

Pascal

N₂ Gas Balancer

model **DNG**

BALANCER for SPINDLE HEAD



CE marking
Pressure Equipment
Directive (2014/68/EU)

Japan Patent NO.4921473

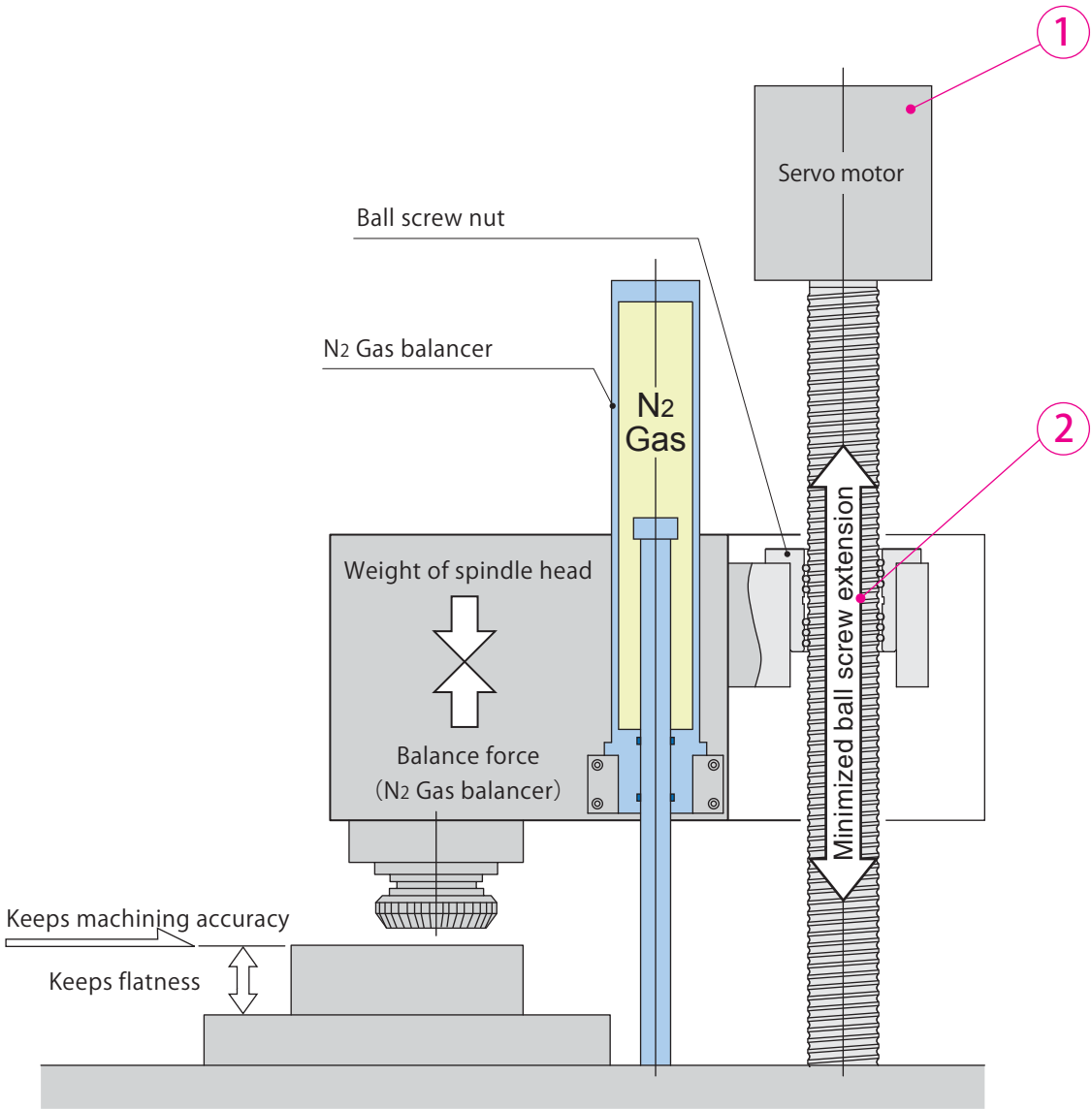
Proposal to Spindle Head of Machining Center

① Reduces load to servo motor, power consumption, and prevents heat generation

When moving a spindle head without balancer, a large load is applied to the servo motor, and it induces large power consumption. Also, the heat at motor brings an expansion of ball screw that lowers the positioning accuracy. Balancing by N₂ gas balancer assures the reduction of load to the servo motor to restrain the power consumption and heat generation.

② Reduces load to ball screw nut to prevent heat generation

Without balancer, a large load is applied to ball screw nut to make it heated. This heat causes an expansion of ball screw that lowers the positioning accuracy. Especially at high speed feed, the heat generation becomes larger, and the machining accuracy significantly goes down. Balancing by N₂ gas balancer assures the decreases of load to the ball screw nut to restrain heat generation.

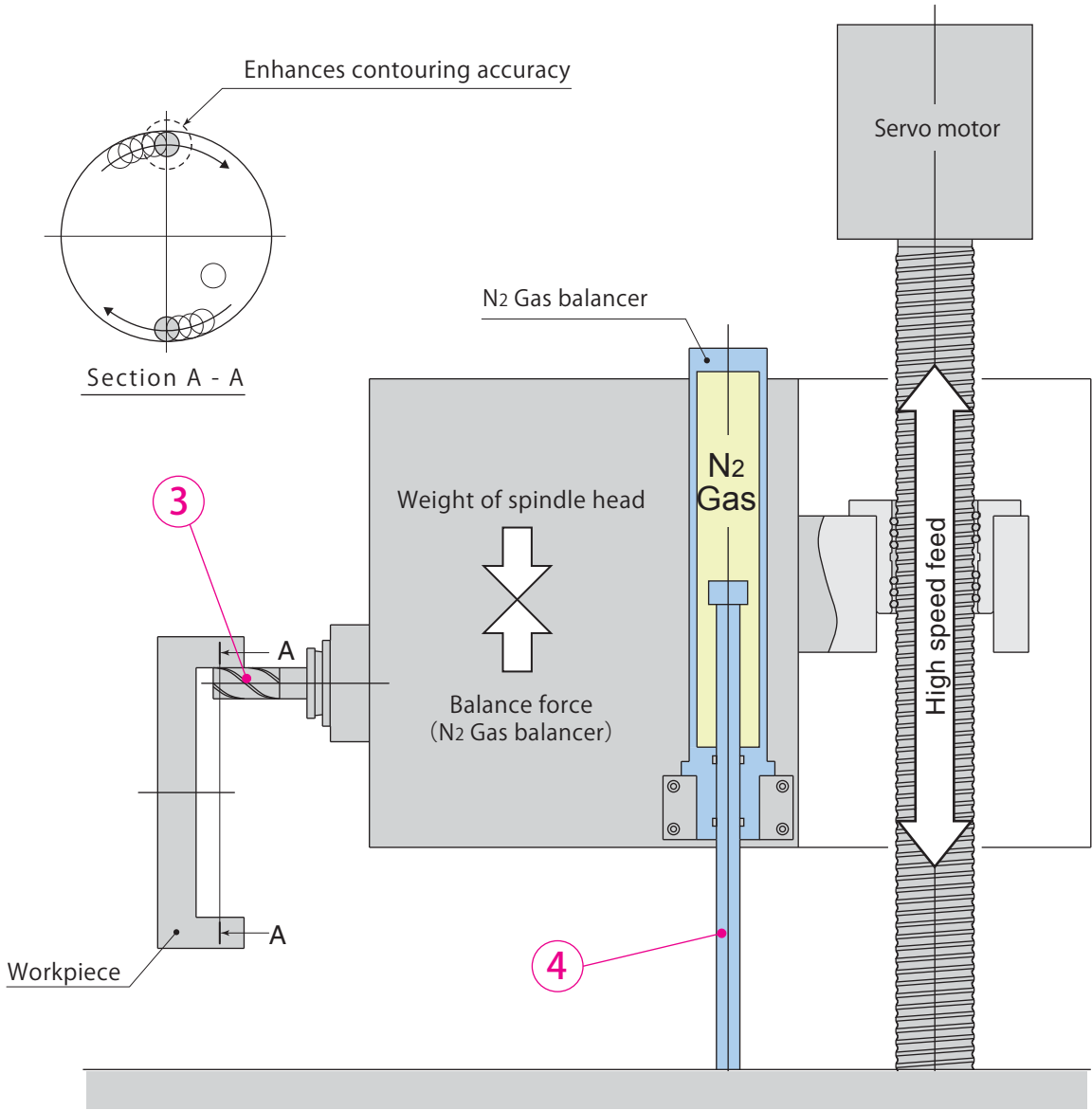


3 Increases machining accuracy at high speed feed

Balancer with N₂ gas brings a higher response speed for up/down motion at high speed feed, thus particularly enhances the accuracy for contouring.

4 Decreases load to ball screw and guide portion of spindle head

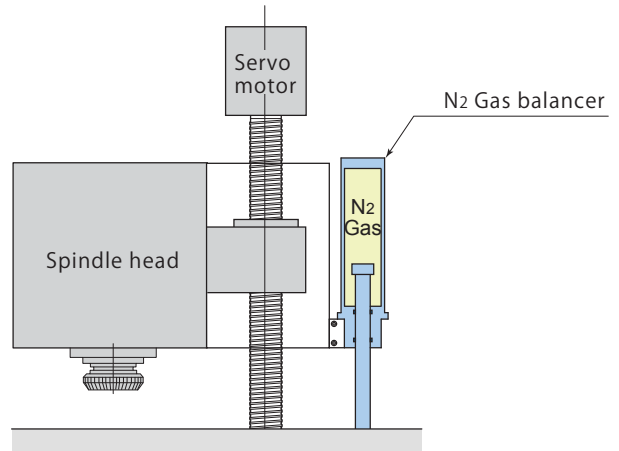
N₂ gas balancer can be easily installed near the center of gravity of spindle head. By supporting the spindle head in good balance, it reduces a load to the ball screw and the guiding portion.



Comparison with a conventional balancer

- High response even at high speed feed
- No power source or piping required
- Space saving compact design
- Minimized pressure fluctuation for stable balancing

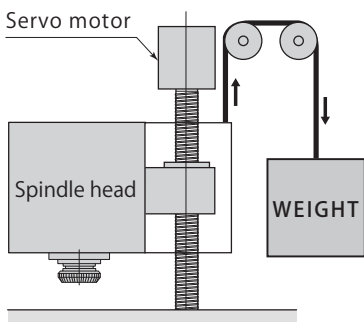
Pascal N2 Gas balancer



Conventional balancers

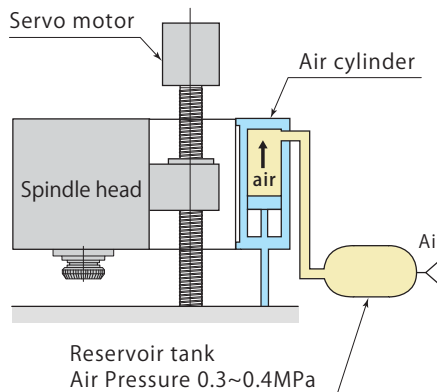
Counter weight

- Slow response. Can not follow up high speed feed.
- Requires large space.



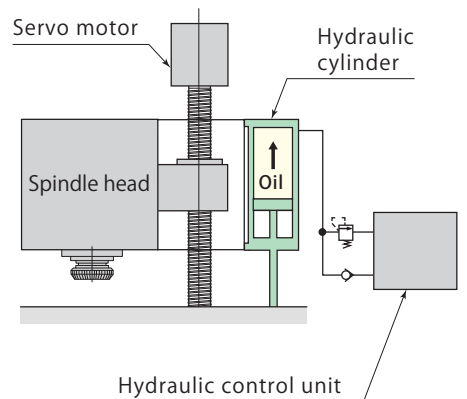
Air cylinder

- Requires an air cylinder of large diameter. (Likely to cause a Stick-Slip)
- Requires large capacity reservoir tank.
- Requires air piping with large diameter.



Hydraulic cylinder

- Requires hydraulic unit and piping.
- Needs to have anti-heat device against oil temperature increase.



N₂ Gas Balancer body

- Mount vertically (piston rod face-down) as shown on the right.
The N₂ gas balancer can not be mounted in an upward or horizontal direction.

Gas charging /discharging tools

- Gas charging should be done by customer. As the gas charging tool is not furnished with the gas balancer, please order separately.
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Mounting adaptor

- Following parts ①~⑦ should be prepared by customer. For details refer to "Mounting adaptor example" on the following pages.
→ page 11

⑥ Parallel key Mounting bolt x 2

③ Parallel key x 1

① Mount block x 1

⑤ Mount block Mounting bolt x 4

④ N₂Gas Balancer Mounting bolt x 6

② Protection plate x 1

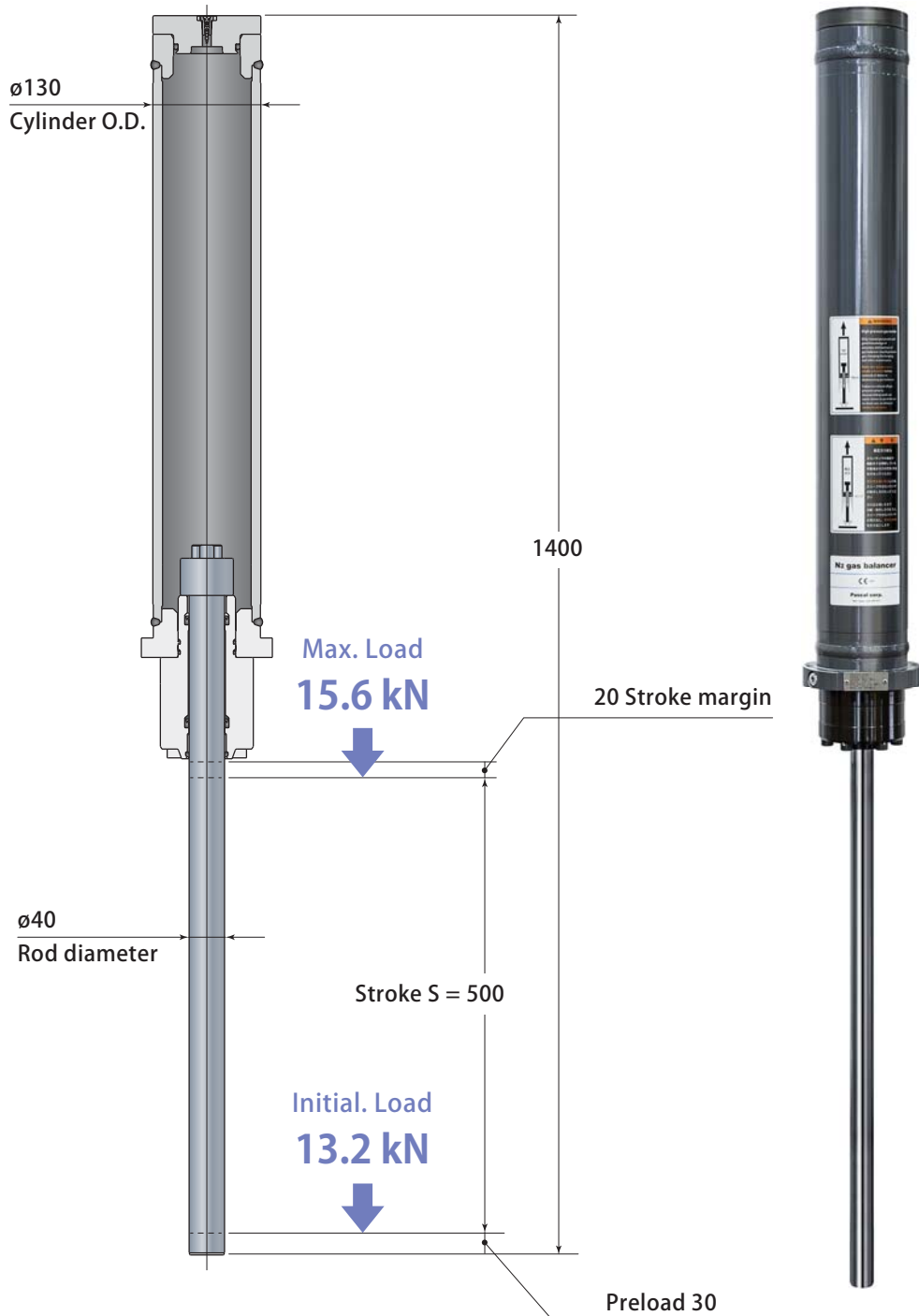
⑦ Protection plate Mounting bolt x 4

Piston rod

Floating pad (Option)

- Floating pad is a must to minimize the eccentric load to the piston rod. Prepare a floating pad by yourself when not using the one of Pascal.
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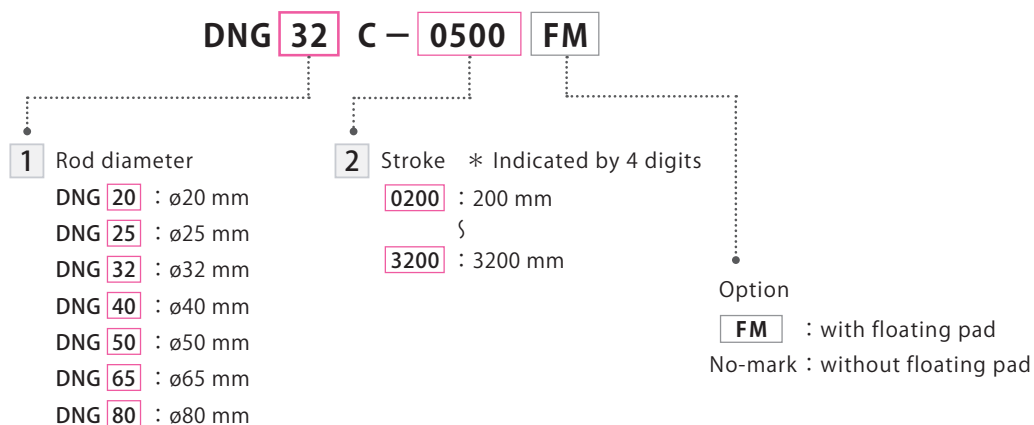
Small cylinder diameter, space saving type. High charging pressure provides high power.



Model	DNG40C-0500
Gas charging pressure	max. 10.5 MPa
Compression ratio	about 1.2

Specifications

Model indication

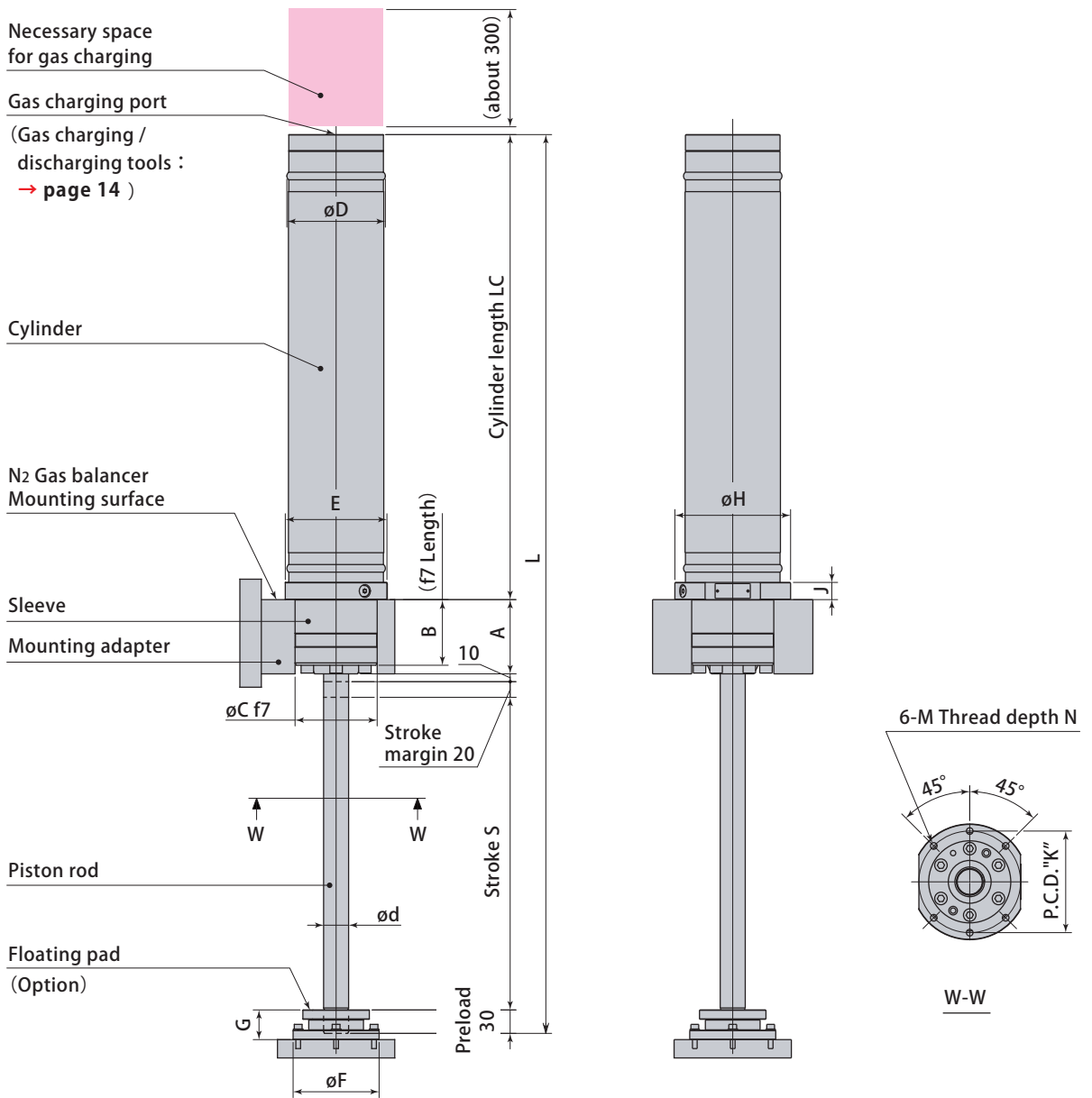


Model	1 Rod diameter ød mm	2 Stroke S mm	Gas charging pressure					
			At 3.5MPa		At 7.0MPa		At 10.5MPa	
			Initial load kN	Max. Load kN	Initial load kN	Max. Load kN	Initial load kN	Max. Load kN
DNG20C	20	200 ~ 800	1.1	1.2	2.2	2.5	3.3	3.7
DNG25C	25	200 ~ 1000	1.7	1.9	3.4	3.9	5.2	5.8
DNG32C	32	200 ~ 1300	2.8	3.3	5.6	6.7	8.4	10.0
DNG40C	40	200 ~ 1600	4.4	5.2	8.8	10.4	13.2	15.6
DNG50C	50	200 ~ 2000	6.9	8.4	13.7	16.8	20.6	25.2
DNG65C	65	200 ~ 2600	11.6	14.2	23.2	28.3	34.8	42.5
DNG80C	80	200 ~ 3200	17.6	20.9	35.2	41.9	52.8	62.8

Gas charging pressure	3.5 ~ 10.5 MPa
Proof pressure	15.8 MPa
Compression ratio	about 1.2
Stroke speed	max. 60 m/min.
Allowable acceleration	max. 9.8 m/s ² (1G)
Operating temperature	0 ~ 40° C *

* Allowable temperature limit of N₂ Gas Balancer is 70° C.

Dimensions



mm

Model	ød	øD	A	B	øC	E	øF	G	øH	J	K	M	N	Floating pad model
DNG20C	20	85	55	46	75	95	95	38	108	20	90	M 6	12	DNJ-FM-20
DNG25C	25	100	65	56	85	105	100	38	123	20	105	M 8	16	DNJ-FM-25
DNG32C	32	105	75	66	90	108	110	38	123	20	108	M 8	16	DNJ-FM-32
DNG40C	40	130	115	104	105	130	120	38	148	22	130	M10	20	DNJ-FM-40
DNG50C	50	160	125	114	120	154	130	38	188	25	165	M10	20	DNJ-FM-50
DNG65C	65	195	155	142	140	186	165	40	218	25	197	M12	25	DNJ-FM-65
DNG80C	80	250	175	158	180	240	185	40	298	30	260	M16	30	DNJ-FM-80

- Stroke S is the actual stroke length excluding the stroke margin of 20 mm and the preload amount of 30 mm.
- The nominal stroke can be extended by shortening of the stroke margin.
(Ex.1) $S = 500$ mm model, and stroke margin set to 0 : $S_1 = 500 + 20 = 520$ mm
- To extend the actual stroke length set the preload amount below 30 mm. (Possible till minimum of 5 mm.)
(Ex.2) Model as above, preload set to 5mm : $S_2 = 520 + (30 - 5) = 545$ mm
- The actual stroke length cannot be extended further than 45 mm. Choose another model with longer stroke, if necessary.

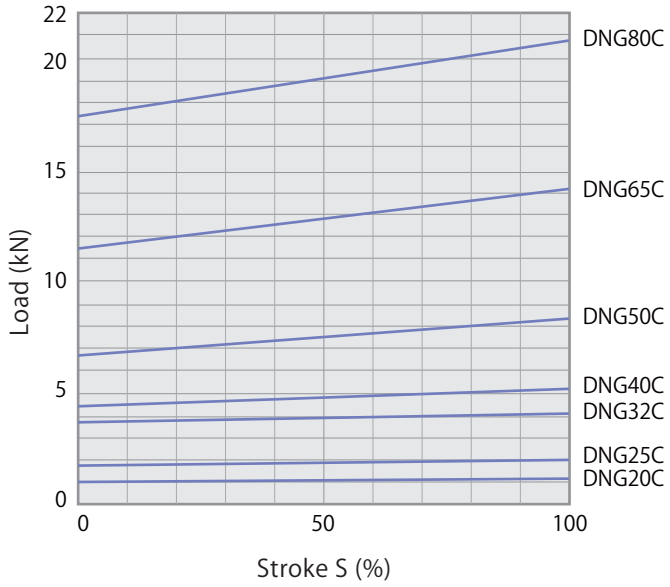
Dimensions table

Model	Stroke S mm	Length L mm	Length LC mm	Mass kg
DNG20C- 0200	200	690	375	9.7
0250	250	790	425	10.6
0300	300	890	475	11.4
0350	350	990	525	12.3
0400	400	1090	575	13.1
0500	500	1290	675	14.8
0600	600	1490	775	16.5
0700	700	1690	875	18.2
0800	800	1890	975	19.9
DNG25C- 0200	200	710	385	14.1
0250	250	810	435	15.3
0300	300	910	485	16.4
0350	350	1010	535	17.6
0400	400	1110	585	18.7
0500	500	1310	685	21.0
0600	600	1510	785	23.3
0700	700	1710	885	25.6
0800	800	1910	985	27.9
0900	900	2110	1085	30.2
1000	1000	2310	1185	32.5
DNG32C- 0200	200	740	405	16.9
0250	250	840	455	18.2
0300	300	940	505	19.5
0350	350	1040	555	20.8
0400	400	1140	605	22.1
0500	500	1340	705	24.7
0600	600	1540	805	27.3
0700	700	1740	905	29.9
0800	800	1940	1005	32.5
0900	900	2140	1105	35.1
1000	1000	2340	1205	37.7
1100	1100	2540	1305	40.3
1200	1200	2740	1405	42.9
1300	1300	2940	1505	45.5
DNG40C- 0200	200	800	425	30.0
0250	250	900	475	32.0
0300	300	1000	525	34.0
0350	350	1100	575	36.0
0400	400	1200	625	38.0
0500	500	1400	725	42.0
0600	600	1600	825	46.0
0700	700	1800	925	50.0
0800	800	2000	1025	54.0
0900	900	2200	1125	58.0
1000	1000	2400	1225	62.0
1100	1100	2600	1325	66.0
1200	1200	2800	1425	70.0
1300	1300	3000	1525	74.0
1400	1400	3200	1625	78.0
1500	1500	3400	1725	82.0
1600	1600	3600	1825	86.0
DNG50C- 0200	200	825	440	49.8
0250	250	925	490	53.3
0300	300	1025	540	56.7
0350	350	1125	590	60.2
0400	400	1225	640	63.6
0500	500	1425	740	70.5
0600	600	1625	840	77.4
0700	700	1825	940	84.3
0800	800	2025	1040	91.2
0900	900	2225	1140	98.1
1000	1000	2425	1240	105.0
1100	1100	2625	1340	111.9
1200	1200	2825	1440	118.8
1300	1300	3025	1540	125.7
1400	1400	3225	1640	132.6

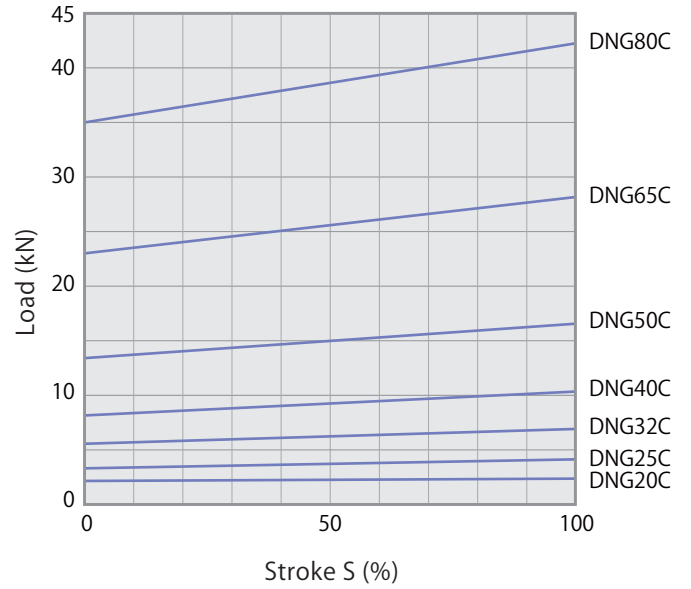
Model	Stroke S mm	Length L mm	Length LC mm	Mass kg
DNG50C -1500	1500	3425	1740	139.5
1600	1600	3625	1840	146.4
1700	1700	3825	1940	153.3
1800	1800	4025	2040	160.2
1900	1900	4225	2140	167.1
2000	2000	4425	2240	174.0
DNG65C -0200	200	890	475	78.8
0250	250	990	525	83.7
0300	300	1090	575	88.6
0350	350	1190	625	93.5
0400	400	1290	675	98.4
0500	500	1490	775	108.2
0600	600	1690	875	118.0
0700	700	1890	975	127.8
0800	800	2090	1075	137.6
0900	900	2290	1175	147.4
1000	1000	2490	1275	157.2
1100	1100	2690	1375	167.0
1200	1200	2890	1475	176.8
1300	1300	3090	1575	186.6
1400	1400	3290	1675	196.4
1500	1500	3490	1775	206.2
1600	1600	3690	1875	216.0
1700	1700	3890	1975	225.8
1800	1800	4090	2075	235.6
1900	1900	4290	2175	245.4
2000	2000	4490	2275	255.2
2100	2100	4690	2375	265.0
2200	2200	4890	2475	274.8
2300	2300	5090	2575	284.6
2400	2400	5290	2675	294.4
2500	2500	5490	2775	304.2
2600	2600	5690	2875	314.0
DNG80C -0200	200	970	535	154.0
0250	250	1070	585	162.0
0300	300	1170	635	170.0
0350	350	1270	685	178.0
0400	400	1370	735	186.0
0500	500	1570	835	202.0
0600	600	1770	935	218.0
0700	700	1970	1035	234.0
0800	800	2170	1135	250.0
0900	900	2370	1235	266.0
1000	1000	2570	1335	282.0
1100	1100	2770	1435	298.0
1200	1200	2970	1535	314.0
1300	1300	3170	1635	330.0
1400	1400	3370	1735	346.0
1500	1500	3570	1835	362.0
1600	1600	3770	1935	378.0
1700	1700	3970	2035	394.0
1800	1800	4170	2135	410.0
1900	1900	4370	2235	426.0
2000	2000	4570	2335	442.0
2100	2100	4770	2435	458.0
2200	2200	4970	2535	474.0
2300	2300	5170	2635	490.0
2400	2400	5370	2735	506.0
2500	2500	5570	2835	522.0
2600	2600	5770	2935	538.0
2700	2700	5970	3035	554.0
2800	2800	6170	3135	570.0
2900	2900	6370	3235	586.0
3000	3000	6570	3335	602.0
3100	3100	6770	3435	618.0
3200	3200	6970	3535	634.0

Capacity diagram

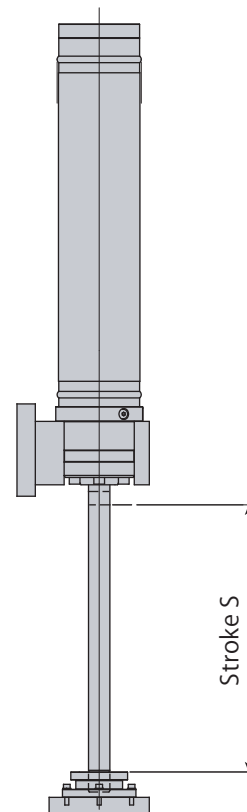
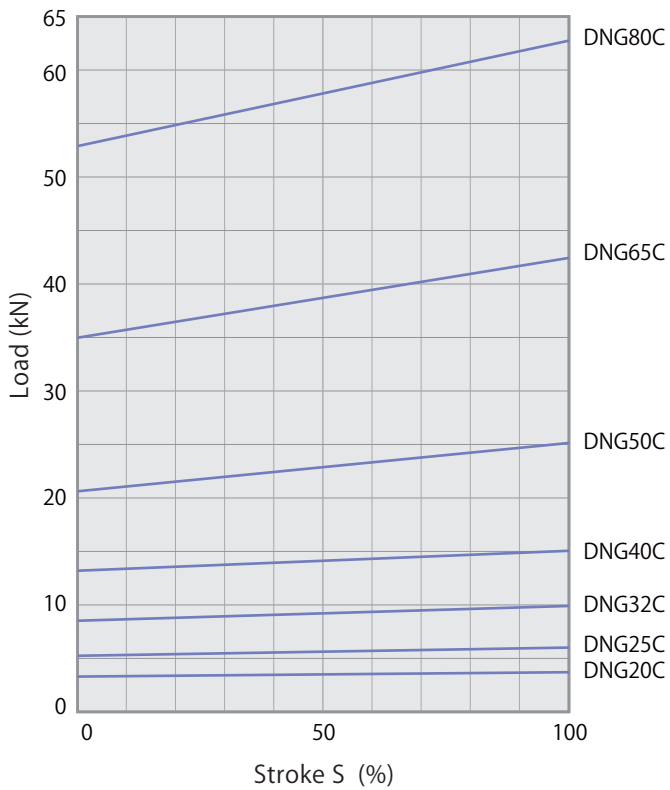
Gas charging pressure 3.5MPa



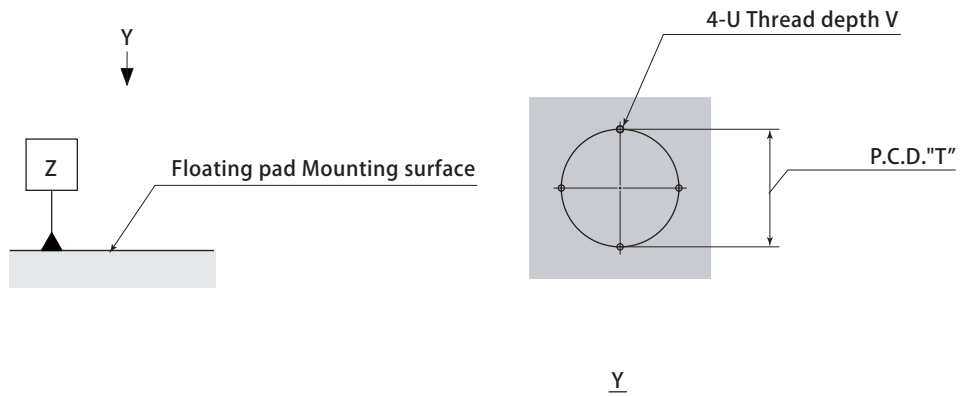
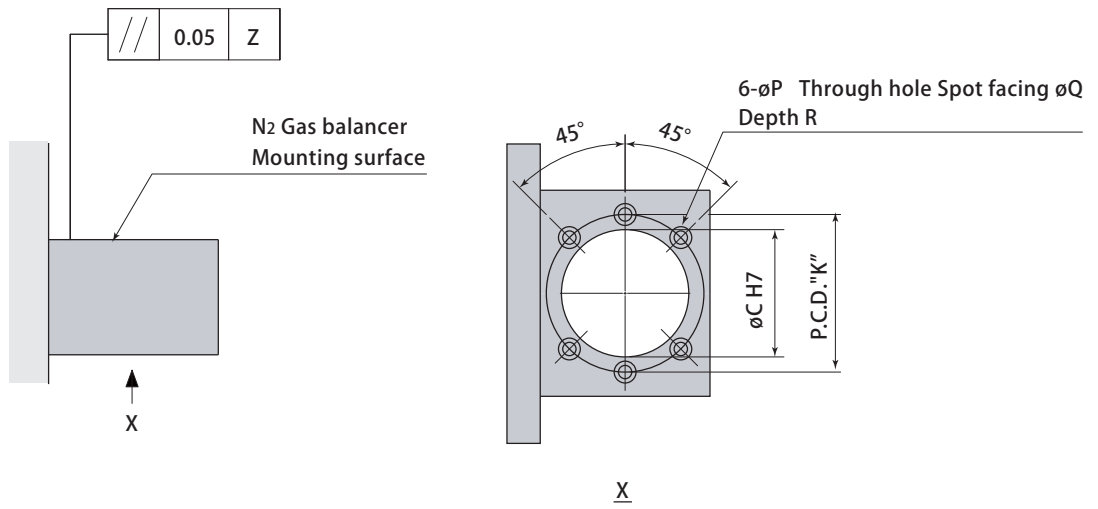
Gas charging pressure 7.0MPa



Gas charging pressure 10.5MPa

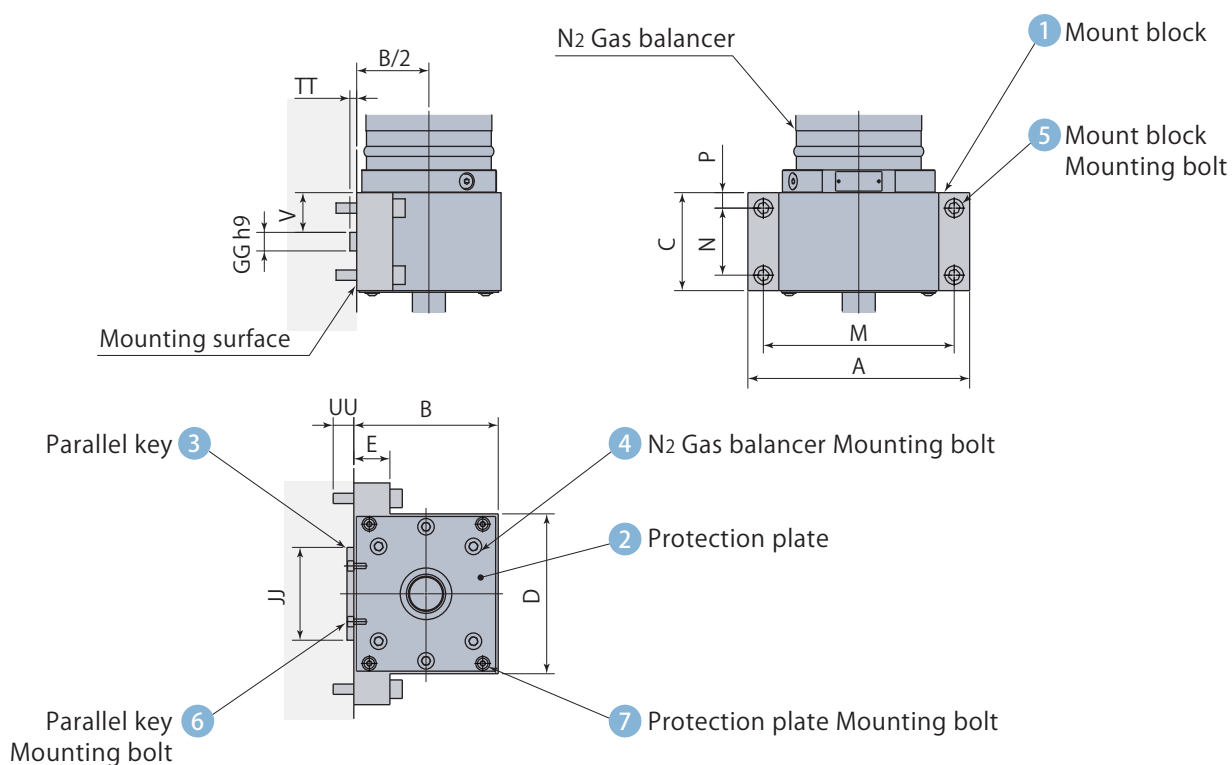


Mounting details



Model	øC	K	øP	øQ	R	T	U	V	Floating pad model
DNG20C	75	90	6.8	11	7	85	M5	9	DNJ-FM-20
DNG25C	85	105	9	14	9	90	M5	9	DNJ-FM-25
DNG32C	90	108	9	14	9	97	M6	15	DNJ-FM-32
DNG40C	105	130	11	18	11	105	M6	15	DNJ-FM-40
DNG50C	120	165	11	18	11	115	M6	15	DNJ-FM-50
DNG65C	140	197	14	20	13	150	M8	15	DNJ-FM-65
DNG80C	180	260	18	26	17	170	M8	15	DNJ-FM-80

mm



Model	A	B	C	D	E	M	N	P	V	GG	JJ	TT	UU
DNG20C	150	100	55	110	25	130	35	10	20.5	14	70	5.2	15
DNG25C	170	110	65	125	25	150	45	10	24.5	16	80	5.7	15
DNG32C	190	120	75	130	35	165	55	10	28.5	18	90	6.6	20
DNG40C	215	140	115	155	45	185	85	15	46.5	22	110	8.6	20
DNG50C	270	170	125	195	50	230	85	20	50	25	140	8.6	25
DNG65C	300	200	155	225	55	260	115	20	63.5	28	160	9.6	30
DNG80C	400	260	175	305	60	350	125	25	71.5	32	200	10.6	35

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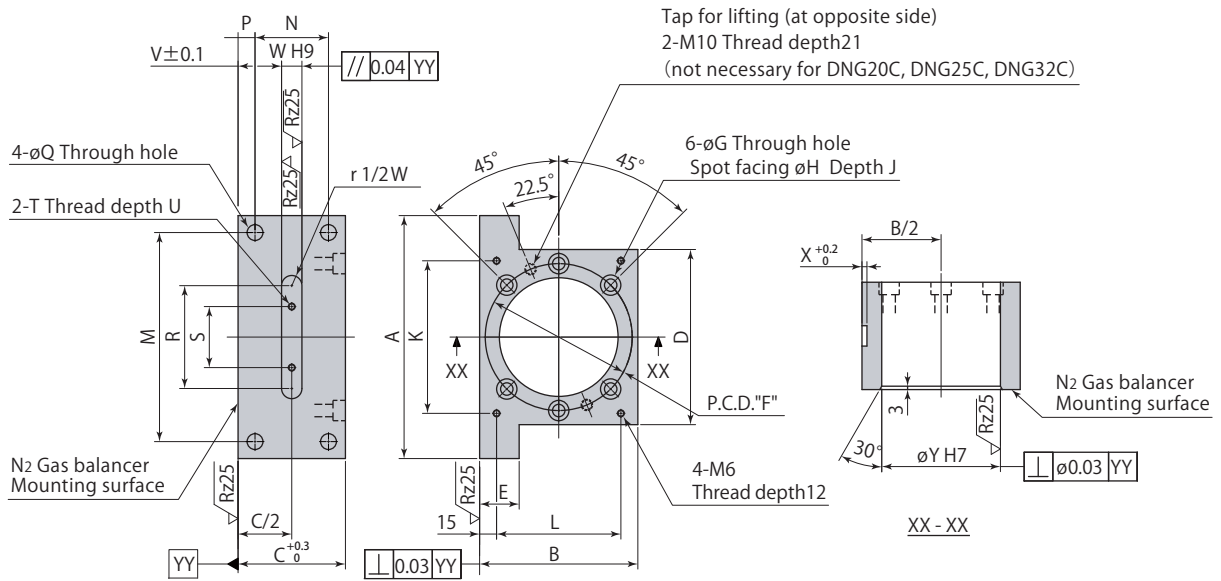
④ ⑤ ⑥ ⑦ Mounting bolt

Model	④N ₂ Gas balancer Mounting bolt *	⑤Mount block Mounting bolt *	⑥Parallel key Mounting bolt *	⑦Protection plate Mounting bolt
DNG20C	M6 × 55	M8 × 40	M5 × 10	Flange button head bolt M6 × 8 (Common to all series)
DNG25C	M8 × 70	M10 × 40	M5 × 10	
DNG32C	M8 × 80	M12 × 55	M6 × 12	
DNG40C	M10 × 120	M12 × 65	M6 × 16	
DNG50C	M10 × 130	M16 × 75	M8 × 16	
DNG65C	M12 × 160	M20 × 85	M10 × 16	
DNG80C	M16 × 180	M24 × 95	M10 × 16	

* Hexagon socket head cap screw JIS B 1176 (Strength class 12.9)

[Reference] Mounting adaptor example

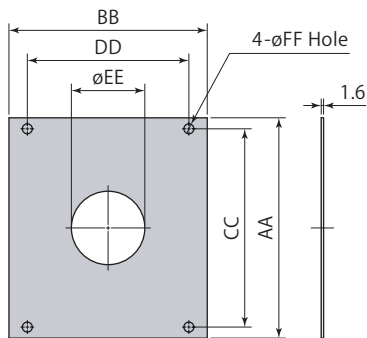
1 Mount block Material : S45C (JIS G 4051)



Model	A	B	C	D	E	F	øG	øH	J	K	L	M	N	P	øQ	R	S	T	U	V	W	X	øY	Mass kg
DNG20C	150	100	55	110	25	90	6.8	11	7	90	70	130	35	10	9	71	42	M 5	8	20.5	14	3.8	75	3.1
DNG25C	170	110	65	125	25	105	9	14	9	105	80	150	45	10	11	81	48	M 5	8	24.5	16	4.3	85	4.9
DNG32C	190	120	75	130	35	108	9	14	9	110	90	165	55	10	14	91	54	M 6	10	28.5	18	4.4	90	6.2
DNG40C	215	140	115	155	45	130	11	18	11	135	110	185	85	15	14	111	66	M 6	12	46.5	22	5.4	105	13.1
DNG50C	270	170	125	195	50	165	11	18	11	175	140	230	85	20	18	141	90	M 8	14	50	25	5.4	120	23.8
DNG65C	300	200	155	225	55	197	14	20	13	205	170	260	115	20	22	161	104	M10	16	63.5	28	6.4	140	38.7
DNG80C	400	260	175	305	60	260	18	26	17	285	230	350	125	25	26	201	136	M10	16	71.5	32	7.4	180	77.8

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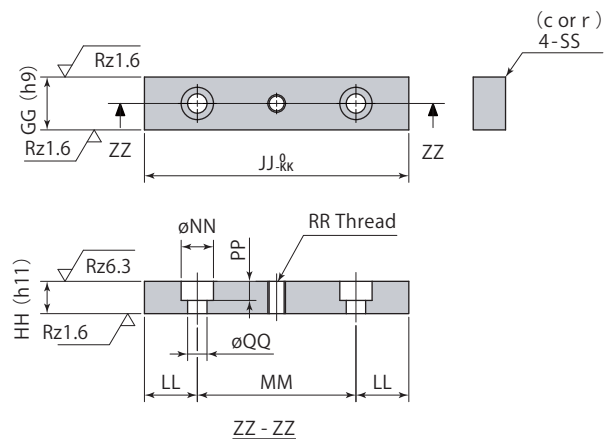
2 Protection plate Material : SPCC (JIS G 3141)



Model	AA	BB	CC	DD	øEE	øFF
DNG20C	105	95	90	70	30	6.8
DNG25C	120	105	105	80	35	6.8
DNG32C	125	115	110	90	42	6.8
DNG40C	150	135	135	110	50	6.8
DNG50C	190	165	175	140	60	6.8
DNG65C	220	195	205	170	75	6.8
DNG80C	300	255	285	230	90	6.8

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3 Parallel key Material : S45C (JIS G 4051)
Type : (JIS B 1301)

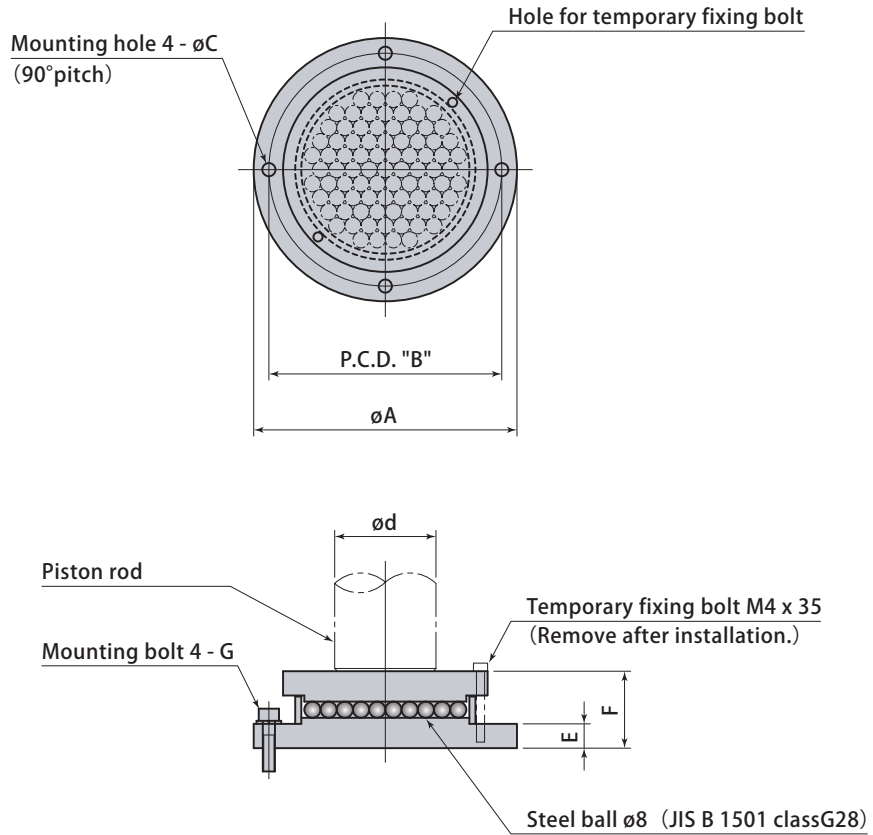


Model	GG	HH	JJ	KK	LL	MM	øNN	PP	øQQ	RR	SS
DNG20C	14	9	70	0.30	14	42	9.5	5.5	5.5	M 5	0.4~0.6
DNG25C	16	10	80	0.30	16	48	9.5	5.5	5.5	M 5	0.4~0.6
DNG32C	18	11	90	0.46	18	54	11	6.5	6.8	M 6	0.4~0.6
DNG40C	22	14	110	0.46	22	66	11	6.5	6.8	M 6	0.6~0.8
DNG50C	25	14	140	0.46	25	90	14	8.5	9	M 8	0.6~0.8
DNG65C	28	16	160	0.46	28	104	17.5	10.5	11	M10	0.6~0.8
DNG80C	32	18	200	0.46	32	136	17.5	10.5	11	M10	0.6~0.8

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Option Floating pad

Floating pad is a must to minimize the eccentric load to the piston rod while the N₂ gas balancer is operating.

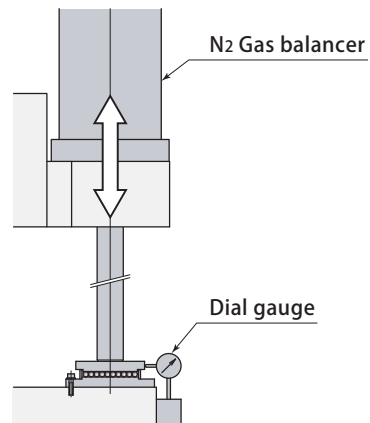


Floating pad model	A	B	C	ød	E	F	G	Qty. of Steel balls	Mass kg
DNJ-FM-20	95	85	5.5	20	12	38	M5 x 20	30	1.3
DNJ-FM-25	100	90	5.5	25	12	38	M5 x 20	37	1.5
DNJ-FM-32	110	97	6.5	32	12	38	M6 x 25	48	1.8
DNJ-FM-40	120	105	6.5	40	12	38	M6 x 25	61	2.1
DNJ-FM-50	130	115	6.5	50	12	38	M6 x 25	85	2.6
DNJ-FM-65	165	150	8.5	65	12	40	M8 x 25	151	4.5
DNJ-FM-80	185	170	8.5	80	12	40	M8 x 25	225	6.0

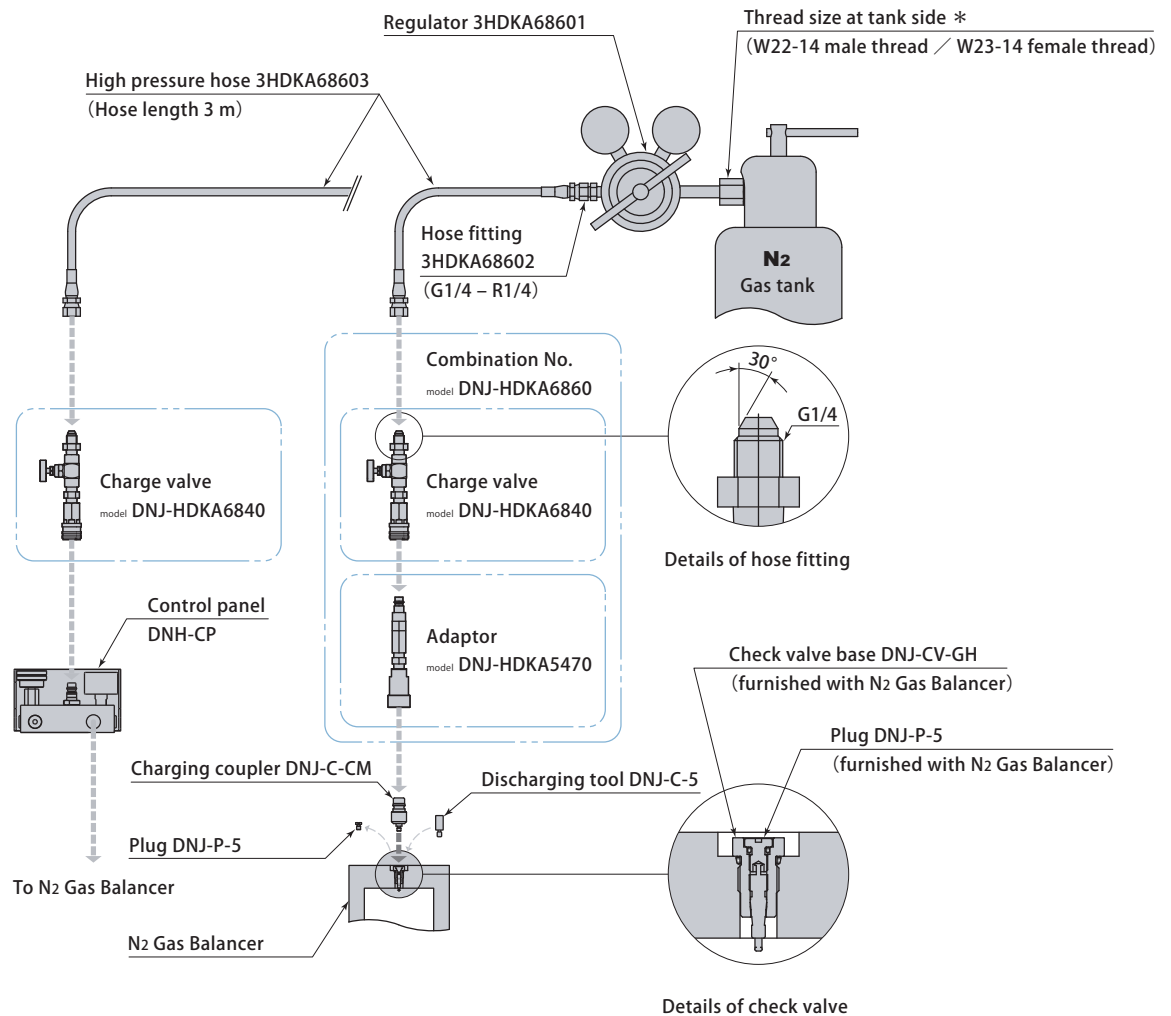
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Eccentricity check

Mount the gas balancer to make fluctuation of dialgauge below 0.3 mm per 1 m stroke at moving up and down the spindle unit.



Option Gas charging / discharging tools



*The regulator can be connected to the tank with a W22-14 thread size male thread (RH) as shipped, and by using the furnished adaptor. A W23-14 female thread (RH) is applicable. In case of the connection port other than above, prepare applicable pipe fitting.

Caution in use of N₂ Gas Balancer

- For installation, gas charging, handling at transport and storage of the N₂ Gas Balancer, refer to the separate instruction manual.
- As high-pressure nitrogen gas is sealed inside the gas balancer, below operations should be strictly avoided.
× Heating × Welding / Fusion × Modification × Additional Machining
- Charge nitrogen gas only. Never charge flammable / explosive gas, or volatile liquid instead of nitrogen gas. These fluids may cause explosion.
- Do not fill oil, water or non-compressed fluid into the cylinder. These fluids make gas pressure too high at stroking and cause leakage or damage at cylinder.
- Charging gas pressure should be within the designated pressure range. Gas pressure becomes higher in accordance with piston rod stroke. Too high gas pressure may cause leakage or damage at cylinder.
- For use in environment of high temperature (above 40° C) and rapid temperature change, please ask us separately.
- Avoid damage of the piston rod and attachment of foreign substances. They may damage the sealing material and shorten the life of the gas balancer.
- When disposing, discharge nitrogen gas out of cylinder. Failure of this procedure may cause explosion.

Pascal

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