

How to Order

MHSJ 3 — **32** **D** — **F9N**

With dust cover • Number of fingers • **3** 3 fingers • **32** 32mm • **D** Double acting • **F9N** • Number of auto switches

Nil	2 pcs.
S	1 pc.

Auto switch type • **Nil** Without auto switch (built-in magnet)

Auto switch specifications

Type	Special function	Electrical entry	Indicator light	Wiring (output)	Load voltage		Auto switch models		Lead wire length (m)*			Applicable loads	
					DC	AC	Electrical entry direction		0.5 (Nil)	3 (L)	5 (Z)		
							Perpendicular	In-line					
Solid state	—	Grommet	Yes	3 wire (NPN)	24V	5V, 12V	—	F9NV	F9N	●	●	—	Relay, PLC
				3 wire (PNP)				F9PV	F9P	●	●	—	
				2 wire	—	F9BV	F9B	●	●	—			
					Water resistant (2 color indicator)	F9BA	—	●	○	—			

Dust cover type •

Nil	Chloroprene rubber (CR)
F	Fluoro rubber (FKM)
S	Silicon rubber (SI)

* Lead wire length symbols: 0.5m Nil (Example) F9B
3m L (Example) F9BL
5m Z (Example) F9BZ

D-F9BA is available only as "L".
* Auto switches marked with a "O" symbol are produced upon receipt of order.
Note 1) Take note of hysteresis with 2 color indication type switches.
Note 2) Refer to pages 53 through 65 for detailed auto switch specifications.

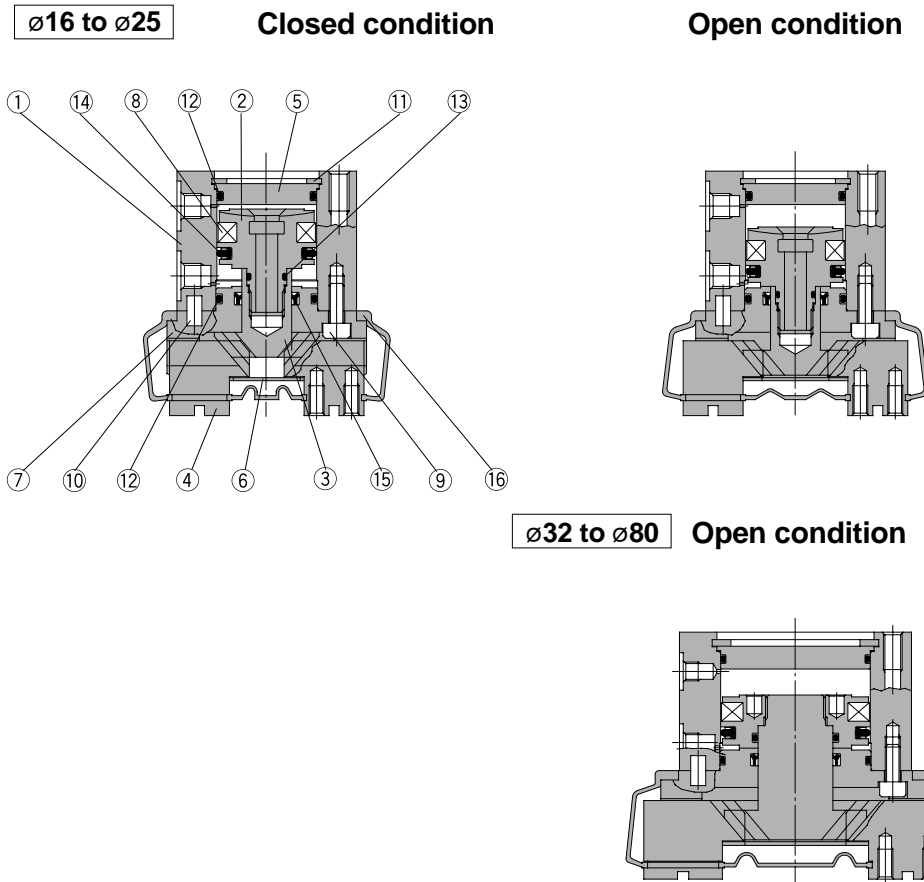
Models and Specifications



Model	MHSJ3-16D	MHSJ3-20D	MHSJ3-25D	MHSJ3-32D	MHSJ3-40D	MHSJ3-50D	MHSJ3-63D	MHSJ3-80D
Cylinder bore size mm	16	20	25	32	40	50	63	80
Fluid	Air							
Operating pressure MPa (psi)	0.2 to 0.6 (29 to 87)				0.1 to 0.6 (14 to 87)			
Ambient and fluid temperature	-10 to 60°C (14 to 140°F)							
Repeatability mm	±0.01							
Max. operating frequency c.p.m.	120				60			
Lubrication	Non-lube							
Action	Double acting							
Effective gripping force N (lbf) at pressure of 0.5MPa (72psi)	9 (2.0) External gripping force 16 (3.6) Internal gripping force	21 (4.7) 28 (6.3)	36 (8.1) 47 (10.6)	62 (13.9) 82 (18.4)	97 (21.8) 130 (29)	155 (35) 204 (46)	280 (63) 359 (81)	400 (90) 525 (118)
Opening/closing stroke mm (dia.)	4	4	6	8	8	12	16	20
Weight g (oz)	95 (3.4)	150 (5.3)	230 (8.1)	440 (15.5)	620 (21.9)	1,050 (37)	1,800 (64)	3,200 (113)

Note 1) Values for ø16 to ø25 are with gripping point L = 20mm, for ø32 to ø63 with gripping point L = 30mm, and for ø80 to ø125 with gripping point L = 50mm.
Refer to the "Effective Gripping Force" data on pages 18 through 20 for the gripping force at each gripping position.
Note 2) Open and closed diameter values apply for external gripping of work pieces.

Construction



Parts list

No.	Description	Material	Note
1	Body	Aluminum alloy	Hard anodized
2	Piston	$\varnothing 16$ to $\varnothing 25$: Stainless steel $\varnothing 32$ to $\varnothing 80$: Aluminum alloy	Hard anodized
3	Cam (J)	Carbon steel	Heat treated, Specially treated
4	Finger	Carbon steel	Heat treated, Specially treated
5	Cap (J)	Aluminum alloy	Hard anodized
6	End plate (J)	Stainless steel	
7	Guide	Aluminum alloy	Hard anodized

No.	Description	Material	Note
8	Rubber magnet	Synthetic rubber	
9	Hexagon socket head screw	Carbon steel	Nickel plated
10	Parallel pin	Stainless steel	
11	C type snap ring	Carbon steel	Nickel plated
12	Gasket	NBR	
13	Gasket	NBR	
14	Piston seal	NBR	
15	Rod seal	NBR	

Replacement parts/Seal kits

Kit number								Contents
MHSJ3-16D	MHSJ3-20D	MHSJ3-25D	MHSJ3-32D	MHSJ3-40D	MHSJ3-50D	MHSJ3-63D	MHSJ3-80D	
MHSJ16-PS	MHSJ20-PS	MHSJ25-PS	MHSJ32-PS	MHSJ40-PS	MHSJ50-PS	MHSJ63-PS	MHSJ80-PS	A set of the above Nos. 12, 13, 14 & 15

* Seal kits are sets consisting of items 12, 13, 14 and 15, which can be ordered using the kit number for each cylinder bore size.

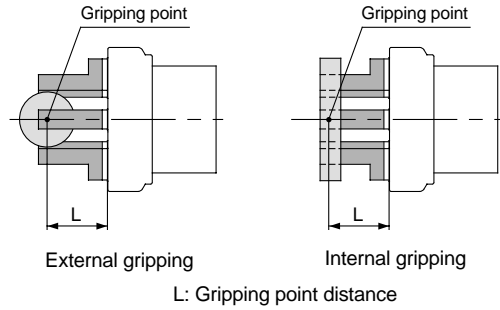
Replacement parts/Dust cover (J)

No.	Description	Material	Part number							
			MHSJ3-16D	MHSJ3-20D	MHSJ3-25D	MHSJ3-32D	MHSJ3-40D	MHSJ3-50D	MHSJ3-63D	MHSJ3-80D
16	Dust cover (J)	CR ^{Note)}	MHSJ3-J16	MHSJ3-J20	MHSJ3-J25	MHSJ3-J32	MHSJ3-J40	MHSJ3-J50	MHSJ3-J63	MHSJ3-J80
		FKM ^{Note)}	MHSJ3-J16F	MHSJ3-J20F	MHSJ3-J25F	MHSJ3-J32F	MHSJ3-J40F	MHSJ3-J50F	MHSJ3-J63F	MHSJ3-J80F
		Si ^{Note)}	MHSJ3-J16S	MHSJ3-J20S	MHSJ3-J25S	MHSJ3-J32S	MHSJ3-J40S	MHSJ3-J50S	MHSJ3-J63S	MHSJ3-J80S

Note) CR: Chloroprene rubber, FKM: Fluoro rubber, Si: Silicon rubber

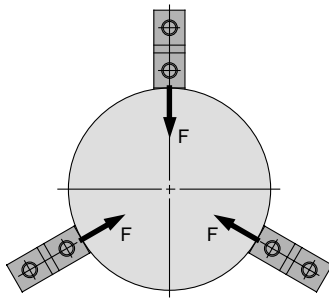
Gripping Point

- The work piece gripping point distance should be within the gripping force ranges given for each pressure in the effective gripping force graphs below.
- If operated with the work piece gripping point beyond the indicated ranges, an excessive offset load will be applied to the sliding section of the fingers, which can have an adverse effect on the service life of the product.

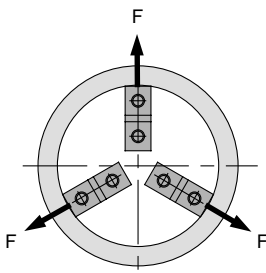


Effective Gripping Force

- Expressing the effective gripping force
- The effective gripping force shown in the graphs to the right is expressed as F, which is the impellent force of one finger when all 3 of the fingers and attachments are in full contact with the work piece as shown in the figure below.



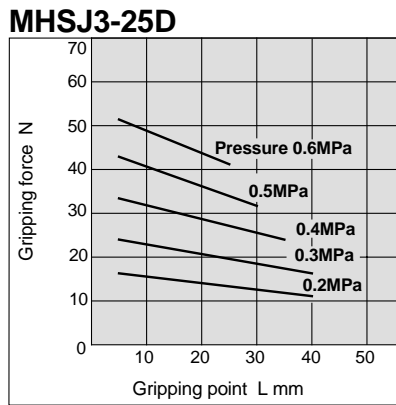
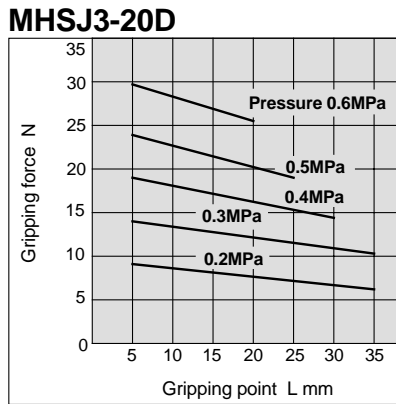
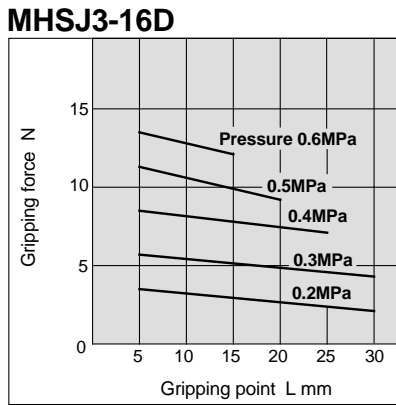
External gripping



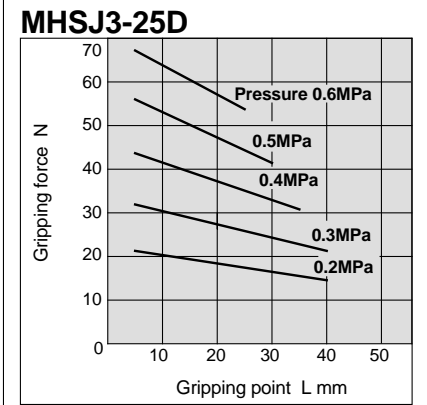
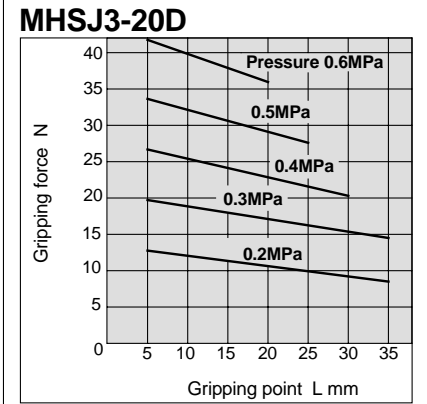
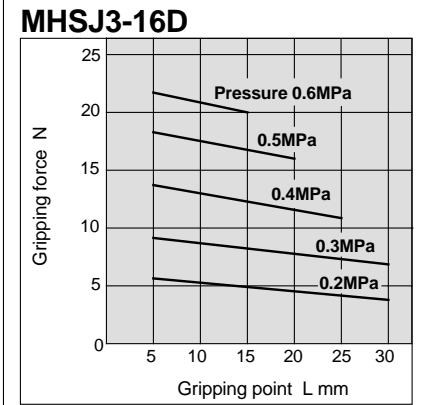
Internal gripping

Note: 1N = 0.2248lbf
1in = 25.4mm
1MPa = 145psi

External gripping force

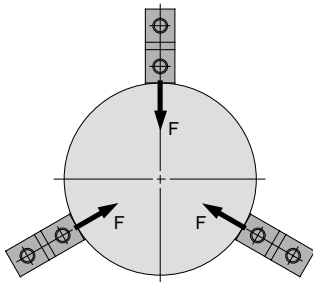


Internal gripping force

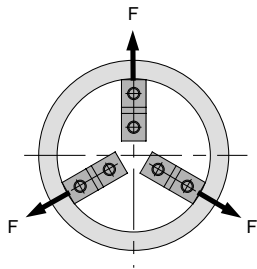


Effective Gripping Force

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 The effective gripping force shown in the graphs to the right is expressed as F, which is the impellent force of one finger when all 3 of the fingers and attachments are in full contact with the work piece as shown in the figure below.



External gripping

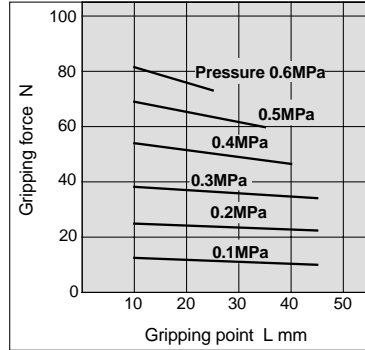


Internal gripping

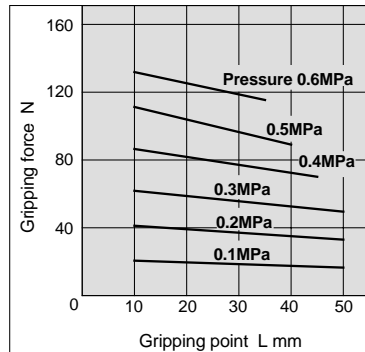
Note: 1N = 0.2248lbf
 1in = 25.4mm
 1MPa = 145psi

External gripping force

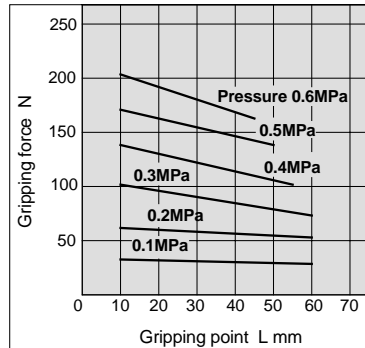
MHSJ3-32D



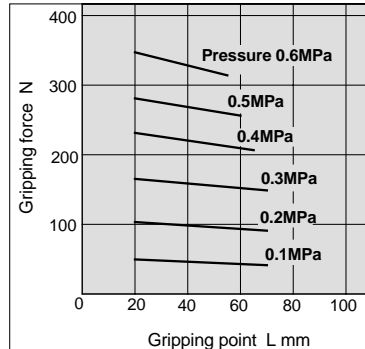
MHSJ3-40D



MHSJ3-50D

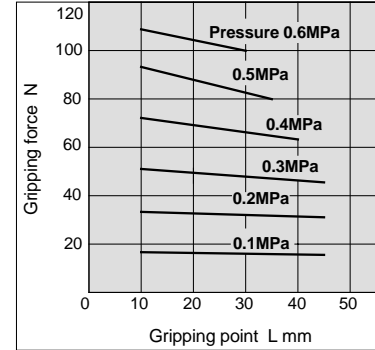


MHSJ3-63D

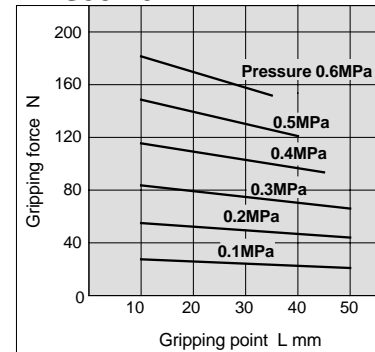


Internal gripping force

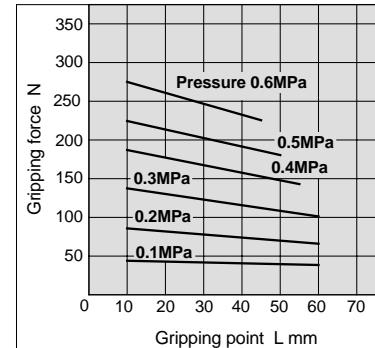
MHSJ3-32D



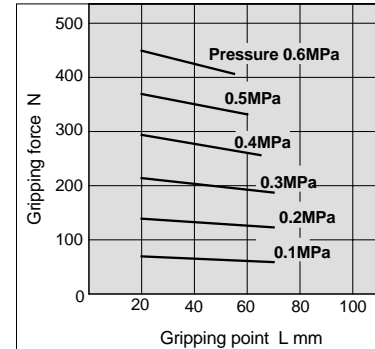
MHSJ3-40D



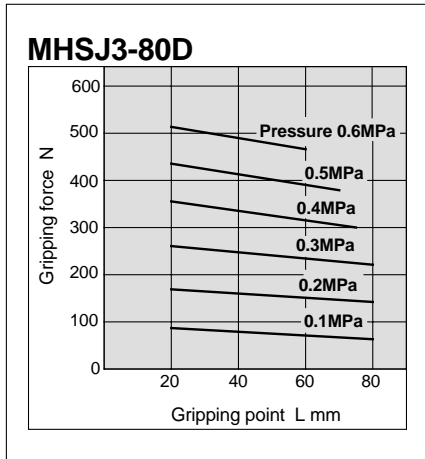
MHSJ3-50D



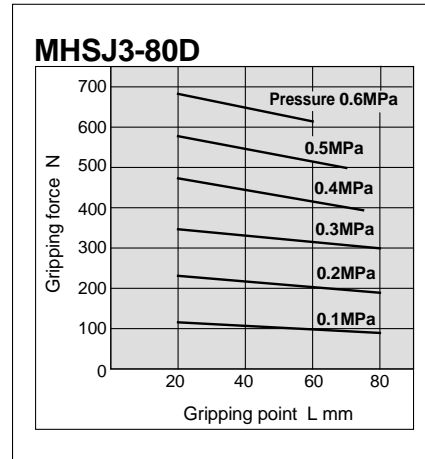
MHSJ3-63D



External gripping force



Internal gripping force



Note: 1N = 0.2248lbf
 1in = 25.4mm
 1MPa = 145psi

2 finger MHSJ2

3 finger MHSJ3

With dust cover MHSJ3

Through hole MHSJ3

Long stroke MHSJ3

4 finger MHSJ4

Auto switches

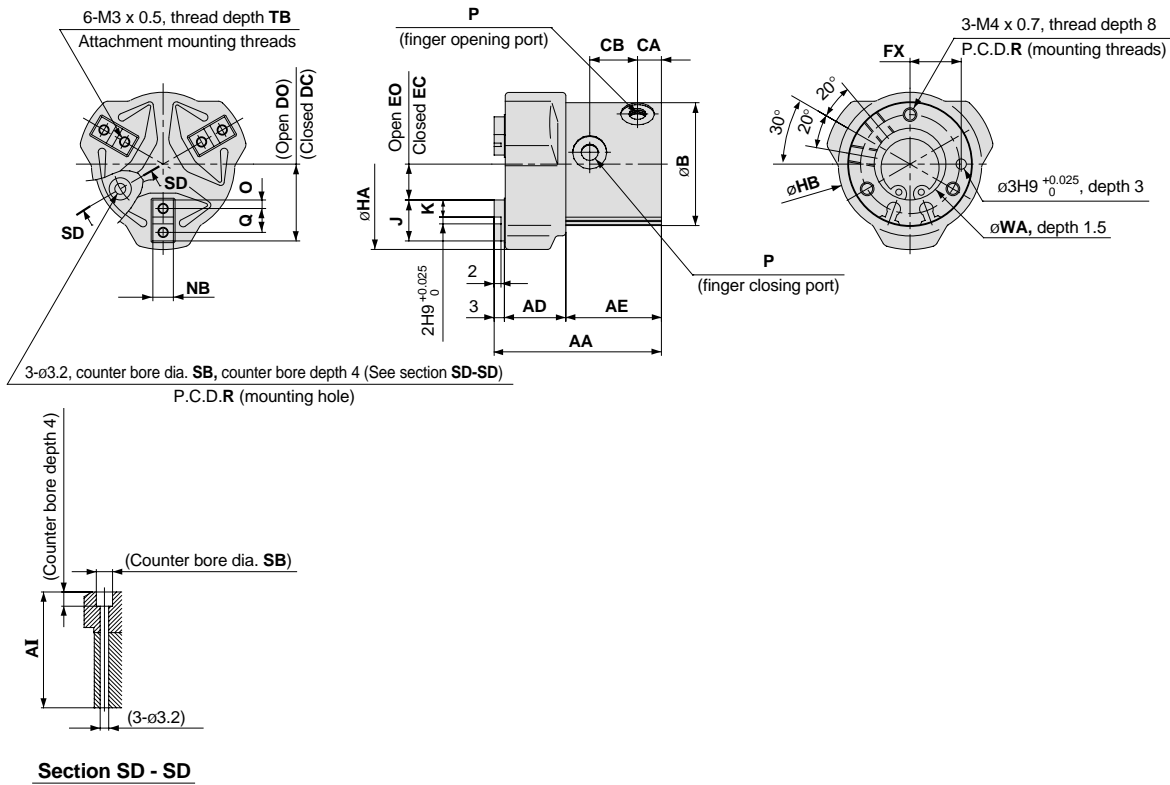
Model selection

Precautions

Dimensions (mm)

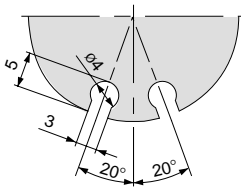
1 in = 25.4mm

MHSJ3-16D to 25D

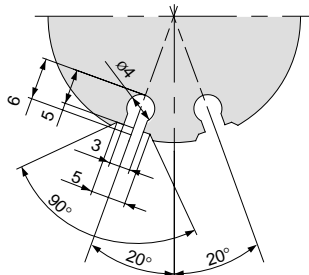


Auto switch mounting groove positions (2 locations)

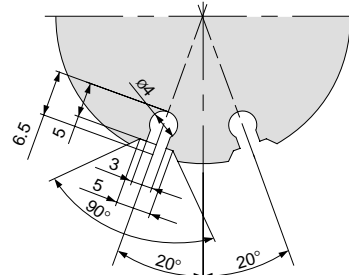
MHSJ3-16D



MHSJ3-20D



MHSJ3-25D



(mm)

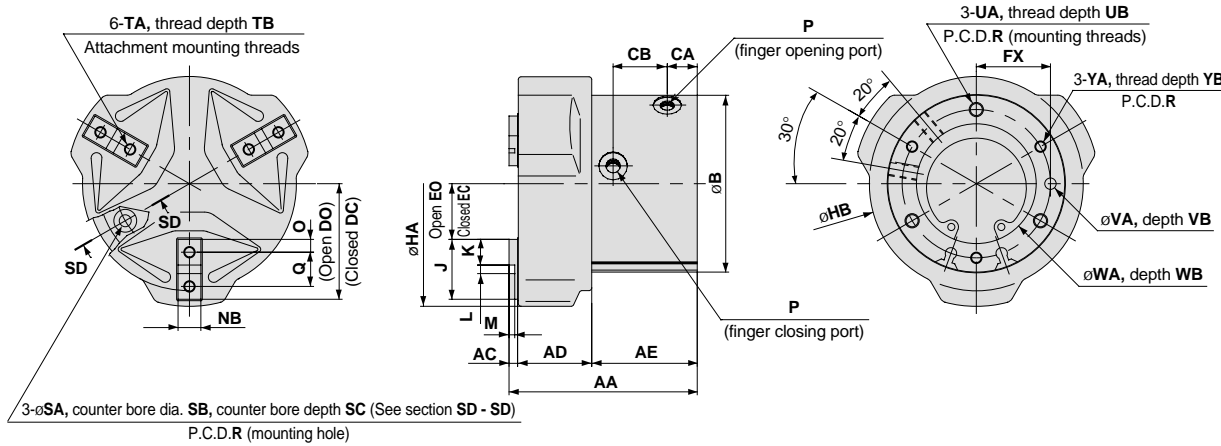
Model	AA	AD	AE	AI	B	CA	CB	DC	DO	EC	EO	FX	HA	HB	J	K	NB	O	P	Q
MHSJ3-16D	46	16	27	39	30	7	14	17.5	19.5	7.5	9.5	12	44	36	10	4	5h9 ₀ ^{0.030}	2	M3 x 0.5	6
MHSJ3-20D	49	18	28	42	36	7	14	20	22	8	10	15	50	42	12	5	6h9 ₀ ^{0.030}	2.5	M5 x 0.8	7
MHSJ3-25D	55	20	32	47	42	7.5	17.5	23.5	26.5	9.5	12.5	18	59	50	14	6	6h9 ₀ ^{0.030}	3	M5 x 0.8	8

Model	R	SB	TB	WA
MHSJ3-16D	24	6	5	17H9 ₀ ^{+0.043}
MHSJ3-20D	29	6.5	6	21H9 ₀ ^{+0.052}
MHSJ3-25D	34	6.5	6	26H9 ₀ ^{+0.052}

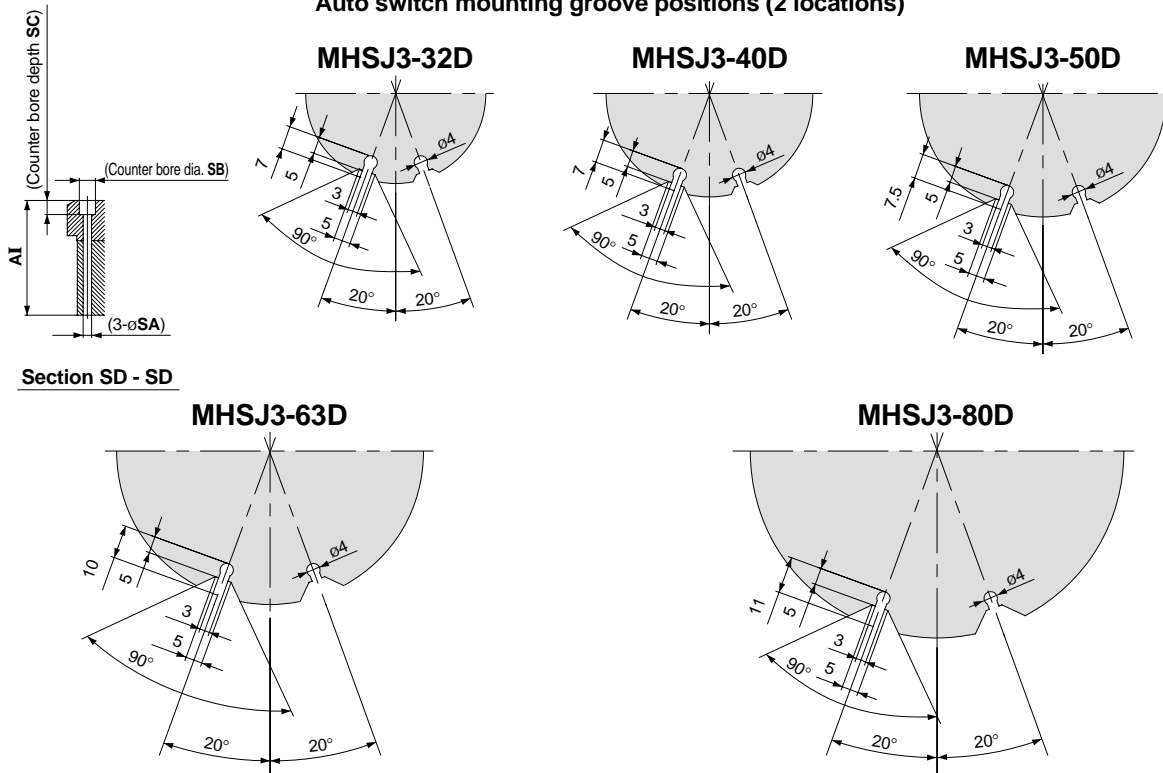
Dimensions (mm)

1in = 25.4mm

MHSJ3-32D to 80D



Auto switch mounting groove positions (2 locations)



Section SD - SD

Model	AA	AC	AD	AE	AI	B	CA	CB	DC	DO	EC	EO	FX	HA	HB	J	K	L	M	NB
MHSJ3-32D	63	3	24	36	54	54	9.5	19	31.5	35.5	11.5	15.5	22	76	65	20	9	2H9 ^{+0.025} ₀	2	8h9 ₀ ^{-0.036}
MHSJ3-40D	66	3	26	37	57	62	10.5	19	36	40	15	19	26	86	75	21	9	3H9 ^{+0.025} ₀	2	8h9 ₀ ^{-0.036}
MHSJ3-50D	80	3	31	46	70	74	11.5	26.5	42	48	18	24	32	103	88	24	10	4H9 ^{+0.030} ₀	2	10h9 ₀ ^{-0.036}
MHSJ3-63D	91	4	37	50	79	92	13	28	51	59	23	31	40	125	106	28	11	6H9 ^{+0.030} ₀	3	12h9 ₀ ^{-0.043}
MHSJ3-80D	108	5	46	57	93	112	14	31	63	73	31	41	50	158	130	32	12	8H9 ^{+0.036} ₀	4	14h9 ₀ ^{-0.043}

Model	O	P	Q	R	SA	SB	SC	TA	TB	UA	UB	VA	VB	WA	WB	YA	YB
MHSJ3-32D	4.5	M5 x 0.8	11	44	4.2	8	7	M4 x 0.7	8	M5 x 0.8	10	4H9 ^{+0.030} ₀	4	34H9 ^{+0.062} ₀	2	M4 x 0.7	8
MHSJ3-40D	4.5	M5 x 0.8	12	52	4.2	8	7	M4 x 0.7	8	M5 x 0.8	10	4H9 ^{+0.030} ₀	4	42H9 ^{+0.062} ₀	2	M4 x 0.7	8
MHSJ3-50D	5	M5 x 0.8	14	63	5.1	9.5	8	M5 x 0.8	10	M6 x 1	12	5H9 ^{+0.030} ₀	5	52H9 ^{+0.074} ₀	2	M5 x 0.8	10
MHSJ3-63D	5.5	M5 x 0.8	17	78	6.6	11	8	M5 x 0.8	10	M8 x 1.25	16	6H9 ^{+0.030} ₀	6	65H9 ^{+0.074} ₀	2.5	M6 x 1	12
MHSJ3-80D	6	Rc 1/8	20	98	6.6	11	8	M6 x 1	12	M8 x 1.25	16	6H9 ^{+0.030} ₀	6	82H9 ^{+0.087} ₀	3	M6 x 1	12

2 finger MHS2

3 finger MHS3

With dust cover MHSJ3

Through hole MHSJ3

Long stroke MHSJ3

4 finger MHS4

Auto switches

Model selection

Precautions

Solid-state Auto Switches for Direct Mounting Series D-M9N(V)/D-M9P(V)/D-M9B(V)



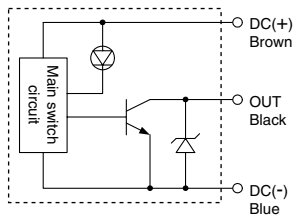
Grommet

- Reduced load currents for two-wire model (2.5 to 40 mA)
- Compliance with lead-free requirements
- Use of UL-approved lead wires (style 2844)

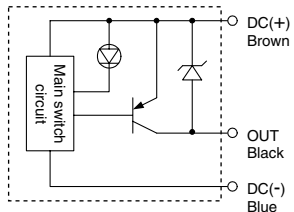


Internal circuits

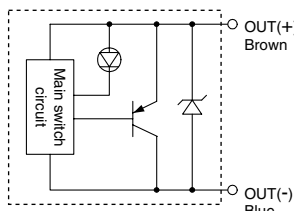
D-M9N/M9NV



D-M9P/M9PV



D-M9B/M9BV



Auto Switch Specifications

PLC: Programmable Logic Controller

D-M9□/D-M9□V (with Indicator light)						
Model number	D-M9N	D-M9NV	D-M9P	D-M9PV	D-M9B	D-M9BV
Electrical entry	In-line	Perpendicular	In-line	Perpendicular	In-line	Perpendicular
Wiring	Three-wire			Two-wire		
Output	NPN		PNP		—	
Applicable load	Integrated circuit, relay and PLC				24 V DC relay and PLC	
Power voltage	5, 12, or 24 V DC (4.5 to 28 V DC)				—	
Current consumption	10 mA or less				—	
Load voltage	28 V DC or less		—		24 V DC (10 to 28 V DC)	
Load current	40 mA or less				2.5 to 40 mA	
Internal voltage drop	0.8 V or less				4 V or less	
Leakage current	100 μA max. at 24 V DC				0.8 mA or less	
Indicator light	Red LED lights when ON.					

- Lead wire: oil-proof heavy-duty vinyl cable
 2.7 x 3.2 with elliptic cross-section, 0.15 mm², two cores (D-M9B),
 or three cores (D-M9N and D-M9P)

Solid state switch specifications

Leakage current	3-wire: 100 μA or less; 2-wire: 0.8 mA max.
Operating time	1 ms or less
Impact resistance	1000 m/s ²
Insulation resistance	50 MΩ or more at 500 V DC (between lead wire and case)
Withstand voltage	1000 V AC for 1 min. (between lead wire and case)
Ambient temperature	-10°C to 60°C
Enclosure	IEC529 standard IP67, JIS C 0920 watertight construction

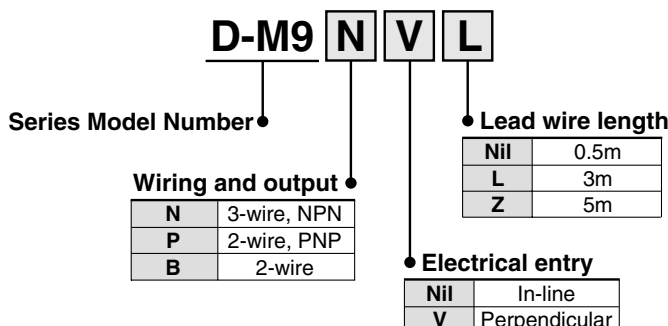
Weight

Unit: g

Model	D-M9N(V)	D-M9P(V)	D-M9B(V)
Lead wire length (m)	0.5	8	7
	3	41	38
	5	68	63

How to Order

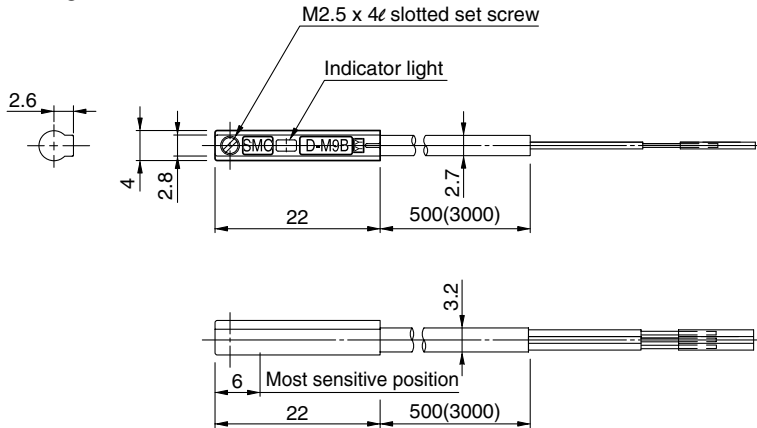
Standard Model Number



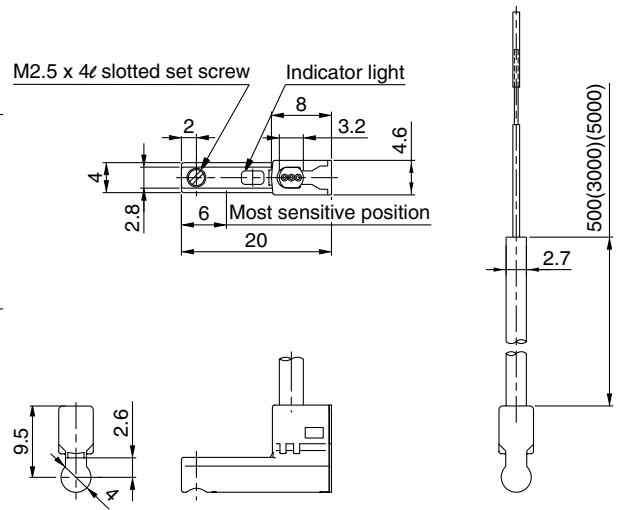
Series D-M9

Auto Switch Dimensions

D-M9□



D-M9□V



⚠ Specific Product Precautions

Be sure to read before handling. Contact SMC when the required specification is out of range.

Handling

⚠ Caution

Observe the following precautions when handling the product.

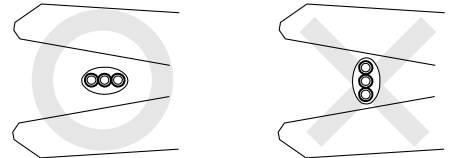
- The D-M9 series of auto switches is not overcurrent-protected. Faulty wiring or short circuit may result in breakage or burning-out of the switch.
- When stripping the cable clad, be careful about the orientation of the cable being stripped. The insulator may be accidentally torn or damaged depending on the orientation, as shown on the right.

- We recommend the following tools

Manufacturer	Product name	Product number
VESSEL	Wire stripper	No 3000G
Tokyo Ideal	Strip master	45-089

* The stripper for the round shape cords (ø2.0) is for a 2-wire style.

- Please do not attach the switch with any other screws than those already attached to the auto switch body.



The operation range is shorter than that of the conventional models.

If the auto switch replaces the conventional model, it may not function depending on its application because the operation range is shorter. Refer to the examples below.

- In an application where at the end, the stopping position shifting range is larger than the operation range. For example, pushing a work against something, or pressing a work into a hole, or clamping a work.
- In an application where the auto switch is used to detect an intermediate stopping position. (Detecting time is shortened.)

Note) Please contact SMC for the operation range details for each actuator.

The switch is damaged instantly when a load is shortened since short circuit protection is not built-in. Pay special attention to avoid reversing the connection of the brown lead of the power supply line and the black output line connection.