



Drill for machining ultra-deep minute holes

EMSBS-TH/SD

Epoch Micro Step Borer S

Mitsubishi Hitachi Tool Engineering, Ltd.

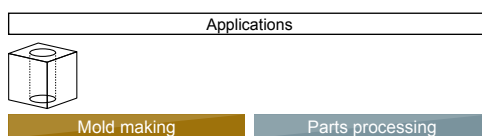
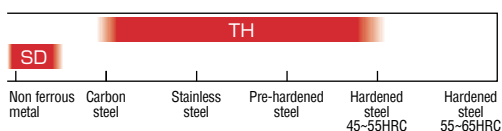
New Product News | No.1101E-2 | 2017-7

Enables ultra-deep drilling of minute holes

Features of EMSBS

- 01** New chip-removal stopper technology + high-rigidity neck shape enables high-accuracy drilling of minute holes.
- 02** Thinning flute shape achieves even higher machining accuracy (Thinning: Drill diameter > $\phi 0.1$)
- 03** Combined with a special starter, it enables stable deep drilling of minute holes.
- 04** Two types of coating to match various applications

For product sizes other than standard product sizes, refer to made-to-order products (up to 100D possible).



EMSBS-TH/SD
$\phi 0.04 \sim \phi 1$ [188 Items]

Features 01 New chip-removal stopper technology

Pat. No.4350161

Chip removal flow direction

Chip removal flute

Chip stopper

High-rigidity neck shape

Features 02 Thinning flute shape (Thinning: Drill diameter > $\phi 0.1$)

Drill dia. : $\phi 0.5$

Drill dia. : $\phi 0.1$

Features 03 Special starter

($\phi 0.1$ or more)

Appearance of Epoch Micro Starter

Features 04 Two types of coating to match various applications

Various kinds of steel
(SUS, common steel, high-hardness materials, etc.)

Micro-TH Coating

Micro-TH

Conventional technology

Non-ferrous
(copper, aluminum, machinable ceramics, etc.)

SD(S-DLC) Coating

High hardness

Diamond (CVD)

SD(S-DLC) Coating

Conventional DLC (PE-CVD)

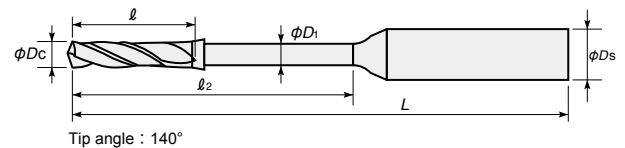
Conventional DLC

Carbide alloy

Hardness H (GPa)

Modulus of elasticity E (GPa)

Epoch Micro Step Borer S



EMSBS- (TH/SD)

Indicate the desired coating type by adding "SD" for SD coating or "TH" for TH coating at the end of the item code.

Tolerance on shank : h4 Tolerance on dia.: $0_{-0.005}^{0}$ mm

Item code	Stock		Size (mm)						
	TH Coat	SD Coat	Tool dia. Dc	Flute length l	Under neck length l ₂	L/D	Neck dia. D ₁	Overall length L	Shank dia. D _s
EMSBS0004-0.4-	●	□	0.04	0.2	0.4	10	0.033	40	3
EMSBS0004-0.8-	□	□	0.04	0.2	0.8	20	0.033	40	3
EMSBS0004-1.2-	●	□	0.04	0.2	1.2	30	0.033	40	3
EMSBS0005-0.5-	●	□	0.05	0.25	0.5	10	0.04	40	3
EMSBS0005-1-	●	□	0.05	0.25	1	20	0.04	40	3
EMSBS0005-1.5-	●	□	0.05	0.25	1.5	30	0.04	40	3
EMSBS0005-2-	□	□	0.05	0.25	2	40	0.04	40	3
EMSBS0005-2.5-	□	□	0.05	0.25	2.5	50	0.04	40	3
EMSBS0006-0.6-	●	□	0.06	0.3	0.6	10	0.05	40	3
EMSBS0006-1.2-	□	□	0.06	0.3	1.2	20	0.05	40	3
EMSBS0006-1.8-	●	□	0.06	0.3	1.8	30	0.05	40	3
EMSBS0006-2.4-	□	□	0.06	0.3	2.4	40	0.05	40	3
EMSBS0006-3-	□	□	0.06	0.3	3	50	0.05	40	3
EMSBS0007-0.7-	●	□	0.07	0.35	0.7	10	0.06	40	3
EMSBS0007-1.4-	□	□	0.07	0.35	1.4	20	0.06	40	3
EMSBS0007-2.1-	●	□	0.07	0.35	2.1	30	0.06	40	3
EMSBS0007-2.8-	□	□	0.07	0.35	2.8	40	0.06	40	3
EMSBS0007-3.5-	□	□	0.07	0.35	3.5	50	0.06	40	3
EMSBS0008-0.8-	●	□	0.08	0.4	0.8	10	0.07	40	3
EMSBS0008-1.6-	□	□	0.08	0.4	1.6	20	0.07	40	3
EMSBS0008-2.4-	●	□	0.08	0.4	2.4	30	0.07	40	3
EMSBS0008-3.2-	□	□	0.08	0.4	3.2	40	0.07	40	3
EMSBS0008-4-	□	□	0.08	0.4	4	50	0.07	40	3
EMSBS0009-0.9-	●	□	0.09	0.45	0.9	10	0.08	40	3
EMSBS0009-1.8-	□	□	0.09	0.45	1.8	20	0.08	40	3
EMSBS0009-2.7-	●	□	0.09	0.45	2.7	30	0.08	40	3
EMSBS0009-3.6-	□	□	0.09	0.45	3.6	40	0.08	40	3
EMSBS0009-4.5-	□	□	0.09	0.45	4.5	50	0.08	40	3
EMSBS0010-1-	●	□	0.1	0.5	1	10	0.09	45	3
EMSBS0010-2-	□	□	0.1	0.5	2	20	0.09	45	3
EMSBS0010-3-	●	□	0.1	0.5	3	30	0.09	45	3
EMSBS0010-5-	●	□	0.1	0.5	5	50	0.09	45	3
EMSBS0010-7.5-	□	□	0.1	0.5	7.5	75	0.09	45	3
EMSBS0010-10-	□	□	0.1	0.5	10	100	0.09	45	3
EMSBS0015-1.5-	●	□	0.15	0.75	1.5	10	0.14	50	3
EMSBS0015-3-	□	□	0.15	0.75	3	20	0.14	50	3
EMSBS0015-4.5-	●	□	0.15	0.75	4.5	30	0.14	50	3
EMSBS0015-7.5-	●	□	0.15	0.75	7.5	50	0.14	50	3
EMSBS0015-11.25-	□	□	0.15	0.75	11.25	75	0.14	50	3
EMSBS0015-15-	□	□	0.15	0.75	15	100	0.14	50	3
EMSBS0020-2-	●	□	0.2	1	2	10	0.19	45	3
EMSBS0020-4-	□	□	0.2	1	4	20	0.19	45	3
EMSBS0020-6-	●	□	0.2	1	6	30	0.19	45	3
EMSBS0020-10-	●	□	0.2	1	10	50	0.19	45	3
EMSBS0020-15-	□	□	0.2	1	15	75	0.19	55	3
EMSBS0020-20-	□	□	0.2	1	20	100	0.19	55	3
EMSBS0030-3-	●	□	0.3	1.5	3	10	0.28	45	3

Item code	Stock		Size (mm)						
	TH Coat	SD Coat	Tool dia. Dc	Flute length l	Under neck length l ₂	L/D	Neck dia. D ₁	Overall length L	Shank dia. D _s
EMSBS0030-6-	□	□	0.3	1.5	6	20	0.28	45	3
EMSBS0030-9-	●	□	0.3	1.5	9	30	0.28	45	3
EMSBS0030-15-	●	□	0.3	1.5	15	50	0.28	55	3
EMSBS0030-22.5-	□	□	0.3	1.5	22.5	75	0.28	65	3
EMSBS0030-30-	□	□	0.3	1.5	30	100	0.28	65	3
EMSBS0040-4-	●	□	0.4	2	4	10	0.38	50	3
EMSBS0040-8-	□	□	0.4	2	8	20	0.38	50	3
EMSBS0040-12-	●	□	0.4	2	12	30	0.38	50	3
EMSBS0040-20-	●	□	0.4	2	20	50	0.38	60	3
EMSBS0040-30-	□	□	0.4	2	30	75	0.38	75	3
EMSBS0040-40-	□	□	0.4	2	40	100	0.38	75	3
EMSBS0050-5-	●	□	0.5	2.5	5	10	0.48	50	3
EMSBS0050-10-	□	□	0.5	2.5	10	20	0.48	50	3
EMSBS0050-15-	□	□	0.5	2.5	15	30	0.48	50	3
EMSBS0050-25-	●	□	0.5	2.5	25	50	0.48	65	3
EMSBS0050-37.5-	□	□	0.5	2.5	37.5	75	0.48	85	3
EMSBS0050-50-	□	□	0.5	2.5	50	100	0.48	85	3
EMSBS0060-6-	●	□	0.6	3	6	10	0.57	55	3
EMSBS0060-12-	□	□	0.6	3	12	20	0.57	55	3
EMSBS0060-18-	●	□	0.6	3	18	30	0.57	55	3
EMSBS0060-30-	●	□	0.6	3	30	50	0.57	75	3
EMSBS0060-45-	□	□	0.6	3	45	75	0.57	95	3
EMSBS0060-60-	□	□	0.6	3	60	100	0.57	95	3
EMSBS0070-7-	●	□	0.7	3.5	7	10	0.67	60	4
EMSBS0070-14-	□	□	0.7	3.5	14	20	0.67	60	4
EMSBS0070-21-	●	□	0.7	3.5	21	30	0.67	60	4
EMSBS0070-35-	●	□	0.7	3.5	35	50	0.67	80	4
EMSBS0070-52.5-	□	□	0.7	3.5	52.5	75	0.67	105	4
EMSBS0070-70-	□	□	0.7	3.5	70	100	0.67	105	4
EMSBS0080-8-	●	□	0.8	4	8	10	0.76	60	4
EMSBS0080-16-	□	□	0.8	4	16	20	0.76	60	4
EMSBS0080-24-	●	□	0.8	4	24	30	0.76	60	4
EMSBS0080-40-	●	□	0.8	4	40	50	0.76	85	4
EMSBS0080-60-	□	□	0.8	4	60	75	0.76	115	4
EMSBS0080-80-	□	□	0.8	4	80	100	0.76	115	4
EMSBS0090-9-	●	□	0.9	4.5	9	10	0.85	65	4
EMSBS0090-18-	□	□	0.9	4.5	18	20	0.85	65	4
EMSBS0090-27-	□	□	0.9	4.5	27	30	0.85	65	4
EMSBS0090-45-	●	□	0.9	4.5	45	50	0.85	90	4
EMSBS0090-67.5-	□	□	0.9	4.5	67.5	75	0.85	125	4
EMSBS0090-90-	□	□	0.9	4.5	90	100	0.85	125	4
EMSBS0100-10-	●	□	1	5	10	10	0.95	70	4
EMSBS0100-20-	□	□	1	5	20	20	0.95	70	4
EMSBS0100-30-	●	□	1	5	30	30	0.95	70	4
EMSBS0100-50-	●	□	1	5	50	50	0.95	100	4
EMSBS0100-75-	□	□	1	5	75	75	0.95	135	4
EMSBS0100-100-	□	□	1	5	100	100	0.95	135	4

● : Stocked Items. □ : Stocked by specified distributor. Contact with our sales department.
Under-neck length (l₂) conforms to through-hole drilling depth.

Recommended Cutting Conditions

Epoch Micro Step Borer S EMSBS

Item Code	Tool dia. (mm)	Under neck length (mm)	L/D	1			2			3			4			5		
				Aluminium, Resin, Acrylic			Carbon steels (180~250HB)			Stainless steels (25~35HRC)			Pre-hardened steels (35~45HRC)			Hardened steels (45~55HRC)		
				Revolution n min ⁻¹	Feed rate v_f mm/min	Step Feed (mm)	Revolution n min ⁻¹	Feed rate v_f mm/min	Step Feed (mm)	Revolution n min ⁻¹	Feed rate v_f mm/min	Step Feed (mm)	Revolution n min ⁻¹	Feed rate v_f mm/min	Step Feed (mm)	Revolution n min ⁻¹	Feed rate v_f mm/min	Step Feed (mm)
EMSBS0004-0.4-00	0.04	0.4	10	39,789	80	0.004	35,810	72	0.004	31,831	64	0.004	27,852	56	0.0028	23,873	24	0.002
EMSBS0004-1.2-00	0.04	1.2	30	39,789	80	0.004	35,810	72	0.004	31,831	64	0.004	27,852	56	0.0028	23,873	24	0.002
EMSBS0005-0.5-00	0.05	0.5	10	38,197	76	0.005	31,831	64	0.005	28,648	57	0.005	25,465	51	0.0035	22,282	22	0.0025
EMSBS0005-1-00	0.05	1	20	38,197	76	0.005	31,831	64	0.005	28,648	57	0.005	25,465	51	0.0035	22,282	22	0.0025
EMSBS0005-1.5-00	0.05	1.5	30	38,197	76	0.005	25,465	51	0.005	22,918	46	0.005	20,372	41	0.0035	17,825	18	0.0025
EMSBS0006-0.6-00	0.06	0.6	10	37,136	74	0.006	29,178	58	0.006	26,526	53	0.006	23,873	48	0.0042	21,221	21	0.003
EMSBS0006-1.8-00	0.06	1.8	30	37,136	74	0.006	29,178	58	0.006	26,526	53	0.006	23,873	48	0.0042	21,221	21	0.003
EMSBS0007-0.7-00	0.07	0.7	10	36,378	73	0.007	27,284	55	0.007	25,010	50	0.007	22,736	45	0.0049	20,463	20	0.0035
EMSBS0007-2.1-00	0.07	2.1	30	36,378	73	0.007	27,284	55	0.007	25,010	50	0.007	22,736	45	0.0049	20,463	20	0.0035
EMSBS0008-0.8-00	0.08	0.8	10	35,810	72	0.008	27,852	56	0.008	25,863	52	0.008	23,873	48	0.0056	21,884	22	0.004
EMSBS0008-2.4-00	0.08	2.4	30	35,810	72	0.008	27,852	56	0.008	25,863	52	0.008	23,873	48	0.0056	21,884	22	0.004
EMSBS0009-0.9-00	0.09	0.9	10	35,368	71	0.009	26,526	53	0.009	24,757	50	0.009	22,989	46	0.0063	21,221	21	0.0045
EMSBS0009-2.7-00	0.09	2.7	30	35,368	71	0.009	26,526	53	0.009	24,757	50	0.009	22,989	46	0.0063	21,221	21	0.0045
EMSBS0010-1-00	0.1	1	10	35,014	105	0.01	25,465	76	0.01	23,873	72	0.01	22,282	67	0.007	20,690	41	0.005
EMSBS0010-3-00	0.1	3	30	35,014	105	0.01	25,465	76	0.01	23,873	72	0.01	22,282	67	0.007	20,690	41	0.005
EMSBS0010-5-00	0.1	5	50	28,011	84	0.01	20,372	61	0.01	19,099	57	0.01	17,825	53	0.007	16,552	33	0.005
EMSBS0015-1.5-00	0.15	1.5	10	25,465	76	0.015	23,343	70	0.015	21,221	64	0.015	20,160	60	0.0105	19,099	38	0.0075
EMSBS0015-4.5-00	0.15	4.5	30	25,465	76	0.015	23,343	70	0.015	21,221	64	0.015	20,160	60	0.0105	19,099	38	0.0075
EMSBS0015-7.5-00	0.15	7.5	50	20,372	61	0.015	18,674	56	0.015	16,977	51	0.015	16,128	48	0.0105	15,279	31	0.0075
EMSBS0020-2-00	0.2	2	10	23,873	95	0.02	20,690	83	0.02	19,099	76	0.02	17,507	70	0.014	16,711	50	0.01
EMSBS0020-6-00	0.2	6	30	23,873	95	0.02	20,690	83	0.02	19,099	76	0.02	17,507	70	0.014	16,711	50	0.01
EMSBS0020-10-00	0.2	10	50	19,099	76	0.02	16,552	66	0.02	15,279	61	0.02	14,006	56	0.014	13,369	40	0.01
EMSBS0030-3-00	0.3	3	10	15,915	64	0.03	14,854	59	0.03	13,793	55	0.03	12,732	51	0.021	12,202	37	0.015
EMSBS0030-9-00	0.3	9	30	15,915	64	0.03	14,854	59	0.03	13,793	55	0.03	12,732	51	0.021	12,202	37	0.015
EMSBS0030-15-00	0.3	15	50	12,732	51	0.03	11,884	48	0.03	11,035	44	0.03	10,186	41	0.021	9,762	29	0.015
EMSBS0040-4-00	0.4	4	10	13,528	54	0.04	12,335	49	0.04	11,937	48	0.04	11,539	46	0.028	10,743	43	0.02
EMSBS0040-12-00	0.4	12	30	13,528	54	0.04	12,335	49	0.04	11,937	48	0.04	11,539	46	0.028	10,743	43	0.02
EMSBS0040-20-00	0.4	20	50	10,823	43	0.04	9,868	39	0.04	9,549	38	0.04	9,231	37	0.028	8,594	34	0.02
EMSBS0050-5-00	0.5	5	10	10,823	54	0.05	9,868	49	0.05	9,549	48	0.05	9,231	46	0.035	8,594	43	0.025
EMSBS0050-15-00	0.5	15	30	10,823	54	0.05	9,868	49	0.05	9,549	48	0.05	9,231	46	0.035	8,594	43	0.025
EMSBS0050-25-00	0.5	25	50	8,658	43	0.05	7,894	39	0.05	7,639	38	0.05	7,385	37	0.035	6,875	34	0.025
EMSBS0060-6-00	0.6	6	10	9,019	54	0.06	8,223	49	0.06	7,958	48	0.06	7,692	46	0.042	7,162	43	0.03
EMSBS0060-18-00	0.6	18	30	9,019	54	0.06	8,223	49	0.06	7,958	48	0.06	7,692	46	0.042	7,162	43	0.03
EMSBS0060-30-00	0.6	30	50	7,215	43	0.06	6,578	39	0.06	6,366	38	0.06	6,154	37	0.042	5,730	34	0.03
EMSBS0070-7-00	0.7	7	10	7,730	54	0.07	7,048	49	0.07	6,821	48	0.07	6,594	46	0.049	6,139	43	0.035
EMSBS0070-21-00	0.7	21	30	7,730	54	0.07	7,048	49	0.07	6,821	48	0.07	6,594	46	0.049	6,139	43	0.035
EMSBS0070-35-00	0.7	35	50	6,184	43	0.07	5,639	39	0.07	5,457	38	0.07	5,275	37	0.049	4,911	34	0.035
EMSBS0080-8-00	0.8	8	10	6,764	54	0.08	6,167	49	0.08	5,968	48	0.08	5,769	46	0.056	5,371	43	0.04
EMSBS0080-24-00	0.8	24	30	6,764	54	0.08	6,167	49	0.08	5,968	48	0.08	5,769	46	0.056	5,371	43	0.04
EMSBS0080-40-00	0.8	40	50	5,411	43	0.08	4,934	39	0.08	4,775	38	0.08	4,615	37	0.056	4,297	34	0.04
EMSBS0090-9-00	0.9	9	10	6,013	54	0.09	5,482	49	0.09	5,305	48	0.09	5,128	46	0.063	4,775	43	0.045
EMSBS0090-27-00	0.9	27	30	6,013	54	0.09	5,482	49	0.09	5,305	48	0.09	5,128	46	0.063	4,775	43	0.045
EMSBS0090-45-00	0.9	45	50	4,810	43	0.09	4,386	39	0.09	4,244	38	0.09	4,103	37	0.063	3,820	34	0.045
EMSBS0100-10-00	1	10	10	5,411	54	0.1	4,934	49	0.1	4,775	48	0.1	4,615	46	0.07	4,297	43	0.05
EMSBS0100-30-00	1	30	30	5,411	54	0.1	4,934	49	0.1	4,775	48	0.1	4,615	46	0.07	4,297	43	0.05
EMSBS0100-50-00	1	50	50	4,329	43	0.1	3,947	39	0.1	3,820	38	0.1	3,692	37	0.07	3,438	34	0.05

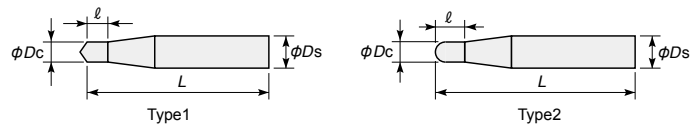
- This standard cutting condition table is intended as reference cutting conditions. The conditions should be adjusted as necessary according to the actual conditions of machined shape, purpose, machine used, etc.
- In general, water-soluble or oil-based coolant should be used to ensure chip removal.
- Always use with a G83 program (Peck drilling cycle).
- Under-neck length (ℓ₂) conforms to through-hole drilling depth.
- When drilling through holes, drill the through hole to a depth of between 20% and 30% of the diameter from the tip of the tool.
Ex.: For work thickness T=5mm and tool= φ0.5×5mm,
drilling depth should be 5.14mm (from tip of tool).

Line Up, Recommended Cutting Conditions

Epoch Micro Starter



Tolerance on dia. : $D_c < 0.2 : -0.005 \sim -0.01 \text{ mm}$
 $D_c \geq 0.2 : -0.005 \sim -0.015 \text{ mm}$



EMST-TH

Item code	Stock	Size(mm)				Shape
		Tool dia. D_c	Flute length l	Overall length L	Shank dia. D_s	
EMST0004-TH	●	0.04	0.04	45	3	Type 1
EMST0005-TH	●	0.05	0.05	45	3	
EMST0006-TH	●	0.06	0.06	45	3	
EMST0007-TH	●	0.07	0.07	45	3	
EMST0008-TH	●	0.08	0.08	45	3	
EMST0009-TH	●	0.09	0.09	45	3	
EMST0010-TH	●	0.1	0.1	45	3	
EMST0011-TH	●	0.11	0.11	45	3	
EMST0012-TH	●	0.12	0.12	45	3	
EMST0013-TH	●	0.13	0.13	45	3	
EMST0014-TH	●	0.14	0.14	45	3	Type 2
EMST0015-TH	●	0.15	0.15	45	3	
EMST0016-TH	●	0.16	0.16	45	3	
EMST0017-TH	●	0.17	0.17	45	3	
EMST0018-TH	●	0.18	0.18	45	3	
EMST0019-TH	●	0.19	0.19	45	3	
EMST0020-TH	●	0.2	0.2	45	3	
EMST0021-TH	□	0.21	0.21	45	3	
EMST0029-TH	□	0.29	0.29	45	3	
EMST0030-TH	●	0.3	0.3	45	3	
EMST0031-TH	□	0.31	0.31	45	3	
EMST0039-TH	□	0.39	0.39	45	3	Type 2
EMST0040-TH	●	0.4	0.4	45	3	
EMST0041-TH	□	0.41	0.41	45	3	
EMST0049-TH	□	0.49	0.49	45	3	
EMST0050-TH	●	0.5	0.5	45	3	
EMST0051-TH	□	0.51	0.51	45	3	
EMST0059-TH	□	0.59	0.59	45	3	
EMST0060-TH	●	0.6	0.6	45	3	
EMST0061-TH	□	0.61	0.61	45	3	
EMST0069-TH	□	0.69	0.69	45	4	
EMST0070-TH	●	0.7	0.7	45	4	Type 2
EMST0071-TH	□	0.71	0.71	45	4	
EMST0079-TH	□	0.79	0.79	45	4	
EMST0080-TH	●	0.8	0.8	45	4	
EMST0081-TH	□	0.81	0.81	45	4	
EMST0089-TH	□	0.89	0.89	45	4	
EMST0090-TH	●	0.9	0.9	45	4	
EMST0091-TH	□	0.91	0.91	45	4	
EMST0099-TH	□	0.99	0.99	45	4	
EMST0100-TH	●	1	1	45	4	
EMST0101-TH	□	1.01	1.01	45	4	

● : Stocked Items. □ : Stocked by specified distributor. Contact with our sales department.

Recommended cutting conditions

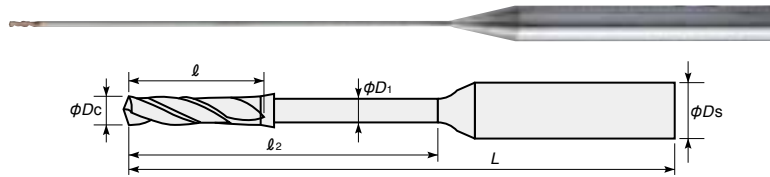
Epoch Micro Starter EMST-TH

Item Code	Tool dia. (mm)	Under neck length (mm)	1			2			3			4			5		
			Aluminium, Resin, Acrylic			Carbon steels (180~250HB)			Stainless steels (25~35HRC)			Pre-hardened steels (35~45HRC)			Hardened steels (45~55HRC)		
			Revolution n min ⁻¹	Feed rate v_f mm/min	Step Feed (mm)	Revolution n min ⁻¹	Feed rate v_f mm/min	Step Feed (mm)	Revolution n min ⁻¹	Feed rate v_f mm/min	Step Feed (mm)	Revolution n min ⁻¹	Feed rate v_f mm/min	Step Feed (mm)	Revolution n min ⁻¹	Feed rate v_f mm/min	Step Feed (mm)
EMST0004-TH	0.04	0.4	39,789	20	0.001	35,810	18	0.001	31,831	16	0.001	27,852	14	0.001	23,873	6	0.001
EMST0005-TH	0.05	0.5	38,197	19	0.001	31,831	16	0.001	28,648	14	0.001	25,465	13	0.001	22,282	6	0.001
EMST0006-TH	0.06	0.6	37,136	19	0.002	29,178	15	0.002	26,526	13	0.002	23,873	12	0.001	21,221	5	0.001
EMST0007-TH	0.07	0.7	36,378	18	0.002	27,284	14	0.002	25,010	13	0.002	22,736	11	0.001	20,463	5	0.001
EMST0008-TH	0.08	0.8	35,810	18	0.002	27,852	14	0.002	25,863	13	0.002	23,873	12	0.001	21,884	5	0.001
EMST0009-TH	0.09	0.9	35,368	18	0.002	26,526	13	0.002	24,757	12	0.002	22,989	11	0.002	21,221	5	0.001
EMST0010-TH	0.1	1	35,014	26	0.003	25,465	19	0.003	23,873	18	0.003	22,282	17	0.002	20,690	10	0.001
EMST0015-TH	0.15	1.5	25,465	19	0.004	23,343	18	0.004	21,221	16	0.004	20,160	15	0.003	19,099	10	0.002
EMST0020-TH	0.2	2	23,873	24	0.005	20,690	21	0.005	19,099	19	0.005	17,507	18	0.004	16,711	13	0.003
EMST0030-TH	0.3	3	15,915	16	0.008	14,854	15	0.008	13,793	14	0.008	12,732	13	0.005	12,202	9	0.004
EMST0040-TH	0.4	4	13,528	14	0.010	12,335	12	0.010	11,937	12	0.010	11,539	12	0.007	10,743	11	0.005
EMST0050-TH	0.5	5	10,823	14	0.013	9,868	12	0.013	9,549	12	0.013	9,231	12	0.009	8,594	11	0.006
EMST0060-TH	0.6	6	9,019	14	0.015	8,223	12	0.015	7,958	12	0.015	7,692	12	0.011	7,162	11	0.008
EMST0070-TH	0.7	7	7,730	14	0.018	7,048	12	0.018	6,821	12	0.018	6,594	12	0.012	6,139	11	0.009
EMST0080-TH	0.8	8	6,764	14	0.020	6,167	12	0.020	5,968	12	0.020	5,769	12	0.014	5,371	11	0.010
EMST0090-TH	0.9	9	6,013	14	0.023	5,482	12	0.023	5,305	12	0.023	5,128	12	0.016	4,775	11	0.011
EMST0100-TH	1	10	5,411	14	0.025	4,934	12	0.025	4,775	12	0.025	4,615	12	0.018	4,297	11	0.013

- These Recommended Cutting Conditions indicate only the rule of a thumb for the cutting conditions. In actual machining, the condition should be adjusted according to the machining shape, purpose and the machine type.
- In general, water-soluble or oil-based coolant should be used to ensure chip removal.
- Always use with a G83 program (Peck drilling cycle).
- Hole depth: Be sure to drill to a depth of 60% of the diameter. (Ex.: For $\phi 0.1$, depth=0.06mm)

Manufactured upon request only.

We can deliver the size to match customer needs.
Manufactured upon request only.



EMSBS ○○○○ - ○○ - □□

ℓ₂: Designation of under neck length; (B) Designation of coating

Tolerance on shank : h4

Tolerance on dia.: $0 \begin{smallmatrix} -0.005 \end{smallmatrix} \text{mm}$

Order code	Kind of coating (B)	Size (mm)								
		ℓ_2/Dc	Tool dia. D_c	Flute length ℓ	Neck dia. D_1	Under neck length ℓ_2	Overall length L			Shank dia. D_s
							$\ell_2/Dc < 35$	$\ell_2/Dc < 65$	$\ell_2/Dc \geq 65$	
EMSBS0004-(A)-(B)	TH/SD	Value of 30 or less	0.04	0.2	0.033	Value can be specified freely.	40			3
EMSBS0005-(A)-(B)	TH/SD	Value of 50 or less can be specified.	0.05	0.25	0.04		40			3
EMSBS0006-(A)-(B)	TH/SD		0.06	0.3	0.05		40			3
EMSBS0007-(A)-(B)	TH/SD		0.07	0.35	0.06		40			3
EMSBS0008-(A)-(B)	TH/SD		0.08	0.4	0.07		40			3
EMSBS0009-(A)-(B)	TH/SD		0.09	0.45	0.08		40			3
EMSBS0010-(A)-(B)	TH/SD		Value of 100 or less can be specified.	0.1	0.5		0.09	45		
EMSBS0015-(A)-(B)	TH/SD	0.15		0.75	0.14		50			3
EMSBS0020-(A)-(B)	TH/SD	0.2		1	0.19		45		55	3
EMSBS0030-(A)-(B)	TH/SD	0.3		1.5	0.28		45	55	65	3
EMSBS0040-(A)-(B)	TH/SD	0.4		2	0.38		50	60	75	3
EMSBS0050-(A)-(B)	TH/SD	0.5		2.5	0.48		50	65	85	3
EMSBS0060-(A)-(B)	TH/SD	0.6		3	0.57		55	75	95	3
EMSBS0070-(A)-(B)	TH/SD	0.7		3.5	0.67		60	80	105	4
EMSBS0080-(A)-(B)	TH/SD	0.8		4	0.76		60	85	115	4
EMSBS0090-(A)-(B)	TH/SD	0.9		4.5	0.85		65	90	125	4
EMSBS0100-(A)-(B)	TH/SD	1		5	0.95		70	100	135	4

Cutting conditions for different L/D

Adjust cutting conditions according to the following ratios based on the cutting conditions for L/D=10 on p. 4.

L/D	Revolution	Feed rate	Step	L/D	Revolution	Feed rate	Step
20 times or less	1	1	1	70 times or less	0.55	0.55	1
30 times or less	1	1	1	80 times or less	0.4	0.4	1
40 times or less	0.9	0.9	1	90 times or less	0.35	0.35	1
50 times or less	0.8	0.8	1	100 times or less	0.3	0.3	1
60 times or less	0.65	0.65	1				

Ordering method

The under neck length and coating can be freely selected according to the application.

Selecting under neck length

Please specify the under neck length using (hole depth + tool diameter) as criteria.

Selecting coating

In general, SD should be selected for non-ferrous materials, and TH should be selected for other materials.

【Example 1】 For example, when drilling a hole in SUS304 that is $\phi 0.3\text{mm}$ in diameter with a depth of 15mm, specify a tool with a diameter of $\phi 0.3\text{mm}$ and a under neck length of 15.3mm (hole depth + tool diameter).

Order code : **EMSBS0030-15.3-TH**

(Note) For products with tool dimensions other than those listed above, separate consultation is needed. Please contact our sales office.

Field data, How to use

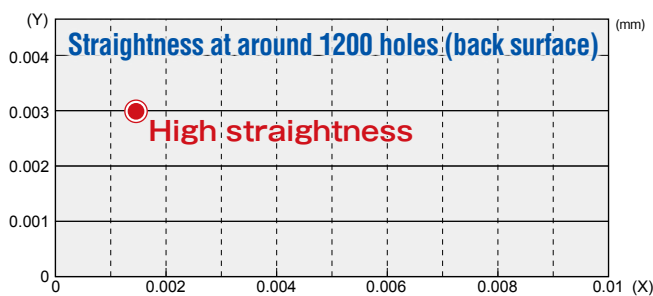
Machining data

01 Example of minute hole drilling of nozzle

Work material : SUS316 Tool : $\phi 0.07 \times 0.7\text{mm}$ (L/D=10)
 Cutting depth = 0.5mm (Through hole)
 Coolant : Water-base $n=20,000\text{min}^{-1}$ $vc=4.4\text{m/min}$ $vf=50\text{mm/min}$
 $f=0.0025\text{mm/rev}$ Step=0.007mm



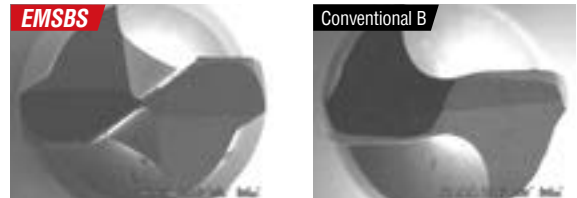
Number of holes drilled:
1200 holes
Drilling time:
30s/hole



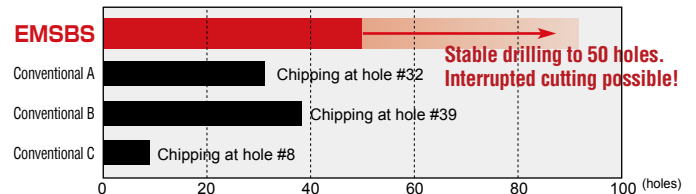
02 Minute die holes

Work material : HAP40[Ⓐ] Tool : $\phi 0.5 \times 5\text{mm}$ (L/D=10)
 Cutting depth = 5mm (Through hole)
 Coolant : Air-blow $n=10,000\text{min}^{-1}$ $vc=15.7\text{m/min}$ $vf=50\text{mm/min}$
 $f=0.005\text{mm/rev}$ Step=0.05mm

Tool condition after drilling 30 holes



Number of holes drilled



Enables stable machining of powder metallurgy HSS which often causes seizing with other tools.

How to use Epoch Micro Step Borer

Caution points when machining

<About pilot holes>

Use of the special starter is recommended.

* Particularly when drilling high-accuracy holes, please use the special starter.

Always perform step drilling using a G83 program. Hole depth: Be sure to drill to a depth of 60% of the diameter. (Ex.: For $\phi 0.1$, depth=0.06mm)

<About coolants>

In general, oil-based or water-soluble coolants are recommended.

When using, set it up so that the coolant hits the flute tips.

<About machining programs>

Always perform drilling using a G83 program (Peck drilling cycle).

Recommended reference position: 0.05 to 0.1mm. However, for aspect ratios of greater than 50D, the position should be set as 30% of the tool diameter below the surface of the work.

(Ex.: For $\phi 1 \times 100\text{mm}$ under neck length, reference position = -0.3mm)

Recommended approach distance: 0.05mm

*Change according to the machine parameter setting screen. If these values are large, machining time may become longer.

<About fast feed rates>

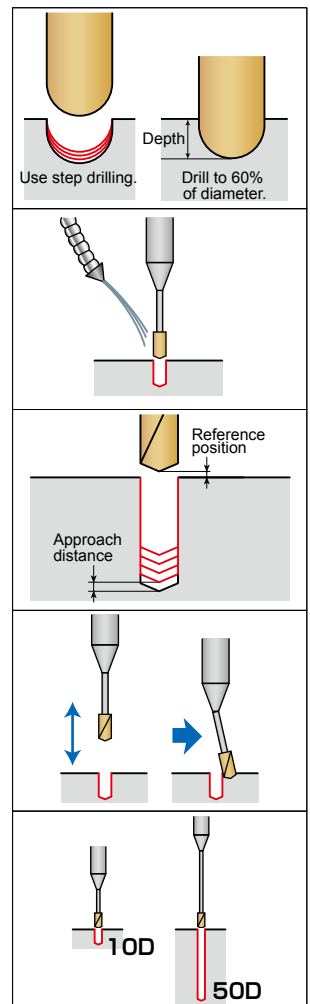
When the under neck length is long, if the fast feed rate is too fast, bit may be broken.

Recommended: 20m/min. or less (for greater than 30D, 5m/min. or less)

<When focusing on accuracy for hole depths of 30D or greater>

Drilling accuracy can be further improved by inserting 10D before drilling after drilling with a starter.

For aspect ratios of greater than 50D, always insert 10D before starting drilling.





The diagrams and table data are examples of test results, and are not guaranteed values.

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Attentions on Safety

1. Cautions regarding handling

- (1) When removing the tool from its case (packaging), be careful that the tool does not pop out or is dropped. Be particularly careful regarding contact with the tool flutes.
- (2) When handling tools with sharp cutting flutes, be careful not to touch the cutting flutes directly with your bare hands.

2. Cautions regarding mounting

- (1) Before use, check the outside appearance of the tool for scratches, cracks, etc. and that it is firmly mounted in the collet chuck, etc.
- (2) If abnormal chattering, etc. occurs during use, stop the machine immediately and remove the cause of the chattering.

3. Cautions during use

- (1) Before use, confirm the dimensions and direction of rotation of the tool and milling work material.
- (2) The numerical values in the standard cutting conditions table should be used as criteria when starting new work. The cutting conditions should be adjusted as appropriate when the cutting depth is large, the rigidity of the machine being used is low, or according to the conditions of the work material.
- (3) Cutting tools are made of a hard material. During use, they may break and fly off. In addition, cutting chips may also fly off. Since there is a danger of injury to workers, fire, or eye damage from such flying pieces, a safety cover should be attached when work is performed and safety equipment such as safety goggles should be worn to create a safe environment for work.
- (4) There is a risk of fire or inflammation due to sparks, heat due to breakage, and cutting chips. Do not use where there is a risk of fire or explosion. **Please caution of fire while using oil base coolant, fire prevention is necessary.**
- (5) Do not use the tool for any purpose other than that for which it is intended.

4. Cautions regarding regrinding

- (1) If regrinding is not performed at the proper time, there is a risk of the tool breaking. Replace the tool with one in good condition, or perform regrinding.
- (2) Grinding dust will be created when regrinding a tool. When regrinding, be sure to attach a safety cover over the work area and wear safety clothes such as safety goggles, etc.
- (3) This product contains the specified chemical substance cobalt and its inorganic compounds. When performing regrinding or similar processing, be sure to handle the processing in accordance with the local laws and regulations regarding prevention of hazards due to specified chemical substances.

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