FERRAMENTAS PARA ROSCAR

	≤3xD											Machos lam.	
No. do art.	**5560**	**5590**	**5561**	**5586**	**5558**	**5587**	**5588**	**5559**	**5557**	**5550**	**5595**	**5598**	**5599**
Tipo de rosca	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**
Tolerância	**6H**	**6H**	**6H**	**6H**	**6H**	**6H**	**6H**	**6H**	**6H**	**6HX**	**6HX**	**6HX**	**6HX**
Norma/DIN	**371/376**	**371/376**	**371/376**	**371/376**	**371/376**	**371/376**	**371/376**	**371/376**	**371/376**	**371/376**	**371/376**	**~371**	**~376**
Material de corte	**HSS-E**	**HSS-E**	**HSS-E**	**HSS-E**	**HSS-E**	**HSS-E**	**HSS-E**	**HSS-E-PM**	**HSS-E**	**HSS-E**	**HSS-E**	**HSS-E**	**HSS-E**
Tipo/forma	N/B	N/B	N/B	N/B	H/B	H/B	VA/B	VA/B	AI/B	GG/C	GG/C	N/C	N/C
Superfície	●	S	●	S	●	C	S	●	○	●	F	S	S
Refrigeração	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	**axial**
Tolerância do cone	h9	h9	h9	h9	h9	h9	h9	h9	h9	h9	h9	h9	h9
Progr. pág.	84	84	88	88	85	85	86	87	89	90	90	91	92

Refrigeração da ferramenta:
⊗ sem canais de refrigeração

Refrigerante conforme o material:
○ Ar
● Óleo
● Emulsão
△ Colar

Grupo de materiais	Exemplos de materiais, nova denominação (denominação antiga entre parênteses) Números em negrito = Nr. do material conforme DIN EN	Res. à tração N/mm²	Dureza	Refrig.	v_c m/min	v_c m/min	v_c m/min	v_c m/min	v_c m/min	v_c m/min	v_c m/min	v_c m/min	v_c m/min	v_c m/min	v_c m/min	v_c m/min	v_c m/min
Aços de construção	**1.0035** S185(St33), **1.0486** P275N(StE285), **1.0345** P235GH(H1), **1.0425** P265GH(H2)	≤500		●●△	**10**	**12**	**12**	**15**			**10**	**12**				**15**	**15**
	1.0050 E295 (St50-2), **1.0070** E360 (St70-2), **1.8937** P500NH (WStE500)	≤1000		●●△	**8**	**10**	**12**	**15**			**10**	**12**				**15**	**15**
Aços para máquinas automáticas	**1.0718** 11SMnPb30 (9SMnPb28), **1.0736** 11SMn37 (9SMn36)	≤850		●●△	**8**	**10**	**10**	**12**			**8**	**10**				**15**	**15**
	1.0727 46S20 (45S20), **1.0728** (60S20), **1.0757** 46SPb20 (45SPb20)	≤1000		●●△	**6**	**8**	**10**	**12**			**8**	**10**				**15**	**15**
Aços para beneficiam. sem liga	**1.0402** C22, **1.1178** C30E (Ck30)	≤700		●●△	**10**	**12**	**12**	**15**			**10**	**12**				**15**	**15**
	1.0503 C45, **1.1191** C45E (Ck45)	≤850		●●△	**10**	**12**	**12**	**15**			**10**	**12**				**15**	**15**
	1.0601 C60, **1.1221** C60E (Ck60)	≤1000		●●△			**10**	**12**			**8**	**10**				**12**	**12**
Aços para beneficiam. com liga	**1.5131** 50MnSi4, **1.7003** 38Cr2, **1.7030** 28Cr4	≤1000		●●△			**6**	**8**	**10**	**12**	**4**	**6**				**12**	**12**
	1.5710 36NiCr6, **1.7035** 41Cr4, **1.7225** 42CrMo4	≤1400		●●△					**8**	**10**						**8**	**8**
Aços para cementação sem liga	**1.0301** (C10), **1.1121** C10E (Ck10)	≤850		●●△	**10**	**12**	**12**	**15**			**10**	**12**				**15**	**15**
Aços para cementação com liga	**1.7276** 10CrMo11, **1.5125** 11MnSi6	≤1000		●●△			**6**	**8**	**10**	**12**	**4**	**6**				**15**	**15**
	1.5752 15NiCr13, **1.7131** 16MnCr5, **1.7264** 20CrMo5	≤1400		●●△					**8**	**10**						**8**	**8**
Aços para nitretação	**1.8504** 34CrAl6	≤1000		●●△			**6**	**8**	**10**	**12**	**4**	**6**				**15**	**15**
	1.8519 31CrMoV9, **1.8550** 34CrAlNi7	≤1400		●●△					**8**	**10**						**8**	**8**
Aços para ferramentas	**1.1750** C75W, **1.2067** 102Cr6, **1.2307** 29CrMoV9	≤850		●●△					**10**	**12**						**12**	**12**
	1.2080 X210Cr12, **1.2083** X42Cr13, **1.2419** 105WCr6, **1.2767** X45NiCrMo4	≤1400		●●△					**8**	**10**						**8**	**8**
Aços rápidos	**1.3243** S 6-5-2-5, **1.3343** S 6-5-2, **1.3344** S 6-5-3	≤1400		●●△					**8**	**10**						**8**	**8**
Aços para molas	**1.5026** 55Si7, **1.7176** 55Cr3, **1.8159** 51CrV4 (51CrV4)		≤350 HB	●●△					**8**	**10**						**10**	**10**
Aços temperados	–		≤48 HRC	●●													
			≤66 HRC	●●													
Aços inoxidáveis, sulfurosos	**1.4005** X12CrS13, **1.4104** X14CrMoS17, **1.4105** X6CrMoS17, **1.4305** X8CrNiS18-9	≤900		●△●			**4**	**6**			**10**	**8**				**6**	**6**
austeníticos	**1.4301** X5CrNi18-10 (V2A), **1.4541** X6CrNiTi18-10, **1.4571** X6CrNiMoTi 17-12-2 (V4A)	≤1100		●△●			**4**	**6**			**10**	**8**				**6**	**6**
martensíticos	**1.4057** X20CrNi172 (X17CrNi16-2), **1.4122** X39CrMo17-1, **1.4521** X2CrMoTi18-2	≤1500		●△●							**8**	**6**				**4**	**4**
Ferro fundido	**0.6010** EN-GJL-100 (GG10), **0.6020** EN-GJL-200 (GG20)		≤240 HB	●●										**15**	**25**		
	0.6025 EN-GJL-250 (GG25), **0.6035** EN-GJL-350 (GG35)		≤350 HB	●●										**15**	**25**		
Fundição nodular e fundição maleável	**0.7050** EN-GJS-500-7 (GGG50), **0.8035** EN-GJMW-350-4 (GTW35)		≤240 HB	●●										**10**	**20**		
	0.7070 EN-GJS-700-2 (GGG70), **0.8170** EN-GJMB-700-2 (GTS70)		≤350 HB	●●										**10**	**20**		
Fundição dura	–		≤350 HB	●●										**10**	**15**		
Novos materiais fundidos GGV	**EN-GJV250** (GGV25), **EN-GJV350** (GGV35)		≤220 HB	●●										**8**	**15**		
	EN-GJV400 (GGV40), **EN-GJV500** (GGV50), SiMo 6		≤300 HB	●●										**8**	**15**		
Novos materiais fundidos ADI	**EN-GJS-800-8** (ADI800), **EN-GJS-1000-5** (ADI1000)	≤1000		●●										**8**	**15**		
	EN-GJS-1200-2 (ADI1200), **EN-GJS-1400-1** (ADI1400)	≤1400		●●											**10**		
Ligas especiais	Nimonic, Inconel, Monel, Hastelloy	≤2000		●●													
Titânio e ligas de titânio	**3.7024** Ti99,5, **3.7114** TiAl5Sn2,5, **3.7124** TiCu2	≤850		●●													
	3.7154 TiAl6Zr5, **3.7165** TiAl6V4, **3.7184** TiAl4Mo4Sn2,5, - TiAl8Mo1V1	≤1400		●●													
Alumínio e ligas de alumínio	**3.0255** Al99,5, **3.2315** AlMgSi1, **3.3515** AlMg1	≤400		●△●									**15**			**20**	**20**
Ligas de alumínio forjáveis	**3.0615** AlMgSiPb, **3.1325** AlCuMg1, **3.3245** AlMg3Si, **3.4365** AlZnMgCu1,5	≤650		●△●									**15**			**20**	**20**
Ligas de al fundido ≤ 10 % Si	**3.2131** G-AlSi5Cu1, **3.2153** G-AlSi7Cu3, **3.2573** G-AlSi9	≤600		●△●												**20**	**20**
> 10 % Si	**3.2581** G-AlSi12, **3.2583** G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		●△●													
Ligas de magnésio	**3.5200** MgMn2, **3.5812.05** G-MgAl8Zn1, **3.5612.05** G-MgAl6Zn1	≤400		●△●													
Cobre, de liga baixa	**2.0070** SE-Cu, **2.1020** CuSn6, **2.1096** G-CuSn5ZnPb	≤500		●△●									**15**				
Latão, de cavacos curtos	**2.0380** CuZn39Pb2, **2.0401** CuZn39Pb3, **2.0410** CuZn43Pb2	≤600		●△●													
de cavacos longos	**2.0250** CuZn20, **2.0280** CuZn33, **2.0332** CuZn37Pb0,5	≤600		●△●									**15**			**20**	**20**
Bronzes, de cavacos curtos	**2.1090** CuSn7ZnPb, **2.1170** CuPb5Sn5, **2.1176** CuPb10Sn	≤600		●△●													
	2.0790 CuNi18Zn19Pb	≤850		●△●													
Bronzes, de cavacos longos	**2.0916** CuAl5, **2.0960** CuAl9Mn, **2.1050** CuSn10	≤850		●△●									**15**			**20**	**20**
	2.0980 CuAl11Ni, **2.1247** CuBe2	≤1000		●△●									**15**			**20**	**20**
Plásticos,duroplásticos	Resina epóxi, Resopal, Pertinax, Moltopren	≤150		●													
termoplástico	Plexiglas, Hostalen, Novodur, Makralon	≤100		●													
Plást. reforç. com fibr. de aramid	Kevlar	≤1000		●													
Vidros reforç. com fibr. de carb.	GFK/CFK	≤1000		●													

FERRAMENTAS PARA ROSCAR

	≤3xD										≤2xD	
No. do art.	5554	5592	5555	5594	5552	5591	5596	5553	5551	5593	5547	5548
Tipo de rosca	M	M	M	M	M	M	M	M	M	M	M	M
Tolerância	6H	6H	6H	6H	6H	6H	6H	6H	6H	6HX		
Norma/DIN	371/376	371/376	371/376	371/376	371/376	371/376	371/376	371/376	371/376	371/376		
Material de corte	HSS-E	HSS-E	HSS-E	HSS-E	HSS-E	HSS-E	HSS-E	HSS-E	HSS-E	MDI	MDI	MDI
Tipo/forma	N R40/C	N R40/C	N R40/C	N R40/C	H R40/C	H R40/C	VA R40/C	VA R40/C	Al R45/C	H/C	TM SP/HB	TM SP/HA
Superfície	●	S	●	S	●	C	S	●	○	○	C	C
Refrigeração	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	**axial**	⊗	**axial**
Tolerância do cone	h9	h9	h9	h9	h9	h9	h9	h9	h9	h6		
Progr. pág.	78	78	81	81	79	79	80	80	82	83	93	93

Ø de ferr. mm	Código das séries de avanço 1	2	3	4	5	6
	f_z (mm/dente) Fresado en sentido opuesto					
4,80	0,010	0,020	0,025	0,030	0,045	0,050
6,40	0,012	0,025	0,030	0,035	0,050	0,055
7,95	0,018	0,030	0,040	0,050	0,060	0,060
9,95	0,020	0,040	0,050	0,060	0,070	0,075
11,20	0,022	0,045	0,050	0,060	0,080	0,085
12,80	0,025	0,050	0,050	0,065	0,085	0,090
14,95	0,030	0,050	0,055	0,065	0,090	0,100

Refrigeração da ferramenta:
⊗ sem canais de refrigeração

Refrigerante conforme o material:
○ Ar
● Óleo
● Emulsão
△ Colar

Grupo de materiais	Exemplos de materiais, nova denominação (denominação antiga entre parênteses) Números em negrito = Nr. do material conforme DIN EN	Res. à tração N/mm²	Dureza	Refrig.	v_c m/min	v_c m/min	v_c m/min	v_c m/min	v_c m/min	v_c m/min	v_c m/min	v_c m/min	v_c m/min	v_c m/min	v_c m/min	VR Cód.	v_c m/min	VR Cód.
Aços de construção	**1.0035** S185(St33), **1.0486** P275N(StE285), **1.0345** P235GH(H1), **1.0425** P265GH(H2)	≤500		●●△	**8**	**12**	**10**	**15**							110	**4**	110	**4**
	1.0050 E295 (St50-2), **1.0070** E360 (St70-2), **1.8937** P500NH (WStE500)	≤1000		●●△			**10**	**15**							110	**4**	110	**4**
Aços para máquinas automáticas	**1.0718** 11SMnPb30 (9SMnPb28), **1.0736** 11SMn37 (9SMn36)	≤850		●●△			**10**	**15**							110	**4**	110	**4**
	1.0727 46S20 (45S20), **1.0728** (60S20), **1.0757** 46SPb20 (45SPb20)	≤1000		●●△			**8**	**10**							110	**4**	110	**4**
Aços para beneficiam. sem liga	**1.0402** C22, **1.1178** C30E (Ck30)	≤700		●●△	**8**	**12**	**10**	**15**							110	**4**	110	**4**
	1.0503 C45, **1.1191** C45E (Ck45)	≤850		●●△	**8**	**12**	**10**	**15**							110	**4**	110	**4**
	1.0601 C60, **1.1221** C60E (Ck60)	≤1000		●●△			**8**	**10**							110	**4**	110	**4**
Aços para beneficiam. com liga	**1.5131** 50MnSi4, **1.7003** 38Cr2, **1.7030** 28Cr4	≤1000		●●△			**4**	**6**	**8**	**10**					90	**3**	90	**3**
	1.5710 36NiCr6, **1.7035** 41Cr4, **1.7225** 42CrMo4	≤1400		●●△					**6**	**8**					90	**3**	90	**3**
Aços para cementação sem liga	**1.0301** (C10), **1.1121** C10E (Ck10)	≤850		●●△	**8**	**12**	**10**	**15**							110	**4**	110	**4**
Aços para cementação com liga	**1.7276** 10CrMo11, **1.5125** 11MnSi6	≤1000		●●△			**4**	**6**	**8**	**10**					90	**3**	90	**3**
	1.5752 15NiCr13, **1.7131** 16MnCr5, **1.7264** 20CrMo5	≤1400		●●△					**6**	**8**					90	**3**	90	**3**
Aços para nitretação	**1.8504** 34CrAl6	≤1000		●●△			**4**	**6**	**8**	**10**					90	**3**	90	**3**
	1.8519 31CrMoV9, **1.8550** 34CrAlNi7	≤1400		●●△					**6**	**8**					90	**3**	90	**3**
Aços para ferramentas	**1.1750** C75W, **1.2067** 102Cr6, **1.2307** 29CrMoV9	≤850		●●△			**4**	**6**	**8**	**10**					90	**3**	90	**3**
	1.2080 X210Cr12, **1.2083** X42Cr13, **1.2419** 105WCr6, **1.2767** X45NiCrMo4	≤1400		●●△					**6**	**8**					90	**3**	90	**3**
Aços rápidos	**1.3243** S 6-5-2-5, **1.3343** S 6-5-2, **1.3344** S 6-5-3	≤1400		●●△					**6**	**8**					90	**3**	90	**3**
Aços para molas	**1.5026** 55Si7, **1.7176** 55Cr3, **1.8159** 51CrV4 (51CrV4)		≤350 HB	●●△											90	**3**	90	**3**
Aços temperados	–		≤48 HRC	●●											25	**1**	25	**1**
			≤66 HRC	●●														
Aços inoxidáveis, sulfurosos	**1.4005** X12CrS13, **1.4104** X14CrMoS17, **1.4105** X6CrMoS17, **1.4305** X8CrNiS18-9	≤900		●△●							**10**	**8**			60	**2**	60	**2**
austeníticos	**1.4301** X5CrNi18-10 (V2A), **1.4541** X6CrNiTi18-10, **1.4571** X6CrNiMoTi 17-12-2 (V4A)	≤1100		●△●							**10**	**8**			60	**2**	60	**2**
martensíticos	**1.4057** X20CrNi172 (X17CrNi16-2), **1.4122** X39CrMo17-1, **1.4521** X2CrMoTi18-2	≤1500		●△●							**6**	**4**			60	**2**	60	**2**
Ferro fundido	**0.6010** EN-GJL-100 (GG10), **0.6020** EN-GJL-200 (GG20)		≤240 HB	●●										**45**	120	**4**	120	**4**
	0.6025 EN-GJL-250 (GG25), **0.6035** EN-GJL-350 (GG35)		≤350 HB	●●										**45**	120	**4**	120	**4**
Fundição nodular e fundição maleável	**0.7050** EN-GJS-500-7 (GGG50), **0.8035** EN-GJMW-350-4 (GTW35)		≤240 HB	●●										**35**	120	**4**	120	**4**
	0.7070 EN-GJS-700-2 (GGG70), **0.8170** EN-GJMB-700-2 (GTS70)		≤350 HB	●●										**35**	120	**4**	120	**4**
Fundição dura	–		≤350 HB	●●										**30**	100	**3**	100	**3**
Novos materiais fundidos GGV	**EN-GJV250** (GGV25), **EN-GJV350** (GGV35)		≤220 HB	●●										**30**	120	**4**	120	**4**
	EN-GJV400 (GGV40), **EN-GJV500** (GGV50), SiMo 6		≤300 HB	●●										**30**	120	**4**	120	**4**
Novos materiais fundidos ADI	**EN-GJS-800-8** (ADI800), **EN-GJS-1000-5** (ADI1000)	≤1000		●●										**30**	100	**3**	100	**3**
	EN-GJS-1200-2 (ADI1200), **EN-GJS-1400-1** (ADI1400)	≤1400		●●										**30**	100	**3**	100	**3**
Ligas especiais	Nimonic, Inconel, Monel, Hastelloy	≤2000		●●											35	**2**	35	**2**
Titânio e ligas de titânio	**3.7024** Ti99,5, **3.7114** TiAl5Sn2,5, **3.7124** TiCu2	≤850		●●											35	**2**	35	**2**
	3.7154 TiAl6Zr5, **3.7165** TiAl6V4, **3.7184** TiAl4Mo4Sn2,5, - TiAl8Mo1V1	≤1400		●●											35	**2**	35	**2**
Alumínio e ligas de alumínio	**3.0255** Al99,5, **3.2315** AlMgSi1, **3.3515** AlMg1	≤400		●△●									**15**		250	**5**	250	**5**
Ligas de alumínio forjáveis	**3.0615** AlMgSiPb, **3.1325** AlCuMg1, **3.3245** AlMg3Si, **3.4365** AlZnMgCu1,5	≤650		●△●									**15**		250	**5**	250	**5**
Ligas de al fundido ≤ 10 % Si	**3.2131** G-AlSi5Cu1, **3.2153** G-AlSi7Cu3, **3.2573** G-AlSi9	≤600		●△●										**50**	250	**5**	250	**5**
> 10 % Si	**3.2581** G-AlSi12, **3.2583** G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		●△●										**50**	250	**5**	250	**5**
Ligas de magnésio	**3.5200** MgMn2, **3.5812.05** G-MgAl8Zn1, **3.5612.05** G-MgAl6Zn1	≤400		●△●											250	**5**	250	**5**
Cobre, de liga baixa	**2.0070** SE-Cu, **2.1020** CuSn6, **2.1096** G-CuSn5ZnPb	≤500		●△●									**15**		250	**5**	250	**5**
Latão, de cavacos curtos	**2.0380** CuZn39Pb2, **2.0401** CuZn39Pb3, **2.0410** CuZn43Pb2	≤600		●△●										**50**	250	**5**	250	**5**
de cavacos longos	**2.0250** CuZn20, **2.0280** CuZn33, **2.0332** CuZn37Pb0,5	≤600		●△●									**15**		250	**5**	250	**5**
Bronzes, de cavacos curtos	**2.1090** CuSn7ZnPb, **2.1170** CuPb5Sn5, **2.1176** CuPb10Sn	≤600		●△●											250	**5**	250	**5**
	2.0790 CuNi18Zn19Pb	≤850		●△●											250	**5**	250	**5**
Bronzes, de cavacos longos	**2.0916** CuAl5, **2.0960** CuAl9Mn, **2.1050** CuSn10	≤850		●△●									**15**	**15**	250	**5**	250	**5**
	2.0980 CuAl11Ni, **2.1247** CuBe2	≤1000		●△●									**15**	**15**	250	**5**	250	**5**
Plásticos,duroplásticos	Resina epóxi, Resopal, Pertinax, Moltopren	≤150		●											350	**5**	350	**5**
termoplástico	Plexiglas, Hostalen, Novodur, Makralon	≤100		●											350	**6**	350	**6**
Plást. reforç. com fibr. de aramid	Kevlar	≤1000		●														
Vidros reforç. com fibr. de carb.	GFK/CFK	≤1000		●														