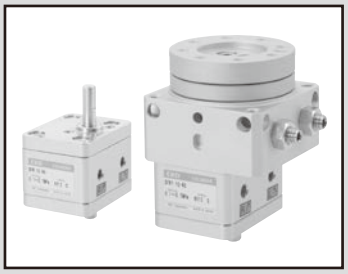


Fine Speed Rotary Axis type

SFR Series

Fine Speed Rotary Table type

SFRT Series

● Size: 3, 10, 20

JIS symbol

RoHS

Specifications

Item			SFR-3	SFR-10	SFR-20	SFRT-3	SFRT-10	SFRT-20
Size			3	10	20	3	10	20
Effective torque Note 1	90°		0.47	1.44	2.71	0.47	1.44	2.71
N•m	180°		0.35	1.08	2.03	0.35	1.08	2.03
Working fluid			Compressed air					
Actuation	90°		Vane type					
	180°		Vane and pinion gear type					
Max. working pressure		MPa	0.7					
Min. working pressure		MPa	0.1					
Proof pressure		MPa	1.05					
Ambient temperature		°C	0 to 60 (there should be no freezing)					
Port size			M5					
Permission absorbed energy		mJ	0.8	1.7	3.5	1.3	6.3	9.6
Lubrication			Unnecessary (use ISOVG32 turbine oil for lubrication)					
Internal volume		cm^3	3.7	9.1	19.4	3.7	9.1	19.4
Weight	90°	g	70	120	250	200	350	560
	180°	g	120	220	430	230	430	690
Allowable radial load	Note 2	N	40	50	300	40	50	60
Allowable thrust load	Note 2	N	13	16	20	30	60	80
Allowable moment		N•m	−			0.7	0.9	2.9
Oscillating angle adjustment range	90°		−			90°±5°		
	180°		−			180°±5°		
Oscillating time adjustment range		sec/90°	0.07 to 1.5					
Table deflection accuracy		mm	−			0.03		
Backlash (SFR-180 type only)		Note 3	1.5° or less	2.5° or less	2.5° or less	−	−	−

Note 1: The effective torque is for when the working pressure is 0.5 MPa.
Note 2: The SFR allowable radial load and allowable thrust load values are not dynamic load values.
Note 3: The backlash values are reference values.
* The SFR-□-180 shaft type oscillating angle is 190°.

Switch Specifications

Item	Contactless 2-wire type	Contactless 3-wire type
	F2S	F3S
Application	For programmable controller only	For programmable controller, relays
Output method	−	NPN output
Power supply voltage	−	10 to 28 VDC
Load voltage	10 to 30 VDC	30 VDC or less
Load current	5 to 20mA	50mA or less
Indicator lamp	Illuminates when LED ON	
Leakage current	1mA or less	10μA or less

Note 1: The above maximum load current value of 20mA is at 25°C. The current will be lower than 20mA if ambient temperature around the switch is higher than 25 °C. (5 to 10mA at 60 °C)

How to Order

●Without switch

SFR - 10 - 90

●With switch

SFRT - 20 - 180 - F2S - D

Ⓐ Model No.
Ⓑ Size
Ⓒ Oscillating angle
Ⓓ Switch model No.
Ⓔ Number of switches

Code	Descriptions
Ⓐ Model No.	
SFR	Shaft type
SFRT	Table type

Ⓑ Size	
Size	**Effective torque (when 0.5MPa)**
3	0.3 [N·m]
10	1.0 [N·m]
20	2.0 [N·m]

Ⓒ Oscillating angle	
90	90°
180	180°

Ⓓ Switch model No.			
Model	**Contacts**	**Display**	**Lead wires**
F2S *	Contactless	Single-color display	2 wires
F3S *			3 wires

*** Lead wire length**	
Blank	1 m (standard)
3	3 m (option)

Ⓔ Number of switches	
R	1 right rotation detection switch
L	1 left rotation detection switch
D	2

[Model No. indication example]

SFRT-20-180-F2S-D

Ⓐ Model : Table type SFRT
Ⓑ Size : 2.0 N·m
Ⓒ Oscillating angle : 180°
Ⓓ Switch model No. : F2S
Ⓔ Number of switches : 2

●Switch unit model No. indication method

SFR - F2S - D - 3

Ⓐ Switch model No.
Ⓑ Number of switches
Ⓒ Size

Code	Descriptions
Ⓐ Switch model No.	
Model	**Contacts** / **Display** / **Lead wires**
F2S *	Contactless / Single-color display / **2 wires**
F3S *	Contactless / Single-color display / **3 wires**

*** Lead wire length**	
Blank	1 m (standard)
3	3 m (option)

Ⓑ Number of switches	
S	1
D	2

Ⓒ Size	
3	Effective torque 0.3 [N·m] type
10	Effective torque 1.0 [N·m] type
20	Effective torque 2.0 [N·m] type

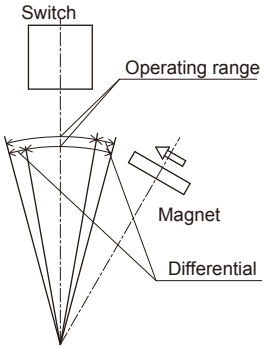
[Model No. indication example]

SFR-F2S-D-3

Ⓐ Switch model No. : F2S
Ⓑ Number of switches : 2
Ⓒ Size : Effective torque 0.3 [N·m] type

Switch Operating Range

Item	F2S, F3S	
Model No.	Operating range	Differential
SFR, SFRT	10 to 20°	5° or less



Switch Part Configuration

· With 1 switch

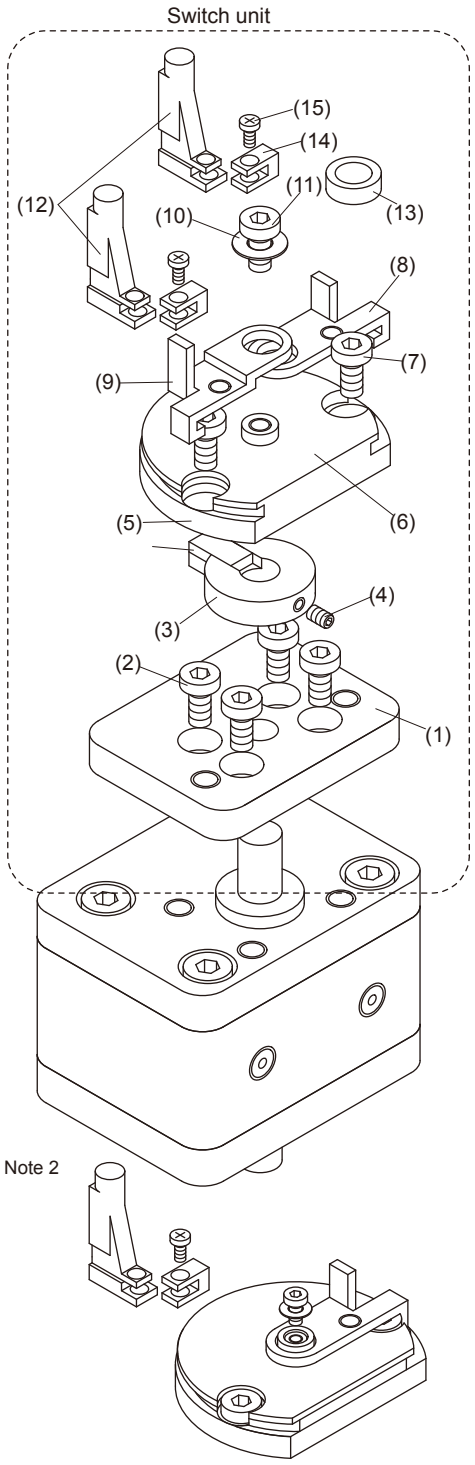
Part No.	Part name	Qty	
(1)	Switch unit mounting plate	1	Note 1
(2)	Mounting bolt	4	
(3)	Magnet holder	1	Note 1
(4)	Magnet holder set screw	1	
(5)	Magnet	1	
(6)	Switch unit	1	
(7)	Mounting bolt	2	
(8)	Switch holder 1	1	
(9)	Switch holder 2	–	
(10)	Plain washer	1	
(11)	Switch holder securing bolt	1	
(12)	Type F switch	1	
(13)	Spacer	1	Note 2
(14)	Securing nut	1	
(15)	Switch mounting screw	1	

· With 2 switch

Part No.	Part name	Qty	
(1)	Switch unit mounting plate	1	Note 1
(2)	Mounting bolt	4	
(3)	Magnet holder	1	Note 1
(4)	Magnet holder set screw	1	
(5)	Magnet	1	
(6)	Switch unit	1	
(7)	Mounting bolt	2	
(8)	Switch holder 1	1	
(9)	Switch holder 2	1	
(10)	Plain washer	1	
(11)	Switch holder securing bolt	1	
(12)	Type F switch	2	
(13)	Spacer	–	Note 2
(14)	Securing nut	2	
(15)	Switch mounting screw	2	

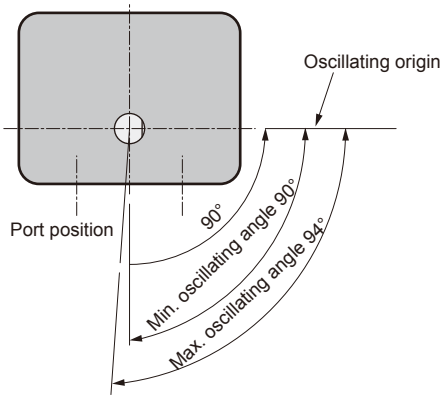
Note 1 : The switch unit mounting plates and magnet holders differ based on the size. Other parts are the same for all sizes.

Note 2 : On units with 1 switch, units are mounted with the (10) plain washer and (13) spacer inserted between the (8) switch holder and (11) switch holder securing bolt. (See drawing on right)

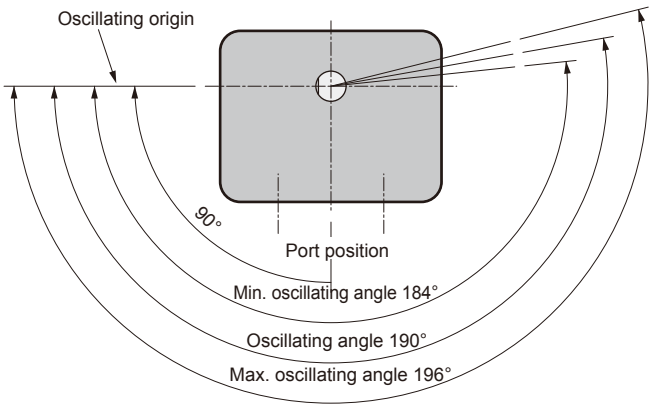


Oscillating Origin and Oscillating Direction

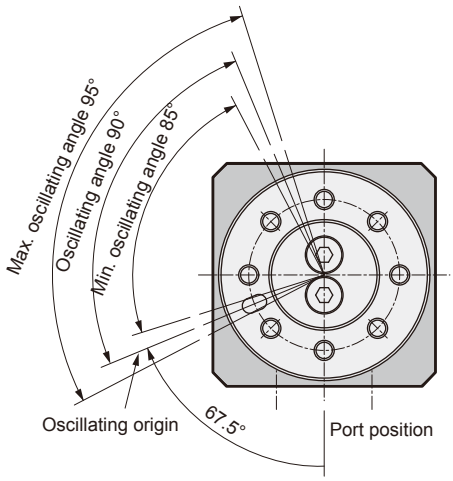
●SFR-□-90



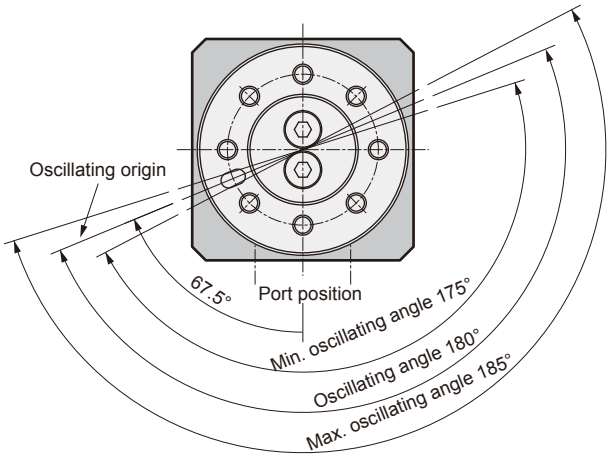
●SFR-□-180



●SFRT-□-90



●SFRT-□-180

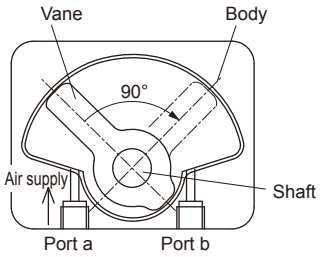


Operating Principle

● 90° type

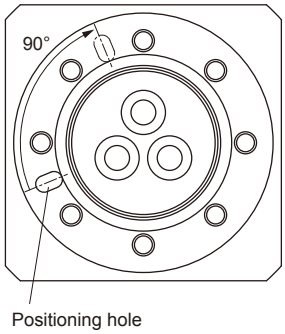
(1) When table positioning hole oscillates clockwise

Vane section



By supplying air from port a, the vane stopped at the stopper (stop pin for shaft type) oscillates clockwise. The vane contacts the stopper (body for shaft type) following a 90° oscillation, and then stops.

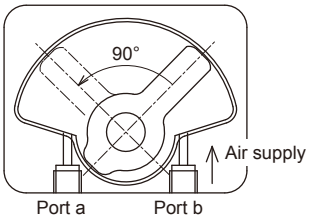
· Table section



As the shaft and table are directly linked, the positioning hole (D cut surface for shaft type) on the top surface oscillates 90° in the same direction (clockwise) as the vane.

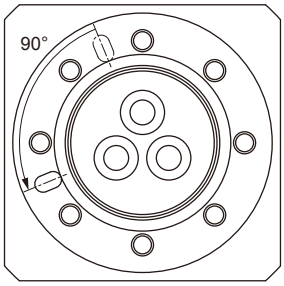
(2) When table positioning hole oscillates counterclockwise

· Vane section



By supplying air from port b, the vane oscillates counterclockwise. The vane contacts the stopper (stop pin for shaft type) following a 90° oscillation, and then stops.

· Table section

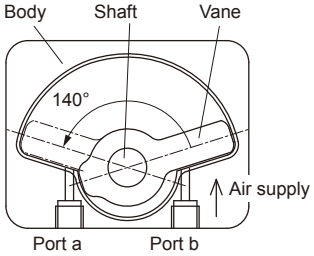


As the shaft and table are directly linked, the positioning hole (D cut surface for shaft type) on the top surface oscillates 90° in the same direction (counterclockwise) as the vane.

● 180° type

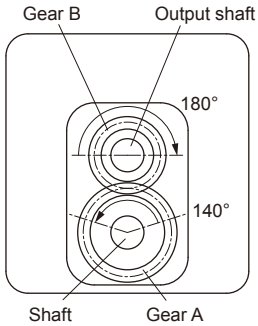
(1) When table positioning hole oscillates clockwise

· Vane section



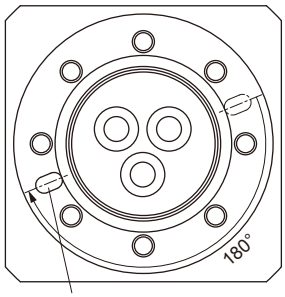
By supplying air from port b, the vane oscillates counterclockwise. The vane contacts the stopper following a 140° oscillation, and then stops. With the shaft type, the vane contacts the body following a 145° oscillation, and then stops.

· Gear section



Force is transferred from the shaft (vane connection) to gear A to gear B to the output shaft (table connection), causing the output shaft to oscillate.
The 140° oscillating angle is amplified to 180° by the gear section gear ratio at this time. With the shaft type, the 145° oscillating angle is amplified to 190°. Furthermore, the output shaft oscillates in the opposite direction (clockwise) to the shaft.

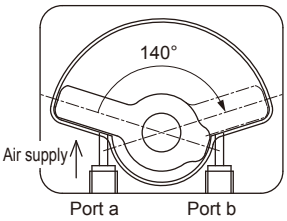
· Table section



As the oscillating direction at the gear section is clockwise, the positioning hole (D cut section for shaft type) on the table's top surface rotates clockwise.

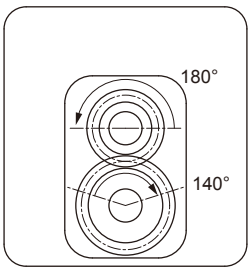
(2) When table positioning hole oscillates counterclockwise

· Vane section



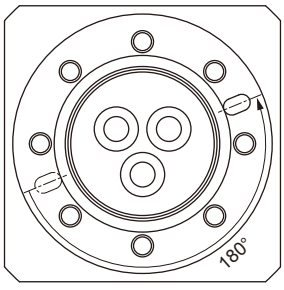
By supplying air from port b, the vane oscillates clockwise. The vane contacts the stopper following a 140° oscillation, and then stops. With the shaft type, the vane contacts the body following a 145° oscillation, and then stops.

· Gear section



Force is transferred from the shaft (vane connection) to gear A to gear B to output shaft (table connection), causing the output shaft to oscillate.
The 140° oscillating angle is amplified to 180° by the gear section gear ratio at this time. With the shaft type, the 145° oscillating angle is amplified to 190°. Furthermore, the output shaft oscillates in the opposite direction (counterclockwise) to the shaft.

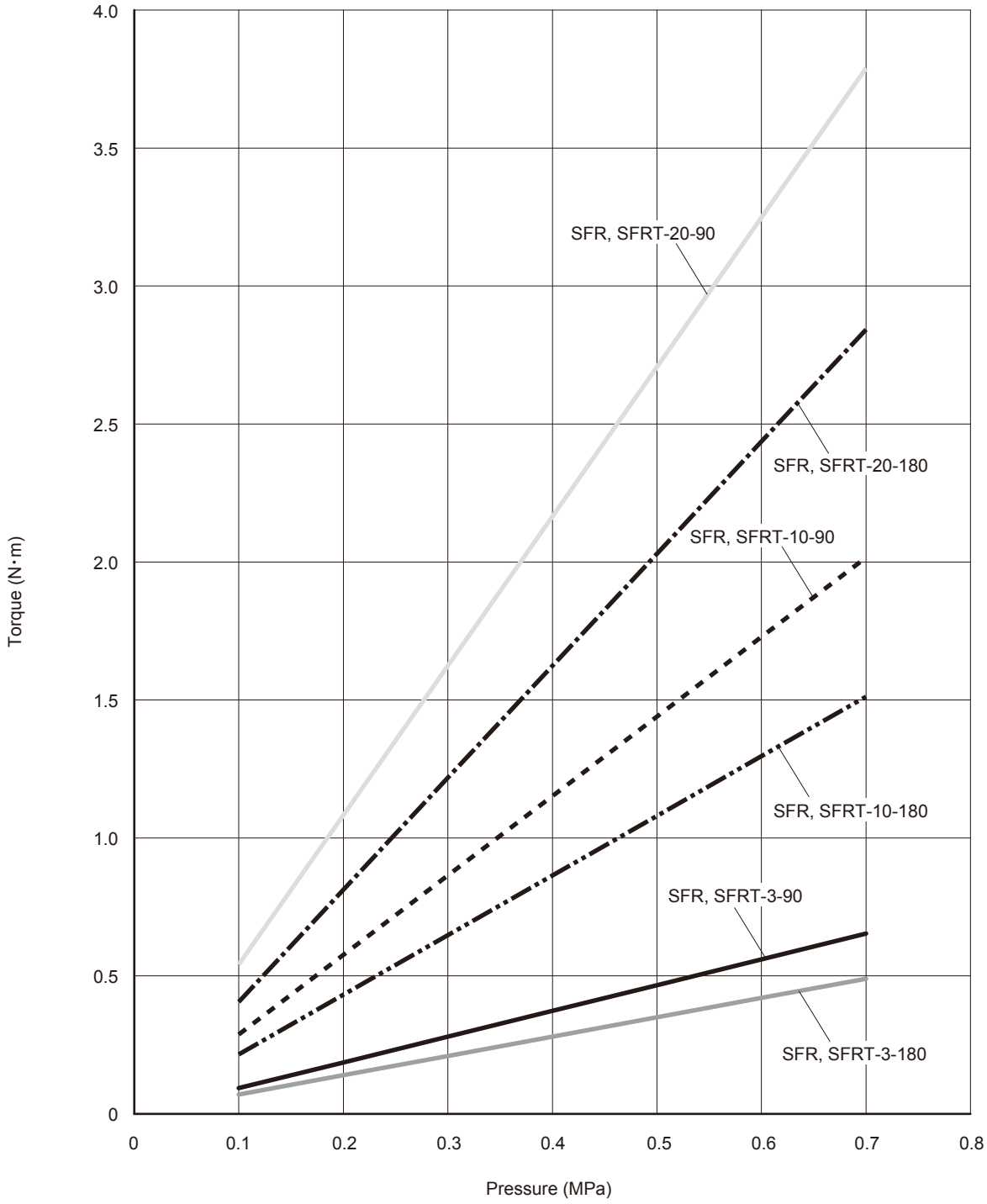
· Table section



As the oscillating direction at the gear section is counterclockwise, the positioning hole (D cut section for shaft type) on the table's top surface rotates counterclockwise.

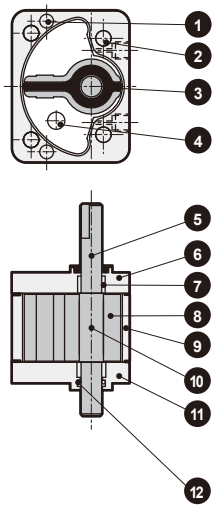
* As SFR employs the same mechanism, the operation is the same as that above. However, the oscillating angle is 190°.

3. Effective Torque Chart

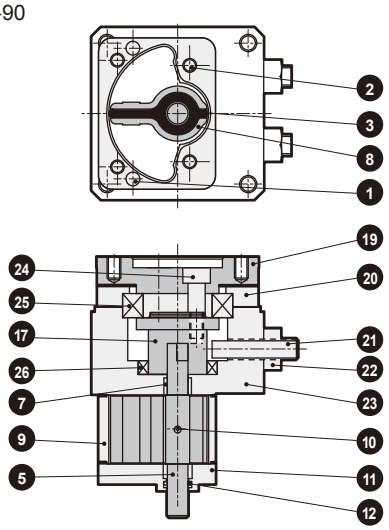


Internal Structure and Parts List

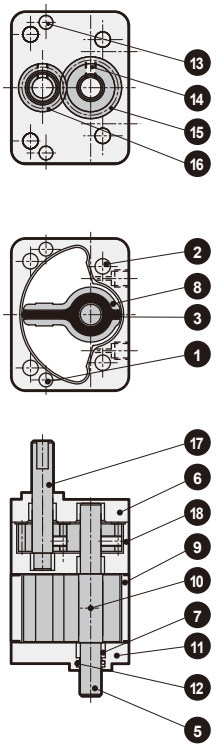
●SFR-□-90



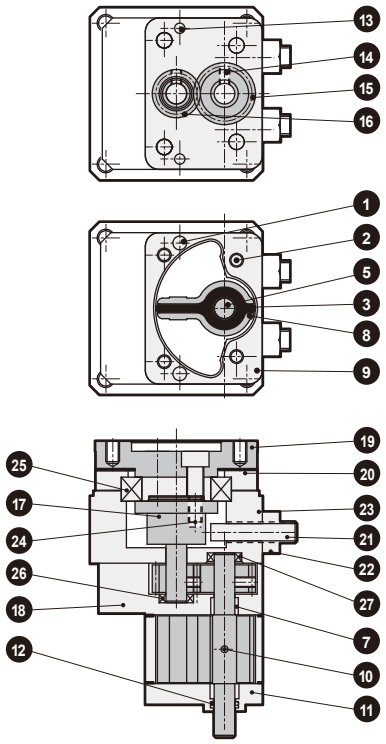
●SFRT-□-90



●SFR-□-180



●SFRT-□-180

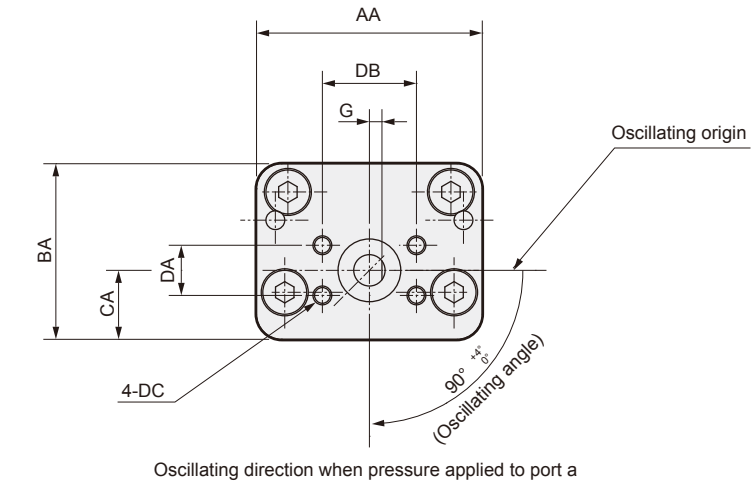


Parts List

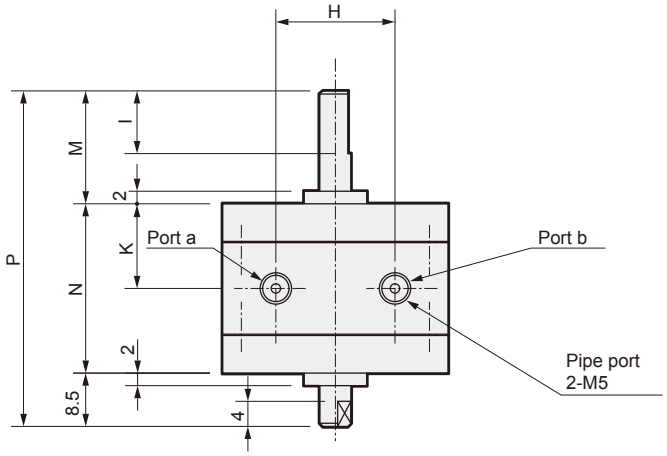
Part No.	Part name	Material	Part No.	Part name	Material
1	Straight pin A	Steel	15	Gear A	Steel
2	Hex socket head cap bolt	Steel	16	Gear B	Steel
3	Packing	Nitrile rubber	17	Output shaft	Steel
4	Stop pin	Steel	18	Gear case	Aluminum alloy
5	Shaft	Steel	19	Table	Aluminum alloy
6	Cover A	Aluminum alloy	20	Bearing holder	Aluminum alloy
7	Bush	Plastic	21	Angle adjustment stopper	Steel
8	Vane	Aluminum alloy	22	Angle adjustment hex nut	Steel
9	Cylinder	Aluminum alloy	23	Table body	Aluminum alloy
10	Straight pin B	Steel	24	Hex socket head cap bolt	Steel
11	Cover B	Aluminum alloy	25	Bearing A	Alloyed steel
12	O-ring	Nitrile rubber	26	Bearing B	Alloyed steel
13	Straight pin C	Steel	27	Bearing C	Alloyed steel
14	Hex socket set screw	Steel			

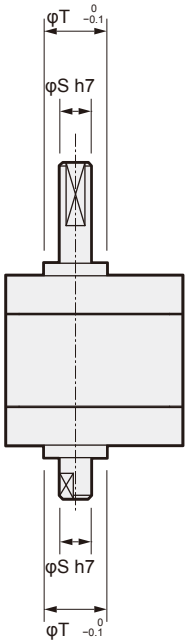
External Dimensions Drawings (SFR Series)

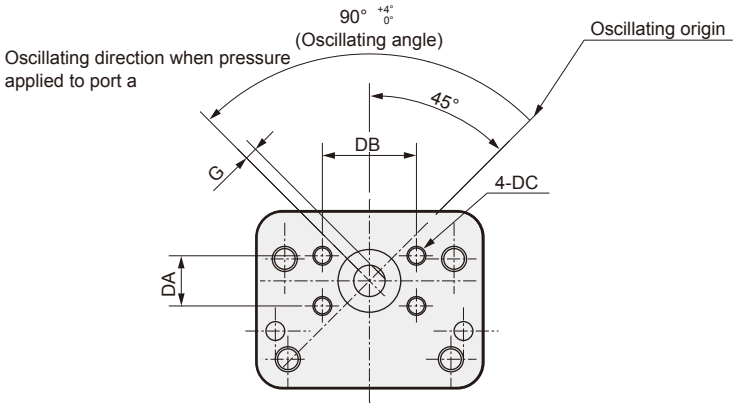
●SFR-□-90



Oscillating direction when pressure applied to port a



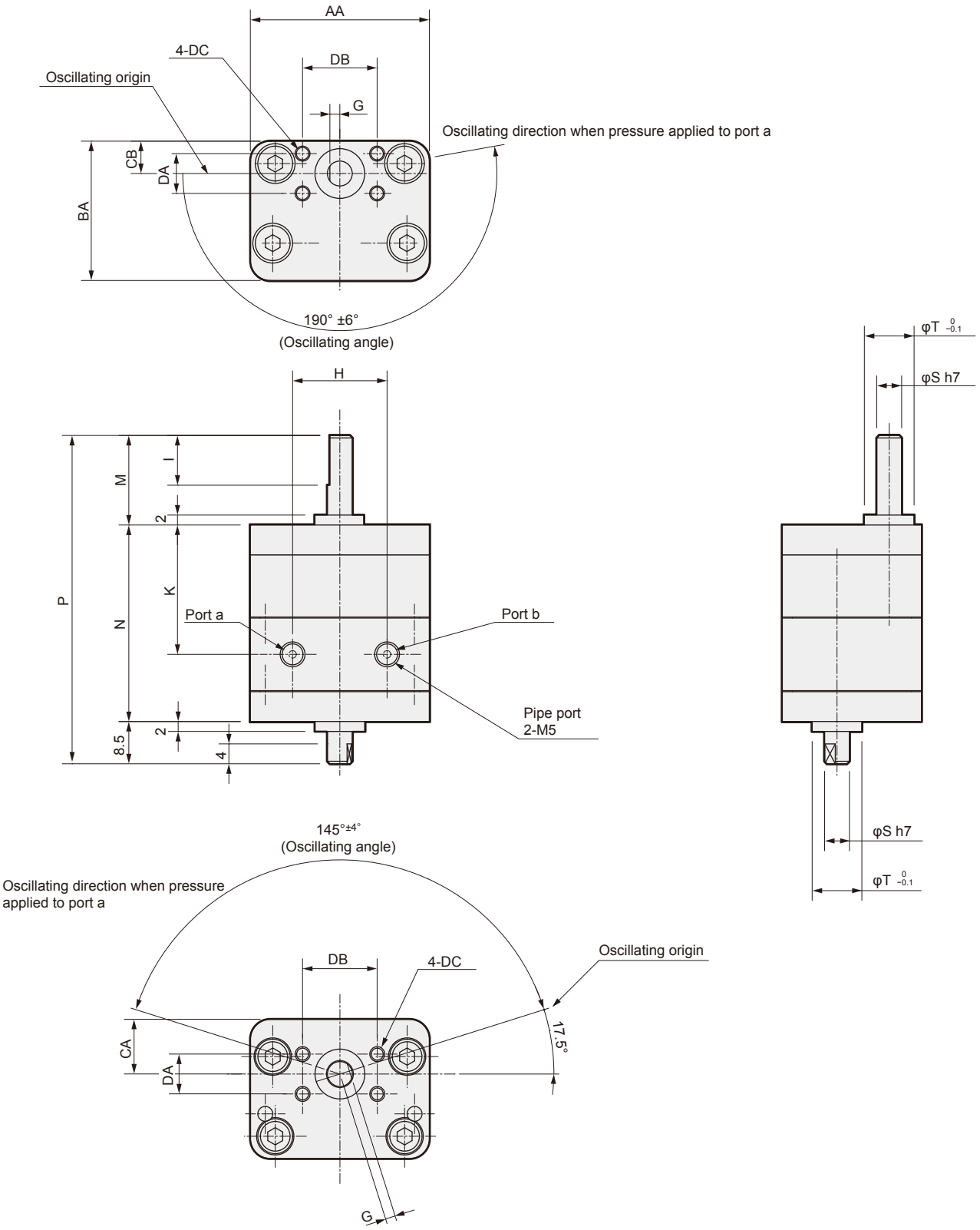




Size	AA	BA	CA	DA	DB	DC	G	H	I	K	M	N	P	S	T
3	36	28	11	8	15	M3 depth 5	2	19	10	13.5	18	27	53.5	5	10
10	44	34	11	12	15	M4 depth 5	2.5	21	10	16	20	32	60.5	6	12
20	58	45	15	14	18	M4 depth 6	3	27	12	20.5	22	41	71.5	8	14

External Dimensions Drawings (SFR Series)

●SFR-□-180

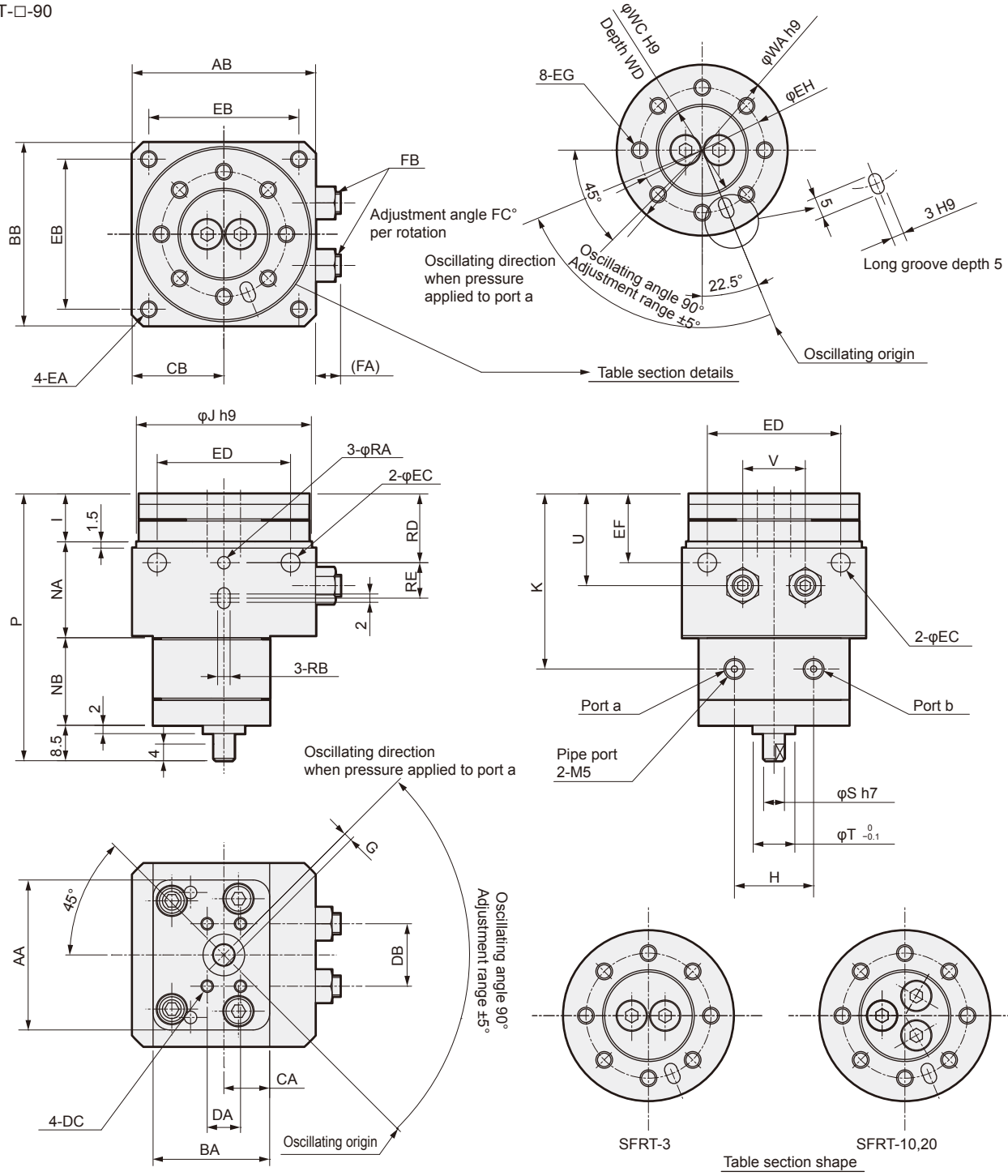


Note 1: There is play in the output shaft. See Design and Selection precautions.

Size	AA	BA	CA	CB	DA	DB	DC	G	H	I	K	M	N	P	S	T
3	36	28	11	6.5	8	15	M3 depth 5	2	19	10	26	18 Note 1	39.5	66	5	10
10	44	34	11	9	12	15	M4 depth 5	2.5	21	10	31	20 Note 1	47	75.5	6	12
20	58	45	15	12.5	14	18	M4 depth 6	3	27	12	39	22 Note 1	59.5	90	8	14

External Dimensions Drawings (SFRT Series)

●SFRT-□-90



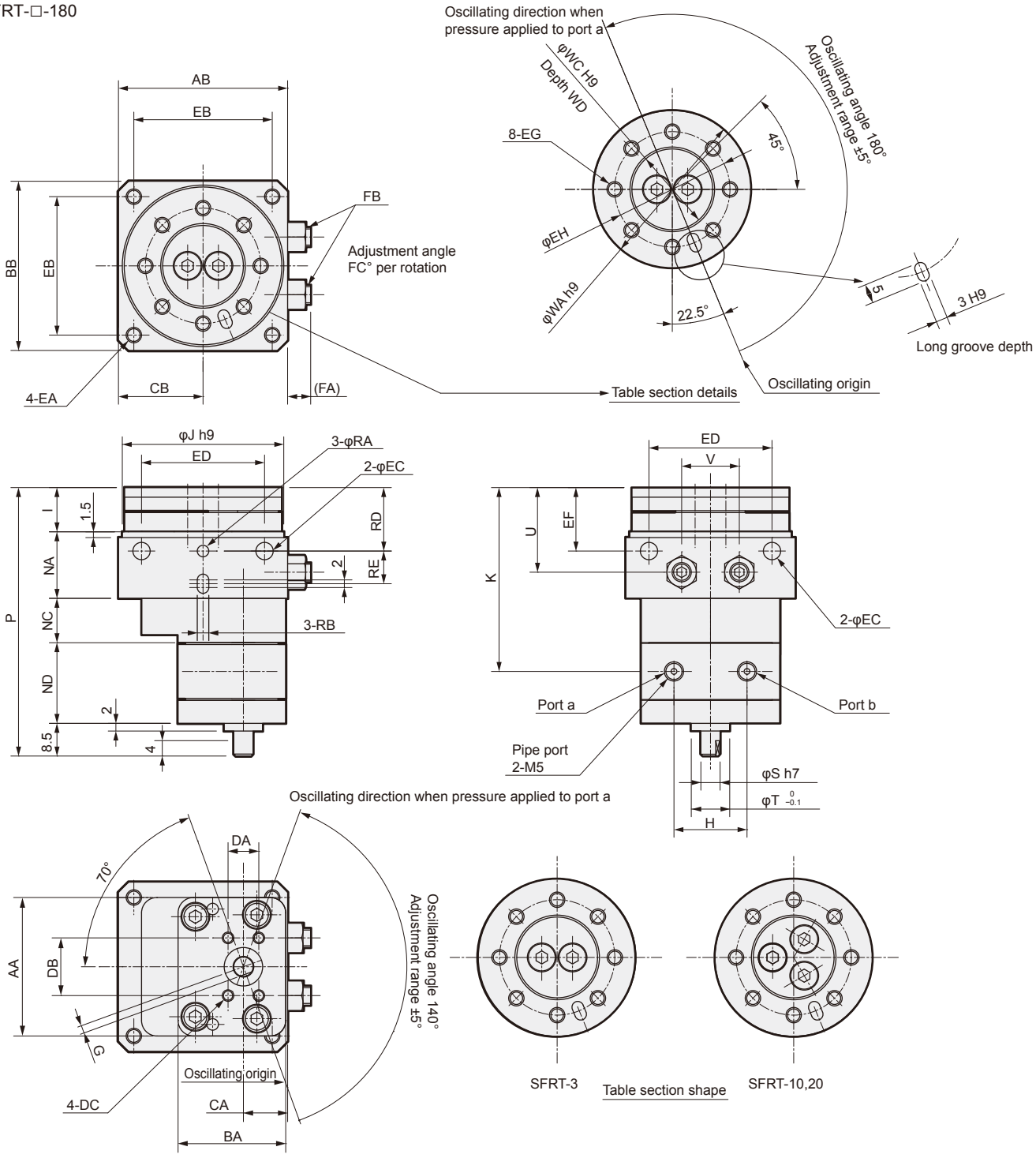
Size	AA	AB	BA	BB	CA	CB	DA	DB	DC	EA	EB	EC	ED
3	36	44	28	44	11	22	8	15	M3 depth 5	M4 depth 15	36	4.5 penetration	32
10	44	50	34	50	11	25	12	15	M4 depth 5	M5 depth 15	41	5.5 penetration	38
20	58	62.5	45	59	15	30	14	18	M4 depth 6	M6 depth 20	48	6.5 penetration	42

Size	EF	EG	EH	FA	FB	FC	G	H	I	J	K	NA	NB	P
3	16.5	M4 depth 6	30	6	M5×0.8	6.1	2	19	11.5	42	42	23	21	64
10	20.5	M4 depth 6	37	8	M6×1	5.4	2.5	21	14.5	48	50	25.5	26	74.5
20	22.5	M5 depth 8	42	11.5	M6×1	4.4	3	27	16	53.5	59.5	30.5	33.5	88.5

Size	RA	RB	RD	RE	S	T	U	V	WA	WC	WD
3	3 H9 depth 3	3 H9 depth 2.5	16.5	8.5	5	10	22	15	41	21	3
10	4 H9 depth 4	4 H9 depth 3	20.5	9	6	12	26.5	21	47	26	3
20	4 H9 depth 4	4 H9 depth 3	22.5	12.5	8	14	31.5	26	52	30	4

External Dimensions Drawings (SFRT Series)

●SFRT-□-180



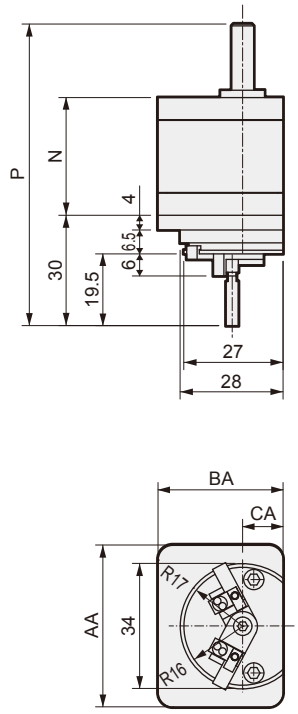
Size	AA	AB	BA	BB	CA	CB	DA	DB	DC	EA	EB	EC	ED
3	36	44	28	44	11.5	22	8	15	M3 depth 5	M4 depth 15	36	4.5 penetration	32
10	44	50	34	50	11	25	12	15	M4 depth 5	M5 depth 15	41	5.5 penetration	38
20	58	62.5	45	59	15	30	14	18	M3 depth 6	M6 depth 20	48	6.5 penetration	42

Size	EF	EG	EH	FA	FB	FC	G	H	I	J	K	NA	NC	ND
3	16.5	M4 depth 6	30	6	M5×0.8	6.1	2	19	11.5	42	47.8	17.3	11.5	21
10	20.5	M4 depth 6	37	8	M6×1	5.4	2.5	21	14.5	48	60.5	21	15	26
20	22.5	M5 depth 8	42	11.5	M6×1	4.4	3	27	16	53.5	70.5	24	17.5	33.5

Size	P	RA	RB	RD	RE	S	T	U	V	WA	WC	WD
3	69.8	3 H9 depth 3	3 H9 depth 2.5	16.5	8.5	5	10	22	15	41	21	3
10	85	4 H9 depth 4	4 H9 depth 3	20.5	9	6	12	26.5	21	47	26	3
20	99.5	4 H9 depth 4	4 H9 depth 3	22.5	12.5	8	14	31.5	26	52	30	4

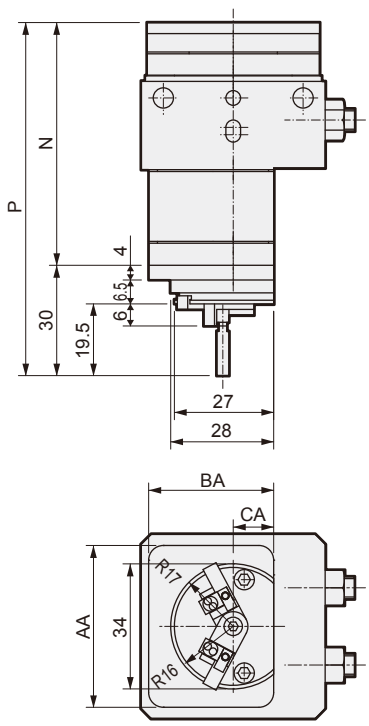
External Dimensions Drawings for Units with Switch

●SFR-□-90



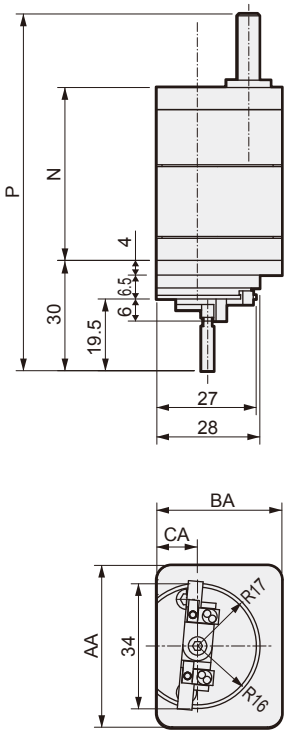
Size	AA	BA	CA	N	P
3	36	28	11	27	75
10	44	34	11	32	82
20	58	45	15	41	93

●SFRT-□-90



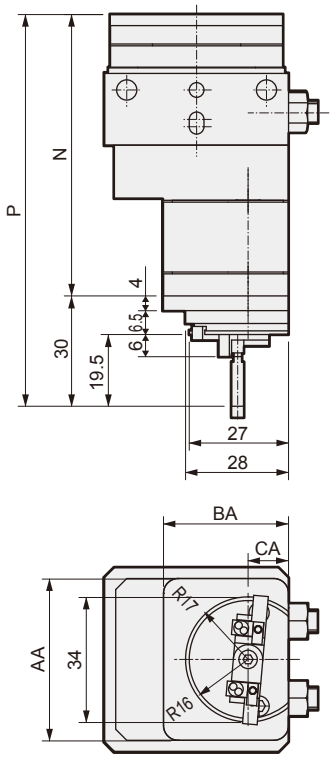
Size	AA	BA	CA	N	P
3	36	28	11	55.5	85.5
10	44	34	11	66	96
20	58	45	15	80	110

●SFR-□-180



Size	AA	BA	CA	N	P
3	36	28	11	39.5	87.5
10	44	34	11	47	97
20	58	45	15	59.5	111.5

●SFRT-□-180



Size	AA	BA	CA	N	P
3	36	28	11	61.3	91.3
10	44	34	11	76.5	106.5
20	58	45	15	91	121