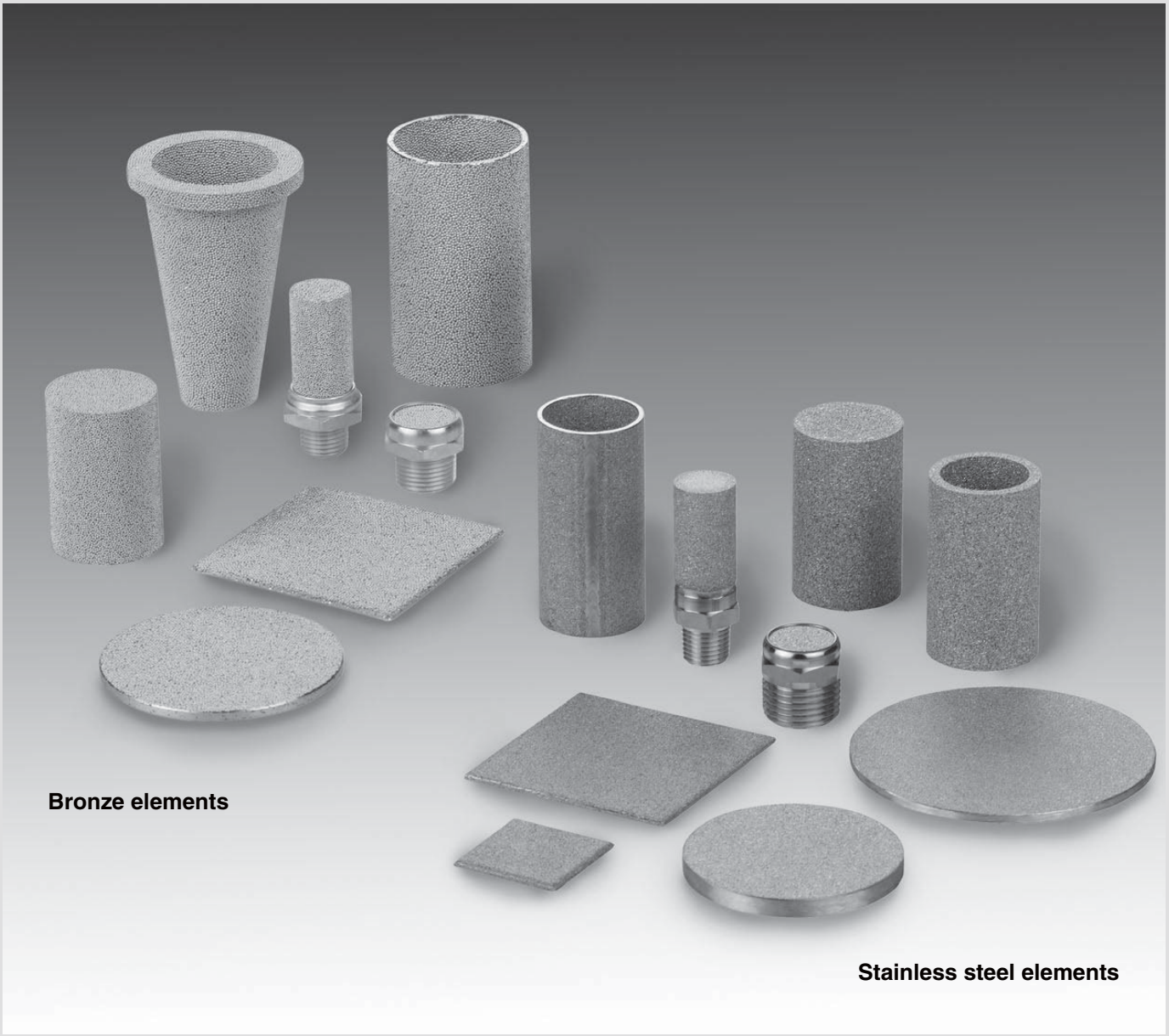
Sintered Metal Element

EB□/ES□ Series

Bronze/Stainless Steel

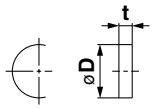
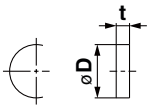
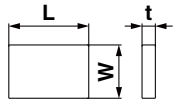
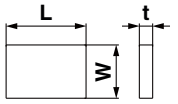
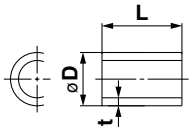
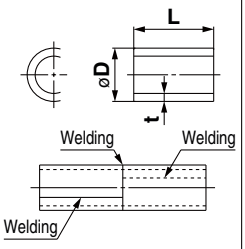
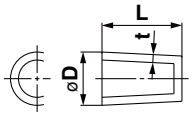
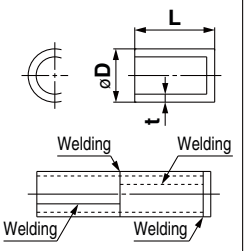
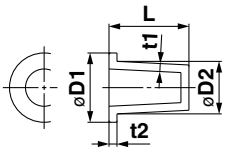
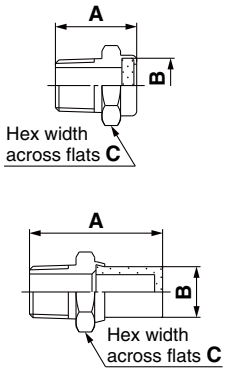
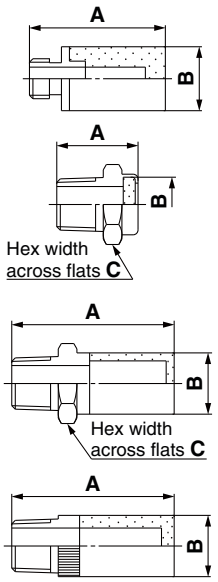
RoHS



Bronze elements

Stainless steel elements

Product Configurations of Sintered Metal Elements

Configuration	Bronze elements (BC)			Stainless steel elements (SUS)		
Disc		**EBD Series (P.108)**	· With outside diameter cutting finish · Without outside diameter cutting finish		**ESD Series (P.111)**	· With outside diameter cutting finish · Without outside diameter cutting finish
Square sheet		**EBS Series (P.108)**	· With external shearing finish · With external machining finish		**ESS Series (P.112)**	· With external shearing finish · With external machining finish
Cylinder		**EBP Series (P.109)**	—		**ESP Series (P.113)**	· Seamless finish (molded product) · With seams (welded product)
Cylinder with bottom		**EBW Series (P.109)**	—		**ESW Series (P.114)**	· Seamless finish (molded product) · With seams (welded product)
Cone with flange		**EBF Series (P.110)**	—	—	—	—
Element with fitting		**P.110**	· With fitting (M3, M5, R1/8, R1/4, R3/8, R1/2)		**P.115**	· With fitting (M3, M5, R1/8, R1/4, R3/8, R1/2)
Features	Sintered material: CAC403 equivalent (Metal material of elements with fitting: brass) • Produces $2CuCO_3 \cdot Cu(OH)_2$ (patina) in the atmosphere, providing good corrosion resistance.			Sintered material: SUS316L equivalent (Metal material of elements with fitting: stainless steel) · Austenite stainless steel with good corrosion resistance to acids, alkaline substances, and other chemicals		

SMC sintered metal elements are suitable

- **High mechanical strength and withstand pressure**
- **Anti-corrosion**
- **Suitable for high-accuracy filtration**
- **Suitable for machining, crimping, brazing, welding, and simultaneous sintering**
- **Washing allows repeated use**

Specifications

Item	Bronze	Stainless steel
Material	CAC403 equivalent	SUS316L equivalent
Sintering density (g/cm^3)	5.0 to 6.5	4.2 to 5.2
Void ratio (%)	25 to 43	36 to 48
Operating temperature range (°C) Note 4)	–160 to 200	–250 to 550
Thermal expansion coefficient (/°C)	1.8 x 10^{-5}	1.6 x 10^{-5}
Tensile strength (MPa)	9.8 to 83.4	
Nominal filtration accuracy (μm)	(1), 2, 5, 10, 20, 40, 70, 100, 120	
Typical configurations	Disc, square sheet, cylinder, cylinder with bottom, cone with flange, element with fitting, etc.	

Note 1) Sintering density, void ratio, and tensile strength differ according to nominal filtration accuracy.
Note 2) Thermal expansion coefficient applies to stainless steel or bronze material, not to sintered metal elements.
Note 3) Nominal filtration accuracy of 1 μm is an optional value.
Note 4) For operating temperature range of the element with fitting (standard product), refer to pages 110 and 115.

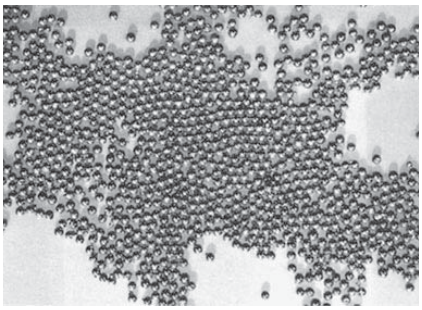
Raw material categories and nominal filtration accuracy (μm)

Sieve (mesh)	20	24	32	42	60	80	120	200	250
Opening (μm)	850	710	500	355	250	180	125	75	63
Nominal filtration accuracy (μm)	120	100	70	40	20	10	5	2	

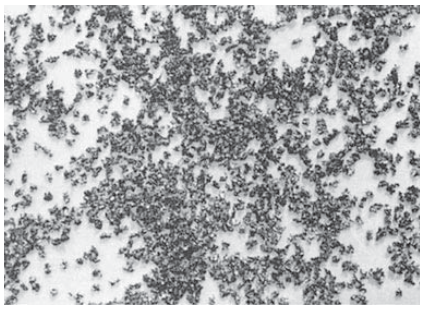
Note 1) Sieve (mesh) and opening values apply to metal mesh separating raw material, not to elements.
Note 2) Nominal filtration accuracy: Refers to value used to categorize raw material, not to filtration rating.
(Refer to the page 118 for "11 Nominal filtration accuracy".)

Raw Material Powder and Sintered Metal Element

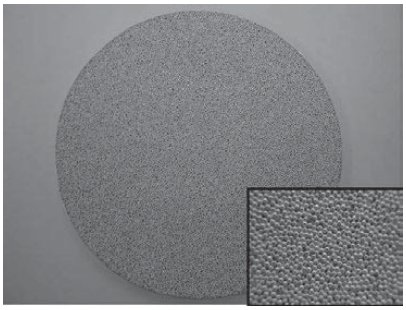
<Bronze powder>



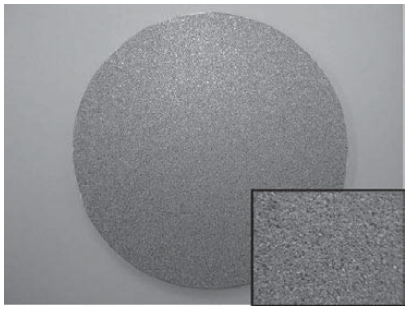
<Stainless steel powder>



<Sintered bronze>



<Sintered stainless steel>



Applications

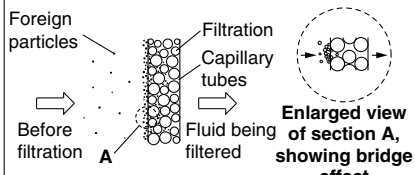
A sintered metal element consists of countless interconnected capillary tubes, making it suitable for a wide range of uses. For detailed information on purpose-specific applications, please contact SMC.

1. Filtration

Sintered metal elements are widely used for removing foreign particles from many different kinds of flow media.

Major application fields: General gases, water, various kinds of oils

Normally, filtration makes use of the so-called bridge effect where foreign particles are blocked because they form a bridge-like accumulation.
The size and distribution of particles to be filtered can be controlled through parameters such as the diameter of the capillary tubes. Particles may be blocked completely or selectively.



2. High-viscosity filtration

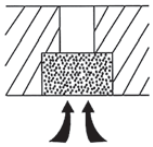
This is used to remove foreign matter or gel from raw materials for fibers or films.

3. Sound absorption

The porous quality of sintered metal elements allows them to absorb sound energy, providing a muffling or silencing effect.

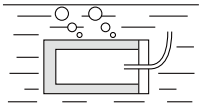
4. Gas removal

Sintered metal elements are used for degassing purposes in forming and molding processes.



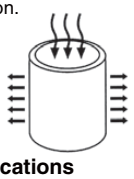
5. Foaming

Sintered metal elements positioned in various kinds of fluids are used to introduce gases, for stirring and other purposes.



6. Flow control

Because a sintered metal element consists of countless interconnected capillary tubes, it can be used to control the flow of fluids. Cylindrical bronze elements are especially suited for this type of application.



7. Other applications

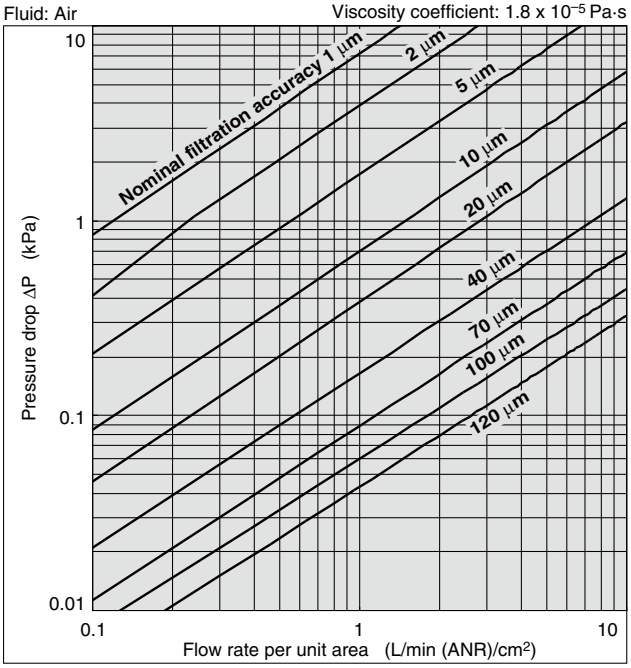
Various other applications make use of the fluid-passing functionality of sintered metal elements.

for a wide range of industrial applications.

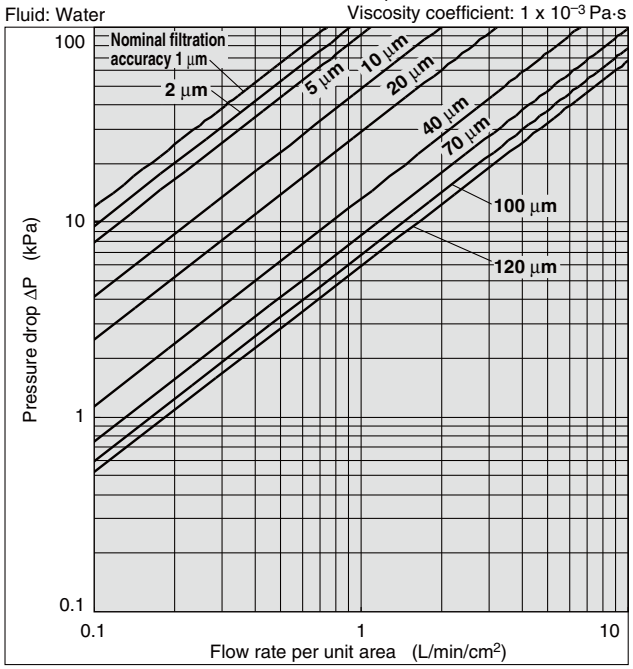
Flow Rate Characteristics

Bronze (BC)

Element thickness: 3 mm
Temperature: 20°C
Viscosity coefficient: 1.8 x 10^{-5} Pa·s
Fluid: Air

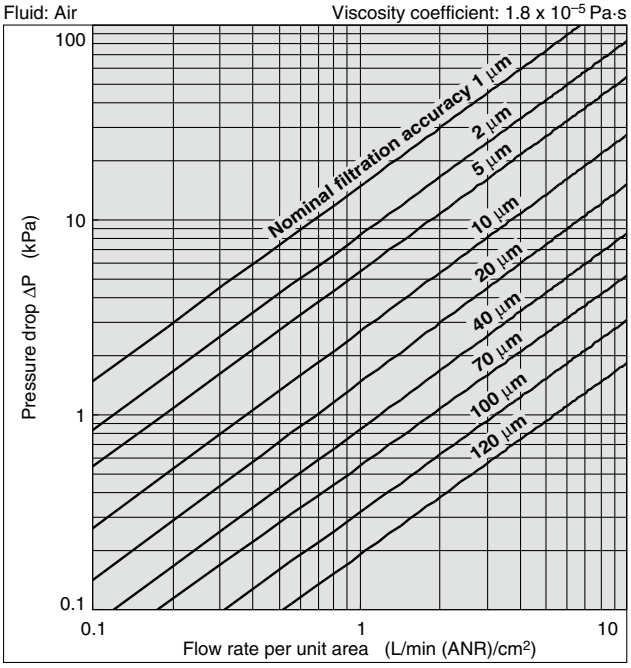


Element thickness: 3 mm
Temperature: 20°C
Viscosity coefficient: 1 x 10^{-3} Pa·s
Fluid: Water

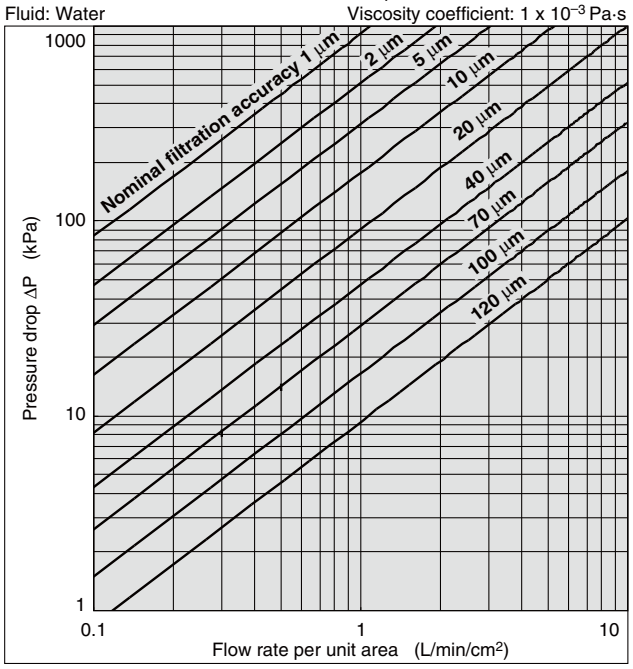


Stainless steel (SUS)

Element thickness: 2.3 mm
Temperature: 20°C
Viscosity coefficient: 1.8 x 10^{-5} Pa·s
Fluid: Air



Element thickness: 2.3 mm
Temperature: 20°C
Viscosity coefficient: 1 x 10^{-3} Pa·s
Fluid: Water



Note) Flow rate characteristics for stainless steel elements ESP-ESW (diameter 120 mm or less, no ESD seams) are different.

<Simplified formula for calculating pressure drop>

The state equation of an ideal gas (PV/T = constant) and the pressure drop are proportional to element thickness and viscosity. Based on this, the pressure drop under conditions that are different from those used in the flow rate characteristics chart can be calculated roughly for reference, using the following simplified procedure.

(1) Pressure drop ΔP kPa when flow medium is air, temperature T_1°C, pressurization P_1 kPa:

$$\Delta P = \frac{101.3 \times \Delta P_0 \times (273 + T_1)}{293 \times (P_1 + 101.3)}$$

ΔP_0: Pressure drop kPa obtained from flow rate characteristics chart

(2) Element thickness dependent pressure drop ΔP kPa when flow medium is air and water, element thickness t1 mm, and element thickness in flow rate characteristics chart differs:

$$\Delta P = \Delta P_0 \times \frac{t_1}{t_{0\ (2.3\ or\ 3)}}$$

ΔP_0: Pressure drop kPa obtained from flow rate characteristics chart or from (1)

t_0: Element thickness in flow rate characteristics chart (BC element = 3 mm/ SUS element = 2.3 mm)

(3) Pressure drop ΔP kPa when viscosity η_1 of flow medium differs from that of air or water:

$$\Delta P = \Delta P_0 \times \frac{\eta_1}{\eta_0}$$

ΔP_0: Pressure drop kPa obtained from flow rate characteristics chart

η_1: Viscosity of flow medium Pa·s

η_0: Viscosity of flow rate characteristics chart (air = 1.8 x 10^{-5} Pa·s, water = 1 x 10^{-3} Pa·s)

Sintered Metal Element

Standard Configurations and Dimensions (Unit: mm)

Bronze (BC)

RoHS

1. Disc

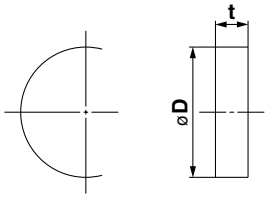
How to Order

EBD − 6 − 2 − 5 □

- 6: øD
- 2: t
- 5: Nominal filtration accuracy (μm)
- □: Outside diameter finish category

Nominal filtration accuracy (μm)
2
5
10
20
40
70
100
120

Outside diameter finish category	
Nil	Without cutting finish
M	With cutting finish



Standard dimensions product (no cutting finish)

øD	6	8	10	12	15	20
t	2	2	2	3	3	3
μm	2 to 120					

Note) For products with non-standard dimensions, sintering mold is required. Please contact SMC.

Manufacturing range for product without cutting finish

øD	2 to 30		
t	1	1.5	2 to 10
μm	2 to 20	2 to 40	2 to 120

Tolerance

øD	± 0.3
t	± 0.3

Note) Smallest unit for specifying diameter D values is 1 mm, and 0.5 mm for t values.

Manufacturing range for product with cutting finish

øD	30 to 200	30 to 300	30 to 400
t	1	1.5	2 to 10
μm	2 to 20	2 to 40	2 to 120

Tolerance

øD	± 0.3	30 D 120
	± 0.5	120 < D 315
	± 0.8	315 < D 400
t	± 0.3	
	± 0.5	t: 5 to 10 (exceeds 300)

Note 1) Smallest unit for specifying diameter D and t values is 0.5 mm.
Note 2) Edge sections of products with a nominal filtration accuracy of 70 μm and higher may exhibit particle chipping and other machining problems.
∗ Minimum order quantity is 10 pieces. (Excluding EBD-□M)

2. Square Sheet

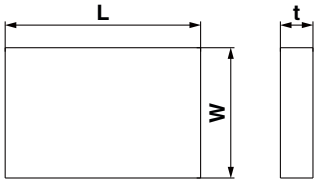
How to Order

EBS − 20 − 50 − 3 − 5 □

- 20: W
- 50: L
- 3: t
- 5: Nominal filtration accuracy (μm)
- □: Circumference finish category

Nominal filtration accuracy (μm)
2
5
10
20
40
70
100
120

Circumference finish category	
Nil	Product with shirring finish
M	Product with machining finish



Manufacturing range for product with shearing finish

W (Width)	10 to 200	10 to 300	10 to 300
L (Length)	20 to 200	20 to 300	20 to 500
t	1	1.5	2 to 3
μm	2 to 20	2 to 40	2 to 120

Tolerance

W, L	± 1	10 W, L 120
	± 2	120 < W, L 500
t	± 0.3	

Note 1) Smallest unit for specifying W and L values is 1 mm, and 0.5 mm for t values.
Note 2) When shearing is used, the cut section is a break surface which will have shear drops and cracks. To remove these, process at least 5 mm on one side.
Note 3) Edge sections of products with a nominal filtration accuracy of 70 μm and higher may exhibit particle chipping and other machining problems.

Manufacturing range for product with machining finish

W (Width)	5 to 200	5 to 30	30 to 300	5 to 30	30 to 300
L (Length)	5 to 200	5 to 200	30 to 300	5 to 200	30 to 500
t	1	1.5		2 to 10	
μm	2 to 20	2 to 40		2 to 120	

Tolerance

W, L	± 0.3	5 W, L 30
	± 0.5	30 < W, L 120
	± 1	120 < W, L 315
	± 1.5	315 < W, L 500
t	± 0.3	
	± 0.5	t: 5 to 10 (exceeds L300)

Note 1) Smallest unit for specifying W, L, and t values is 0.5 mm.
Note 2) Edge sections of products with a nominal filtration accuracy of 70 μm and higher may exhibit particle chipping and other machining problems.

Standard Configurations and Dimensions (Unit: mm)

Bronze (BC)

RoHS

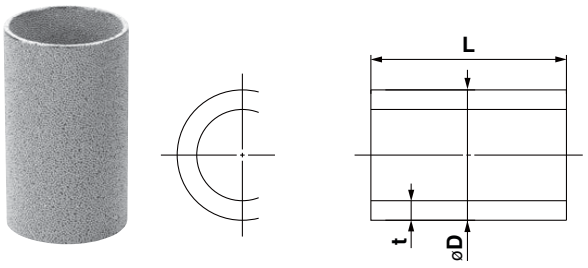
3. Cylinder

How to Order

EBP – 10 – 200 – 3 – 5

10: øD, 200: L, 3: t, 5: Nominal filtration accuracy (μm)

Nominal filtration accuracy (μm)
2
5
10
20
40
70
100
120



Standard dimensions product

øD	10	20	30	40	45	50	65	
L	200	200	200	200	200	250	250	500
t	2	2	2	2	2.5	3	3	
μm	2 to 120							

Manufacturing range

øD	L						
10 D 20	10 to 50	10 to 200					
20 < D 35	20 to 80	20 to 200	20 to 300				
35 < D 45		35 to 200	35 to 400				
45 < D 65			45 to 500				
65 < D 130				65 to 500			
130 < D 200				130 to 500	130 to 300		
200 < D 250					200 to 300		
t	1.5	2	2.5	3	4	5	6
μm	2 to 40	2 to 120					

Tolerance (for standard and custom products)

øD	± 0.3	10 D 30
	± 0.5	30 < D 120
	± 1	120 < D 250
L	± 0.3	10 L 30
	± 0.5	30 < L 120
	± 1	120 < L 315
	± 1.5	315 < L 500
t	± 0.3	

Note 1) For a 200 mm length, there is a draft taper of about 1 mm across. Therefore the diameter D tolerance refers to the value at the center of L.
Note 2) End surfaces are created by cutting. Edge sections of products with a nominal filtration accuracy of 70 μm and higher may exhibit particle chipping and other machining problems.
Note 3) Smallest unit for specifying diameter D and L values is 0.5 mm. Smallest unit for specifying t values is as noted in the table.
Note 4) For products with non-standard dimensions, sintering mold is required. Please contact SMC.

4. Cylinder with Bottom

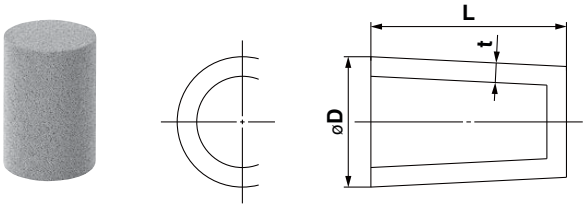
How to Order

EBW – 8 – 20 – 2 – 5 [ ]

8: øD, 20: L, 2: t, 5: Nominal filtration accuracy (μm), [ ]: Opening side finish category

Nominal filtration accuracy (μm)
2
5
10
20
40
70
100
120

Opening side finish category	
Nil	Without cutting finish
M	With cutting finish



Standard dimensions product (no cutting finish)

øD	8	10	20
L	20		40
t	2		
μm	2 to 120		

Manufacturing range for product without cutting finish

øD	7 ≤ D ≤ 10		10 < D ≤ 20			
L	7 to 10		10 to 50			
t	1.5	2	1.5	2	2.5	3
μm	2 to 40	2 to 120	2 to 40	2 to 120		

Manufacturing range for product with cutting finish

øD	20 < D ≤ 30				30 < D ≤ 40		
L	20 to 80				30 to 80		
t	1.5	2	2.5	3	2	2.5	3
μm	2 to 40	2 to 120			2 to 120		

Tolerance (for standard and custom products)

øD	± 0.3	7 ≤ D ≤ 30
	± 0.5	30 < D ≤ 40
L	± 0.3	7 ≤ L ≤ 30
	± 0.5	30 < L ≤ 80
t	± 0.3	

Note 1) There is a draft taper of about 1 mm across.
Note 2) Opening side end surface is created by cutting. Edge sections of products with a nominal filtration accuracy of 70 μm and higher may exhibit particle chipping and other machining problems.
Note 3) Smallest unit for specifying diameter D and L values is 0.5 mm. Smallest unit for specifying t values is as noted in the table.
Note 4) For products with non-standard dimensions, sintering mold is required. Please contact SMC.

Sintered Metal Element

Standard Configurations and Dimensions (Unit: mm)

Bronze (BC)

RoHS

5. Cone with Flange

How to Order

EBF – 9 – 10 – 1 – 5

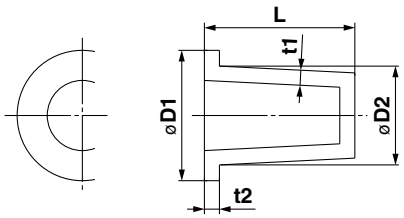
- 9: ø**D1**
- 10: **L**
- 1: **t1**
- 5: **Nominal filtration accuracy (μm)**

Nominal filtration accuracy (μm)
2
5
10
20
40
70
100
120

Standard dimensions product

ø**D1** (± 0.5)	9	10	12	15	20
ø**D2** (± 0.5)	7	8	9	11	15
L (± 0.5)	10		11	13	14
t1 (± 0.3)	1	1.5		2	3
t2 (± 0.3)	2	2	2	2	3
μm	2 to 20	2 to 40	2 to 120		

Note) Figures in brackets indicate tolerance.



6. Element with Fitting (Standard product)

EBKX model number

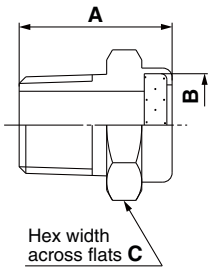
Connection thread	Model number	Dimensions A	B	C	Configuration
M3	EBKX-X9007-□	9.7	8	12	①
M5	EBKX-X9008-□	9.7	8	12	①
R1/8	EBKX-L7004-□	13.5	8	11	①
R1/4	EBKX-J2001-□	47.3	17	21	②
	EBKX-L7005-□	19	19	21	①
R3/8	EBKX-J2002-□	48.3	17	21	②
	EBKX-L7006-□	20	19	21	①
R1/2	EBKX-J2003-□	51.3	17	21	②
	EBKX-L7007-□	23	19	21	①

Model number suffix □ (nominal filtration accuracy) definition

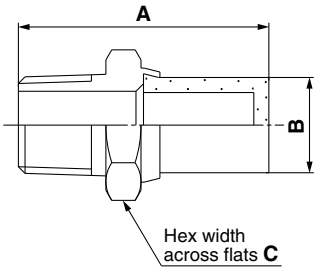
symbol	Nominal filtration accuracy
002	2 μm
005	5 μm
010	10 μm
020	20 μm
040	40 μm
070	70 μm
100	100 μm
120	120 μm

Example: Nominal filtration accuracy 2 μm
EBKX-J2001-002

Operating temperature: –160 to 100°C



① **Crimping**



② **Crimping**

Standard Configurations and Dimensions (Unit: mm)

Stainless steel (SUS)

RoHS

1. Disc

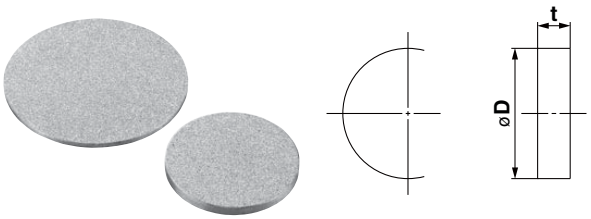
How to Order

ESD – 4 – 2 – 5 □

- 4: øD
- 2: t
- 5: Nominal filtration accuracy (μm)
- □: Outside diameter finish category

Nominal filtration accuracy (μm)
2
5
10
20
40
70
100
120

Outside diameter finish category	
No symbol	Without cutting finish
M	With cutting finish



Standard dimensions product (no cutting finish)

øD	4	5	6	8	10	12	15	20
t	2	2	2	2	3	3	3	3

Manufacturing range for product without cutting finish

øD	2 D < 4	4 D 30
t	1 to 4	1 to 10

Tolerance

øD	± 0.3
t	± 0.2

Note 1) For products with non-standard dimensions, sintering mold is required. Please contact SMC.
Note 2) Smallest unit for specifying diameter D values is 1 mm, and 0.5 mm for t values.

Manufacturing range for product with cutting finish (no welding)

øD	20 to 220	220.5 to 350
t	1 to 3, 4, 5	(3), 4, 5

Tolerance

øD	± 0.3	20 D 120
	± 0.5	120 < D 315
	± 0.8	315 < D 350
t	± 0.2	

Note 1) Smallest unit for specifying diameter D values is 0.5 mm, and 0.5 mm for t values of 3 mm or less.
Note 2) Figures in brackets manufacturing range for nominal filtration accuracy 2 μm.

Manufacturing range for product with cutting finish (with welding)

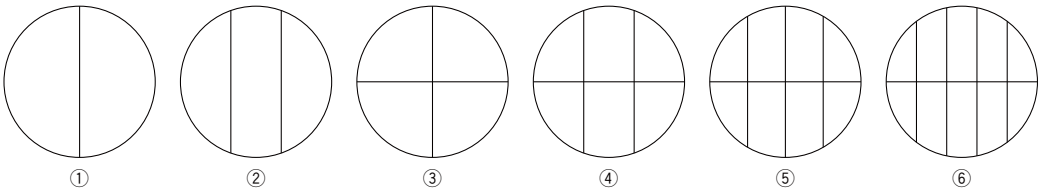
øD	Welding pattern	t
221 D 440	①	2 to 3
440 < D 500	②	2 to 3
500 < D 660	④	3
660 < D 880	⑤	3
880 < D 1000	⑥	3
350 < D 700	③	(3), 4, 5

Tolerance

øD	± 0.5	221 D 315
	± 0.8	315 < D 800
	± 2	800 < D 1000
t	± 0.2 (excluding welded sections)	

Note 1) Smallest unit for specifying diameter D values is 0.5 mm, and 0.5 mm for t values of 3 mm or less.
Note 2) Products with t = 2 to 3 and D ≥ 221, or t = (3), 4, 5 and D ≥ 350 have welded seams.
Products with t ≥ 3 have dual-sided welding. Figures in brackets indicate manufacturing range for nominal filtration accuracy 2 μm.
Note 3) Products with outside diameter D ≥ 800 are finished by manual grinding.
Welded sections are wire brushed to remove oxide scales. (Oxide bath cleaning is not performed.)

(Welding patterns)



∗ Minimum order quantity is 10 pieces. (Excluding ESD-□M)

Sintered Metal Element

Standard Configurations and Dimensions (Unit: mm)

Stainless steel (SUS)

RoHS

2. Square Sheet

How to Order

ESS − 20 − 50 − 3 − 5 □

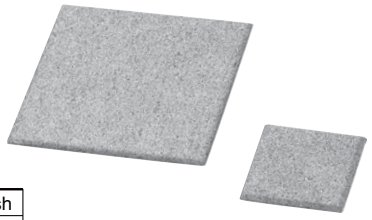
W L t

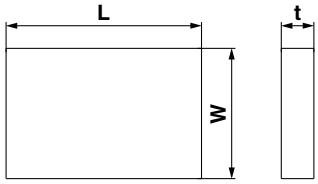
Nominal filtration accuracy (μm)

2
5
10
20
40
70
100
120

Outside finish category

No symbol	Product with shearing finish
M	Product with machining finish





Manufacturing range for product with shearing finish (no welding)

W (Width)	10 to 220	10 to 220
L (Length)	20 to 220	20 to 500
t	1, 1.5	2 to 3

Welded product

W (Width)	221 to 500	20 to 1000
L (Length)	221 to 500	501 to 1000
t	2 to 3	3

Tolerance

W, L	± 1	10 ≤ W, L ≤ 120
	± 2	120 < W, L ≤ 1000
t	± 0.2 (excluding welded sections)	

Note 1) Smallest unit for specifying W and L values is 1 mm, and 0.5 mm for t values.
Note 2) When shearing is used, the cut section is a break surface which will have shear drops and cracks. To remove these, process at least 5 mm on one side.

Manufacturing range for product with machining finish (no welding)

W (Width)	5 ≤ W < 221	5 ≤ W ≤ 30	30 ≤ W < 221	5 ≤ W ≤ 30	30 ≤ W ≤ 350
L (Length)	5 ≤ L < 221	5 ≤ L ≤ 200	30 ≤ L < 501	5 ≤ L ≤ 200	30 ≤ L ≤ 350
t	1, 1.5	2 to 3		(3), 4, 5	

Tolerance

W, L	± 0.3	5 ≤ W, L ≤ 30
	± 0.5	30 < W, L ≤ 120
	± 1	120 < W, L ≤ 315
	± 1.5	315 < W, L < 501
t	± 0.2	

Note 1) Smallest unit for specifying W and L values is 0.5 mm, and 0.5 mm for t values of 3 mm or less.
Note 2) Figures in brackets indicate manufacturing range for nominal filtration accuracy 2 μm.

Manufacturing range for product with machining finish (with welding)

W (Width)	221 ≤ W ≤ 450	40 ≤ W ≤ 450	40 ≤ W ≤ 1000
L (Length)	221 ≤ L < 501	501 ≤ L ≤ 1000	351 ≤ L ≤ 1000
t	2 to 3	3	(3), 4, 5

Tolerance

W, L	± 0.5	40 ≤ W, L ≤ 120
	± 1	120 < W, L ≤ 315
	± 1.5	315 < W, L < 1000
	± 5	t ≥ 4 (W < 450)
t	± 0.2 (excluding welded sections)	

Note 1) Smallest unit for specifying W and L values is 0.5 mm, and 0.5 mm for t values of 3 mm or less.
Note 2) Products with W > 450 are cut sheets welded together which may have a slight shift or uneven height.
Note 3) Figures in brackets indicate manufacturing range for nominal filtration accuracy 2 μm.

Welding pattern (t= 2 to 3, common to shearing/machining finish)

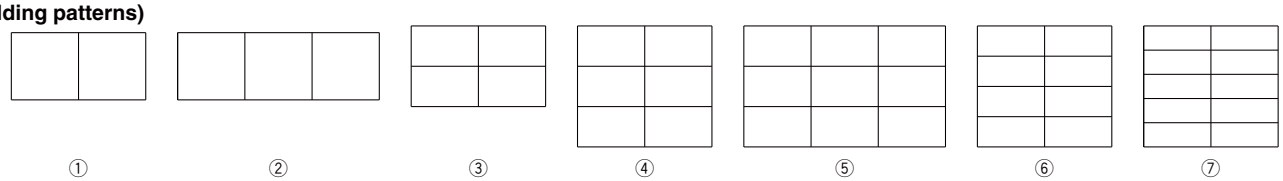
W (Width)	**L** (Length)	Configuration	Number of sheets	
			W	L
20 ≤ W < 221	501 ≤ L ≤ 1000	①	1	2
221 ≤ W ≤ 441	221 ≤ L ≤ 441	①	1	2
	441 < L < 501		2	1
	501 ≤ L ≤ 1000	③	2	2
441 < W < 501	441 < L < 662	②	1	3
	662 ≤ L ≤ 1000	④	3	2
501 ≤ W < 662	501 ≤ L < 662	④	2	3
	662 ≤ L ≤ 1000	④	3	2
662 ≤ W ≤ 882	662 ≤ L ≤ 882	⑥	2	4
	882 < L ≤ 1000	⑥	4	2
882 < W ≤ 1000	882 < L ≤ 1000	⑦	2	5

Welding pattern (t = (3), 4, 5)

W (Width)	**L** (Length)	Configuration	Number of sheets	
			W	L
40 ≤ W < 351	351 ≤ L < 701	①	1	2
	701 ≤ L ≤ 1000	②	1	3
351 ≤ W < 701	351 ≤ L < 701	③	2	2
	701 ≤ L ≤ 1000	④	2	3
701 ≤ W ≤ 1000		⑤	3	3

Note 1) Products with t = 2 to 3 and W ≥ 221, L ≥ 501 or t = (3), 4, 5 and W, L ≥ 350 have welded seams. Products with t ≥ 3 have dual-sided welding.
Note 2) Welded sections of products with W, L ≥ 800 are wire brushed to remove oxide scales. (Oxide bath cleaning is not performed.)

(Welding patterns)



Standard Configurations and Dimensions (Unit: mm)

Stainless steel (SUS)

RoHS

3. Cylinder

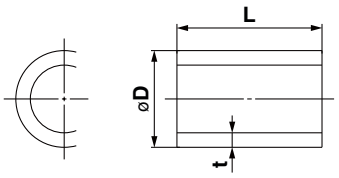
How to Order

ESP – 20 – 50 – 3 – 5 □

- 20: øD
- 50: L
- 3: t
- 5: Nominal filtration accuracy (μm)
- □: Cylinder outside diameter finish category

Nominal filtration accuracy (μm)
2
5
10
20
40
70
100
120

Cylinder outside diameter finish category	
No symbol	Seamless finish (molded product)
W	With seams (welded product)



Standard dimensions product (seamless)

øD	4	5	6	8	10	12	15	20	30
L	16	20	20	30	30	40	40	50	60
t	1, 1.5			1.5, 2			2, 3		3

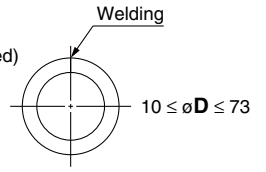
Manufacturing range for seamless product

øD	L (*: 2 weld seams dimensions)								
4 ≤ D < 5	5 to 16								
5 ≤ D < 8	5 to 20								
8 ≤ D < 11	5 to 30								
11 ≤ D < 15	5 to 40								
15 ≤ D < 18		5 to 40							
18 ≤ D < 21		5 to 50							
21 ≤ D < 26			5 to 50 (100 *)						
26 ≤ D ≤ 30			10 to 60 (120 *)						
t	1	1.5	2	2.5	3	3.5	4	4.5	5

Tolerance

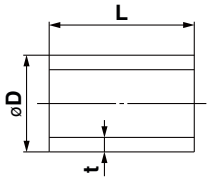
øD	± 0.3	4 ≤ D ≤ 20
	± 0.5	20 < D ≤ 30
	± 1	*: 2 weld seams
L	± 0.3	5 ≤ L ≤ 30
	± 0.5	30 < L ≤ 60
	± 2	*: 2 weld seams
t	± 0.2	

Note 1) For products with non-standard dimensions, sintering mold is required. Please contact SMC.
Note 2) Smallest unit for specifying diameter D and L values is 0.5 mm. Smallest unit for specifying t values is as noted in the table. Products with 2 weld seams are only available in the dimensions indicated in the table.
Note 3) Products with 2 weld seams may have some curvature or uneven height.
Note 4) End finish: no cutting (for 2 μm or less, and L > 40, cutting finish is provided)



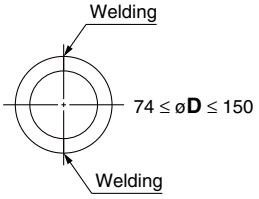
Standard dimensions product (with seams)

øD	30		40		50		65	
L	250	500	250	500	250	500	250	500
t	2						2.3	



Manufacturing range for product with seams

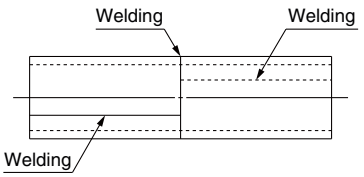
øD	10 to 14	15 to 19	20 to 29	30 to 39	40 to 49	50 to 73	74 to 150
L (*: 2 weld seams dimensions)	10 to 500		10 to 500 (1000 *)				50 to 500 (1000 *)
t	1	1 to 1.5	1 to 2	1.5 to 2	1.5 to 2.5	1.5 to 3	2 to 3



Tolerance

øD	± 1.5	10 to 73
	± 2	74 to 150
L	± 0.3	10 ≤ L ≤ 30
	± 0.5	30 < L ≤ 120
	± 1	120 < L ≤ 315
	± 1.5	315 < L ≤ 500
	± 3	500 < L ≤ 1000
t	± 0.2	

Note 1) Smallest unit for specifying diameter D and L values is 1mm, and 0.5mm for t values. Dimension in brackets for 2-seam products refer to maximum length.
Note 2) Products with D ≥ 74 have 2 seams in lengthwise direction.
Note 3) End finish: with cutting.



Sintered Metal Element

Standard Configurations and Dimensions (Unit: mm)

Stainless steel (SUS)

RoHS

4. Cylinder with Bottom

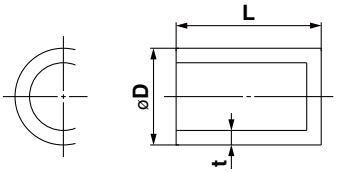
How to Order

ESW– 8 – 10 – 2 – 5 ☐

- 8: øD
- 10: L
- 2: t
- 5: Nominal filtration accuracy (μm)
- ☐: Cylinder outside diameter finish category

Nominal filtration accuracy (μm)
2
5
10
20
40
70
100
120

Cylinder outside diameter finish category	
No symbol	Seamless finish (molded product)
W	With seams (welded product)



Standard dimensions product (seamless)

øD	8	10	12	15	20	30
L	10	20	20	20	40	50
t	2					3

Manufacturing range for seamless product

øD	L								
5 ≤ D < 8	5 to 20								
8 ≤ D < 11	5 to 30								
11 ≤ D < 15	5 to 40								
15 ≤ D < 18		5 to 40							
18 ≤ D < 21		5 to 50							
21 ≤ D < 26			5 to 50						
26 ≤ D ≤ 30			10 to 60						
t	1	1.5	2	2.5	3	3.5	4	4.5	5

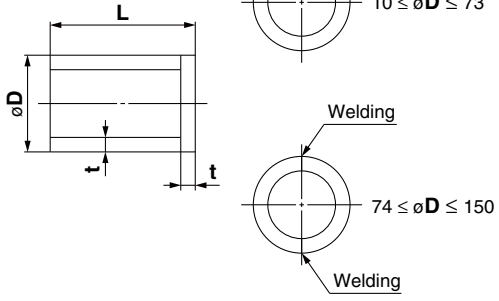
Tolerance

øD	± 0.3	5 ≤ D ≤ 20
	± 0.5	20 < D ≤ 30
L	± 0.3	5 ≤ L ≤ 30
	± 0.5	30 < L ≤ 60
t	± 0.2	

Note 1) For products with non-standard dimensions, sintering mold is required. Please contact SMC.
Note 2) Smallest unit for specifying diameter D and L values is 0.5 mm. Smallest unit for specifying t values is as noted in the table.
Note 3) End finish: no cutting (For 2 μm or less, and L > 40, cutting finish is provided.)

Standard dimensions product (with seams)

øD	30		40		50		65	
L	250	500	250	500	250	500	250	500
t	2						2.3	



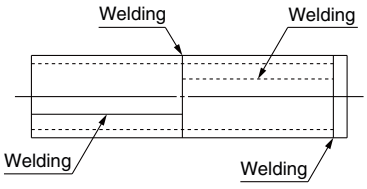
Manufacturing range for product with seams

øD	10 to 14	15 to 19	20 to 29	30 to 39	40 to 49	50 to 73	74 to 150
L (*: 2 weld seams dimensions)	10 to 500		10 to 500 (1000 *)				50 to 500 (1000 *)
t	1	1 to 1.5	1 to 2	1.5 to 2	1.5 to 2.5	1.5 to 3	2 to 3

Tolerance

øD	± 1.5	10 to 73
	± 2	74 to 150
L	± 1.0	10 ≤ L ≤ 30
	± 1.0	30 < L ≤ 120
	± 2	120 < L ≤ 315
	± 2.5	315 < L ≤ 500
	± 3	500 < L ≤ 1000
t	± 0.2	

Note 1) Smallest unit for specifying diameter D and L values is 1 mm, and 0.5 mm for t values. Dimensions in brackets for 2-seam products refer to maximum length.
Note 2) Products with D ≥ 74 have 2 seams in lengthwise direction.
Note 3) End finish: with cutting.



Standard Configurations and Dimensions (Unit: mm)

Stainless steel (SUS)

RoHS

5. Element with Fitting (Standard product)

ESKA model number

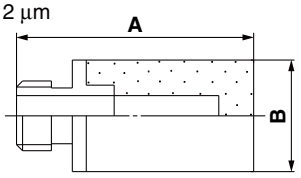
Connection thread	Model number	Dimensions			Configuration
		A	B	C	
M3	ESKA-Z2701-□	9	6	N/A ∗1	①
	ESKA-Z2711-□	9.7	8	14	②
M5	ESKA-Z2702-□	17	8	N/A ∗1	①
	ESKA-Z2712-□	9.7	8	14	②
R1/8	ESKA-Z2801-□	38	13	N/A ∗2	③
	ESKA-Z2811-□	13.5	8	14	②
R1/4	ESKA-Z2802-□	52	17	17	③
	ESKA-Z2812-□	19	19	21	②
R3/8	ESKA-Z2803-□	53	17	17	③
	ESKA-Z2813-□	20	19	21	②
R1/2	ESKA-Z2804-□	58	17	22	③
	ESKA-Z2814-□	23	19	21	②

Model number suffix □ (nominal filtration accuracy) definition

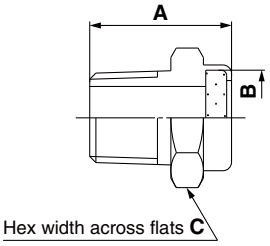
symbol	Nominal filtration accuracy
002	2 μm
005	5 μm
010	10 μm
020	20 μm
040	40 μm
070	70 μm
100	100 μm
120	120 μm

Example: Nominal filtration accuracy 2 μm
ESKA-Z2701-002

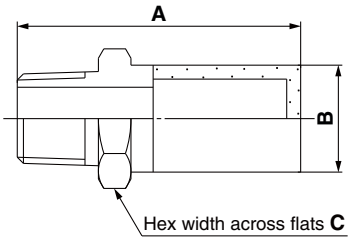
Operating temperature: –196 to 150°C



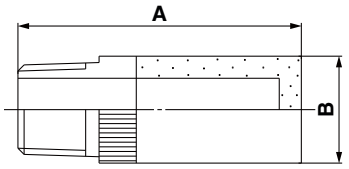
① **Simultaneous sintering (∗1)**



② **Crimping**



③ **Welding**

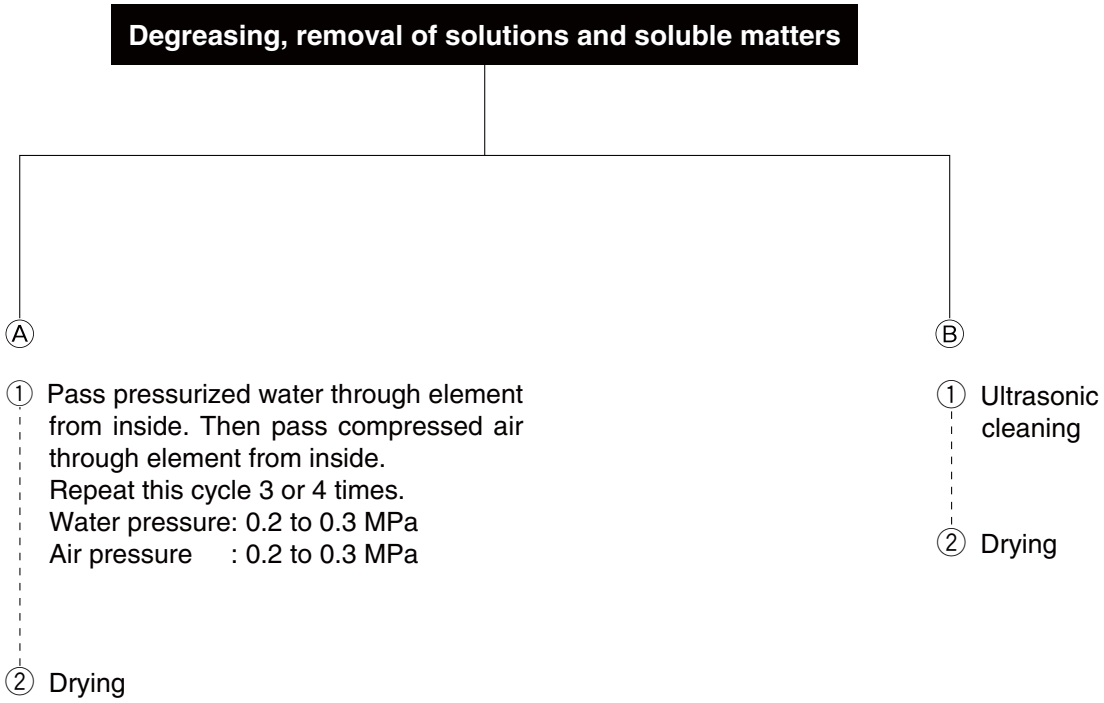


(∗2)

Sintered Metal Element

Cleaning Method

According to the clogged material and clogging condition, select an appropriate cleaning method from those shown below. A combination of both methods may yield greater results.



Sintered Metal Element
Specific Product Precautions 1

Be sure to read this before handling the products.

Precautions on Design

⚠Caution

1. Strength

The elements are made of porous material with voids inside. Therefore their tensile strength compared to conventional stainless steel or bronze products is lower by a factor of one or two magnitudes. Depending on the application conditions, reinforcing material may be required. Use punched metal or similar for reinforcement.

2. Operating temperature

The operating temperature range given in the specifications (page 106) is the range in which material strength does not deteriorate significantly.

In an oxidizing atmosphere (atmospheric air), the temperature point where oxidization and discoloring begins is 100°C for bronze elements and 250°C for stainless steel elements.

3. Fatigue breakdown

Fatigue breakdown may occur under the following conditions:

1) Element is subject to vibrations
2) Element is subject to cyclic thermal expansion and contraction

In such cases, use suitable countermeasures such as vibration dampers or punched metal reinforcements to support the element, or employ a construction that absorbs thermal expansion and contraction.

4. End configuration

For information on end configurations of cylinder elements (open or with bottom), check the notes and configuration information on the page for the respective product in this catalog. When devising applications, make sure that there are no problems such as improper sealing or leaks due to the end configurations.

5. Particle separation

When cutting is performed, particle chipping will occur at edge sections. This is especially noticeable with products rated for high nominal filtration accuracy (μm) values. Particle chipping and other machining problems may also occur at edges of products that are not finished by cutting. Carefully check sealing properties before use.

6. Welded products (Stainless steel elements)

Welded stainless steel elements are produced by argon welding. Consequently, problems such as uneven height, distortion, warping, raised beads etc. may be present.

Discoloration of sections exposed to heat may not be completely removed by cleaning.

7. Cleaning

The products of sintered metal elements in the table are cleaned before shipping, but not to clean room standards. Before use in a clean room, elements must be cleaned and flushed by the customer, and application suitability must be verified.

Bronze element	Oxide bath cleaning	Note)
Stainless steel element	Oxide bath cleaning → Passivation (Nitric acid bath)	Welded products
	Passivation (Nitric acid bath)	Non-welded finished products

Note) Products with nominal filtration accuracy of 2 to 10 micron and 5 t or higher may exhibit discoloration by oxide bath cleaning.

⚠Caution

8. Corrosion

Note that corrosion will occur, depending on usage and ambient conditions. Major corrosive substances and corrosion conditions are listed below. Be sure to check this information.

Bronze elements

Category	Corrosive substances and corrosion conditions
Acid, alkali	Use in solutions with ferric or cupric ion content or ammonium content not possible, due to corrosion
	Use in nitric acid, sulfur, and hydrochloric acid not possible, due to corrosion
Atmosphere	Corrosion caused by hydrogen sulfide (H_2S) and sulfurous acid (SO_2)
Sea water	Products have some resistance but long-term use will cause corrosion
Fresh water	Corrosion caused by presence of carbonic acid (carbonation)

Stainless steel elements

Category	Corrosive substances and corrosion conditions
Acid, alkali, etc.	Sulfur, hydrochloric acid, etc. Corrosion may be accelerated by density, temperature, halogen (especially chlorine) ion content, etc.
	Nitric acid Compared to sulfur, hydrochloric acid etc., resistance is better due to passivity, but under certain conditions, corrosion may occur.
	Corrosion due to sodium hydroxide and potassium hydroxide Corrosion will be intensified by introduction of dissolved oxygen
	Sodium chloride, sodium bromide etc.
Atmosphere	Corrosion caused by CO_2, SO_2, NH_3 etc. in the atmosphere, and by temperature and other atmospheric conditions
Sea water	Corrosion depending on chlorine ion content, dissolved oxygen content, and organic matter
Fresh water	Corrosion caused by halogen (especially chlorine) ion content, deposits, etc.
	Corrosion caused by presence of carbonic acid (carbonation)
High-temperature water	Corrosion is accelerated at higher temperatures
Steam	Corrosion is accelerated at higher temperatures

9. Discoloration

1) Elements can be discolored by foreign matter deposits, oxidization by flow medium, and other conditions.
In particular, as for the bronze element, a dark red CuO film is formed by the moisture included in the atmosphere and the product may be discolored when unpacked. However, this does not affect the product characteristics. If the discoloration of the bronze element is pointed out as appearance problem, Ni plating treatment is available. For details, contact SMC.

2) A portion that may be seen as black point may rarely occur on the element surface.
This is caused by raw materials included in the raw material powder and does not adversely affect the product performance.

Sintered Metal Element
Specific Product Precautions 2

Be sure to read this before handling the products.

Precautions on Design

⚠Caution

11. Nominal filtration accuracy

Nominal filtration accuracy of sintered metal elements is a classification rating using the particle size of the raw material. (This is different from the filtration rating with regard to the flow medium.) For reference, particle sizes that can be removed with an efficiency of 95% (in air and water) at different nominal filtration accuracy ratings are listed below.

Nominal filtration accuracy and 95% removable particle sizes (reference)

Nominal filtration accuracy (μm)	95% removable particle size (μm)			
	Flow medium: Air		Flow medium: Water	
	Bronze (BC)	Stainless steel (SUS)	Bronze (BC)	Stainless steel (SUS)
120	—	—	244	110
100	—	—	177	87
70	—	—	104	66
40	3.6	2.5	90	45
20	2.8	2	59	31
10	2.1	1.5	32	20
5	1.5	1.1	20	15
2	1	0.7	17	10

Installation

⚠Caution

1. Installation of standard elements with fitting

When the element is held with a tool directly, this may cause damage to the element, resulting in breakage.

1) Connection thread M3
   First tighten by hand and then use a suitable wrench on the hex sleeve of the fitting to tighten further by about 1/4 turn.
   Tighten the ESKA-Z2701-□ by hand. Do not grip the sintered part with pliers or other tools.
2) Connection thread M5
   First tighten by hand and then use a suitable wrench on the hex sleeve of the fitting to tighten further by about 1/6 turn.
   Tighten the ESKA-Z2702-□ by hand. Do not grip the sintered part with pliers or other tools.
3) Connection thread R (pipe taper thread)
   First tighten by hand and then use a suitable wrench on the hex sleeve of the fitting to tighten further.

Connection thread	Suitable tightening torque (N·m)
R1/8	7 to 9 *
R1/4	12 to 14
R3/8	22 to 24
R1/2	28 to 30

* Tighten the ESKA-Z2801-□ by hand. Do not grip the sintered part with pliers or other tools.

Operating Environment

⚠Caution

1. **Discoloration and material degradation may occur if used in a corrosive atmospheric environment.**
   Severe corrosion will cause the product to lose its filtering functionality.
2. **When the product is subject to vibrations or shock, fatigue breakdown may occur. Provide suitable reinforcement to avoid such conditions.**

Storage

⚠Caution

1. **Keep the product indoors and in its packing until use.**
   Protect the product from water, humidity, and high temperatures, to avoid discoloration and corrosion.
2. **Do not place any objects on top of the product.**
   Otherwise there is a risk of deformation or breakage.

Maintenance

⚠Caution

1. **Pressure drop ΔP will change depending on operating conditions.**
   Pressure drop ΔP is one of the performance parameters of the element. Establish suitable management standards for this parameter.
2. **Be aware of individual product warranty conditions and exclusions.**
   In the case of sintered metal products, conditions such as filter performance degradation due to clogging and discoloration are not covered by the warranty, even during the warranty period.