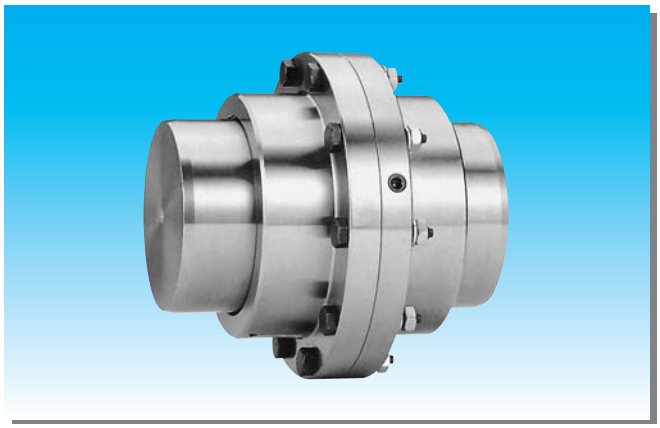
GEAR COUPLING

DESCRIPTION



NARA has been engaging in the design, manufacture and sale of gear couplings since the development was accomplished by its own technology.

NARA gear couplings basically conformable to the “Gear couplings” are further engineered to have them display higher perfomance by making the best use of its year’s technical experience and accumulated field experiments.

You can, therefore, select the most suitable ones to your applications.

Designations of NARA gear couplings are based on flange diamenters of sleeve for the purpose of providing customers with convenient way for selection.

1) With the capacity of handling heavy loads. NARA gear cou plings are much smaller and lighter than any other couplin gs. Noise or vibration is hardly produced even in high spe ed operating. And service taps in sleeve and hub make it easier to disassemble and assemble the gear couplings.

2) NARA gear couplings can be protected against offset and anguar displacement of the shafts, and have greater horsepower capacity than other flexible couplings of comparable size. Positive lubrication cushions the load and provides long wear life.

3) NARA gear couplings up to size 400 are always massproduced and kept in stock to permit quick delivery upon request. Large size and special type can be manufactured by your requirements.

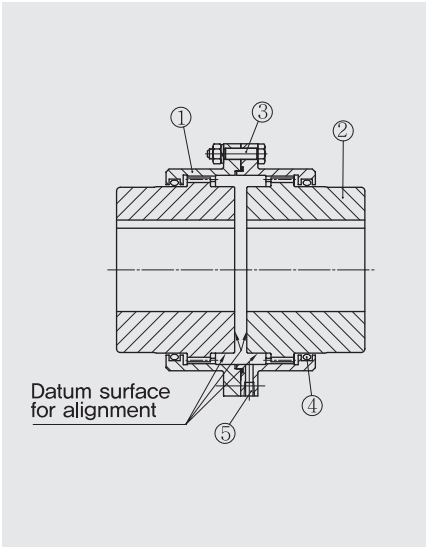
STRUCTURE

NARA gear coupling consists of the internal spur gears in its sleeves and the external spur gears with crowened teeth on its hubs, both of which are in mesh when assembled.

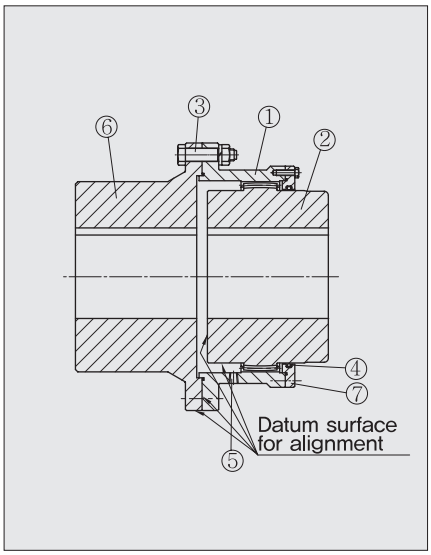
Since these spur gears are so designed as to employ an involute tooth profile and to have a special form on the top and bottom lands of their teeth. taking account of the tilting and lubrication. And equal speed rotation and smooth power transmission can be obtained even when a little tilting occur between the sleeves and the hubs.

In the types of NR-SSM & NR-CCM which are in double engagement, they can smoothly transmit the power, keeping the covers always in a neutral position, even if they have the angular displacement, offset displacement and axial displacement.

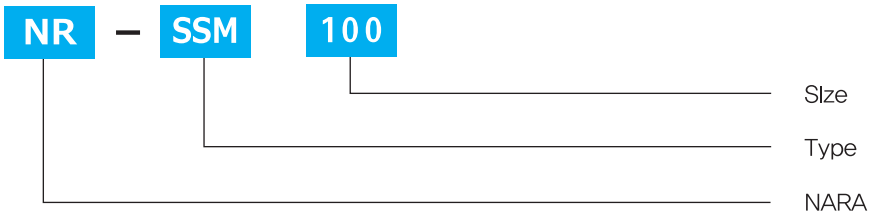
In the types of NR-SEM & NR-CEM which are in single engagement, they can absorb the angular displacement and axial displacement, and therefore, the two sets of them should be used by the use of an intermediate shaft as shown in Fig. 5.



Parts
①Sleeve
②Hub
③Reamer bolt
④ " O "–ring
⑤Oil plug
⑥Flange
⑦Side cover



SELECTION



① Select service factor F_1 from page 43.

② Determine the reversing factor F2.
If one - way rotation. $F_2 = 1.0$
If both - way rotation. $F_2 = 1.5$

③ Calculate the operating torque T, refer to below.
Operating Torque(T) =
Transmitting torque(T_0)×Service factor(F_1)×Reversing factor(F_2)

$$T_0(N{\cdot}m) = 9550 \times \frac{kw}{rpm}$$

④ Select a coupling size from dimension's tables.
- Check the rating toeque, maximum speed and maximum bore.

⑤ In case where brake torque are greater than the basic rating, select the size taking T as brake torque.

⑥ Consult NARA for special purposes.

▣ Displacement Factor(F_3)

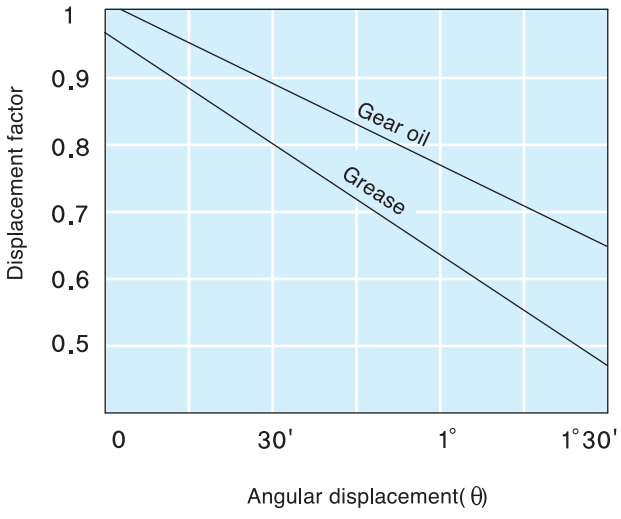
When the offset and angular displacement are happened at installation and operation, consider the displacement factor F_3, and caculate the operating torque as follows

$$T = T_0 \times \frac{F_1 \times F_2}{F_3}$$

The offset and angular displacement factor F_3 can be obtained from the following steps:
First find the angular displacement amount(θ) by substituting the offset displacement amount(ε) for the following formula and then determine F_3 by applying the(θ) found at the above step to the Tab.5.

$$\tan\theta = \frac{\varepsilon}{L}$$

For the unit sizes. the dimensions "L" are shown in the Tab.5.



And, when offset and angular displacement are happened simutaneously, use following formula.

$\varnothing + \alpha$, $\varnothing = \tan^{-1}\frac{\varepsilon}{L}$ ($\varnothing$: Angular amount by offset displacement)

α : Augular displa cement Amount

DISPLACEMENT

① Offset displacement (ε) : The axes of connected shafts are parallel but not in the same straight line.
② Angular displacement (α) : The shafts are intersected at center point of coupling but not in the same straight line
③ Combined displacement : Offset displacement and Angular displacement are occurred simultaneusly.
④ Axial dispacement (S) : Change of the gap between the shafts at Axial direction.

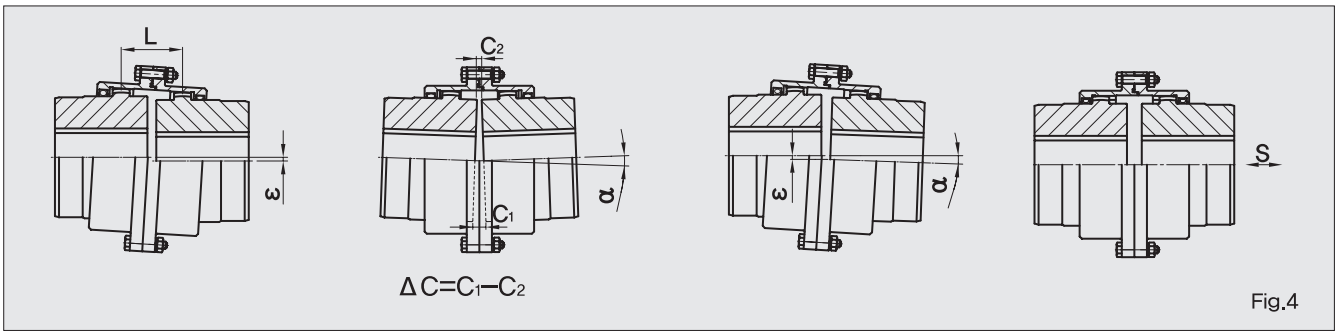


Fig.4

Allowable amounts of misalignments

The following tables show the allowable amounts of displacement determined by a structural consideration.
It is, therefore, practically recommended that the alignment should be made as accurately as possible according to the service conditiions such as the place of application, type of machine, service rpm. etc.

■ Amounts Of Offset Displacement(ε) And Axial Displacement(S)

(mm) Tab.5

Size	ε	ε′	ΔC	S	L	Size	ε	ε′	ΔC	S	L	Size	ε	ε′	ΔC	S	L
100	0.75	0.03	0.04	−0.5~1.0	36	280	2.0	0.08	0.17	−0.5~4.5	88	800	5.5	0.31	0.50	−0.5~9.5	356
112	1.0	0.03	0.05	−0.5~2.0	42	315	2.5	0.10	0.20	−0.5~5.5	114	900	6.5	0.58	0.33	−0.5~10.5	385
125	1.0	0.04	0.06	−0.5~2.5	45	355	3.0	0.11	0.22	−0.5~5.5	126	1000	7.0	0.63	0.35	−0.5~12.0	422
140	1.25	0.04	0.07	−0.5~2.5	50	400	3.0	0.11	0.25	−0.5~6.5	130	1120	8.0	0.41	0.73	−0.5~13.0	474
160	1.25	0.05	0.08	−0.5~3.0	55	450	3.0	0.17	0.25	−0.5~5.0	196	1250	9.0	0.47	0.84	−0.5~14.0	532
180	1.5	0.05	0.09	−0.5~3.0	58	500	3.5	0.19	0.29	−0.5~6.0	221						
200	1.5	0.05	0.10	−0.5~3.0	64	560	4.0	0.21	0.36	−0.5~6.5	247						
224	1.5	0.06	0.13	−0.5~4.0	69	630	4.5	0.24	0.40	−0.5~8.0	284						
250	2.0	0.07	0.14	−0.5~4.0	79	710	5.0	0.28	0.45	−0.5~8.5	319						

※ The SEM & CEM can not absorb the offset displacement(ε) by itself. whose axial displacement (S) will be half of the amount given above.
※ The value (ε′, ΔC) was recommended for long life time.

■ Amount Of Angular Displacement

Tab.6

Type	α
SSM	3°
CCM	2°
SEM	1.5°
CEM	1°

For the types SEM & CEM, two sets of either type should be used with an intermediate shaft as shown in Fig.5. In this case, the amount of offset displacement can be obtained from the following equations.

$$\tan\theta = \frac{\varepsilon}{L} \quad \text{or} \quad \varepsilon = L \times \tan\theta$$

Usually taking as $L \fallingdotseq L'$

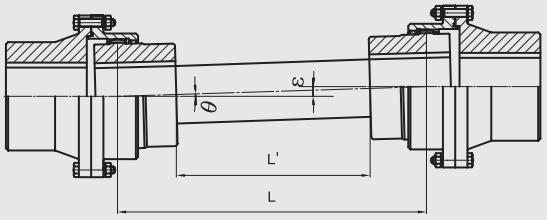
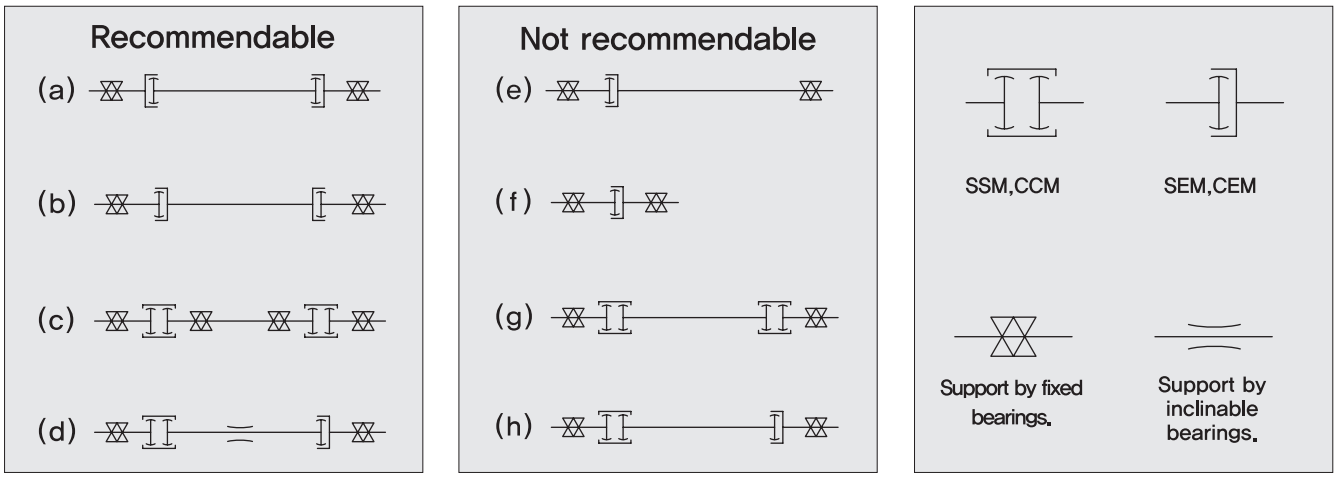


Fig.5

MOUNTING



① In case of SEM it will be used like (a) or (b). Case such as (e) must by basically avoided excepting for when shafts are in complicated alignment.

② When SSM are coupled with an intermediate shaft, the shaft requires fixed supports as (c). When they are used as (g) the intermediate shaft moves freely and caused vibration.

③ When SSM is used with SEM and an intermediate shaft, an inclining support must be set up.

④ If couplings are used as (h). The intermediate shaft is in the inclining state and causes vibration.

⑤ For use in high speed revolution, the allowable max, rpm of the coupling can be increased by adjusting the alignment and improving the balance of the coupling sleeves.

⑥ For oil supply to the coupling, its keyway should be sealed with any sealing agent to prevent oil leakage thereby, and the oil-leak preventive cover will also be provided, if so ordered.

⑦ The normal ambient temperatures for the couplings are -10℃ to + 80℃. For temperatures beyond the highest limit, the material for the "O" ring and the lubricating oil must be selected with special consideration, and for temperatures below the lowest limit, the alterations of the materials for the coupling hub and sleeve may be required depending upon the conditions besides the same consideration as above.
Therefore, consult our factory for the above two cases.

⑧ When mounting a NARA Coupling, care must be taken to the following points.
Chuck the coupling hub or the rigid on a lathe without damaging its boss, and accurately machine the bore after aligning it by use of the periphery and side face of the datum surfaces for coupling alignment.

LUBRICANTS

In the case of grease

When assembling, pack the coupling sleeve and the coupling hub with the recommended grease until their teeth become invisible, and after tightening the reamer bolts, add the grease through the oil plug hole using a grease gun. etc.

The time to change the grease is 3months for first filling and each 6months refilling, so the entire grease should be changed for fresh grease after the inside of the coupling has been cleaned thoroughly by means of disassembly.

✻ For gear oil, consult NARA

■ Recommended Lubricants

Tab.7

Makers	Grease
Exxon	Pen-o-led EP 35
Shell	Alvania EP grease 1
Caltex	Multifak EP 1
Mobil	Mobilux EP 1

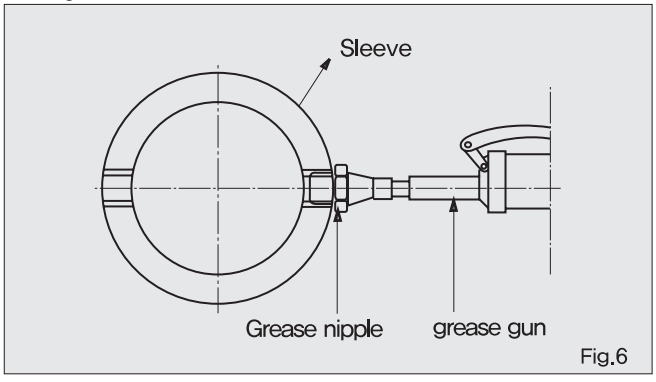
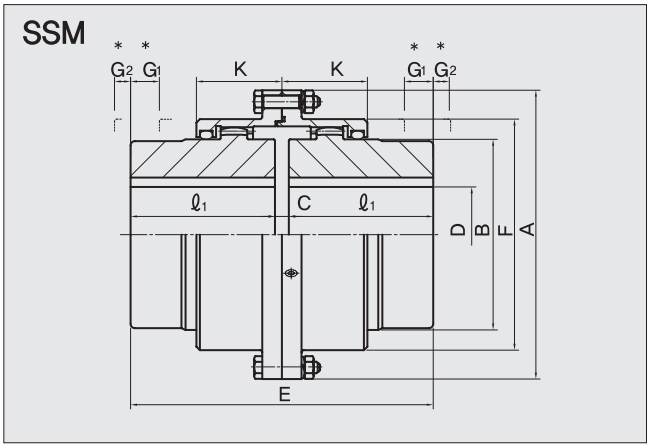


Fig.6

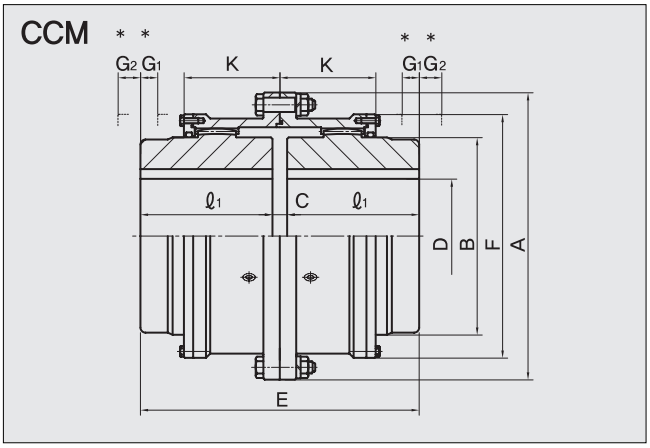
DIMENSIONS

SSM



※ G_1 is the position of the coupling sleeve at alignment.

CCM



※ G_2 is the position of the coupling sleeve at tooth check.

SSM

Size outside dia.A.	Rating torque (N·m)	Max. speed (rpm)	Dimensions(mm)									Mass (kg)	J (kg·m²)	Grease (g)
			Bore D (max/min)	E	ℓ1	C	B	F	K	G_1	G_2			
100	421	5,000	32/17	88	40	8	46	67	34	−1	15	2.9	0.003	40
112	788	5,000	40/17	98	45	8	58	79	40	−4	19	4.1	0.005	50
125	1400	5,000	50/22	108	50	8	70	92	43	−4	20	5.8	0.008	70
140	2010	5,000	56/22	134	63	8	80	107	47	3	15	8.8	0.015	100
160	3080	5,000	65/22	170	80	10	95	120	52	12	7	14	0.03	130
180	4730	5,000	75/32	190	90	10	105	134	56	15	5	19	0.05	160
200	6750	4,700	85/32	210	100	10	120	149	61	18	5	26	0.08	220
224	9810	4,200	100/42	236	112	12	145	174	65	25	1	40	0.16	320
250	14400	3,800	115/42	262	125	12	165	200	74	28	1	56	0.29	480
280	22900	3,400	135/42	294	140	14	190	224	82	28	1	79	0.50	620
315	36100	3,000	160/100	334	160	14	225	260	98	23	11	122	1.01	1000
355	54400	2,600	180/125	376	180	16	250	288	108	24	11	171	1.77	1200
400	76400	2,300	200/140	416	200	16	285	329	114	39	0	245	3.25	1800

1. Mass & J are the values in case of solid shaft. ($GD^2 = 4J$)

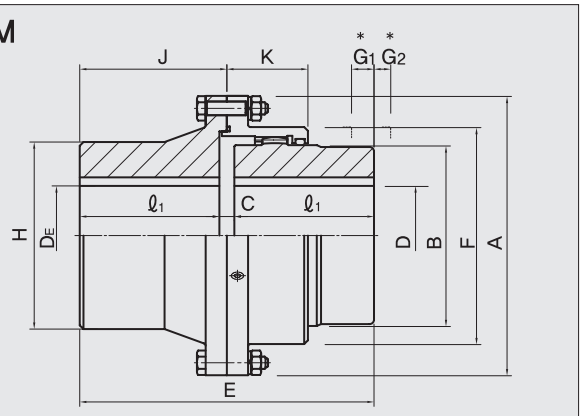
CCM

Size outside dia.A.	Rating torque (KN·m)	Max. speed (rpm)	Dimensions(mm)									Mass (kg)	J (kg·m²)	Grease (kg)
			Bore D (max/min)	E	ℓ1	C	B	F	K	G_1	G_2			
450	93	2,100	205/140	418	200	18	290	372	151	−3	6	300	5.1	2.3
500	127	1,900	236/170	470	224	22	335	424	168	−2	7	429	9.1	3.5
560	204	1,700	275/190	522	250	22	385	475	187	−8	13	619	16.9	4.5
630	309	1,500	325/224	588	280	28	455	544	213	−18	25	921	32.4	7.0
710	450	1,300	360/250	658	315	28	510	622	242	−23	30	1,312	59.9	10.5
800	643	1,150	405/280	738	355	28	570	690	267	−24	32	1,830	102	13.7
900	915	1,050	475/315	832	400	32	670	792	295	−23	20	2,753	200	18
1000	1254	950	510/355	932	450	32	720	858	322	−14	24	3,700	322	23
1120	1764	850	600/400	1,040	500	40	840	990	360	−5	15	5,402	622	34
1250	2450	750	710/500	1,160	560	40	960	1,126	399	0	10	7,730	1129	48

1. Mass & J are the values in case of solid shaft. ($GD^2 = 4J$)

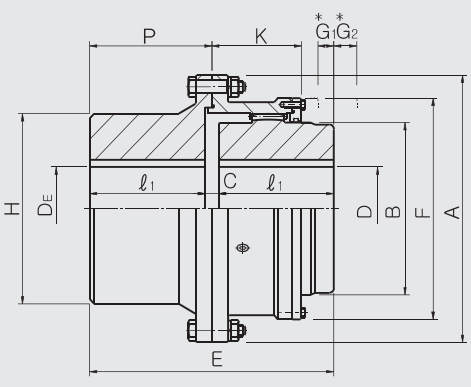
DIMENSIONS

SEM



※ G_1 is he position of the coupling sleeve at alignment.

CEM



※ G_2 is the position of the coupling sleeve at tooth check.

SEM

Size outside dia.A.	Rating torque (N·m)	Max. speed (rpm)	Dimensions(mm)										Mass (kg)	J (kg·m²)	Grease (g)
			Bore D (max/min)	Bore D_E (max/min)	E	ℓ_1	C	K	P	H	G_1	G_2			
100	421	5,000	32/17	40/17	88	40	8	34	44	55	−1	15	3.0	0.003	30
112	788	5,000	40/17	50/17	98	45	8	40	49	70	−4	19	4.3	0.005	40
125	1400	5,000	50/22	56/22	108	50	8	43	54	80	−4	20	6.0	0.008	60
140	2010	5,000	56/22	63/22	134	63	8	47	67	90	3	15	9.0	0.015	80
160	3080	5,000	65/22	75/22	170	80	10	52	85	105	12	7	14	0.03	110
180	4730	5,000	75/32	80/32	190	90	10	56	95	115	15	5	19	0.05	130
200	6750	4,700	85/32	95/32	210	100	10	61	105	135	18	5	27	0.08	170
224	9810	4,200	100/42	105/42	236	112	12	65	118	150	25	1	40	0.16	270
250	14400	3,800	115/42	125/42	262	125	12	74	131	180	28	1	58	0.29	370
280	22900	3,400	135/42	150/42	294	140	14	82	147	210	28	1	84	0.54	510
315	36100	3,000	160/100	180/100	334	160	14	98	167	250	23	11	130	1.10	810
355	54400	2,600	180/125	200/125	376	180	16	108	188	275	24	11	180	1.89	1,000
400	76400	2,300	200/140	236/140	416	200	16	114	208	325	39	0	260	3.60	1,440

1. Mass & J are the values in case of solid shaft. ($GD^2 = 4J$) 2. Demensions "B & F"are the same as those of type "SSM."

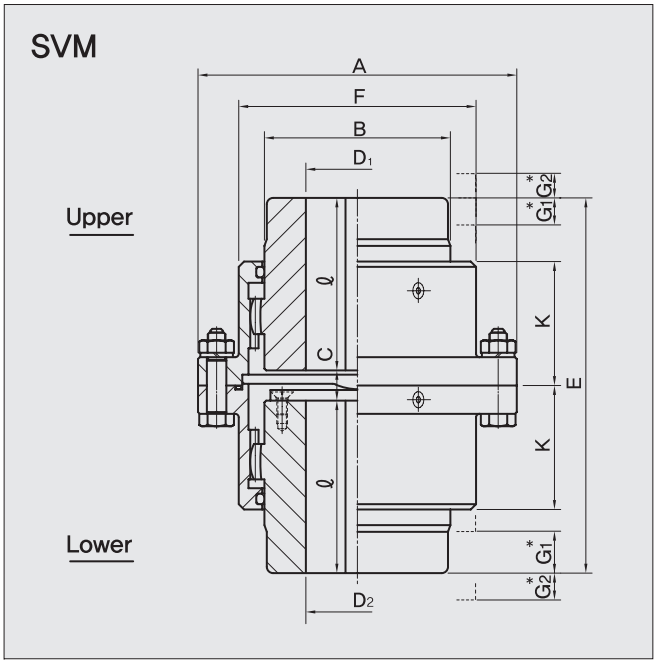
CEM

Size outside dia.A.	Rating torque (KN·m)	Max. speed (rpm)	Dimensions(mm)										Mass (kg)	J (kg·m²)	Grease (kg)
			Bore D (max/min)	Bore D_E (max/min)	E	ℓ_1	C	K	P	H	G_1	G_2			
450	93	2,100	205/140	225/140	418	200	18	151	209	320	−3	75	300	4.9	1.9
500	127	1,900	236/170	270/170	470	224	22	168	235	380	−2	80	441	9.2	2.8
560	204	1,700	275/190	305/190	522	250	22	187	261	430	−8	90	635	17.1	3.5
630	309	1,500	325/224	355/224	588	280	28	213	294	500	−18	100	944	33.0	5.4
710	450	1,300	360/250	400/250	658	315	28	242	329	565	−23	125	1,343	59.5	7.7
800	643	1,150	405/280	450/280	738	355	28	267	369	635	−24	130	1,891	105	10
900	915	1,050	475/315	510/315	832	400	32	295	416	715	−23	130	2,756	196	13.5
1000	1254	950	510/355	570/355	932	450	32	322	466	800	−14	130	3,800	336	18
1120	1764	850	600/400	640/400	1,040	500	40	360	520	900	−5	160	5,462	616	26
1250	2450	750	710/500	800/500	1,160	560	40	399	580	1,060	0	175	8,045	1183	36

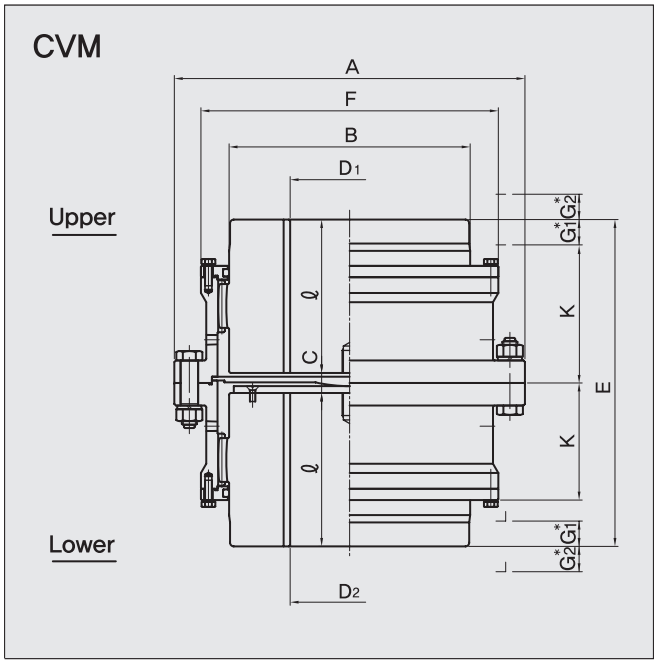
1. Mass & J are the values in case of solid shaft. ($GD^2 = 4J$) 2. Demensions "B & F"are the same as those of type "CCM."

DIMENSIONS

SVM



CVM



※ G_1 is the position of the coupling sleeve at alignment.

※ G_2 is the position of the coupling sleeve at tooth check.

SVM

Size outside dia.A.	Rating torque (N·m)	Max. speed (rpm)	Dimensions(mm)											Mass (kg)	J ($kg \cdot m^2$)	Grease (g)	
			Bore			E	ℓ	C	B	F	K	G_1	G_2			Upper	Lower
			D_1max	D_2max	min												
100	421	1,800	32	22	17	88	35	18	46	67	34	−1	15	3.0	0.003	25	20
112	788	1,800	40	32	17	98	40	18	58	79	40	−4	19	4.2	0.005	35	25
125	1400	1,800	50	40	22	108	45	18	70	92	43	−4	20	6	0.008	50	40
140	2010	1,800	56	50	22	134	58	18	80	107	47	3	15	9	0.016	70	60
160	3080	1,800	65	60	22	170	76	18	95	120	52	12	7	14	0.03	90	80
180	4730	1,800	75	70	32	190	86	18	105	134	56	15	5	19	0.05	120	100
200	6750	1,800	85	82	32	210	96	18	120	149	61	18	5	26	0.08	150	120
224	9810	1,800	100		42	236	108	20	145	174	65	25	1	40	0.16	220	170
250	14400	1,800	115		42	262	121	20	165	200	74	28	1	57	0.29	370	290
280	22900	1,800	135		42	294	136	22	190	224	82	28	1	81	0.51	450	360
315	36100	1,800	160		100	334	156	22	225	260	98	23	11	124	1.03	740	620
355	54400	1,800	180		125	376	177	22	250	288	108	24	11	174	1.80	900	750
400	76400	1,800	200		140	416	197	22	285	329	114	39	0	249	3.30	1300	1000

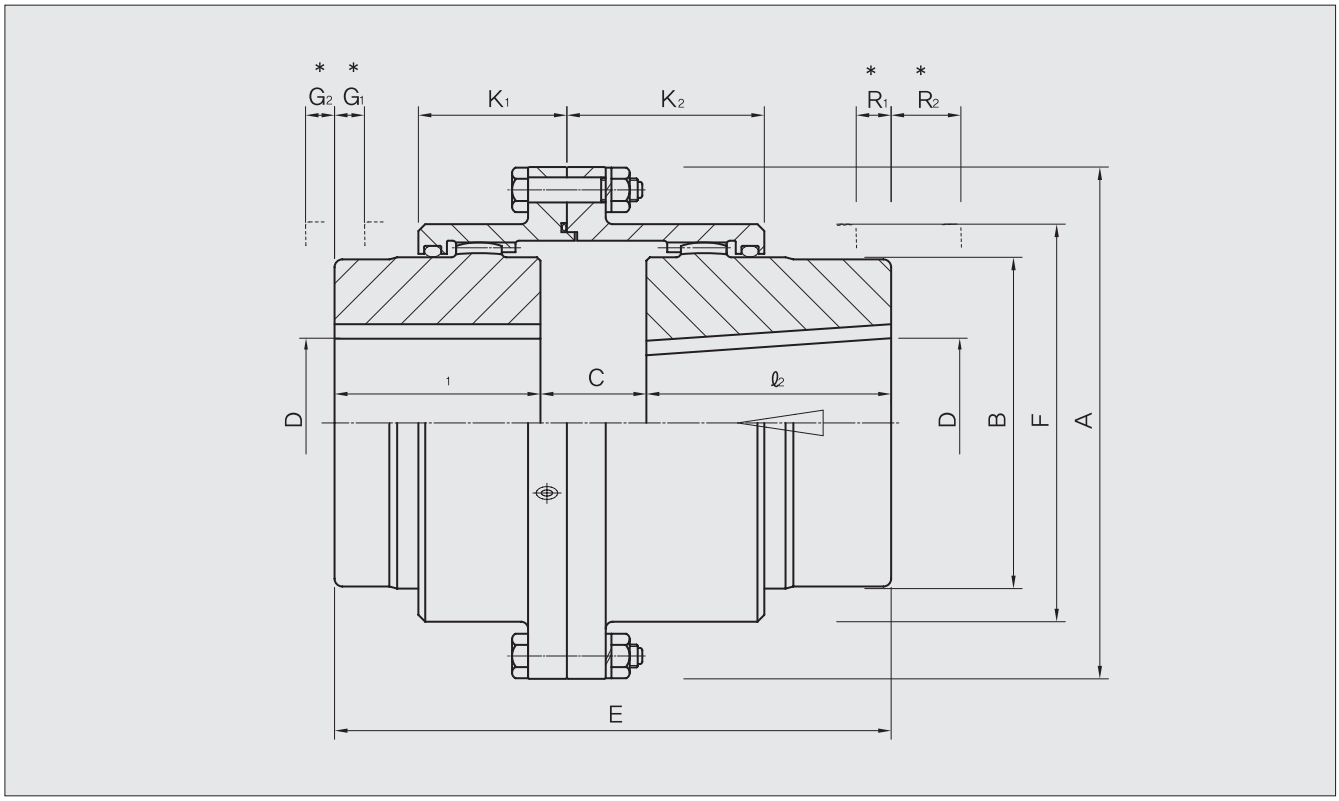
1. Mass & J are the values in case of solid shaft. ($GD^2 = 4J$)

CVM

Size outside dia.A.	Rating torque (KN·m)	Max. speed (rpm)	Dimensions(mm)											Mass (kg)	J ($kg \cdot m^2$)	Grease (kg)	
			Bore			E	L	C	B	F	K	G_1	G_2			Upper	Lower
			D_1max	D_2max	min												
450	93	1800	205		140	418	196	26	290	372	151	−3	6	305	5.2	1.65	1.4
500	127	1800	236		170	470	220	30	335	424	168	−2	7	436	9.3	2.5	2.1
560	204	1700	275		190	522	245	32	385	475	187	−8	13	629	17.2	3.2	2.7
630	309	1500	325		224	588	275	38	455	544	213	−18	25	936	33.1	5.0	4.2

1. Mass & J are the values in case of solid shaft. ($GD^2 = 4J$)

DIMENSIONS



※ G_1, R_1 is the position of the coupling sleeve at alignment.
※ G_2, R_2 is the position of the coupling sleeve at tooth check.

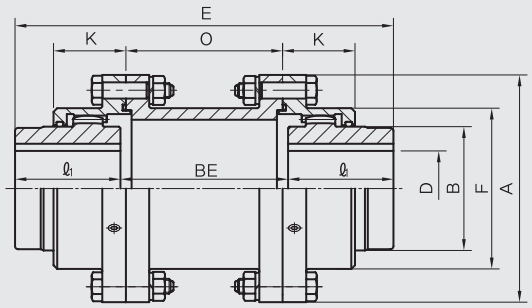
SMM

Size outside dia.A.	Rating torque (N·m)	Dimensions(mm)													Mass (kg)	J (kg·m²)	Grease (g)
		Bore D (max/min)	E	ℓ1	ℓ2	C	B	F	K1	K2	G1	R1	G2	R2			
125(a)	1400	50/22	157	50	75	32	70	92	43	67	−4	0	20	16	6.8	0.010	160
125(b)	1400	50/22	172	50	90	32	70	92	43	67	−4	15	20	1	7.3	0.010	160
140	2010	56/22	185	63	90	32	80	107	47	71	3	9	15	9	10	0.018	220
160	3080	65/22	220	80	100	40	95	120	52	82	12	5	7	14	15	0.03	360
180	4730	75/32	246	90	115	41	105	134	56	87	15	12	5	8	22	0.06	440
200	6750	85/32	260	100	115	45	120	149	61	96	18	2	5	21	28	0.09	600
224	9810	100/42	289	112	125	52	145	174	65	105	25	2	1	24	43	0.18	980
250	14400	115/42	305	125	125	55	165	200	74	117	28	−11	1	40	58	0.31	1,400
280(a)	22900	135/42	339	140	140	59	190	224	82	127	28	−13	1	42	81	0.53	1,900
280(b)	22900	135/42	339	140	150	49	190	224	82	127	28	−13	1	42	84	0.54	1,700
315(a)	36100	160/100	386	160	170	56	225	260	98	140	23	−4	11	38	127	1.07	2,800
315(b)	36100	160/100	421	160	185	76	225	260	98	140	23	31	11	3	132	1.10	3,600
355	54400	180/125	491	180	235	76	250	288	108	168	24	24	11	11	196	2.03	4,400

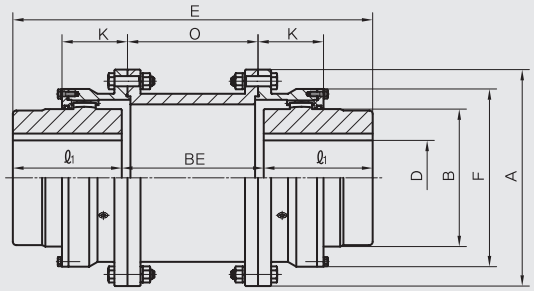
1. Mass & J are the values in case of solid shaft. ($GD^2 = 4J$)
2. Max. speed are the same as those of the type"SSM."

DIMENSIONS

SAM



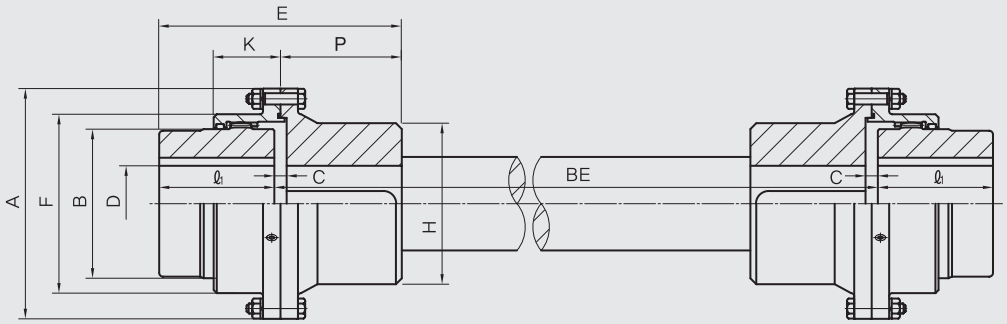
CAM



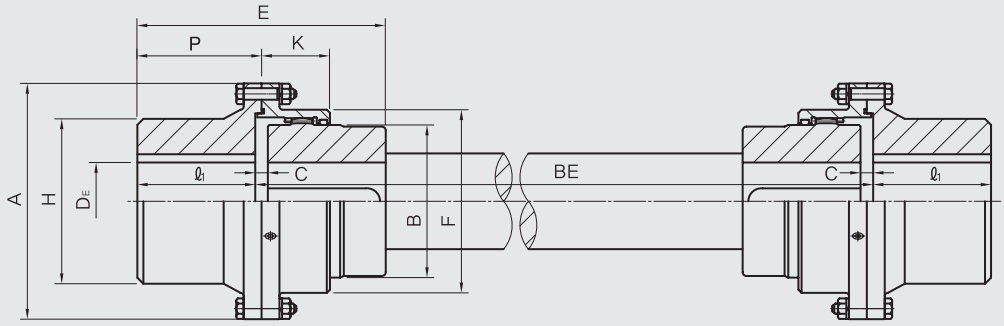
Type	Size (outside dia.A)	Dimensions(mm)							
		Bore D (max/min)	ℓ1	B	F	K	E	BE	O
SAM	100	32/17	40	46	67	34	To be arranged		
	112	40/17	45	58	79	40			
	125	50/22	50	70	92	43			
	140	56/22	63	80	107	47			
	160	65/22	80	95	120	52			
	180	75/32	90	105	134	56			
	200	85/32	100	120	149	61			
	224	100/42	112	145	174	65			
	250	115/42	125	165	200	74			
	280	135/42	140	190	224	82			
	315	160/100	160	225	260	98			
	355	180/125	180	250	288	108			
	400	200/140	200	285	329	114			
CAM	450	205/140	200	290	372	151	To be arranged		
	500	236/170	224	335	424	168			
	560	275/190	250	385	475	187			
	630	325/224	280	455	544	213			
	710	360/250	315	510	622	242			
	800	405/280	355	570	690	267			
	900	475/315	400	670	792	295			
	1000	510/355	450	720	858	322			
	1120	600/400	500	840	990	360			
	1250	710/500	560	960	1126	399			

1. Contact to NARA when the intermediate plate is required.

SFM



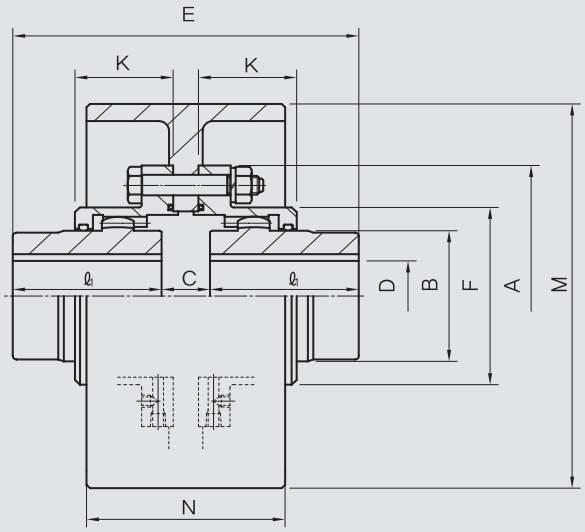
SHM



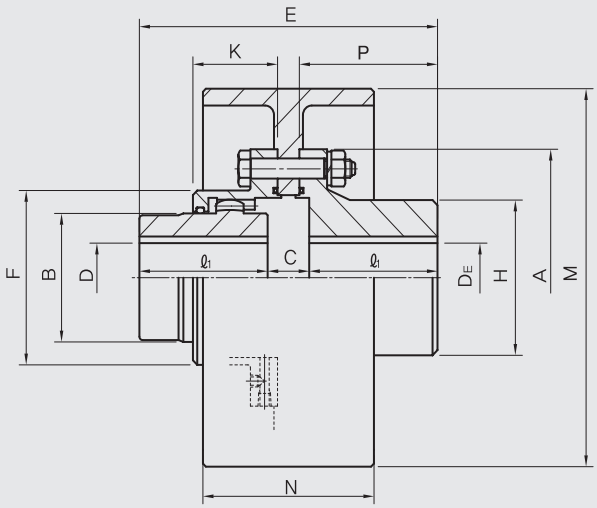
1. Dimensions and torques are same as those of the type"SEM."
2."BE"is available in optional lengths upon request.

DIMENSIONS

SSMB



SEMB

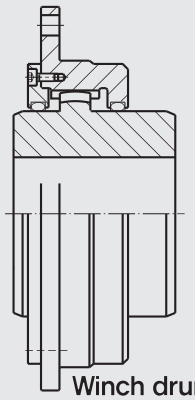


SSMB, SEMB

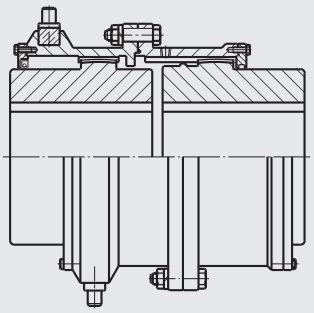
Size outside dia.A.	Max. spped (rpm)	Dimensions(mm)													Mass(kg)		J (kg·m²)	
		M	N	Bore D (max)	Bore D_E (max)	Bore D (min)	E	ℓ_1	C	K	P	H	B	F	SSMB	SEMB	SSMB	SEMB
100	3,580	160	80	32	40	17	98	40	18	34	44	55	46	67	6.7	6.8	0.022	0.022
112	3,580	160	80	40	50	17	108	45	18	40	49	70	58	79	7.7	8.0	0.024	0.024
125	2,850	200	100	50	56	22	124	50	24	43	54	80	70	92	12.9	13.2	0.064	0.064
140	2,850	200	100	56	65	22	150	63	24	47	67	90	80	107	15.7	15.8	0.070	0.069
160	2,290	250	125	65	75	22	186	80	26	52	85	105	95	120	26	27	0.18	0.18
180	2,290	250	125	75	80	32	209	90	29	56	95	115	105	134	32	32	0.21	0.21
200	1,800	315	160	85	95	32	229	100	29	61	105	135	120	149	50	51	0.55	0.55
224	1,610	355	180	100	105	42	261	112	37	65	118	150	145	174	76	76	1.06	1.05
250	1,430	400	200	115	125	42	287	125	37	74	131	180	165	200	104	106	1.81	1.82
280	1,270	450	224	135	150	42	319	140	39	82	147	210	190	224	143	147	3.08	3.10
315	1,140	500	250	160	180	100	359	160	39	98	167	250	225	260	217	225	5.85	5.95
355	1,020	560	280	180	200	125	406	180	46	108	188	275	250	288	311	320	10.7	10.8
400	750	762	362	200	236	140	446	200	46	114	208	325	285	329	532	548	37.0	37.0

1. Max speed is based on maximum rim velocity of 30m/s.
2. Mass & J are the values in case of solid shaft. ($GD^2 = 4J$)

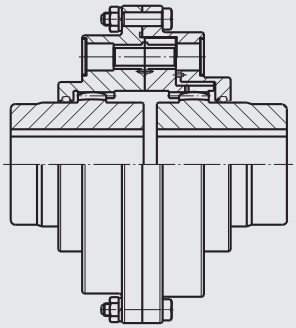
VARIATIONS



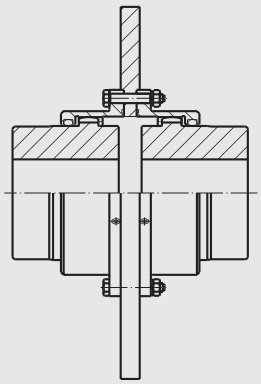
Winch drum(Gear type)



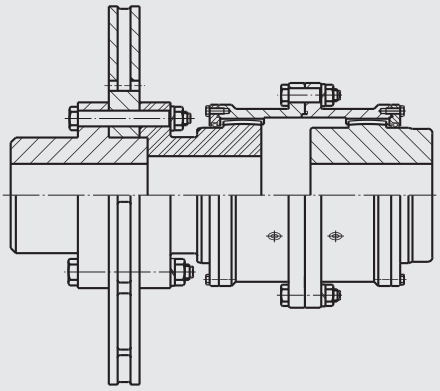
Clutch



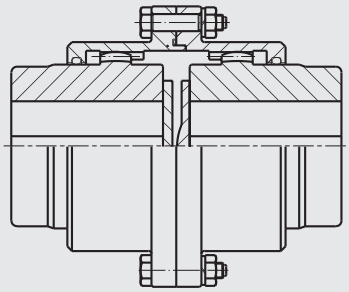
Shear-pin



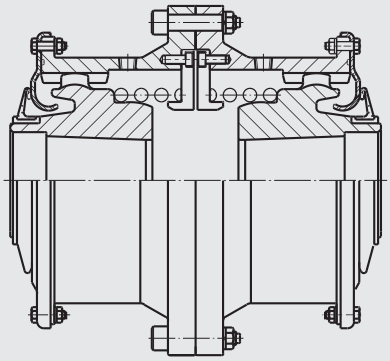
Disk brake



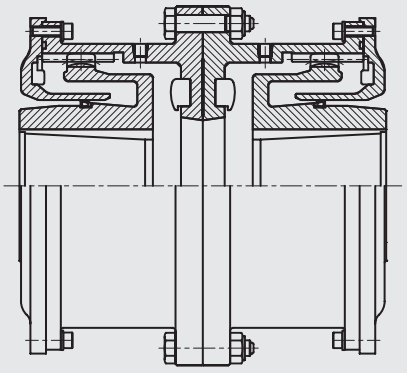
Disk brake



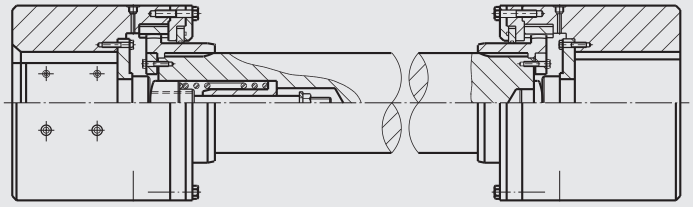
Limited float



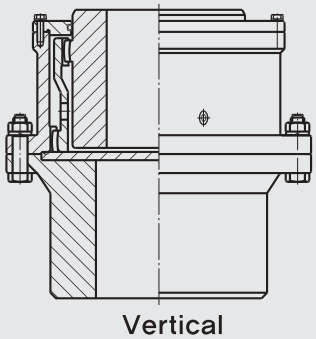
Traction drive(spring)



Traction drive(No spring)



Spindle coupling



Vertical