas de aço -30 HRC | | Aço pré endurecido -40HRC | | Aço inoxidável | | Ferro fundido | | Ferro fundido nodular GGG | | Liga de alumínio | | Ligas resistentes ao calor | |
|-------------------|------------------------|---------------|----------------------------------|---------------|---------------------------|--------------|------------------------|--------------|------------------------|---------------|---------------------------|---------------|------------------------|----------------|----------------------------|--------------|
| | Vc | 80 - 150m/min | 80 - 150m/min | 80 - 150m/min | 50 - 80m/min | 50 - 80m/min | 50 - 80m/min | 50 - 80m/min | 80 - 150m/min | 80 - 150m/min | 60 - 120m/min | 60 - 120m/min | 100 - 180m/min | 100 - 180m/min | 15 - 25m/min | 15 - 25m/min |
| Ø (mm) | n (min ⁻¹) | f (mm/r) | n (min ⁻¹) | f (mm/r) | n (min ⁻¹) | f (mm/r) | n (min ⁻¹) | f (mm/r) | n (min ⁻¹) | f (mm/r) | n (min ⁻¹) | f (mm/r) | n (min ⁻¹) | f (mm/r) | n (min ⁻¹) | f (mm/r) |
| 3 | 12700 | 0.09-0.12 | 12700 | 0.09-0.12 | 7400 | 0.09-0.12 | 6300 | 0.03-0.07 | 12700 | 0.09-0.12 | 9500 | 0.09-0.12 | 15000 | 0.09-0.12 | 2100 | 0.03-0.06 |
| 4 | 9600 | 0.10-0.15 | 9600 | 0.10-0.15 | 5600 | 0.10-0.15 | 4700 | 0.04-0.08 | 9600 | 0.10-0.15 | 7000 | 0.10-0.15 | 11100 | 0.10-0.15 | 1600 | 0.04-0.07 |
| 5 | 7600 | 0.12-0.18 | 7600 | 0.12-0.18 | 4500 | 0.12-0.18 | 3800 | 0.05-0.10 | 7600 | 0.12-0.18 | 5700 | 0.12-0.18 | 9000 | 0.12-0.18 | 1250 | 0.05-0.09 |
| 6 | 6400 | 0.14-0.20 | 6400 | 0.14-0.20 | 3700 | 0.14-0.20 | 3200 | 0.06-0.12 | 6400 | 0.14-0.20 | 4700 | 0.14-0.20 | 7400 | 0.14-0.20 | 1050 | 0.06-0.11 |
| 8 | 4800 | 0.16-0.24 | 4800 | 0.16-0.24 | 2800 | 0.16-0.24 | 2400 | 0.08-0.16 | 4800 | 0.16-0.24 | 3600 | 0.16-0.24 | 5600 | 0.16-0.24 | 800 | 0.08-0.14 |
| 10 | 3800 | 0.18-0.27 | 3800 | 0.18-0.27 | 2200 | 0.18-0.27 | 1900 | 0.10-0.18 | 3800 | 0.18-0.27 | 2800 | 0.18-0.27 | 4500 | 0.18-0.27 | 600 | 0.10-0.16 |
| 12 | 3200 | 0.20-0.30 | 3200 | 0.20-0.30 | 1900 | 0.20-0.30 | 1600 | 0.12-0.20 | 3200 | 0.20-0.30 | 2400 | 0.20-0.30 | 3700 | 0.20-0.30 | 500 | 0.12-0.18 |
| 14 | 2700 | 0.22-0.35 | 2700 | 0.22-0.35 | 1600 | 0.22-0.35 | 1350 | 0.13-0.22 | 2700 | 0.22-0.35 | 2100 | 0.22-0.35 | 3200 | 0.22-0.35 | 450 | 0.13-0.20 |
| 16 | 2400 | 0.25-0.36 | 2400 | 0.25-0.36 | 1400 | 0.25-0.36 | 1200 | 0.14-0.25 | 2400 | 0.25-0.36 | 1800 | 0.25-0.36 | 2800 | 0.25-0.36 | 400 | 0.14-0.23 |
| 18 | 2100 | 0.28-0.38 | 2100 | 0.28-0.38 | 1200 | 0.28-0.38 | 1050 | 0.15-0.28 | 2100 | 0.28-0.38 | 1600 | 0.28-0.38 | 2500 | 0.28-0.38 | 350 | 0.15-0.25 |
| 20 | 1900 | 0.30-0.40 | 1900 | 0.30-0.40 | 1100 | 0.30-0.40 | 950 | 0.16-0.30 | 1900 | 0.30-0.40 | 1400 | 0.30-0.40 | 2300 | 0.30-0.40 | 320 | 0.16-0.28 |

* Brocas da linha GOLD e da GOLD Vulcan as condições de usinagem podem se aumentadas em 30%

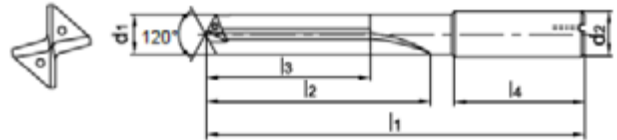
DADOS DE CORTE

Brocas com refrigeração interna

10xD / 12xD

| Diâmetro da broca | Aço carbono HB ≤ 180 | | Aço carbono ligas de aço -30 HRC | | Aço pré endurecido -40HRC | | Aço inoxidável | | Ferro fundido | | Ferro fundido nodular GGG | | Liga de alumínio | | Ligas resistentes ao calor | |
|-------------------|------------------------|-----------|----------------------------------|-----------|---------------------------|-----------|------------------------|-----------|------------------------|-----------|---------------------------|-----------|------------------------|-----------|----------------------------|-----------|
| | Vc | | 60 - 120m/min | | 50 - 80m/min | | 40 - 60m/min | | 80 - 150m/min | | 60 - 120m/min | | 100 - 180m/min | | 10 - 20m/min | |
| Ø (mm) | n (min ⁻¹) | f (mm/r) | n (min ⁻¹) | f (mm/r) | n (min ⁻¹) | f (mm/r) | n (min ⁻¹) | f (mm/r) | n (min ⁻¹) | f (mm/r) | n (min ⁻¹) | f (mm/r) | n (min ⁻¹) | f (mm/r) | n (min ⁻¹) | f (mm/r) |
| 3 | 10600 | 0.06-0.1 | 10600 | 0.06-0.01 | 7400 | 0.06-0.1 | 5300 | 0.03-0.07 | 12700 | 0.06-0.1 | 9500 | 0.06-0.1 | 15000 | 0.09-0.12 | 2100 | 0.03-0.06 |
| 4 | 8000 | 0.08-0.12 | 8000 | 0.08-0.12 | 5600 | 0.08-0.12 | 4000 | 0.04-0.08 | 96000 | 0.08-0.12 | 7000 | 0.08-0.12 | 11000 | 0.10-0.15 | 1600 | 0.04-0.07 |
| 5 | 6400 | 0.10-0.14 | 6400 | 0.10-0.14 | 4500 | 0.10-0.14 | 3200 | 0.05-0.10 | 7600 | 0.10-0.14 | 5700 | 0.10-0.14 | 9000 | 0.10-0.15 | 1250 | 0.05-0.9 |
| 6 | 5300 | 0.11-0.16 | 5300 | 0.11-0.16 | 3700 | 0.11-0.16 | 2700 | 0.06-0.12 | 6400 | 0.11-0.16 | 4700 | 0.11-0.16 | 7400 | 0.11-0.16 | 1050 | 0.06-0.11 |
| 8 | 4000 | 0.13-0.19 | 4000 | 0.13-0.19 | 2800 | 0.13-0.19 | 2000 | 0.08-0.16 | 4800 | 0.13-0.19 | 3600 | 0.13-0.19 | 5600 | 0.13-0.19 | 800 | 0.08-0.14 |
| 10 | 3200 | 0.14-0.22 | 3200 | 0.14-0.22 | 2200 | 0.14-0.22 | 1600 | 0.10-0.18 | 3800 | 0.14-0.22 | 2800 | 0.14-0.22 | 4500 | 0.14-0.22 | 600 | 0.10-0.16 |
| 12 | 2700 | 0.16-0.24 | 2700 | 0.16-0.24 | 1900 | 0.16-0.24 | 1300 | 0.12-0.20 | 3200 | 0.16-0.24 | 2400 | 0.16-0.24 | 3700 | 0.16-0.24 | 500 | 0.12-0.18 |
| 14 | 2300 | 0.18-0.28 | 2300 | 0.18-0.28 | 1600 | 0.18-0.28 | 1100 | 0.13-0.22 | 2700 | 0.18-0.28 | 2100 | 0.18-0.28 | 3200 | 0.18-0.28 | 450 | 0.13-0.20 |
| 16 | 2100 | 0.20-0.30 | 2100 | 0.20-0.30 | 1400 | 0.20-0.30 | 1050 | 0.14-0.25 | 2100 | 0.20-0.30 | 1800 | 0.20-0.30 | 2800 | 0.25-0.36 | 400 | 0.14-0.23 |

BROCAS 5xD, 10xD e 15xD



| 5xD | d1 (m7) | | d2 (h6) | l1 | l2 | l3 | l4 | Com refrigeração interna |
|-----|---------|--------|---------|-----|----|----|----|--------------------------|
| | 6 | a 4 | 6 | 82 | 44 | 35 | 36 | x |
| | 8 | a 6,1 | 8 | 91 | 53 | 43 | 36 | x |
| | 10 | a 8,1 | 10 | 103 | 61 | 49 | 40 | x |
| | 12 | a 10,1 | 12 | 118 | 71 | 56 | 45 | x |
| | 14 | a 12,1 | 14 | 124 | 77 | 60 | 45 | x |
| | 16 | a 14,1 | 16 | 133 | 83 | 63 | 48 | x |
| | 18 | a 16,1 | 18 | 143 | 93 | 71 | 48 | x |
| 20 | a 18,1 | 20 | 153 | 101 | 77 | 50 | x | |

| 10xD | d1 (m7) | | d2 (h6) | l1 | l2 | l3 | l4 | Com refrigeração interna |
|------|---------|--------|---------|-----|-----|-----|----|--------------------------|
| | 6 | a 4 | 6 | 104 | 68 | 61 | 36 | x |
| | 8 | a 6,1 | 8 | 130 | 94 | 84 | 36 | x |
| | 10 | a 8,1 | 10 | 158 | 115 | 103 | 40 | x |
| | 12 | a 10,1 | 12 | 183 | 135 | 121 | 45 | x |
| 14 | a 12,1 | 14 | 209 | 160 | 144 | 45 | x | |

| 15xD | d1 (m7) | | d2 (h6) | l1 | l2 | l3 | l4 | Com refrigeração interna |
|------|---------|--------|---------|-----|-----|-----|----|--------------------------|
| | 4 | a 6 | 6 | 145 | 105 | 96 | 36 | x |
| | 8 | a 6,1 | 8 | 180 | 137 | 127 | 36 | x |
| | 10 | a 8,1 | 10 | 217 | 170 | 158 | 40 | x |
| | 12 | a 10,1 | 12 | 258 | 205 | 190 | 45 | x |
| 14 | a 12,1 | 14 | 290 | 236 | 219 | 45 | x | |

| PLUS | | GOLD | | GOLD Vulcan | |
|-----------|--------|-----------|--------|-------------|--------|
| Cobertura | Classe | Cobertura | Classe | Cobertura | Classe |
| Griza | VR 20 | Griza | VR 22R | Skia | VR 22R |

DADOS DE CORTE CR - Broca de Canal Reto

Brocas com refrigeração interna

Canal Reto 5xD

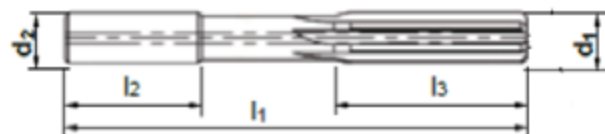
| Diâmetro da broca | Ferro fundido | | Ferro fundido nodular GGG | |
|-------------------|------------------------|-----------|---------------------------|-----------|
| | 80 - 150m/min | | 60 - 120m/min | |
| Vc | | | | |
| Ø (mm) | n (min ⁻¹) | f (mm/r) | n (min ⁻¹) | f (mm/r) |
| 3 | 12700 | 0.09-0.12 | 9500 | 0.09-0.12 |
| 4 | 9600 | 0.10-0.15 | 7000 | 0.10-0.15 |
| 5 | 7600 | 0.12-0.18 | 5700 | 0.12-0.18 |
| 6 | 6400 | 0.14-0.20 | 4700 | 0.14-0.20 |
| 8 | 4800 | 0.16-0.24 | 3600 | 0.16-0.24 |
| 10 | 3800 | 0.18-0.27 | 2800 | 0.18-0.27 |
| 12 | 3200 | 0.20-0.30 | 2400 | 0.20-0.35 |
| 14 | 2700 | 0.22-0.35 | 2100 | 0.22-0.35 |
| 16 | 2400 | 0.25-0.36 | 1800 | 0.25-0.36 |
| 18 | 2100 | 0.28-0.38 | 1600 | 0.28-0.38 |
| 20 | 1900 | 0.30-0.40 | 1400 | 0.30-0.40 |

Brocas com refrigeração interna

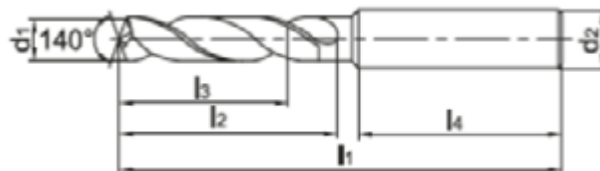
Canal Reto 10xD e 15xD

| Diâmetro da broca | Ferro fundido | | Ferro fundido nodular GGG | |
|-------------------|------------------------|-----------|---------------------------|-----------|
| | 80 - 150m/min | | 60 - 120m/min | |
| Vc | | | | |
| Ø (mm) | n (min ⁻¹) | f (mm/r) | n (min ⁻¹) | f (mm/r) |
| 3 | 12700 | 0.06-0.1 | 9500 | 0.06-0.1 |
| 4 | 9600 | 0.08-0.12 | 7000 | 0.08-0.12 |
| 5 | 7600 | 0.10-0.14 | 5700 | 0.10-0.14 |
| 6 | 6400 | 0.11-0.16 | 4700 | 0.11-0.16 |
| 8 | 4800 | 0.13-0.19 | 3600 | 0.13-0.19 |
| 10 | 3800 | 0.14-0.22 | 2800 | 0.14-0.22 |
| 12 | 3200 | 0.16-0.24 | 2400 | 0.16-0.24 |
| 14 | 2700 | 0.18-0.28 | 2100 | 0.18-0.28 |

Alargador de canal reto



| d1 (h7) | d2 (h6) | l1 | l3 | l2 | Sem refrigeração interna | Com refrigeração interna |
|---------|---------|-----|----|----|--------------------------|--------------------------|
| 4 | 4 | 70 | 20 | 28 | x | x |
| 5 | 6 | 70 | 22 | 28 | x | x |
| 6 | 6 | 100 | 22 | 36 | x | x |
| 7 | 8 | 100 | 25 | 42 | x | x |
| 8 | 8 | 100 | 25 | 42 | x | x |
| 9 | 10 | 100 | 25 | 42 | x | x |
| 10 | 10 | 100 | 25 | 42 | x | x |
| 11 | 12 | 100 | 28 | 42 | x | x |
| 12 | 12 | 100 | 28 | 42 | x | x |
| 13 | 14 | 100 | 28 | 42 | x | x |
| 14 | 14 | 100 | 32 | 42 | x | x |
| 15 | 16 | 100 | 32 | 42 | x | x |
| 16 | 16 | 150 | 32 | 52 | x | x |
| 18 | 18 | 150 | 36 | 52 | x | x |
| 20 | 20 | 150 | 36 | 52 | x | x |



| d1 (h7) | d2 (h6) | l1 | l2 | l3 | l4 | Sem refrigeração interna | Com refrigeração interna |
|---------|---------|-----|----|----|----|--------------------------|--------------------------|
| 3.9 | 6 | 70 | 28 | 20 | 36 | x | x |
| 4.9 | 6 | 70 | 36 | 22 | 36 | x | x |
| 5.85 | 6 | 100 | 36 | 22 | 36 | x | x |
| 6.8 | 8 | 100 | 36 | 25 | 36 | x | x |
| 7.8 | 8 | 100 | 36 | 25 | 36 | x | x |
| 8.8 | 10 | 100 | 36 | 25 | 40 | x | x |
| 9.8 | 10 | 100 | 36 | 25 | 40 | x | x |
| 10.8 | 12 | 100 | 40 | 28 | 45 | x | x |
| 11.8 | 12 | 100 | 40 | 28 | 45 | x | x |
| 12.8 | 14 | 100 | 40 | 28 | 45 | x | x |
| 13.8 | 14 | 100 | 45 | 32 | 45 | x | x |
| 14.8 | 16 | 100 | 45 | 32 | 48 | x | x |
| 15.8 | 18 | 150 | 60 | 32 | 48 | x | x |
| 17.8 | 18 | 150 | 65 | 36 | 48 | x | x |
| 19.8 | 20 | 150 | 65 | 36 | 50 | x | x |

| PLUS | | GOLD | | GOLD Vulcan | | ALUMINUM | |
|-----------|--------|-----------|--------|-------------|--------|-----------|--------|
| Cobertura | Classe | Cobertura | Classe | Cobertura | Classe | Cobertura | Classe |
| Griza | VR 20 | Griza | VR 22R | Skia | VR 22R | SEM | VR 20 |

Dados técnicos para alargador

| Diâmetro | Ferro fundido nodular GGG | | | Ligas de cobre | | | Aços em geral ligas de alumínio | | |
|----------|---------------------------|-------------|----------------|------------------------|--------------|----------------|------------------------------------|--------------|----------------|
| | Vc | 8 - 16m/min | | | 10 - 25m/min | | | 15 - 30m/min | |
| Ø (mm) | n (min ⁻¹) | f (mm/r) | Tolerance (mm) | n (min ⁻¹) | f (mm/r) | Tolerance (mm) | n (min ⁻¹) | f (mm/r) | Tolerance (mm) |
| 4 | 950 | 0.04 - 0.06 | 0.1 - 0.2 | 1600 | 0.04 - 0.06 | 0.1 - 0.2 | 2000 | 0.04 - 0.06 | 0.1 - 0.2 |
| 5 | 760 | 0.05 - 0.09 | 0.1 - 0.2 | 1300 | 0.05 - 0.09 | 0.1 - 0.2 | 1600 | 0.05 - 0.09 | 0.1 - 0.2 |
| 6 | 640 | 0.06 - 0.12 | 0.1 - 0.2 | 1050 | 0.06 - 0.12 | 0.1 - 0.2 | 1300 | 0.06 - 0.12 | 0.1 - 0.2 |
| 7 | 550 | 0.07 - 0.14 | 0.1 - 0.2 | 910 | 0.07 - 0.14 | 0.1 - 0.2 | 1150 | 0.07 - 0.14 | 0.1 - 0.2 |
| 8 | 480 | 0.08 - 0.16 | 0.1 - 0.2 | 800 | 0.08 - 0.16 | 0.1 - 0.2 | 1000 | 0.08 - 0.16 | 0.1 - 0.2 |
| 9 | 430 | 0.09 - 0.18 | 0.1 - 0.2 | 710 | 0.09 - 0.18 | 0.1 - 0.2 | 890 | 0.09 - 0.18 | 0.1 - 0.2 |
| 10 | 380 | 0.10 - 0.20 | 0.1 - 0.2 | 640 | 0.10 - 0.20 | 0.1 - 0.2 | 800 | 0.10 - 0.20 | 0.1 - 0.2 |
| 11 | 350 | 0.11 - 0.22 | 0.1 - 0.2 | 580 | 0.11 - 0.22 | 0.1 - 0.2 | 720 | 0.11 - 0.22 | 0.1 - 0.2 |
| 12 | 320 | 0.12 - 0.24 | 0.1 - 0.2 | 530 | 0.12 - 0.24 | 0.1 - 0.2 | 660 | 0.12 - 0.24 | 0.1 - 0.2 |
| 13 | 290 | 0.13 - 0.26 | 0.1 - 0.2 | 490 | 0.13 - 0.26 | 0.1 - 0.2 | 610 | 0.13 - 0.26 | 0.1 - 0.2 |
| 14 | 270 | 0.14 - 0.28 | 0.1 - 0.2 | 460 | 0.14 - 0.28 | 0.1 - 0.2 | 570 | 0.14 - 0.28 | 0.1 - 0.2 |
| 15 | 250 | 0.15 - 0.30 | 0.1 - 0.2 | 430 | 0.15 - 0.30 | 0.1 - 0.2 | 530 | 0.15 - 0.30 | 0.1 - 0.2 |
| 16 | 240 | 0.16 - 0.32 | 0.1 - 0.2 | 400 | 0.16 - 0.32 | 0.1 - 0.2 | 500 | 0.16 - 0.32 | 0.1 - 0.2 |
| 17 | 225 | 0.18 - 0.34 | 0.1 - 0.2 | 380 | 0.18 - 0.34 | 0.1 - 0.2 | 470 | 0.18 - 0.34 | 0.1 - 0.2 |
| 18 | 210 | 0.20 - 0.36 | 0.1 - 0.2 | 350 | 0.20 - 0.36 | 0.1 - 0.2 | 440 | 0.20 - 0.36 | 0.1 - 0.2 |
| 19 | 200 | 0.22 - 0.38 | 0.1 - 0.2 | 340 | 0.22 - 0.38 | 0.1 - 0.2 | 420 | 0.22 - 0.38 | 0.1 - 0.2 |
| 20 | 190 | 0.24 - 0.40 | 0.1 - 0.2 | 320 | 0.24 - 0.40 | 0.1 - 0.2 | 400 | 0.24 - 0.40 | 0.1 - 0.2 |



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