NS TOOL

For Crafting Tomorrow

Long Neck End Mill for Copper Electrode

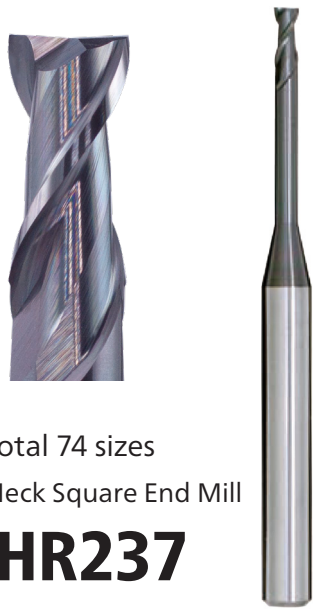
DHR237
DRB230
DHR237R

Total 321 sizes

N

Realized overwhelming long tool life and high quality burrless cutting performance

End Mill for Copper Electrode series with great size expansions from all 193 sizes to all 321 sizes.



Total 74 sizes

Long Neck Square End Mill

DHR237

ϕ 0.1 ～ ϕ 6

Total 94 sizes

Long Neck Ball End Mill

DRB230

R 0.05 ～ R 3

Total 153 sizes

Long Neck Corner Radius End Mill

DHR237R

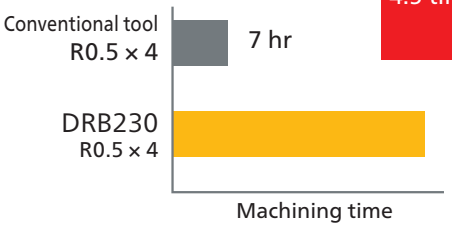
ϕ 0.2 × R 0.02 ～ ϕ 6 × R 1

Features

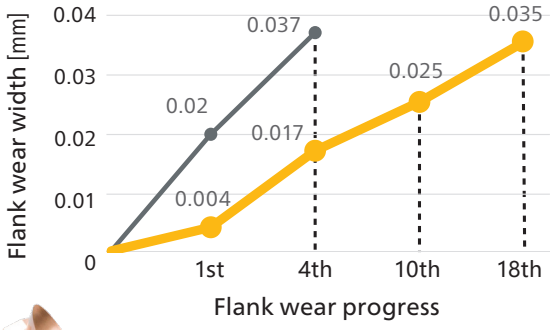
Feature 1 — Long tool life — Coating DLC COATING

DLC Coating optimized for copper and copper alloy machining increases tool life compare to conventional tool

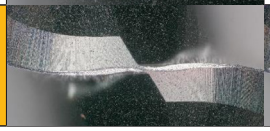
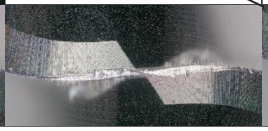
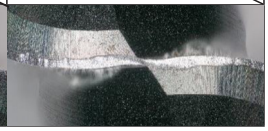
Tool life comparison with conventional tool



4.5 times longer tool life than conventional tool



Material : Tough pitch copper (TPC)
Coolant : Water-soluble fluid

	After machining 4pcs 7hr	After machining 10pcs 17hr 30min	After machining 18pcs 31hr 30min
Conventional tool R0.5×4			
DRB230 R0.5×4			

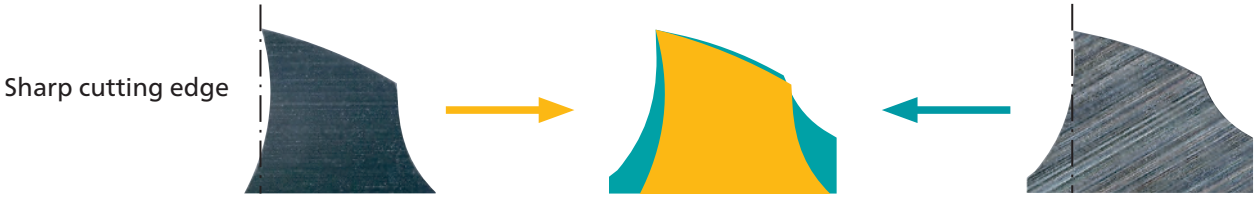
Ended at the fourth work piece by excess wear width

DRB230 machined 18pieces (31 hr 30 min)

Feature 2 **Burr suppression** Shape Sharp cutting edge

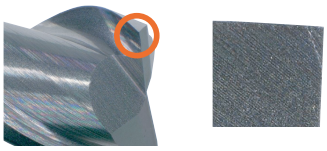
2-1 Shape of cutting edge

Adoption of sharper cutting edge to realize high precision machining by suppressing burr and deflection



Copper Electrode series | Comparison with general cutting edge | General cutting edge

Long Neck Square DHR237



Small gash land for cutting performance and better strength

Long Neck Ball DRB230

Smooth spiral radius end for high cutting quality and accuracy

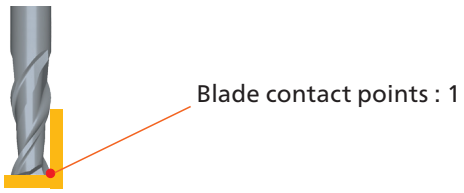
Long Neck Corner Radius DHR237R

Corner part with high shearing ability realizes high precision machining surface.

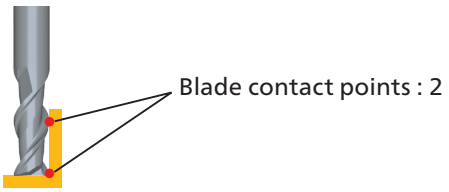
2-2 Helix angle of peripheral flutes

High helix angle improves shearing ability
Specialized 37.5°helix angle with high shearing ability and less contact point to reduce waveness

Cutting depth ap:2D



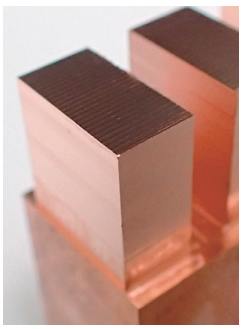
Specialized for copper electrode machining 37.5°helix angle DHR237 / DHR237R

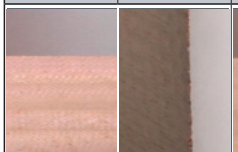
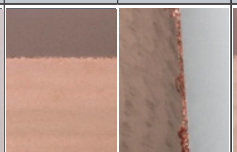
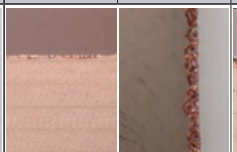
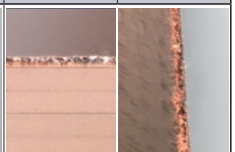
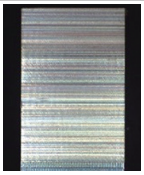


General high helix angle type 45°helix angle

Comparison with conventional tool

Material:
Tough pitch copper (TPC)
Work size: 8 × 15 mm
Cutting depth: 12 mm
Coolant:
Water-insoluble fluid



	DHR237 ϕ3×15				Conventional tool ϕ3×14			
	Beginning		After 10hr		Beginning		After 10hr	
	Top	Side	Top	Side	Top	Side	Top	Side
Burr height								
	0.002mm/0.002mm		0.003mm/0.013mm		0.003mm/0.016mm		0.012mm/0.018mm	
Roughness								
	Ra:0.075μm		Ra:0.076μm		Ra:0.120μm		Ra:0.350μm	

DHR237

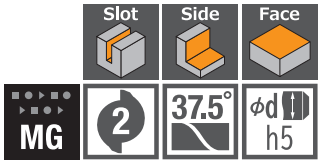
Size ϕ 0.1 ～ϕ 6

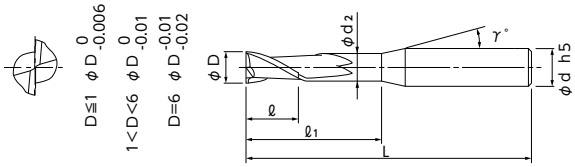
DLC

Long Neck Square End Mill for Copper Electrode

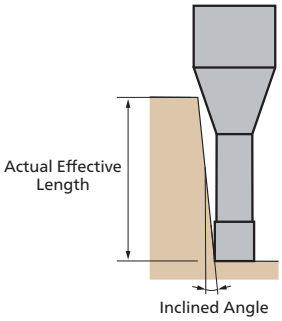
Total 74 sizes

Long neck square end mill specialized for machining copper alloy.
Sharpe cutting edge makes less burr and high quality surface.





- Long neck square end mill specialized for machining copper electrode.
- Helix angle 37.5 degrees to achieve both sharpness and finished surface quality that prevents scratches on cutting surface.
- High quality and stable milling performance with long tool life by optimized design and DLC COATING.
- Machining copper tungsten electrodes is also effective.



Work material

Copper	Copper Tungsten
◎	◎

Unit [Size : mm]

Code No.	Dia. (D)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
								30′	1°	1°30′	2°	3°
07-00100-01003	0.1	0.3	0.2	0.085	12°	4	45	0.34	0.36	0.38	0.40	0.44
07-00100-01005		0.5	0.2	0.085	12°	4	45	0.55	0.58	0.61	0.64	0.71
07-00100-01007		0.75	0.2	0.085	12°	4	45	0.81	0.85	0.89	0.93	1.04
07-00100-01010		1	0.2	0.085	12°	4	45	1.07	1.12	1.18	1.23	1.37
07-00100-02005	0.2	0.5	0.4	0.18	12°	4	45	0.57	0.59	0.62	0.65	0.72
07-00100-02010		1	0.4	0.18	12°	4	45	1.09	1.14	1.19	1.25	1.38
07-00100-02015		1.5	0.4	0.18	12°	4	45	1.61	1.68	1.76	1.85	2.05
07-00100-02020		2	0.4	0.18	12°	4	45	2.13	2.23	2.33	2.44	2.71
07-00100-03010	0.3	1	0.6	0.28	12°	4	45	1.09	1.14	1.19	1.25	1.38
07-00100-03015		1.5	0.6	0.28	12°	4	45	1.61	1.68	1.76	1.85	2.05
07-00100-03020		2	0.6	0.28	12°	4	45	2.13	2.23	2.33	2.44	2.71
07-00100-03030		3	0.6	0.28	12°	4	45	3.17	3.31	3.47	3.64	4.04
07-00100-04010	0.4	1	0.8	0.37	12°	4	45	1.11	1.16	1.22	1.28	1.42
07-00100-04020		2	0.8	0.37	12°	4	45	2.15	2.25	2.36	2.47	2.74
07-00100-04030		3	0.8	0.37	12°	4	45	3.20	3.34	3.50	3.67	4.07
07-00100-04040		4	0.8	0.37	12°	4	45	4.24	4.43	4.64	4.87	5.40
07-00100-05015	0.5	1.5	1	0.46	12°	4	45	1.66	1.73	1.81	1.90	2.11
07-00100-05020		2	1	0.46	12°	4	45	2.18	2.28	2.38	2.50	2.77
07-00100-05030		3	1	0.46	12°	4	45	3.22	3.37	3.52	3.70	4.10
07-00100-05040		4	1	0.46	12°	4	45	4.26	4.46	4.66	4.89	5.43
07-00100-05060		6	1	0.46	12°	4	45	6.35	6.63	6.95	7.29	8.08
07-00100-06020	0.6	2	1.2	0.56	12°	4	45	2.18	2.28	2.38	2.50	2.77
07-00100-06030		3	1.2	0.56	12°	4	45	3.22	3.37	3.52	3.70	4.10
07-00100-06040		4	1.2	0.56	12°	4	45	4.26	4.46	4.66	4.89	5.43
07-00100-06060		6	1.2	0.56	12°	4	45	6.35	6.63	6.95	7.29	8.08

How to order When you order, indicate DHR237 (D)×(ℓ1). ※(γ) is reference value.

Long Neck Square End Mill for Copper Electrode

Code No.	Dia. (D)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
								30′	1°	1°30′	2°	3°
07-00100-08030	0.8	3	1.6	0.76	12°	4	45	3.22	3.37	3.52	3.70	4.10
07-00100-08040		4	1.6	0.76	12°	4	45	4.26	4.46	4.66	4.89	5.43
07-00100-08060		6	1.6	0.76	12°	4	45	6.35	6.63	6.95	7.29	8.08
07-00100-08080		8	1.6	0.76	12°	4	50	8.44	8.81	9.23	9.68	10.74
07-00100-10030	1	3	2	0.95	12°	4	45	3.25	3.39	3.55	3.73	4.13
07-00100-10040		4	2	0.95	12°	4	45	4.29	4.48	4.69	4.92	5.46
07-00100-10050		5	2	0.95	12°	4	45	5.33	5.57	5.83	6.12	6.79
07-00100-10060		6	2	0.95	12°	4	45	6.37	6.66	6.97	7.32	8.11
07-00100-10080		8	2	0.95	12°	4	50	8.46	8.84	9.25	9.71	10.77
07-00100-10100		10	2	0.95	12°	4	50	10.55	11.02	11.53	12.10	13.42
07-00100-10120		12	2	0.95	12°	4	50	12.63	13.20	13.82	14.49	16.08
07-00100-15040	1.5	4	3	1.45	12°	4	45	4.29	4.48	4.69	4.92	5.46
07-00100-15060		6	3	1.45	12°	4	50	6.37	6.66	6.97	7.32	8.11
07-00100-15080		8	3	1.45	12°	4	50	8.46	8.84	9.25	9.71	10.77
07-00100-15100		10	3	1.45	12°	4	50	10.55	11.02	11.53	12.10	13.42
07-00100-15120		12	3	1.45	12°	4	50	12.63	13.20	13.82	14.49	16.08
07-00100-15160		16	3	1.45	12°	4	60	16.80	17.55	18.38	19.28	21.39
07-00100-20060	2	6	4	1.94	12°	4	50	6.40	6.69	7.00	7.34	8.15
07-00100-20080		8	4	1.94	12°	4	50	8.48	8.86	9.28	9.74	10.80
07-00100-20100		10	4	1.94	12°	4	50	10.57	11.04	11.56	12.13	13.45
07-00100-20120		12	4	1.94	12°	4	50	12.66	13.22	13.84	14.52	16.11
07-00100-20140		14	4	1.94	12°	4	50	14.74	15.40	16.12	16.92	18.76
07-00100-20160		16	4	1.94	12°	4	60	16.83	17.58	18.40	19.31	Free
07-00100-20200		20	4	1.94	12°	4	60	21.00	21.94	22.97	24.10	Free
07-00100-25060	2.5	6	5	2.4	12°	4	45	6.50	6.79	7.11	7.46	8.27
07-00100-25080		8	5	2.4	12°	4	50	8.58	8.97	9.39	9.85	10.93
07-00100-25100		10	5	2.4	12°	4	50	10.67	11.15	11.67	12.24	13.58
07-00100-25120		12	5	2.4	12°	4	50	12.75	13.32	13.95	14.64	Free
07-00100-25140		14	5	2.4	12°	4	50	14.84	15.50	16.23	17.03	Free
07-00100-25160		16	5	2.4	12°	4	50	16.93	17.68	18.51	19.42	Free
07-00100-25200		20	5	2.4	12°	4	60	21.10	22.04	23.07	Free	Free
07-00100-30080	3	8	6	2.85	12°	6	50	8.71	9.10	9.52	9.99	11.08
07-00100-30100		10	6	2.85	12°	6	50	10.79	11.27	11.80	12.38	13.74
07-00100-30150		15	6	2.85	12°	6	60	16.01	16.72	17.50	18.37	20.37
07-00100-30200		20	6	2.85	12°	6	60	21.22	22.17	23.21	24.35	27.01
07-00100-30250		25	6	2.85	12°	6	70	26.43	27.62	28.91	30.33	Free
07-00100-40100	4	10	8	3.8	12°	6	50	10.91	11.40	11.94	12.52	13.89
07-00100-40150		15	8	3.8	12°	6	60	16.13	16.85	17.64	18.51	Free
07-00100-40200		20	8	3.8	12°	6	60	21.34	22.30	23.34	24.49	Free
07-00100-40250		25	8	3.8	12°	6	70	26.56	27.74	29.04	Free	Free
07-00100-40300		30	8	3.8	12°	6	70	31.77	33.19	34.75	Free	Free
07-00100-50150	5	15	10	4.8	12°	6	50	16.13	16.85	17.64	Free	Free
07-00100-50200		20	10	4.8	12°	6	60	21.34	22.30	Free	Free	Free
07-00100-50250		25	10	4.8	12°	6	60	26.56	27.74	Free	Free	Free
07-00100-50300		30	10	4.8	12°	6	70	31.77	Free	Free	Free	Free
07-00100-60150	6	15	12	5.8	–	6	50	Free	Free	Free	Free	Free
07-00100-60200		20	12	5.8	–	6	60	Free	Free	Free	Free	Free
07-00100-60300		30	12	5.8	–	6	70	Free	Free	Free	Free	Free
07-00100-60500		50	12	5.8	–	6	90	Free	Free	Free	Free	Free

Recommended Milling Conditions

Work material			Copper							Copper tungsten (W70%-Cu30%)						
Dia.	Under neck length	L/D	Side Milling				Slotting			Side Milling				Slotting		
			Spindle speed	Feed	Depth of cut		Spindle speed	Feed	Depth of cut	Spindle speed	Feed	Depth of cut		Spindle speed	Feed	Depth of cut
			min^{-1}	mm/min	a_p mm	a_e mm	min^{-1}	mm/min	a_p mm	min^{-1}	mm/min	a_p mm	a_e mm	min^{-1}	mm/min	a_p mm
0.1	0.3	3	40,000	180	0.1	0.006	40,000	170	0.01	30,000	120	0.05	0.004	30,000	110	0.006
	0.5	5	40,000	140	0.1	0.004	40,000	130	0.007	30,000	80	0.05	0.003	30,000	70	0.004
	0.75	7.5	40,000	100	0.1	0.003	40,000	90	0.005	30,000	50	0.05	0.003	30,000	45	0.003
	1	10	40,000	80	0.1	0.003	40,000	70	0.003	30,000	40	0.05	0.003	30,000	35	0.002
0.2	0.5	2.5	40,000	400	0.2	0.008	40,000	380	0.02	30,000	260	0.1	0.006	30,000	250	0.01
	1	5	40,000	350	0.2	0.006	40,000	320	0.015	30,000	220	0.1	0.004	30,000	200	0.008
	1.5	7.5	40,000	300	0.2	0.004	40,000	250	0.01	30,000	200	0.1	0.003	30,000	130	0.005
	2	10	40,000	250	0.2	0.003	40,000	180	0.005	30,000	150	0.1	0.003	30,000	90	0.003
0.3	1	3.3	40,000	500	0.3	0.01	40,000	450	0.035	30,000	350	0.15	0.008	30,000	280	0.014
	1.5	5	40,000	450	0.3	0.008	40,000	400	0.025	30,000	300	0.15	0.006	30,000	250	0.012
	2	6.7	40,000	380	0.3	0.006	40,000	350	0.017	30,000	250	0.15	0.004	30,000	220	0.008
	3	10	35,000	300	0.3	0.004	35,000	250	0.01	30,000	200	0.15	0.003	30,000	150	0.005
0.4	1	2.5	40,000	700	0.4	0.02	40,000	650	0.045	30,000	500	0.2	0.014	30,000	450	0.025
	2	5	40,000	600	0.4	0.015	40,000	550	0.03	30,000	450	0.2	0.01	30,000	400	0.02
	3	7.5	35,000	500	0.4	0.01	35,000	450	0.02	26,000	350	0.2	0.007	26,000	300	0.015
	4	10	28,000	350	0.4	0.006	28,000	300	0.015	24,000	220	0.2	0.004	22,000	200	0.01
0.5	1.5	3	40,000	900	0.5	0.025	40,000	800	0.07	30,000	650	0.3	0.02	30,000	550	0.05
	2	4	38,000	800	0.5	0.02	35,000	700	0.055	28,000	550	0.3	0.016	26,000	450	0.04
	3	6	35,000	700	0.5	0.015	32,000	600	0.04	26,000	500	0.3	0.012	25,000	400	0.03
	4	8	28,000	550	0.5	0.008	26,000	500	0.03	24,000	400	0.3	0.005	22,000	300	0.02
	6	12	18,000	350	0.5	0.005	18,000	300	0.015	15,000	220	0.3	0.003	15,000	180	0.01
0.6	2	3.3	38,000	1,000	0.6	0.025	35,000	850	0.1	28,000	700	0.4	0.018	26,000	650	0.08
	3	5	32,000	800	0.6	0.02	30,000	700	0.08	24,000	550	0.4	0.014	22,000	500	0.06
	4	6.7	28,000	700	0.6	0.015	26,000	600	0.06	22,000	500	0.4	0.012	20,000	400	0.04
	6	10	20,000	450	0.6	0.01	20,000	400	0.03	18,000	350	0.4	0.008	16,000	300	0.02
0.8	3	3.8	30,000	1,300	0.8	0.04	28,000	1,200	0.15	24,000	1,000	0.6	0.03	22,000	900	0.1
	4	5	26,000	1,100	0.8	0.03	24,000	1,000	0.12	22,000	850	0.6	0.02	18,000	650	0.08
	6	7.5	22,000	900	0.8	0.02	18,000	650	0.08	16,000	600	0.6	0.014	14,000	500	0.06
	8	10	16,000	600	0.8	0.01	16,000	500	0.05	14,000	450	0.6	0.01	13,000	350	0.03
1	3	3	24,000	2,200	1	0.06	24,000	2,000	0.22	20,000	1,600	0.8	0.04	20,000	1,400	0.16
	4	4	24,000	2,000	1	0.05	22,000	1,800	0.2	20,000	1,400	0.8	0.035	18,000	1,100	0.14
	5	5	22,000	1,700	1	0.04	20,000	1,500	0.16	18,000	1,200	0.8	0.028	16,000	950	0.12
	6	6	20,000	1,500	1	0.03	18,000	1,200	0.14	16,000	1,000	0.8	0.02	14,000	800	0.1
	8	8	16,000	1,200	1	0.025	15,000	1,000	0.1	14,000	800	0.8	0.018	12,000	650	0.08
	10	10	14,000	1,000	1	0.02	12,000	800	0.07	12,000	650	0.8	0.014	11,000	550	0.05
	12	12	10,000	700	1	0.01	10,000	650	0.05	9,000	450	0.8	0.007	8,000	400	0.035
1.5	4	2.7	20,000	2,500	1.5	0.08	18,000	2,000	0.35	17,000	1,850	1	0.06	15,000	1,300	0.22
	6	4	18,000	2,200	1.5	0.08	16,000	1,800	0.3	15,000	1,600	1	0.05	14,000	1,200	0.2
	8	5.3	16,000	1,700	1.5	0.06	14,000	1,400	0.25	13,000	1,200	1	0.04	12,000	950	0.18
	10	6.7	14,000	1,450	1.5	0.05	12,000	1,150	0.2	11,000	950	1	0.035	10,000	750	0.15
	12	8	12,000	1,200	1.5	0.04	11,000	1,000	0.15	10,000	800	1	0.03	9,000	650	0.1
	16	10.7	10,000	900	1.5	0.02	10,000	800	0.08	8,000	600	1	0.015	7,000	500	0.06

Work material			Copper							Copper tungsten (W70%-Cu30%)						
Dia.	Under neck length	L/D	Side Milling				Slotting			Side Milling				Slotting		
			Spindle speed	Feed	Depth of cut		Spindle speed	Feed	Depth of cut	Spindle speed	Feed	Depth of cut		Spindle speed	Feed	Depth of cut
			min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm
2	6	3	18,000	2,500	2	0.1	16,000	2,200	0.45	14,000	1,800	1.5	0.08	12,000	1,500	0.3
	8	4	16,000	2,200	2	0.09	14,000	1,900	0.4	12,000	1,500	1.5	0.07	12,000	1,400	0.28
	10	5	14,000	1,900	2	0.08	12,000	1,600	0.35	10,000	1,200	1.5	0.06	10,000	1,000	0.24
	12	6	12,000	1,600	2	0.07	11,000	1,400	0.28	10,000	1,100	1.5	0.05	9,000	900	0.2
	14	7	11,000	1,400	2	0.06	10,000	1,200	0.24	9,000	950	1.5	0.04	8,000	800	0.16
	16	8	10,000	1,200	2	0.045	9,000	1,000	0.18	8,000	800	1.5	0.03	7,000	650	0.12
	20	10	9,000	1,000	2	0.03	8,000	850	0.12	7,000	700	1.5	0.02	6,000	550	0.08
2.5	6	2.4	17,000	2,450	2.5	0.13	15,000	2,100	0.55	13,000	1,800	2	0.1	12,000	1,600	0.4
	8	3.2	16,000	2,300	2.5	0.12	14,000	1,950	0.5	12,000	1,650	2	0.09	11,000	1,450	0.35
	10	4	15,000	2,100	2.5	0.1	13,000	1,700	0.4	11,000	1,500	2	0.07	10,000	1,300	0.3
	12	4.8	14,000	1,900	2.5	0.08	12,000	1,550	0.35	10,000	1,300	2	0.065	9,000	1,100	0.25
	14	5.6	13,000	1,700	2.5	0.07	11,000	1,350	0.3	10,000	1,250	2	0.06	9,000	1,050	0.2
	16	6.4	11,000	1,400	2.5	0.06	10,000	1,200	0.25	9,000	1,100	2	0.05	8,000	850	0.15
	20	8	10,000	1,250	2.5	0.05	9,000	1,000	0.2	8,000	950	2	0.04	7,000	700	0.12
3	8	2.7	16,000	2,400	3	0.15	14,000	2,000	0.75	12,000	1,800	2.4	0.11	11,000	1,500	0.55
	10	3.3	16,000	2,400	3	0.12	14,000	2,000	0.7	12,000	1,800	2.4	0.08	11,000	1,500	0.5
	15	5	14,000	2,100	3	0.1	12,000	1,600	0.6	11,000	1,600	2.4	0.07	9,000	1,100	0.4
	20	6.7	11,000	1,500	3	0.07	10,000	1,200	0.4	9,000	1,100	2.4	0.05	8,000	900	0.3
	25	8.3	10,000	1,300	3	0.05	9,000	1,000	0.2	8,000	900	2.4	0.03	7,000	700	0.15
4	10	2.5	12,000	2,400	4	0.2	10,000	2,000	1	9,000	1,600	3	0.15	8,000	1,400	0.8
	15	3.8	12,000	2,400	4	0.2	10,000	2,000	0.9	9,000	1,600	3	0.15	8,000	1,400	0.7
	20	5	10,000	2,000	4	0.15	8,000	1,600	0.7	8,000	1,400	3	0.1	6,000	1,000	0.5
	25	6.3	9,000	1,700	4	0.1	8,000	1,500	0.5	7,000	1,200	3	0.07	6,000	1,000	0.3
	30	7.5	8,000	1,500	4	0.07	7,000	1,300	0.3	6,000	1,000	3	0.05	5,000	800	0.2
5	15	3	9,500	2,600	5	0.25	8,500	2,200	1.1	7,000	1,800	3.5	0.18	6,000	1,400	0.8
	20	4	8,000	2,150	5	0.2	7,000	1,750	1	6,500	1,650	3.5	0.15	5,500	1,150	0.6
	25	5	7,000	1,800	5	0.15	6,000	1,400	0.9	5,800	1,300	3.5	0.12	4,800	1,000	0.5
	30	6	6,000	1,500	5	0.1	5,000	1,100	0.7	5,000	1,000	3.5	0.1	4,000	830	0.4
6	15	2.5	8,000	2,750	6	0.3	7,000	2,350	1.2	6,000	1,950	4	0.2	5,000	1,400	0.9
	20	3.3	7,000	2,400	6	0.3	6,000	2,000	1.2	5,000	1,600	4	0.2	4,500	1,200	0.8
	30	5	5,000	1,600	6	0.2	4,000	1,200	1	4,000	1,100	4	0.15	3,500	900	0.6
	50	8.3	3,500	800	6	0.1	3,000	650	0.4	3,000	600	4	0.07	3,000	500	0.25

Notes

※1 Recommend to use the milling condition as just reference. Adjust milling conditions according to machining shape and machine status.

※2 Depth of cut : ap=Axial Depth of cut / ae=Radial Depth of cut.

※3 Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.

※4 Water-insoluble fluid is recommended.

DRB230

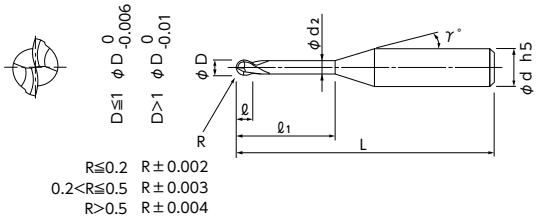
Size R0.05 ～ R3

DLC

Long Neck Ball End Mill for Copper Electrode

Total 94 sizes

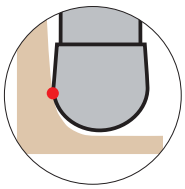
Long neck ball end mill specialized for machining copper alloy.
Sharpe cutting edge makes less burr and high quality surface.

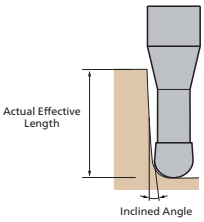


R≦0.2 R±0.002
0.2<R≦0.5 R±0.003
R>0.5 R±0.004

※R accuracy of DRB230 is based on a half value of φ D.

- Long neck ball end mill specialized for machining copper electrode.
- Sharp edge shearing ability and DLC coating realized high quality and stable a long life machining.
- Machining copper tungsten electrodes is also effective.





Work material

Copper	Copper Tungsten
◎	◎

Unit [Size : mm]

Code No.	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
									30′	1°	1°30′	2°	3°
07-00530-00503	R0.05	0.3	0.07	0.1	0.085	12°	4	45	0.34	0.36	0.37	0.39	0.42
07-00530-00505		0.5	0.07	0.1	0.085	12°	4	45	0.55	0.57	0.60	0.63	0.69
07-00530-00703	R0.075	0.3	0.1	0.15	0.13	12°	4	45	0.35	0.37	0.38	0.40	0.43
07-00530-00705		0.5	0.1	0.15	0.13	12°	4	45	0.56	0.58	0.61	0.64	0.70
07-00530-00710		1	0.1	0.15	0.13	12°	4	45	1.08	1.13	1.18	1.23	1.36
07-00530-01005	R0.1	0.5	0.15	0.2	0.18	12°	4	45	0.56	0.58	0.61	0.63	0.69
07-00530-01007		0.75	0.15	0.2	0.18	12°	4	45	0.82	0.85	0.89	0.93	1.02
07-00530-01010		1	0.15	0.2	0.18	12°	4	45	1.08	1.13	1.18	1.23	1.35
07-00530-01015		1.5	0.15	0.2	0.18	12°	4	45	1.60	1.67	1.75	1.83	2.02
07-00530-01020		2	0.15	0.2	0.18	12°	4	45	2.13	2.22	2.32	2.43	2.68
07-00530-01505	R0.15	0.5	0.2	0.3	0.28	12°	4	45	0.56	0.58	0.60	0.62	0.67
07-00530-01510		1	0.2	0.3	0.28	12°	4	45	1.08	1.12	1.17	1.22	1.34
07-00530-01515		1.5	0.2	0.3	0.28	12°	4	45	1.60	1.67	1.74	1.82	2.00
07-00530-01520		2	0.2	0.3	0.28	12°	4	45	2.12	2.21	2.31	2.42	2.66
07-00530-02005	R0.2	0.5	0.3	0.4	0.37	12°	4	45	0.58	0.60	0.62	0.64	0.69
07-00530-02010		1	0.3	0.4	0.37	12°	4	45	1.10	1.14	1.19	1.24	1.35
07-00530-02015		1.5	0.3	0.4	0.37	12°	4	45	1.62	1.69	1.76	1.84	2.02
07-00530-02020		2	0.3	0.4	0.37	12°	4	45	2.15	2.23	2.33	2.43	2.68
07-00530-02030		3	0.3	0.4	0.37	12°	4	45	3.19	3.32	3.47	3.63	4.01
07-00530-02040		4	0.3	0.4	0.37	12°	4	45	4.23	4.41	4.61	4.83	5.33
07-00530-02050		5	0.3	0.4	0.37	12°	4	45	5.27	5.50	5.75	6.02	6.66
07-00530-02060		6	0.3	0.4	0.37	12°	4	45	6.32	6.59	6.89	7.22	7.99
07-00530-02510	R0.25	1	0.35	0.5	0.46	12°	4	45	1.13	1.16	1.21	1.26	1.37
07-00530-02515		1.5	0.35	0.5	0.46	12°	4	45	1.65	1.71	1.78	1.85	2.03
07-00530-02520		2	0.35	0.5	0.46	12°	4	45	2.17	2.25	2.35	2.45	2.69
07-00530-02530		3	0.35	0.5	0.46	12°	4	45	3.21	3.34	3.49	3.65	4.02
07-00530-02540		4	0.35	0.5	0.46	12°	4	45	4.25	4.43	4.63	4.85	5.35
07-00530-02550		5	0.35	0.5	0.46	12°	4	45	5.30	5.52	5.77	6.04	6.68
07-00530-02560		6	0.35	0.5	0.46	12°	4	45	6.34	6.61	6.91	7.24	8.00
07-00530-03010	R0.3	1	0.45	0.6	0.56	12°	4	45	1.12	1.16	1.20	1.25	1.35
07-00530-03015		1.5	0.45	0.6	0.56	12°	4	45	1.64	1.71	1.77	1.84	2.02
07-00530-03020		2	0.45	0.6	0.56	12°	4	45	2.17	2.25	2.34	2.44	2.68
07-00530-03030		3	0.45	0.6	0.56	12°	4	45	3.21	3.34	3.48	3.64	4.01
07-00530-03040		4	0.45	0.6	0.56	12°	4	45	4.25	4.43	4.62	4.84	5.33
07-00530-03050		5	0.45	0.6	0.56	12°	4	45	5.29	5.52	5.76	6.03	6.66
07-00530-03060		6	0.45	0.6	0.56	12°	4	45	6.34	6.61	6.90	7.23	7.99
07-00530-03080		8	0.45	0.6	0.56	12°	4	45	8.42	8.79	9.18	9.62	10.64
07-00530-03100		10	0.45	0.6	0.56	12°	4	50	10.51	10.97	11.47	12.02	13.30

How to order When you order, indicate DRB230 (R)×(ℓ1). ※(γ) is reference value.

Code No.	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
									30′	1°	1°30′	2°	3°
07-00530-04015	R0.4	1.5	0.6	0.8	0.76	12°	4	45	1.64	1.70	1.76	1.83	1.98
07-00530-04020		2	0.6	0.8	0.76	12°	4	45	2.16	2.24	2.33	2.42	2.65
07-00530-04030		3	0.6	0.8	0.76	12°	4	45	3.20	3.33	3.47	3.62	3.97
07-00530-04040		4	0.6	0.8	0.76	12°	4	45	4.25	4.42	4.61	4.82	5.30
07-00530-04050		5	0.6	0.8	0.76	12°	4	45	5.29	5.51	5.75	6.01	6.63
07-00530-04060		6	0.6	0.8	0.76	12°	4	45	6.33	6.60	6.89	7.21	7.96
07-00530-04080		8	0.6	0.8	0.76	12°	4	45	8.42	8.78	9.17	9.60	10.61
07-00530-04100		10	0.6	0.8	0.76	12°	4	50	10.50	10.96	11.45	12.00	13.26
07-00530-05020	R0.5	2	0.75	1	0.95	12°	4	45	2.18	2.26	2.34	2.43	2.65
07-00530-05030		3	0.75	1	0.95	12°	4	45	3.22	3.35	3.48	3.63	3.97
07-00530-05040		4	0.75	1	0.95	12°	4	45	4.27	4.44	4.62	4.83	5.30
07-00530-05050		5	0.75	1	0.95	12°	4	45	5.31	5.53	5.76	6.02	6.63
07-00530-05060		6	0.75	1	0.95	12°	4	45	6.35	6.62	6.90	7.22	7.96
07-00530-05080		8	0.75	1	0.95	12°	4	45	8.44	8.79	9.18	9.61	10.61
07-00530-05100		10	0.75	1	0.95	12°	4	45	10.52	10.97	11.46	12.01	13.26
07-00530-05120		12	0.75	1	0.95	12°	4	45	12.61	13.15	13.75	14.40	15.92
07-00530-05140		14	0.75	1	0.95	12°	4	50	14.70	15.33	16.03	16.79	18.57
07-00530-05160		16	0.75	1	0.95	12°	4	50	16.78	17.51	18.31	19.18	21.23
07-00530-07504	R0.75	4	1.1	1.5	1.45	12°	4	50	4.26	4.41	4.59	4.78	5.22
07-00530-07506		6	1.1	1.5	1.45	12°	4	50	6.34	6.59	6.87	7.17	7.88
07-00530-07508		8	1.1	1.5	1.45	12°	4	50	8.43	8.77	9.15	9.56	10.53
07-00530-07510		10	1.1	1.5	1.45	12°	4	50	10.51	10.95	11.43	11.96	13.18
07-00530-07512		12	1.1	1.5	1.45	12°	4	50	12.60	13.13	13.71	14.35	15.84
07-00530-07514		14	1.1	1.5	1.45	12°	4	50	14.69	15.31	15.99	16.74	18.49
07-00530-07516		16	1.1	1.5	1.45	12°	4	50	16.77	17.49	18.27	19.14	21.15
07-00530-07518		18	1.1	1.5	1.45	12°	4	50	18.86	19.67	20.55	21.53	23.80
07-00530-10030	R1	3	1.5	2	1.94	12°	4	50	3.23	3.33	3.44	3.56	3.85
07-00530-10040		4	1.5	2	1.94	12°	4	50	4.27	4.42	4.58	4.76	5.17
07-00530-10060		6	1.5	2	1.94	12°	4	50	6.36	6.60	6.86	7.15	7.83
07-00530-10080		8	1.5	2	1.94	12°	4	50	8.44	8.78	9.14	9.54	10.48
07-00530-10100		10	1.5	2	1.94	12°	4	50	10.53	10.95	11.42	11.94	13.14
07-00530-10120		12	1.5	2	1.94	12°	4	50	12.61	13.13	13.70	14.33	15.79
07-00530-10140		14	1.5	2	1.94	12°	4	50	14.70	15.31	15.98	16.72	18.45
07-00530-10160		16	1.5	2	1.94	12°	4	50	16.78	17.49	18.27	19.12	Free
07-00530-10200		20	1.5	2	1.94	12°	4	60	20.96	21.85	22.83	23.90	Free
07-00530-10250		25	1.5	2	1.94	12°	4	60	26.17	27.30	28.53	Free	Free
07-00530-15060	R1.5	6	2.5	3	2.85	12°	6	60	6.56	6.78	7.03	7.31	7.95
07-00530-15080		8	2.5	3	2.85	12°	6	60	8.64	8.96	9.31	9.70	10.60
07-00530-15100		10	2.5	3	2.85	12°	6	60	10.73	11.14	11.59	12.09	13.26
07-00530-15120		12	2.5	3	2.85	12°	6	60	12.81	13.32	13.88	14.49	15.91
07-00530-15150		15	2.5	3	2.85	12°	6	70	15.94	16.59	17.30	18.08	19.89
07-00530-15200		20	2.5	3	2.85	12°	6	70	21.16	22.04	23.00	24.06	26.53
07-00530-15250		25	2.5	3	2.85	12°	6	70	26.37	27.48	28.70	30.04	Free
07-00530-15300		30	2.5	3	2.85	12°	6	70	31.58	32.93	34.40	36.03	Free
07-00530-20100	R2	10	3	4	3.8	12°	6	60	10.83	11.22	11.66	12.14	13.25
07-00530-20120		12	3	4	3.8	12°	6	60	12.91	13.40	13.94	14.53	15.91
07-00530-20150		15	3	4	3.8	12°	6	60	16.04	16.67	17.36	18.12	19.89
07-00530-20200		20	3	4	3.8	12°	6	60	21.26	22.12	23.06	24.10	Free
07-00530-20250		25	3	4	3.8	12°	6	70	26.47	27.57	28.77	30.09	Free
07-00530-20300		30	3	4	3.8	12°	6	70	31.68	33.01	34.47	Free	Free
07-00530-20400		40	3	4	3.8	12°	6	80	42.11	43.91	Free	Free	Free
07-00530-30200	R3	20	6	6	5.7	–	6	70	Free	Free	Free	Free	Free
07-00530-30250		25	6	6	5.7	–	6	70	Free	Free	Free	Free	Free
07-00530-30300		30	6	6	5.7	–	6	80	Free	Free	Free	Free	Free
07-00530-30400		40	6	6	5.7	–	6	80	Free	Free	Free	Free	Free
07-00530-30500		50	6	6	5.7	–	6	100	Free	Free	Free	Free	Free

Recommended Milling Conditions

Work material			Copper				Copper tungsten (W70% - Cu30%)			
Radius (R)	Under neck length	L/D	Depth of cut		Feed	Spindle speed	Depth of cut		Feed	Spindle speed
			a_p mm	a_e mm	mm/min	min^{-1}	a_p mm	a_e mm	mm/min	min^{-1}
0.05	0.3	3	0.01	0.01	200	40,000	0.008	0.008	150	30,000
	0.5	5	0.007	0.007	150	40,000	0.005	0.005	100	30,000
0.075	0.3	2	0.015	0.02	250	40,000	0.01	0.015	180	30,000
	0.5	3.3	0.015	0.02	200	40,000	0.008	0.015	150	30,000
	1	6.7	0.007	0.01	150	40,000	0.005	0.008	100	30,000
0.1	0.5	2.5	0.025	0.05	500	40,000	0.02	0.04	350	30,000
	0.75	3.8	0.025	0.05	450	40,000	0.02	0.04	300	30,000
	1	5	0.02	0.04	400	40,000	0.015	0.03	250	30,000
	1.5	7.5	0.015	0.03	300	40,000	0.008	0.02	150	30,000
	2	10	0.008	0.015	200	40,000	0.005	0.01	100	30,000
0.15	0.5	1.7	0.03	0.07	700	40,000	0.03	0.07	500	30,000
	1	3.3	0.03	0.07	700	40,000	0.03	0.07	500	30,000
	1.5	5	0.025	0.05	500	40,000	0.02	0.05	300	30,000
	2	6.7	0.015	0.03	400	40,000	0.01	0.02	200	30,000
0.2	0.5	1.3	0.05	0.1	1,000	40,000	0.04	0.08	700	30,000
	1	2.5	0.05	0.1	1,000	40,000	0.04	0.08	700	30,000
	1.5	3.8	0.04	0.08	1,000	40,000	0.03	0.06	700	30,000
	2	5	0.035	0.06	600	40,000	0.02	0.05	350	30,000
	3	7.5	0.02	0.04	400	30,000	0.01	0.03	200	25,000
	4	10	0.008	0.015	250	25,000	0.005	0.01	100	18,000
	5	12.5	0.005	0.015	200	25,000	0.005	0.01	80	16,000
	6	15	0.005	0.015	150	22,000	0.005	0.01	70	14,000
0.25	1	2	0.08	0.15	800	40,000	0.08	0.15	500	30,000
	1.5	3	0.08	0.15	800	40,000	0.08	0.15	500	30,000
	2	4	0.08	0.15	800	40,000	0.08	0.15	500	30,000
	3	6	0.06	0.1	600	35,000	0.06	0.08	400	27,000
	4	8	0.04	0.08	400	30,000	0.025	0.05	200	22,000
	5	10	0.02	0.04	300	25,000	0.01	0.02	150	18,000
	6	12	0.015	0.03	250	22,000	0.005	0.01	120	16,000
0.3	1	1.7	0.12	0.2	1,600	40,000	0.12	0.2	1,200	30,000
	1.5	2.5	0.12	0.2	1,600	40,000	0.12	0.2	1,200	30,000
	2	3.3	0.12	0.2	1,600	40,000	0.12	0.2	1,200	30,000
	3	5	0.1	0.14	1,000	40,000	0.08	0.1	700	30,000
	4	6.7	0.07	0.1	700	30,000	0.04	0.06	400	25,000
	5	8.3	0.05	0.08	600	27,000	0.02	0.04	300	22,000
	6	10	0.04	0.06	500	25,000	0.01	0.03	200	20,000
	8	13.3	0.015	0.05	400	22,000	0.005	0.02	150	18,000
	10	16.7	0.015	0.03	350	20,000	0.005	0.01	120	16,000
0.4	1.5	1.9	0.15	0.3	2,000	40,000	0.15	0.3	1,400	30,000
	2	2.5	0.15	0.3	2,000	40,000	0.15	0.3	1,400	30,000
	3	3.8	0.15	0.3	2,000	40,000	0.15	0.3	1,400	30,000
	4	5	0.12	0.2	1,600	35,000	0.1	0.16	1,000	27,000
	5	6.3	0.1	0.18	1,200	32,000	0.08	0.12	750	24,000
	6	7.5	0.08	0.15	1,000	30,000	0.05	0.1	500	20,000
	8	10	0.05	0.06	700	22,000	0.02	0.025	300	16,000
	10	12.5	0.02	0.05	600	20,000	0.01	0.02	200	14,000
0.5	2	2	0.25	0.4	2,800	40,000	0.25	0.4	2,000	30,000
	3	3	0.25	0.4	2,800	40,000	0.25	0.4	2,000	30,000
	4	4	0.2	0.4	2,400	40,000	0.2	0.4	1,600	30,000
	5	5	0.16	0.3	2,000	35,000	0.12	0.25	1,400	27,000
	6	6	0.14	0.3	1,600	30,000	0.1	0.25	1,000	25,000

Work material			Copper				Copper tungsten (W70% - Cu30%)			
Radius (R)	Under neck length	L/D	Depth of cut		Feed	Spindle speed	Depth of cut		Feed	Spindle speed
			ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}
0.5	8	8	0.12	0.2	1,000	25,000	0.06	0.1	500	18,000
	10	10	0.08	0.15	800	20,000	0.03	0.05	300	16,000
	12	12	0.06	0.1	600	16,000	0.015	0.04	200	12,000
	14	14	0.04	0.08	500	14,000	0.01	0.035	160	10,000
	16	16	0.02	0.06	400	12,000	0.005	0.03	120	8,000
0.75	4	2.7	0.3	0.6	2,800	35,000	0.3	0.6	2,200	30,000
	6	4	0.3	0.6	2,400	30,000	0.3	0.6	1,800	25,000
	8	5.3	0.25	0.5	1,800	25,000	0.2	0.4	1,200	20,000
	10	6.7	0.2	0.4	1,400	20,000	0.15	0.3	800	16,000
	12	8	0.15	0.3	1,000	16,000	0.1	0.2	500	12,000
	14	9.3	0.12	0.2	800	14,000	0.08	0.1	350	10,000
	16	10.7	0.1	0.15	650	12,000	0.05	0.08	280	9,000
	18	12	0.08	0.12	500	10,000	0.02	0.06	200	8,000
1	3	1.5	0.45	0.8	4,000	30,000	0.45	0.8	2,400	25,000
	4	2	0.45	0.8	4,000	30,000	0.45	0.8	2,400	22,000
	6	3	0.45	0.8	3,000	27,000	0.45	0.8	1,800	20,000
	8	4	0.4	0.8	2,400	25,000	0.4	0.8	1,600	18,000
	10	5	0.3	0.6	2,000	22,000	0.25	0.5	1,400	16,000
	12	6	0.3	0.6	1,400	16,000	0.25	0.5	900	12,000
	14	7	0.25	0.6	1,200	14,000	0.2	0.5	700	10,000
	16	8	0.25	0.5	1,000	12,000	0.12	0.25	500	9,000
	20	10	0.15	0.3	800	10,000	0.06	0.1	350	8,000
	25	12.5	0.08	0.15	600	8,000	0.03	0.05	200	6,000
1.5	6	2	0.7	1.5	3,400	20,000	0.6	1.2	2,400	16,000
	8	2.7	0.7	1.5	3,400	20,000	0.6	1.2	2,400	16,000
	10	3.3	0.7	1.5	3,400	20,000	0.6	1.2	2,400	16,000
	12	4	0.6	1.2	3,400	20,000	0.6	1	2,400	16,000
	15	5	0.6	1	3,000	18,000	0.5	0.8	2,000	14,000
	20	6.7	0.5	0.8	2,400	16,000	0.4	0.6	1,400	12,000
	25	8.3	0.4	0.6	1,800	12,000	0.2	0.3	900	10,000
	30	10	0.2	0.4	1,200	8,000	0.08	0.15	500	6,000
2	10	2.5	1	1.6	4,000	16,000	0.8	1.6	2,800	12,000
	12	3	1	1.6	3,600	16,000	0.8	1.6	2,800	12,000
	15	3.8	0.8	1.6	3,400	16,000	0.8	1.6	2,400	12,000
	20	5	0.8	1.6	3,000	14,000	0.8	1.6	2,000	10,000
	25	6.3	0.6	1.2	3,000	14,000	0.5	1	2,000	10,000
	30	7.5	0.5	1	2,400	12,000	0.3	0.5	1,200	7,000
	40	10	0.4	0.8	1,200	8,000	0.15	0.3	500	5,000
3	20	3.3	1	2	3,600	12,000	1	2	2,400	9,000
	25	4.2	1	1.8	3,300	11,000	0.8	1.2	2,100	8,000
	30	5	0.8	1.6	3,000	10,000	0.4	0.8	1,800	7,000
	40	6.7	0.6	1.2	2,400	8,000	0.3	0.6	1,250	5,500
	50	8.3	0.5	1	1,800	6,000	0.25	0.5	800	4,000

Notes

※1 These recommended cutting conditions indicate just reference. It should be adjusted according to milling shape and machine type.

※2 Depth of cut : ap=Axial Depth of cut / ae=Radial Depth of cut.

※3 Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.

※4 Water-insoluble fluid is recommended.

DHR237R

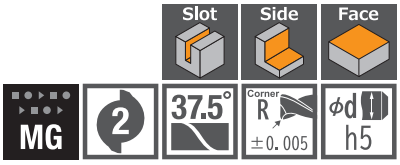
Size ϕ 0.2×R0.02 ～ ϕ 6×R1

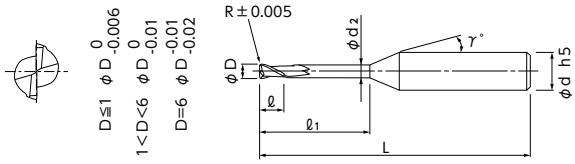
DLC

Long Neck Radius End Mill for Copper Electrode

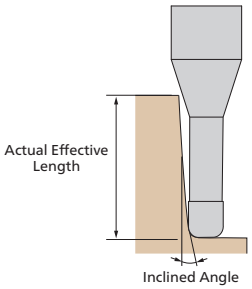
Total 153 sizes

Long neck radius end mill specialized for machining copper alloy.
Sharpe cutting edge makes less burr and high quality surface.





- Long neck radius end mill specialized for machining copper electrode.
- 37.5°helix angle provides both sharpness shearing ability and finishing surface quality, combining the most suitable cutting edge design realizes thehigher quality of finishing surface.
- High quality and stable milling performance with long tool life by optimized design and DLC COATING.
- Machining copper tungsten electrodes is also effective.



Work material

Copper	Copper Tungsten
◎	◎

Unit [Size : mm]

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
									30´	1°	1°30´	2°	3°
07-00110-02021	0.2	R0.02	0.5	0.4	0.18	12°	4	45	0.56	0.59	0.62	0.65	0.71
07-00110-02023			1	0.4	0.18	12°	4	45	1.09	1.13	1.19	1.24	1.38
07-00110-02025			1.5	0.4	0.18	12°	4	45	1.61	1.68	1.76	1.84	2.04
07-00110-02051		R0.05	0.5	0.4	0.18	12°	4	45	0.56	0.59	0.61	0.64	0.71
07-00110-02053			1	0.4	0.18	12°	4	45	1.08	1.13	1.18	1.24	1.37
07-00110-02055			1.5	0.4	0.18	12°	4	45	1.61	1.68	1.75	1.84	2.03
07-00110-03021	0.3	R0.02	1	0.6	0.28	12°	4	45	1.09	1.13	1.19	1.24	1.38
07-00110-03022			1.5	0.6	0.28	12°	4	45	1.61	1.68	1.76	1.84	2.04
07-00110-03023			2	0.6	0.28	12°	4	45	2.13	2.22	2.33	2.44	2.71
07-00110-03051		R0.05	1	0.6	0.28	12°	4	45	1.08	1.13	1.18	1.24	1.37
07-00110-03052			1.5	0.6	0.28	12°	4	45	1.61	1.68	1.75	1.84	2.03
07-00110-03053			2	0.6	0.28	12°	4	45	2.13	2.22	2.32	2.43	2.70
07-00110-04021	0.4	R0.02	1	0.8	0.37	12°	4	45	1.11	1.16	1.21	1.27	1.41
07-00110-04023			2	0.8	0.37	12°	4	45	2.15	2.25	2.35	2.47	2.74
07-00110-04025			3	0.8	0.37	12°	4	45	3.20	3.34	3.49	3.67	4.06
07-00110-04027			4	0.8	0.37	12°	4	45	4.24	4.43	4.63	4.86	5.39
07-00110-04051		R0.05	1	0.8	0.37	12°	4	45	1.11	1.16	1.21	1.27	1.40
07-00110-04053			2	0.8	0.37	12°	4	45	2.15	2.25	2.35	2.46	2.73
07-00110-04055			3	0.8	0.37	12°	4	45	3.19	3.34	3.49	3.66	4.05
07-00110-04057			4	0.8	0.37	12°	4	45	4.24	4.43	4.63	4.86	5.38
07-00110-04101		R0.1	1	0.8	0.37	12°	4	45	1.11	1.15	1.20	1.26	1.38
07-00110-04103			2	0.8	0.37	12°	4	45	2.15	2.24	2.34	2.45	2.71
07-00110-04105			3	0.8	0.37	12°	4	45	3.19	3.33	3.48	3.65	4.04
07-00110-04107			4	0.8	0.37	12°	4	45	4.24	4.42	4.62	4.85	5.37
07-00110-05022	0.5	R0.02	2	1	0.46	12°	4	45	2.18	2.27	2.38	2.50	2.77
07-00110-05023			3	1	0.46	12°	4	45	3.22	3.36	3.52	3.69	4.10
07-00110-05024			4	1	0.46	12°	4	45	4.26	4.45	4.66	4.89	5.42
07-00110-05025			5	1	0.46	12°	4	45	5.31	5.54	5.80	6.09	6.75
07-00110-05052		R0.05	2	1	0.46	12°	4	45	2.18	2.27	2.38	2.49	2.76
07-00110-05053			3	1	0.46	12°	4	45	3.22	3.36	3.52	3.69	4.09
07-00110-05054			4	1	0.46	12°	4	45	4.26	4.45	4.66	4.88	5.41
07-00110-05055			5	1	0.46	12°	4	45	5.31	5.54	5.80	6.08	6.74
07-00110-05102		R0.1	2	1	0.46	12°	4	45	2.17	2.27	2.37	2.48	2.74
07-00110-05103			3	1	0.46	12°	4	45	3.22	3.36	3.51	3.68	4.07
07-00110-05104			4	1	0.46	12°	4	45	4.26	4.45	4.65	4.87	5.40
07-00110-05105			5	1	0.46	12°	4	45	5.30	5.54	5.79	6.07	6.72

How to order When you order, indicate DHR237R (D)×(R)×(ℓ1). ※(γ) is reference value.

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
									30´	1°	1°30´	2°	3°
07-00110-06022	0.6	R0.02	2	1.2	0.56	12°	4	45	2.18	2.27	2.38	2.50	2.77
07-00110-06024			4	1.2	0.56	12°	4	45	4.26	4.45	4.66	4.89	5.42
07-00110-06026			6	1.2	0.56	12°	4	45	6.35	6.63	6.94	7.28	8.08
07-00110-06052		R0.05	2	1.2	0.56	12°	4	45	2.18	2.27	2.38	2.49	2.76
07-00110-06054			4	1.2	0.56	12°	4	45	4.26	4.45	4.66	4.88	5.41
07-00110-06056			6	1.2	0.56	12°	4	45	6.35	6.63	6.94	7.28	8.07
07-00110-06102		R0.1	2	1.2	0.56	12°	4	45	2.17	2.27	2.37	2.48	2.74
07-00110-06104			4	1.2	0.56	12°	4	45	4.26	4.45	4.65	4.87	5.40
07-00110-06106			6	1.2	0.56	12°	4	45	6.35	6.63	6.93	7.27	8.05
07-00110-08024	0.8	R0.02	4	1.6	0.76	12°	4	45	4.26	4.45	4.66	4.89	5.42
07-00110-08026			6	1.6	0.76	12°	4	45	6.35	6.63	6.94	7.28	8.08
07-00110-08028			8	1.6	0.76	12°	4	50	8.43	8.81	9.22	9.68	10.73
07-00110-08054		R0.05	4	1.6	0.76	12°	4	45	4.26	4.45	4.66	4.88	5.41
07-00110-08056			6	1.6	0.76	12°	4	45	6.35	6.63	6.94	7.28	8.07
07-00110-08058			8	1.6	0.76	12°	4	50	8.43	8.81	9.22	9.67	10.72
07-00110-08104		R0.1	4	1.6	0.76	12°	4	45	4.26	4.45	4.65	4.87	5.40
07-00110-08106			6	1.6	0.76	12°	4	45	6.35	6.63	6.93	7.27	8.05
07-00110-08108			8	1.6	0.76	12°	4	50	8.43	8.80	9.21	9.66	10.71
07-00110-10053	1	R0.05	3	2	0.95	12°	4	45	3.24	3.39	3.54	3.72	4.12
07-00110-10054			4	2	0.95	12°	4	45	4.29	4.48	4.68	4.91	5.44
07-00110-10055			5	2	0.95	12°	4	45	5.33	5.57	5.82	6.11	6.77
07-00110-10056			6	2	0.95	12°	4	45	6.37	6.66	6.97	7.31	8.10
07-00110-10058			8	2	0.95	12°	4	50	8.46	8.83	9.25	9.70	10.75
07-00110-10060			10	2	0.95	12°	4	50	10.54	11.01	11.53	12.09	13.41
07-00110-10103		R0.1	3	2	0.95	12°	4	45	3.24	3.38	3.54	3.71	4.10
07-00110-10104			4	2	0.95	12°	4	45	4.28	4.47	4.68	4.90	5.43
07-00110-10105			5	2	0.95	12°	4	45	5.33	5.56	5.82	6.10	6.76
07-00110-10106			6	2	0.95	12°	4	45	6.37	6.65	6.96	7.30	8.08
07-00110-10108			8	2	0.95	12°	4	50	8.46	8.83	9.24	9.69	10.74
07-00110-10110			10	2	0.95	12°	4	50	10.54	11.01	11.52	12.08	13.39
07-00110-10203		R0.2	3	2	0.95	12°	4	45	3.24	3.37	3.52	3.69	4.07
07-00110-10204			4	2	0.95	12°	4	45	4.28	4.46	4.66	4.88	5.40
07-00110-10205			5	2	0.95	12°	4	45	5.32	5.55	5.80	6.08	6.72
07-00110-10206			6	2	0.95	12°	4	45	6.37	6.64	6.94	7.28	8.05
07-00110-10208			8	2	0.95	12°	4	50	8.45	8.82	9.23	9.67	10.71
07-00110-10210			10	2	0.95	12°	4	50	10.54	11.00	11.51	12.06	13.36
07-00110-15105	1.5	R0.1	5	3	1.45	12°	4	45	5.33	5.56	5.82	6.10	6.76
07-00110-15110			10	3	1.45	12°	4	50	10.54	11.01	11.52	12.08	13.39
07-00110-15115			15	3	1.45	12°	4	50	15.76	16.46	17.22	18.07	20.03
07-00110-15205		R0.2	5	3	1.45	12°	4	45	5.32	5.55	5.80	6.08	6.72
07-00110-15210			10	3	1.45	12°	4	50	10.54	11.00	11.51	12.06	13.36
07-00110-15215			15	3	1.45	12°	4	50	15.75	16.45	17.21	18.05	20.00
07-00110-15305		R0.3	5	3	1.45	12°	4	45	5.32	5.54	5.79	6.06	6.69
07-00110-15310			10	3	1.45	12°	4	50	10.53	10.99	11.49	12.04	13.33
07-00110-15315			15	3	1.45	12°	4	50	15.75	16.44	17.20	18.03	19.96
07-00110-15505		R0.5	5	3	1.45	12°	4	45	5.31	5.53	5.76	6.02	6.63
07-00110-15510			10	3	1.45	12°	4	50	10.52	10.97	11.46	12.01	13.26
07-00110-15515			15	3	1.45	12°	4	50	15.74	16.42	17.17	17.99	19.90
07-00110-15520			20	3	1.45	12°	4	60	20.95	21.87	22.87	23.97	Free
07-00110-20105	2	R0.1	5	4	1.94	12°	4	45	5.35	5.59	5.84	6.13	6.79
07-00110-20108			8	4	1.94	12°	4	50	8.48	8.86	9.27	9.72	10.77
07-00110-20110			10	4	1.94	12°	4	50	10.57	11.03	11.55	12.11	13.42
07-00110-20115			15	4	1.94	12°	4	50	15.78	16.48	17.25	18.09	Free
07-00110-20120			20	4	1.94	12°	4	60	20.99	21.93	22.95	24.08	Free
07-00110-20205		R0.2	5	4	1.94	12°	4	45	5.35	5.58	5.83	6.11	6.75
07-00110-20208			8	4	1.94	12°	4	50	8.48	8.85	9.25	9.70	10.74
07-00110-20210			10	4	1.94	12°	4	50	10.56	11.03	11.53	12.09	13.39
07-00110-20215			15	4	1.94	12°	4	50	15.78	16.47	17.24	18.07	Free
07-00110-20220			20	4	1.94	12°	4	60	20.99	21.92	22.94	24.06	Free
07-00110-20305		R0.3	5	4	1.94	12°	4	45	5.34	5.57	5.82	6.09	6.72
07-00110-20308			8	4	1.94	12°	4	50	8.47	8.84	9.24	9.68	10.70
07-00110-20310			10	4	1.94	12°	4	50	10.56	11.02	11.52	12.07	13.36
07-00110-20315			15	4	1.94	12°	4	50	15.77	16.46	17.22	18.05	Free
07-00110-20320			20	4	1.94	12°	4	60	20.99	21.91	22.92	24.04	Free
07-00110-20505		R0.5	5	4	1.94	12°	4	45	5.33	5.55	5.79	6.05	6.66
07-00110-20508			8	4	1.94	12°	4	50	8.46	8.82	9.21	9.64	10.64
07-00110-20510			10	4	1.94	12°	4	50	10.55	11.00	11.49	12.03	13.30
07-00110-20515			15	4	1.94	12°	4	50	15.76	16.45	17.19	18.02	Free
07-00110-20520			20	4	1.94	12°	4	60	20.98	21.89	22.90	24.00	Free

DHR237R

Long Neck Radius End Mill for Copper Electrode

Unit [Size : mm]

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
									30´	1°	1°30´	2°	3°
07-00110-25208	2.5	R0.2	8	5	2.4	12°	4	50	8.57	8.95	9.36	9.81	10.86
07-00110-25214			14	5	2.4	12°	4	50	14.83	15.49	16.20	16.99	Free
07-00110-25220			20	5	2.4	12°	4	60	21.09	22.02	23.05	Free	Free
07-00110-25508		R0.5	8	5	2.4	12°	4	50	8.56	8.92	9.32	9.75	10.77
07-00110-25514			14	5	2.4	12°	4	50	14.82	15.46	16.16	16.93	Free
07-00110-25520			20	5	2.4	12°	4	60	21.08	22.00	23.00	Free	Free
07-00110-30112	3	R0.1	12	6	2.85	12°	6	50	12.87	13.44	14.07	14.76	16.36
07-00110-30118			18	6	2.85	12°	6	60	19.13	19.98	20.91	21.94	24.32
07-00110-30124			24	6	2.85	12°	6	70	25.39	26.52	27.76	29.12	Free
07-00110-30212		R0.2	12	6	2.85	12°	6	50	12.87	13.44	14.06	14.74	16.33
07-00110-30218			18	6	2.85	12°	6	60	19.13	19.97	20.90	21.92	24.29
07-00110-30224			24	6	2.85	12°	6	70	25.38	26.51	27.74	29.10	Free
07-00110-30312		R0.3	12	6	2.85	12°	6	50	12.86	13.43	14.04	14.72	16.29
07-00110-30318			18	6	2.85	12°	6	60	19.12	19.96	20.88	21.90	24.26
07-00110-30324			24	6	2.85	12°	6	70	25.38	26.50	27.73	29.08	Free
07-00110-30512		R0.5	12	6	2.85	12°	6	50	12.86	13.41	14.01	14.68	16.23
07-00110-30515			15	6	2.85	12°	6	60	15.98	16.68	17.44	18.27	20.21
07-00110-30518			18	6	2.85	12°	6	60	19.11	19.95	20.86	21.86	24.19
07-00110-30524			24	6	2.85	12°	6	70	25.37	26.48	27.70	29.04	Free
07-00110-30530			30	6	2.85	12°	6	70	31.63	33.02	34.54	36.22	Free
07-00110-40116	4	R0.1	16	8	3.8	12°	6	60	17.17	17.93	18.77	19.68	Free
07-00110-40124			24	8	3.8	12°	6	60	25.51	26.65	27.89	Free	Free
07-00110-40132			32	8	3.8	12°	6	70	33.85	35.36	37.01	Free	Free
07-00110-40216		R0.2	16	8	3.8	12°	6	60	17.16	17.92	18.75	19.66	Free
07-00110-40224			24	8	3.8	12°	6	60	25.50	26.64	27.88	Free	Free
07-00110-40232			32	8	3.8	12°	6	70	33.85	35.35	37.00	Free	Free
07-00110-40316		R0.3	16	8	3.8	12°	6	60	17.16	17.91	18.74	19.65	Free
07-00110-40324			24	8	3.8	12°	6	60	25.50	26.63	27.86	Free	Free
07-00110-40332			32	8	3.8	12°	6	70	33.84	35.34	36.99	Free	Free
07-00110-40516		R0.5	16	8	3.8	12°	6	60	17.15	17.89	18.71	19.61	Free
07-00110-40524			24	8	3.8	12°	6	60	25.49	26.61	27.83	Free	Free
07-00110-40532			32	8	3.8	12°	6	70	33.83	35.33	36.96	Free	Free
07-00110-41016		R1	16	8	3.8	12°	6	60	17.13	17.85	18.64	19.51	Free
07-00110-41024			24	8	3.8	12°	6	60	25.47	26.57	27.77	29.08	Free
07-00110-41032			32	8	3.8	12°	6	70	33.81	35.28	36.89	Free	Free
07-00110-50120	5	R0.1	20	10	4.8	12°	6	60	21.34	22.29	Free	Free	Free
07-00110-50140			40	10	4.8	12°	6	80	42.19	Free	Free	Free	Free
07-00110-60124	6	R0.1	24	12	5.8	–	6	60	Free	Free	Free	Free	Free
07-00110-60148			48	12	5.8	–	6	90	Free	Free	Free	Free	Free
07-00110-60224		R0.2	24	12	5.8	–	6	60	Free	Free	Free	Free	Free
07-00110-60248			48	12	5.8	–	6	90	Free	Free	Free	Free	Free
07-00110-60324		R0.3	24	12	5.8	–	6	60	Free	Free	Free	Free	Free
07-00110-60348			48	12	5.8	–	6	90	Free	Free	Free	Free	Free
07-00110-60524		R0.5	24	12	5.8	–	6	60	Free	Free	Free	Free	Free
07-00110-60530			30	12	5.8	–	6	70	Free	Free	Free	Free	Free
07-00110-60548			48	12	5.8	–	6	90	Free	Free	Free	Free	Free
07-00110-61024		R1	24	12	5.8	–	6	60	Free	Free	Free	Free	Free
07-00110-61048			48	12	5.8	–	6	90	Free	Free	Free	Free	Free

How to order ▶ When you order, indicate DHR237R (D)×(R)×(ℓ1).

※(γ) is reference value.

Work material				Copper				Copper tungsten (W70% - Cu30%)			
Dia.	Corner Radius	Under Neck Length	L/D	Spindle Speed	Feed	Depth of cut		Spindle Speed	Feed	Depth of cut	
				min^{-1}	mm/min	a_p mm	a_e mm	min^{-1}	mm/min	a_p mm	a_e mm
0.2	0.02	0.5	2.5	40,000	400	0.01	0.1	36,000	360	0.009	0.09
		1	5	40,000	320	0.008	0.1	36,000	280	0.007	0.09
		1.5	7.5	30,000	180	0.005	0.1	27,000	160	0.005	0.09
	0.05	0.5	2.5	40,000	400	0.03	0.1	36,000	360	0.027	0.09
		1	5	40,000	320	0.02	0.1	36,000	280	0.018	0.09
		1.5	7.5	30,000	180	0.01	0.1	27,000	160	0.009	0.09
0.3	0.02	1	3.3	40,000	480	0.01	0.15	36,000	420	0.009	0.14
		1.5	5	40,000	360	0.008	0.15	36,000	320	0.007	0.14
		2	6.7	30,000	240	0.005	0.15	27,000	210	0.005	0.14
	0.05	1	3.3	40,000	480	0.03	0.15	36,000	420	0.027	0.14
		1.5	5	40,000	360	0.024	0.15	36,000	320	0.022	0.14
		2	6.7	30,000	240	0.018	0.15	27,000	210	0.016	0.14
0.4	0.02	1	2.5	40,000	640	0.01	0.2	36,000	580	0.009	0.18
		2	5	40,000	560	0.01	0.2	36,000	500	0.009	0.18
		3	7.5	30,000	420	0.008	0.2	27,000	380	0.007	0.18
		4	10	30,000	360	0.005	0.2	27,000	320	0.005	0.18
	0.05	1	2.5	40,000	640	0.03	0.2	36,000	580	0.027	0.18
		2	5	40,000	560	0.024	0.2	36,000	500	0.022	0.18
		3	7.5	30,000	420	0.018	0.2	27,000	380	0.016	0.18
		4	10	30,000	360	0.012	0.2	27,000	320	0.01	0.18
	0.1	1	2.5	40,000	640	0.06	0.2	36,000	580	0.054	0.18
		2	5	40,000	560	0.05	0.2	36,000	500	0.045	0.18
		3	7.5	30,000	420	0.036	0.2	27,000	380	0.032	0.18
		4	10	30,000	360	0.024	0.2	27,000	320	0.022	0.18
0.5	0.02	2	4	40,000	800	0.01	0.25	36,000	720	0.009	0.23
		3	6	35,000	640	0.01	0.25	32,000	580	0.009	0.23
		4	8	30,000	480	0.008	0.25	27,000	420	0.007	0.23
		5	10	25,000	400	0.005	0.25	23,000	360	0.005	0.23
	0.05	2	4	40,000	800	0.03	0.25	36,000	720	0.027	0.23
		3	6	35,000	640	0.024	0.25	32,000	580	0.022	0.23
		4	8	30,000	480	0.018	0.25	27,000	420	0.016	0.23
		5	10	25,000	400	0.012	0.25	23,000	360	0.01	0.23
	0.1	2	4	40,000	800	0.06	0.25	36,000	720	0.054	0.23
		3	6	35,000	640	0.05	0.25	32,000	580	0.045	0.23
		4	8	30,000	480	0.036	0.25	27,000	420	0.032	0.23
		5	10	25,000	400	0.024	0.25	23,000	360	0.022	0.23
0.6	0.02	2	3.3	30,000	1,000	0.01	0.3	27,000	900	0.009	0.27
		4	6.7	25,000	800	0.01	0.3	23,000	720	0.009	0.27
		6	10	20,000	600	0.008	0.3	18,000	540	0.007	0.27
	0.05	2	3.3	30,000	1,000	0.03	0.3	27,000	900	0.027	0.27
		4	6.7	25,000	800	0.02	0.3	23,000	720	0.018	0.27
		6	10	20,000	600	0.012	0.3	18,000	540	0.01	0.27
	0.1	2	3.3	30,000	1,000	0.06	0.3	27,000	900	0.054	0.27
		4	6.7	25,000	800	0.05	0.3	23,000	720	0.045	0.27
		6	10	20,000	600	0.036	0.3	18,000	540	0.032	0.27
0.8	0.02	4	5	25,000	1,600	0.01	0.4	23,000	1,400	0.009	0.36
		6	7.5	20,000	1,200	0.01	0.4	18,000	1,100	0.009	0.36
		8	10	16,000	800	0.01	0.4	14,000	720	0.009	0.36
	0.05	4	5	25,000	1,600	0.03	0.4	23,000	1,400	0.027	0.36
		6	7.5	20,000	1,200	0.024	0.4	18,000	1,100	0.022	0.36
		8	10	16,000	800	0.02	0.4	14,000	720	0.018	0.36
	0.1	4	5	25,000	1,600	0.06	0.4	23,000	1,400	0.054	0.36
		6	7.5	20,000	1,200	0.05	0.4	18,000	1,100	0.045	0.36
		8	10	16,000	800	0.04	0.4	14,000	720	0.036	0.36

Recommended Milling Conditions

Work material				Copper				Copper tungsten (W70% - Cu30%)			
Dia.	Corner Radius (R)	Under neck length	L/D	Spindle speed	Feed	Depth of cut		Spindle speed	Feed	Depth of cut	
				min^{-1}	mm/min	a_p mm	a_e mm	min^{-1}	mm/min	a_p mm	a_e mm
1	0.05	3	3	25,000	2,400	0.03	0.6	23,000	2,200	0.027	0.55
		4	4	25,000	2,200	0.03	0.6	23,000	2,000	0.027	0.55
		5	5	22,000	2,000	0.024	0.6	20,000	1,800	0.022	0.55
		6	6	20,000	1,800	0.024	0.6	18,000	1,600	0.022	0.55
		8	8	16,000	1,400	0.02	0.6	14,000	1,200	0.018	0.55
		10	10	12,000	1,000	0.02	0.6	11,000	900	0.018	0.55
	0.1	3	3	25,000	2,400	0.06	0.6	23,000	2,200	0.054	0.55
		4	4	25,000	2,200	0.055	0.6	23,000	2,000	0.05	0.55
		5	5	22,000	2,000	0.05	0.6	20,000	1,800	0.045	0.55
		6	6	20,000	1,800	0.045	0.6	18,000	1,600	0.04	0.55
		8	8	16,000	1,400	0.04	0.6	14,000	1,200	0.036	0.55
		10	10	12,000	1,000	0.03	0.6	11,000	900	0.027	0.55
	0.2	3	3	25,000	2,400	0.12	0.6	23,000	2,200	0.11	0.55
		4	4	25,000	2,200	0.11	0.6	23,000	2,000	0.1	0.55
		5	5	22,000	2,000	0.1	0.6	20,000	1,800	0.09	0.55
		6	6	20,000	1,800	0.09	0.6	18,000	1,600	0.08	0.55
		8	8	16,000	1,400	0.08	0.6	14,000	1,200	0.07	0.55
		10	10	12,000	1,000	0.06	0.6	11,000	900	0.054	0.55
1.5	0.1	5	3.3	20,000	2,400	0.06	0.9	18,000	2,200	0.054	0.8
		10	6.6	16,000	1,600	0.05	0.9	14,000	1,400	0.045	0.8
		15	10	12,000	1,000	0.04	0.9	11,000	900	0.036	0.8
	0.2	5	3.3	20,000	2,400	0.12	0.9	18,000	2,200	0.11	0.8
		10	6.6	16,000	1,600	0.1	0.9	14,000	1,400	0.09	0.8
		15	10	12,000	1,000	0.08	0.9	11,000	900	0.07	0.8
	0.3	5	3.3	20,000	2,400	0.18	0.9	18,000	2,200	0.16	0.8
		10	6.6	16,000	1,600	0.15	0.9	14,000	1,400	0.14	0.8
		15	10	12,000	1,000	0.12	0.9	11,000	900	0.11	0.8
	0.5	5	3.3	20,000	2,400	0.25	0.5	18,000	2,200	0.23	0.8
		10	6.6	16,000	1,600	0.2	0.5	14,000	1,400	0.18	0.8
		15	10	12,000	1,000	0.12	0.5	11,000	900	0.11	0.8
		20	13.3	8,000	600	0.06	0.5	7,000	540	0.054	0.8
2	0.1	5	2.5	16,000	3,000	0.06	1.2	14,000	2,700	0.054	1.1
		8	4	14,000	2,600	0.06	1.2	13,000	2,400	0.054	1.1
		10	5	12,000	2,000	0.06	1.2	11,000	1,800	0.054	1.1
		15	7.5	10,000	1,600	0.05	1.2	9,000	1,400	0.045	1.1
		20	10	8,000	1,200	0.04	1.2	7,000	1,100	0.036	1.1
	0.2	5	2.5	16,000	3,000	0.12	1.2	14,000	2,700	0.11	1.1
		8	4	14,000	2,600	0.12	1.2	13,000	2,400	0.11	1.1
		10	5	12,000	2,000	0.12	1.2	11,000	1,800	0.11	1.1
		15	7.5	10,000	1,600	0.1	1.2	9,000	1,400	0.09	1.1
		20	10	8,000	1,200	0.08	1.2	7,000	1,100	0.07	1.1
	0.3	5	2.5	16,000	3,000	0.18	1.2	14,000	2,700	0.16	1.1
		8	4	14,000	2,600	0.18	1.2	13,000	2,400	0.16	1.1
		10	5	12,000	2,000	0.18	1.2	11,000	1,800	0.16	1.1
		15	7.5	10,000	1,600	0.14	1.2	9,000	1,400	0.13	1.1
		20	10	8,000	1,200	0.1	1.2	7,000	1,100	0.09	1.1
	0.5	5	2.5	16,000	3,000	0.3	1.2	14,000	2,700	0.27	1.1
		8	4	14,000	2,600	0.3	1.2	13,000	2,400	0.27	1.1
		10	5	12,000	2,000	0.3	1.2	11,000	1,800	0.27	1.1
		15	7.5	10,000	1,600	0.2	1.2	9,000	1,400	0.18	1.1
		20	10	8,000	1,200	0.15	1.2	7,000	1,100	0.14	1.1
2.5	0.2	8	3.2	15,000	3,000	0.12	1.5	13,500	2,700	0.11	1.4
		14	5.6	12,000	2,200	0.1	1.5	11,000	2,000	0.09	1.4
		20	8	10,000	1,600	0.08	1.5	9,000	1,400	0.04	1.4
	0.5	8	3.2	15,000	3,000	0.3	1.5	13,500	2,700	0.027	1.4
		14	5.6	12,000	2,200	0.25	1.5	11,000	2,000	0.23	1.4
		20	8	10,000	1,600	0.2	1.5	9,000	1,400	0.18	1.4

Work material				Copper				Copper tungsten (W70% - Cu30%)			
Dia.	Corner Radius (R)	Under neck length	L/D	Spindle speed	Feed	Depth of cut		Spindle speed	Feed	Depth of cut	
				min^{-1}	mm/min	a_p mm	a_e mm	min^{-1}	mm/min	a_p mm	a_e mm
3	0.1	12	4	14,000	3,000	0.06	1.8	13,000	2,700	0.054	1.6
		18	6	12,000	2,400	0.05	1.8	11,000	2,200	0.045	1.6
		24	8	10,000	1,800	0.04	1.8	9,000	1,600	0.036	1.6
	0.2	12	4	14,000	3,000	0.12	1.8	13,000	2,700	0.11	1.6
		18	6	12,000	2,400	0.1	1.8	11,000	2,200	0.09	1.6
		24	8	10,000	1,800	0.08	1.8	9,000	1,600	0.07	1.6
	0.3	12	4	14,000	3,000	0.18	1.8	13,000	2,700	0.16	1.6
		18	6	12,000	2,400	0.15	1.8	11,000	2,200	0.14	1.6
		24	8	10,000	1,800	0.12	1.8	9,000	1,600	0.11	1.6
	0.5	12	4	14,000	3,000	0.3	1.8	13,000	2,700	0.27	1.6
		15	5	13,000	2,600	0.3	1.8	12,000	2,400	0.27	1.6
		18	6	12,000	2,400	0.25	1.8	11,000	2,200	0.23	1.6
		24	8	10,000	1,800	0.2	1.8	9,000	1,600	0.18	1.6
		30	10	8,000	1,400	0.16	1.8	7,000	1,200	0.14	1.6
4	0.1	16	4	10,000	2,800	0.06	2.8	9,000	2,500	0.054	2.5
		24	6	8,000	2,200	0.05	2.8	7,000	1,900	0.045	2.5
		32	8	6,000	1,600	0.04	2.8	5,500	1,400	0.036	2.5
	0.2	16	4	10,000	2,800	0.14	2.8	9,000	2,500	0.13	2.5
		24	6	8,000	2,200	0.12	2.8	7,000	1,900	0.11	2.5
		32	8	6,000	1,600	0.1	2.8	5,500	1,400	0.09	2.5
	0.3	16	4	10,000	2,800	0.18	2.8	9,000	2,500	0.16	2.5
		24	6	8,000	2,200	0.15	2.8	7,000	1,900	0.14	2.5
		32	8	6,000	1,600	0.12	2.8	5,500	1,400	0.11	2.5
	0.5	16	4	10,000	2,800	0.3	2.4	9,000	2,500	0.27	2.2
		24	6	8,000	2,200	0.24	2.4	7,000	1,900	0.22	2.2
		32	8	6,000	1,600	0.18	2.4	5,500	1,400	0.16	2.2
	1	16	4	10,000	2,800	0.6	2	9,000	2,500	0.54	1.8
		24	6	8,000	2,200	0.48	2	7,000	1,900	0.43	1.8
		32	8	6,000	1,600	0.36	2	5,500	1,400	0.32	1.8
5	0.1	20	4	8,000	2,700	0.06	3.5	7,000	2,400	0.054	3.2
		40	8	5,000	1,600	0.04	3.5	4,500	1,400	0.036	3.2
6	0.1	24	4	6,000	2,600	0.06	4.2	5,500	2,300	0.054	3.8
		48	8	4,000	1,600	0.03	4.2	3,500	1,400	0.027	3.8
	0.2	24	4	6,000	2,600	0.12	4.2	5,500	2,300	0.11	3.8
		48	8	4,000	1,600	0.06	4.2	3,500	1,400	0.054	3.8
	0.3	24	4	6,000	2,600	0.18	4.2	5,500	2,300	0.16	3.8
		48	8	4,000	1,600	0.09	4.2	3,500	1,400	0.08	3.8
	0.5	24	4	6,000	2,600	0.3	3.6	5,500	2,300	0.27	3.2
		30	5	5,000	2,200	0.24	3.6	4,500	1,900	0.22	3.2
		48	8	4,000	1,600	0.16	3.6	3,500	1,400	0.14	3.2
	1	24	4	6,000	2,600	0.6	3	5,500	2,300	0.54	2.7
		48	8	4,000	1,600	0.3	3	3,500	1,400	0.27	2.7

Notes

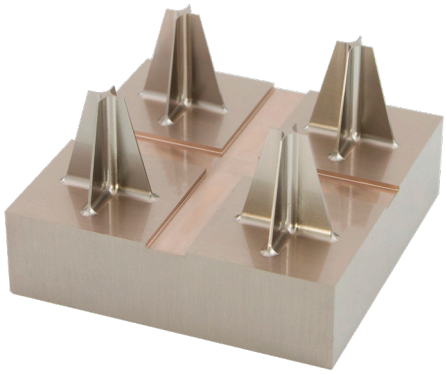
※1 Recommend to use the milling condition as just reference. Adjust milling conditions according to machining shape and machine status.
※2 Depth of cut : ap=Axial Depth of cut / ae=Radial Depth of cut.
※3 Recommend to apply helical or ramping for approaching into axial direction.
※4 For slotting, recommend reciprocating milling by adjusting feed & ap in below 60% of recommended milling condition.
※5 Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.
※6 Water-insoluble fluid is recommended.

Machining case 1

Copper tungsten cross rib electrode

DRB230 realizes long time machining and achieves stable high precision machining surface even on tough material of copper tungsten.

Material : Copper tungsten (W70%-Cu30%)
Work size : 22 × 22 mm /1pc
Cutting depth : 16 mm
Coolant : Water-insoluble fluid
Total machining time : 12hr 52min/1pc



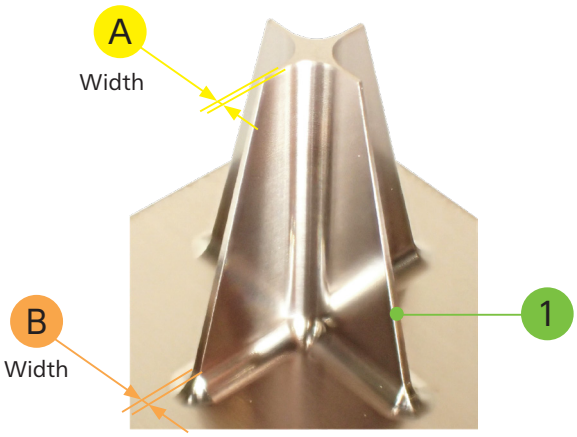
DRB230

Accuracy

Unit [mm]

	Width A	Width B
Rib width Target	0.200	0.444
Actual 1st work	0.202	0.448
Actual 4th work	0.203	0.450

Measuring instrument : Nikon microscope MM-60



Roughness

Unit [μm]

	1
1st work	Ra : 0.082 Rz : 0.783
4th work	Ra : 0.089 Rz : 0.854

Measuring instrument :
Mitaka Kohki point autofocus probe 3D measuring instrumentNH-3SP

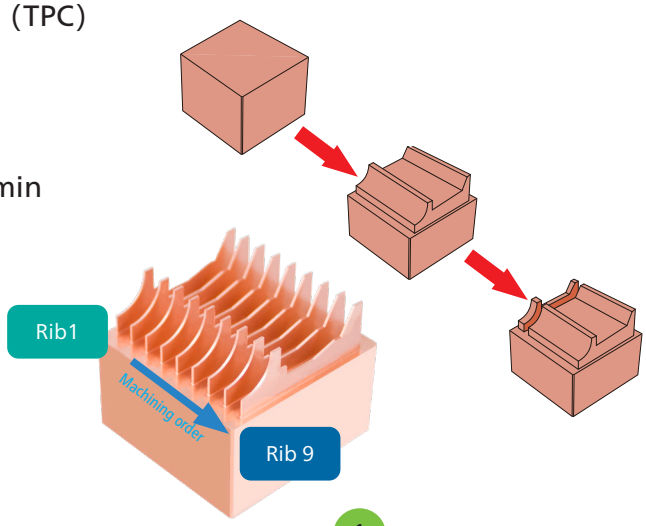
Process	Roughing		Finishing		
	Top・Bottom	Side	Top	Side	Bottom
Tool	DRB230 R1×16		DRB230 R1×16		
Spindle speed [min^{-1}]	7,000		7,000		
Feed [mm/min]	800		500	100	500
Depth of cut ap x ae [mm]	0.15 × 0.25		0.05 × 0.03	0.015 × 1.3	0.05 × 0.03
Stock [mm]	0.05	1.3	-		
Machining time	4hr 37min		6 min	7 hr	1hr 9min

Machining case 2

Tough pitch copper rib shape electrode

Adopt cutting edge with high shearing ability to realize high precision machining even at ribs in thin plates.

Material : Tough pitch copper （TPC)
Work size ： 35 x 35 mm
Cutting depth ： 10 mm
Coolant : Water-soluble fluid
Total machining time : 5hr 31min



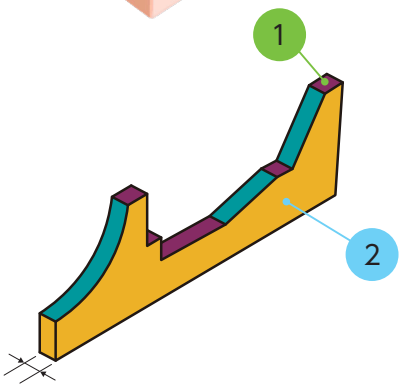
DHR237R

Accuracy

Unit [mm]

	Rib 1	Rib 9
Rib width target	0.500	
Actual	0.500	0.501

Measuring instrument : Nikon microscope MM-60



Roughness

Unit [μm]

	1	2
Ra	0.100	0.126
Rz	0.824	0.797

Measuring instrument : Keyence VK-X250

Process	Roughing 1	Finishing		Roughing 2	Finishing 2
		Flat	Side		Side
Tool	DHR237R ϕ3×R0.2×12	DHR237R ϕ2×R0.1×10			
Spindle speed [min^{-1}]	14,000	12,000			
Feed [mm/min]	2,000	1,000			
Depth of cut ap x ae [mm]	0.12 x 1.8	0.03 x 0.04	0.04 x 0.03	ap 0.06	0.04 x 0.75
Stock [mm]	0.03	-			
Machining time	1hr 4min	1hr 7min		47 min	2hr 33min

NS TOOL CO.,LTD.

www.ns-tool.com
6F., Sumitomo Fudosan Oimachi Ekimae Bldg.,
1-28-1 Oi, Shinagawa-ku, Tokyo 140-0014, Japan
TEL. +81-3-3774-2459 FAX. +81-3-3774-2460

NS TOOL USA, INC.

us.ns-tool.com
2265 Building # 3, Star CT.,
Rochester Hills, MI 48309, USA
TEL. +1-248-829-1960

CAUTION **Attention on Safety**

1) When removing tools from cases, be careful of getting-out of tools and don't touch directly the cutting edges.
2) Never touch the cutting edges directly with bare hand.
3) Use safety covers and eye protection, as tools may be broken.
4) Use holders, etc. that match the tools and nature of the processing operations. The tool should be firmly attached to the holder to prevent shaking.
5) The work materials clamp firmly.
6) Make sure of dimensions of tools and work pieces before starting operation.
7) It is necessary to adjust conditions according to the dimensions of work materials and the machine.
8) Select a cutting fluid appropriate to the particular usage. Using a non-water cutting fluid could lead to fires due to sparks generated during processing or heat caused by breakage. Ensure that you take proper fire-prevention measures.
9) If abnormal sound, etc. occurs during processing, stop the machine immediately.
10) Don't modify tools.

ISO 9001 JQA-QM6096 ISO 14001 JQA-EM3712

VEGETABLE OIL INK

Specifications may change without notice for improvement.

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