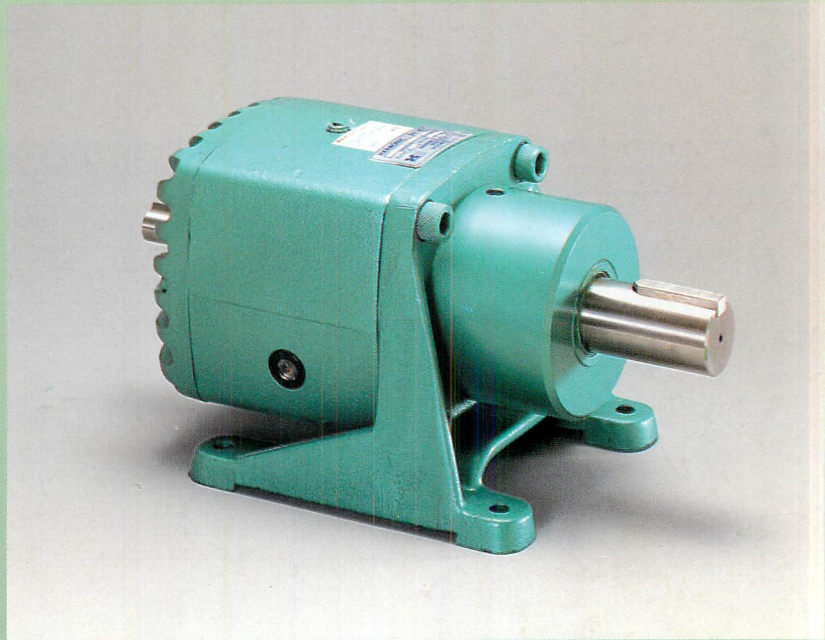


harmonic drive gears

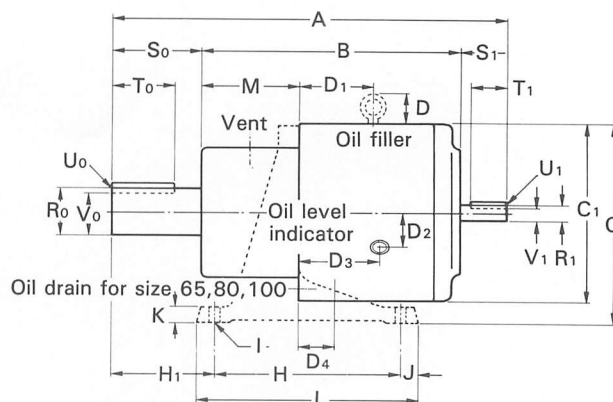
HDUC Speed Reducers



DIMENSIONS

HDUC 20-100

Type 0AG with Foot, Type 1AG without Foot



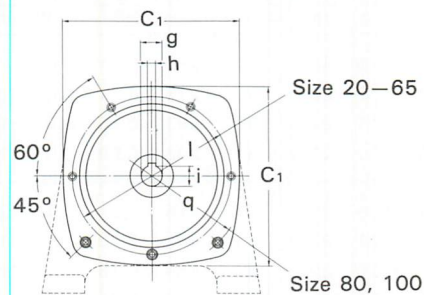
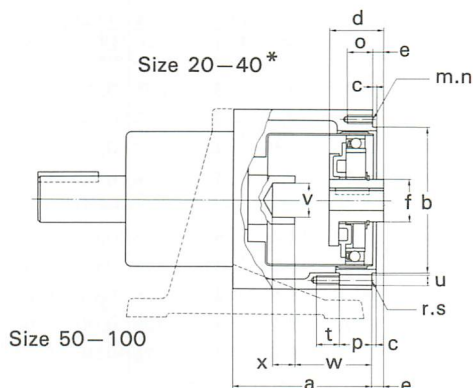
Dimensions in mm

HDUC size	20	25	32	40	50	65	80	100
A Length overall	188	225	270	318	384	442	544	656
B Casing length	119	144	184	214	253	303	374	437
C Height-foot mounted	84	99	136	158	191	251	306.5	371.5
C₁ Height without foot	68	86	112	136	170	222	273	343
C₂ Diagonal across casing	81±3.0	104±3.0	135±3.0	164±3.0	206±3.0	272±3.0	334±3.0	420±3.0
D Lifting eye	—	—	—	—	—	—	60	71
D₁	33	36	54	60	72	98	50	71
D₂	9	17	24	32	38	50	59	74
D₃	33	31	44	51	73	98	99.5	109
D₄ —D₅	13—12	20—12	20—15	25—0	35—0	33—0	38—0	50—0
E Foot width	98	112	140	168	205	260	320	400
F Centerline height	50	56	80	90	106	140	170	200
G Fixing center	35	42	55	67.5	85	110	135	170
H Fixing center	70	85	130	150	180	240	280	330
H₁ Hole to output shaft	55	63	70	82	102	110	122	154
I Fixing hole diameter	7	7	10	10	10	15	15	19
J Fixing center	15	15	15	15	17.5	20	25	30
K Foot thickness	10	10	13	14	16	20	20	22
L Foot length	100	115	160	180	215	280	330	390
M Mounting spigot length	45	56	73	81	95	105	132	146
N Thread size	M5	M6	M10	M12	M14	M20	M24	M27
N Alternative screw size	(Nr.10-24	1/4"-20	3/8"-16	7/16"-14	1/2"-13	3/4"-10	7/8"-9	1"-8)
O Thread depth	11	12	17	20	22	30	32	40
P Pitch circle	70	88	112	140	175	225	280	350
Q Mounting spigot diameter (f8)	58 ^{-0.030} _{-0.076}	70 ^{-0.030} _{-0.076}	90 ^{-0.036} _{-0.090}	102 ^{-0.036} _{-0.090}	125 ^{-0.043} _{-0.106}	140 ^{-0.043} _{-0.106}	180 ^{-0.043} _{-0.106}	210 ^{-0.050} _{-0.122}
R₁ Diameter (h6)	10 ⁰ _{-0.009}	14 ⁰ _{-0.011}	14 ⁰ _{-0.011}	16 ⁰ _{-0.011}	16 ⁰ _{-0.011}	22.4 ⁰ _{-0.013}	30 ⁰ _{-0.013}	35 ⁰ _{-0.016}
S₁ Length	29	32	32	38	44	49	70	91
T₁ Keyway length	20	20	20	26	32	35	50	70
U₁ Keyway width (N9)	3 ^{-0.004} _{-0.029}	5 ⁰ _{-0.030}	5 ⁰ _{-0.030}	5 ⁰ _{-0.030}	5 ⁰ _{-0.030}	8 ⁰ _{-0.036}	8 ⁰ _{-0.036}	10 ⁰ _{-0.036}
V₁ Keyway depth	8.2	11	11	13	13	18.4	26	30
R₀ Diameter (h6)	16 ⁰ _{-0.011}	22.4 ⁰ _{-0.013}	30 ⁰ _{-0.013}	35 ⁰ _{-0.016}	45 ⁰ _{-0.016}	55 ⁰ _{-0.019}	70 ⁰ _{-0.019}	85 ⁰ _{-0.022}
S₀ Length	40	49	54	66	87	90	100	128
T₀ Keyway length	33	40	42	46	62	65	78	105
U₀ Keyway width (N9)	5 ⁰ _{-0.030}	8 ⁰ _{-0.036}	8 ⁰ _{-0.036}	10 ⁰ _{-0.036}	14 ⁰ _{-0.043}	16 ⁰ _{-0.043}	20 ⁰ _{-0.052}	22 ⁰ _{-0.052}
V₀ Keyway depth	13	18.4	26	30	39.5	49	62.5	76
Key	5×5	8×7	8×7	10×8	14×9	16×10	20×12	22×14
Weight (kgf)—Housing with foot	2.5	4.7	9.5	15	27	52	100	181
—Housing without foot	1.9	4.3	8.2	11.5	21	41	79	142

DIMENSIONS

HDUC 20-100

Type 0AG/1AG Close Couple Model



* Circular Spline teeth are integral with housing.

Dimensions in mm

HDUC size	20	25	32	40	50	65	80	100
a Casing length	54	64	86	105	130	163	200	247
b Location diameter (g7)	$54_{-0.040}^{-0.010}$	$67_{-0.040}^{-0.010}$	$90_{-0.047}^{-0.012}$	$110_{-0.047}^{-0.012}$	$135_{-0.054}^{-0.014}$	$177_{-0.054}^{-0.014}$	$218_{-0.061}^{-0.015}$	$272_{-0.069}^{-0.017}$
c Projection	3	3	3	3.5	4	5	6	6
c ₁ Height less foot	68	86	112	136	170	222	273	343
d Input hub length	27	32	32	40	40	52	65	70
e Projection	6	9	6	8	6.5	4.5	10	10
f Hub O.D.	21	26	26	32	32	48	55	65
g Hub bore (H7)	$9_{+0.015}^{+0.015}$	$11_{+0.018}^{+0.018}$	$14_{+0.018}^{+0.018}$	$14_{+0.018}^{+0.018}$	$19_{+0.021}^{+0.021}$	$24_{+0.021}^{+0.021}$	$28_{+0.021}^{+0.021}$	$28_{+0.021}^{+0.021}$
h Keyway width (JS9)	$3_{+0.0125}^{+0.0125}$	$4_{+0.0150}^{+0.0150}$	$5_{+0.0150}^{+0.0150}$	$5_{+0.0150}^{+0.0150}$	$6_{+0.0150}^{+0.0150}$	$8_{+0.0180}^{+0.0180}$	$8_{+0.0180}^{+0.0180}$	$8_{+0.0180}^{+0.0180}$
i Depth including keyway	$10.4_{+0.1}^{+0.1}$	$12.8_{+0.1}^{+0.1}$	$16.3_{+0.1}^{+0.1}$	$16.3_{+0.1}^{+0.1}$	$21.8_{+0.1}^{+0.1}$	$27.3_{+0.2}^{+0.2}$	$31.3_{+0.2}^{+0.2}$	$31.3_{+0.2}^{+0.2}$
l Fixing hole circle	60	76	100	122	152	195	240	305
m Number of tapped holes	6	6	6	6	—	—	—	—
n Thread size	M3	M4	M5	M6	—	—	—	—
n Alternative inch threads	(No.5-40)	(No.8-32)	(No.10-24)	(1/4-20)	—	—	—	—
o Tapped depth	8	10	11	14	—	—	—	—
p Width of circular spline	—	—	—	—	28	36	48	57
q Fixing hole circle	—	—	—	—	—	—	280	350
r Number of tapped holes	—	—	—	—	6	6	8	8
s Thread size	—	—	—	—	M10	M12	M12	M14
s Alternative thread size	—	—	—	—	(3/8-16)	(7/16-14)	(7/16-14)	(1/2-13)
t Tapped depth	—	—	—	—	17	20	20	22
u Clearance holes	—	—	—	—	11	14	14	16
v Ballrace diameter	16	22	22	26	26	42	52	62
w Ballrace to front face	31	36	53	58	82	130	163	206
x Ballrace bore depth	9	10	11	15	16	19	22	26

This page covers gear units without input shafts and bearing housings. This enables a suitable prime mover to be close coupled to the harmonic drive housing using a suitable adaptor which is also available.

RATING TABLE

Input rpm		3500					1750					1150					500**				
Size	Ratio	***					***					***					***				
		Input power	Output	Output	Output torque		Input power	Output	Output torque			Input power	Output	Output torque			Input power	Output	Output torque		
		HP	kW	rpm	Nm	lb-in	HP	kW	rpm	Nm	lb-in	HP	kW	rpm	Nm	lb-in	HP	kW	rpm	Nm	lb-in
20	80	0.21	0.15	43.8	30	265	0.11	0.08	21.9	31	275	0.07	0.05	14.4	31	275	0.03	0.02	6.2	31	275
	100	0.20	0.15	36.5	31	275	0.11	0.08	18.2	37	327	0.08	0.06	12.0	37	327	0.03	0.02	5.2	37	327
	128	0.15	0.11	27.3	32	283	0.10	0.07	13.7	43	380	0.07	0.05	9.6	43	380	0.03	0.02	3.9	44	390
	160	0.13	0.10	21.9	33	292	0.09	0.07	10.9	43	380	0.07	0.05	7.2	49	434	0.03	0.02	3.1	50	442
25	80	0.34	0.25	43.8	47	416	0.21	0.15	21.9	58	513	0.14	0.10	14.4	58	518	0.06	0.04	6.2	58	513
	100	0.29	0.21	35.0	50	442	0.20	0.15	17.5	68	660	0.16	0.12	11.5	81	717	0.07	0.05	5.0	81	717
	120	0.27	0.20	29.2	53	469	0.18	0.13	14.6	71	630	0.14	0.10	9.6	82	725	0.07	0.05	4.2	98	867
	160	0.22	0.16	21.9	55	487	0.14	0.10	10.9	72	637	0.11	0.08	7.2	82	725	0.06	0.04	3.1	108	955
	200	0.19	0.14	17.5	56	496	0.12	0.09	8.8	72	637	0.09	0.07	5.8	82	725	0.05	0.04	2.5	108	955
32	78	0.75	0.55	44.9	103	911	0.41	0.30	22.4	112	990	0.27	0.20	14.7	112	990	0.11	0.08	6.4	112	990
	100	0.65	0.48	33.7	114	1010	0.42	0.31	16.8	144	1275	0.31	0.23	11.0	161	1425	0.13	0.10	4.8	161	1425
	131	0.53	0.39	26.5	114	1010	0.33	0.24	13.3	144	1275	0.26	0.19	8.7	165	1460	0.13	0.10	3.8	207	1830
	157	0.46	0.34	22.2	114	1010	0.29	0.21	11.1	144	1275	0.22	0.16	7.3	165	1460	0.13	0.10	3.2	224	1980
	200	0.37	0.27	16.8	114	1010	0.24	0.18	8.4	144	1275	0.18	0.13	5.5	165	1460	0.10	0.07	2.4	224	1980
	260	0.31	0.23	13.5	114	1010	0.20	0.15	6.7	144	1275	0.15	0.11	4.4	165	1460	0.09	0.07	1.9	224	1980
40	80	1.40	1.03	43.8	196	1735	0.70	0.51	21.9	196	1735	0.47	0.35	14.4	196	1735	0.19	0.14	6.2	196	1735
	100	1.47	1.08	36.5	241	2133	0.81	0.60	18.2	265	2345	0.52	0.31	12.0	265	2345	0.22	0.16	5.2	265	2345
	128	1.15	0.85	27.3	241	2133	0.72	0.53	13.7	301	2660	0.55	0.40	9.0	345	3050	0.25	0.18	3.9	380	3363
	160	0.96	0.71	21.9	241	2133	0.60	0.44	10.9	301	2660	0.45	0.33	7.2	345	3050	0.26	0.19	3.1	461	4080
	200	0.82	0.60	18.0	241	2133	0.51	0.38	9.0	301	2660	0.39	0.29	5.9	345	3050	0.22	0.16	2.6	461	4080
	258	0.67	0.49	13.6	241	2133	0.42	0.31	6.8	301	2660	0.33	0.24	4.5	345	3050	0.18	0.13	1.9	461	4080
50	80	2.6	1.91	43.8	357	3160	1.27	0.93	21.9	357	3160	0.85	0.63	14.4	357	3160	0.35	0.26	6.2	357	3160
	100	2.6	1.91	35.0	447	3955	1.65	1.21	17.5	564	4990	1.10	0.81	11.5	565	5000	0.46	0.34	5.0	565	5000
	120	2.3	1.69	29.2	447	3955	1.42	1.04	14.6	564	4990	1.09	0.80	9.6	646	5720	0.48	0.35	4.2	680	6020
	160	1.8	1.32	21.9	447	3955	1.12	0.82	10.9	564	4990	0.86	0.63	7.2	646	5720	0.48	0.35	3.1	864	7640
	200	1.5	1.10	17.5	447	3955	0.94	0.69	8.8	564	4990	0.72	0.53	5.8	646	5720	0.40	0.29	2.5	864	7640
	242	1.3	0.96	14.5	447	3955	0.83	0.61	7.2	564	4990	0.63	0.46	4.8	646	5720	0.35	0.26	2.0	864	7640
65	78	5.7	4.19	44.9	780*	6900*	2.9	2.13	22.4	780	6900	1.9	1.40	14.7	780	6900	0.8	0.59	6.4	780	6900
	104	4.7	3.46	33.7	832*	7360*	3.0	2.21	16.8	1050	9290	2.3	1.69	11.1	1200	10620	1.0	0.74	4.8	1210	10710
	132	3.9	2.87	26.5	832*	7360*	2.4	1.77	13.3	1050	9290	1.9	1.40	8.7	1200	10620	1.0	0.74	3.8	1600	14160
	158	3.4	2.50	22.2	832*	7360*	2.1	1.54	11.1	1050	9290	1.6	1.18	7.3	1200	10620	0.9	0.66	3.2	1600	14160
	208	2.7	1.99	16.8	832*	7360*	1.7	1.25	8.4	1050	9290	1.3	0.96	5.5	1200	10620	0.7	0.51	2.4	1600	14160
	260	2.3	1.69	13.5	832*	7360*	1.5	1.10	6.7	1050	9290	1.1	0.81	4.4	1200	10620	0.6	0.44	1.9	1600	14160
80	80						5.0	3.68	21.9	1400	12390	3.3	2.43	14.4	1400	12390	1.3	0.96	6.2	1400	12390
	96						5.6	4.12	18.2	1840	16280	3.7	2.72	12.0	1840	16280	1.6	1.18	5.2	1840	16280
	128						5.0	3.68	13.7	2080	18410	3.8	2.79	9.0	2390	21150	1.8	1.32	3.9	2770	24500
	160						4.1	3.02	10.9	2080	18410	3.2	2.35	7.2	2390	21150	1.8	1.32	3.1	3190	28230
	194						3.5	2.57	9.0	2080	18410	2.7	1.99	5.9	2390	21150	1.5	1.10	2.6	3190	28230
	258						2.9	2.13	6.8	2080	18410	2.2	1.62	4.5	2390	21150	1.2	0.88	1.9	3190	28230
	320						2.4	1.77	5.5	2080	18410	1.8	1.32	3.6	2390	21150	1.1	0.81	1.6	3190	28230
100	80						8.9	6.55	21.9	2520	22300	6.0	4.41	14.4	2520	22300	2.5	1.84	6.2	2520	22300
	100						11.1	8.16	17.5	3800	33600	7.4	5.44	11.5	3800	33600	3.1	2.28	5.0	3800	33600
	120						9.7	7.13	14.6	3820	33800	7.4	5.44	9.6	4370	38670	3.4	2.50	4.2	4840	42800
	160						7.6	5.59	10.9	3820	33800	5.8	4.27	7.2	4370	38670	3.3	2.43	3.1	5840	51680
	200						6.4	4.71	8.8	3820	33800	4.9	3.60	5.8	4370	35670	2.7	1.99	2.5	5840	51680
	242						5.6	4.12	7.2	3820	33800	4.3	3.16	4.8	4370	38670	2.4	1.77	2.0	5840	51680
	320						4.5	3.31	5.5	3820	33800	3.4	2.50	3.6	4370	39670	2.0	1.47	1.6	5840	51680

Notes:

* Thermal limited—50% duty cycle with running time not exceeding 30 minutes.

** Rating for input speed below 500 rpm is the same as for 500 rpm.

*** Minimum input power required to generate the output torque shown.

SERVICE FACTOR AND OVERLOADING

SERVICE FACTORS		DRIVEN MACHINE LOAD CLASSIFICATION		
Prime Mover	Service Duration	Uniform	Moderate Shock	Heavy Shock
Electric Motor	3 hrs/day	0.80	1.00	1.50
	10 hrs/day	1.00	1.25	1.75
	24 hrs/day	1.25	1.50	2.00
Internal Combustion Engine	3 hrs/day	1.00	1.25	1.75
	10 hrs/day	1.25	1.50	2.00
	24 hrs/day	1.50	1.75	2.25

The torque ratings on this catalogue are based on a service factor of 1, but they allow occasional momentary loads of up to 200 percent of rating at 1750 rpm during operation or during starting and stopping. To find the equivalent torque for actual service conditions, multiply the anticipated load by the service factor shown in the table above. Then from the rating tables select a unit having the next higher torque rating for the ratio and speed desired. If the momentary peak load exceeds 200 percent of the rated load at 1750 rpm, a larger unit should be selected. For duty cycles of less than 3 hours per day, increased ratings are available.

SHAFT LOADS

HDUC	Overhung Load				Axial Load on Output Shaft	
	Input Shaft		Output Shaft			
	N	lb	N	lb	N	lb
20	184	41	1240	280	1670	375
25	300	68	2450	550	2940	660
32	319	72	3430	770	4120	930
40	516	116	3430	770	4120	930
50	554	125	6570	1480	7850	1770
65	807	182	11200	2520	13200	2970
80	1130	254	18600	4180	24500	5510
100	1660	376	25100	5650	29400	6620

The overhung load is based on a load applied at the midpoint of the exposed shaft length. The input shaft ratings are based on an input shaft speed of 1750 rpm. For other speeds, multiply the selected rating by a speed factor calculated as follows:

$$\text{Input Speed Factor} = \sqrt[3]{\frac{1750}{\text{Actual Input Speed}}}$$

(This factor should not exceed 2.5.)

The output shaft load rating given in the table is applicable to all speeds. No speed factor need be considered.

MOMENT OF INERTIA (J)

HDUC	20	25	32	40	50	65	80	100
$J = \frac{GD^2}{4}$ kg-cm ²	0.217	0.488	1.53	4.13	11.6	43.3	116	333
lb-in ²	0.0742	0.167	0.524	1.41	3.97	14.8	39.5	114

LUBRICATION AND MOUNTING ATTITUDE

Oil is the preferred lubricant for harmonic drive speed reducers. Before shipment, units are bench tested with lubricant, which however is drained at the time of shipment. The speed reducers should be filled with appropriate lubricant up to the level gauge before use.

The appropriate oil quantities for horizontally mounted units are shown in the table below:

HDUC	20	25	32	40	50	65	80	100
Liters	0.03	0.07	0.13	0.25	0.4	1.0	2.0	3.8
Fl. oz	1	2.4	4.4	8.5	14	34	68	130

Compound gear oil is recommended for most industrial applications. For commercially available lubricants consult the table below:

BP	Mobil	Shell	Esso	Aral	Texaco
Energol, GR-XP68	Mobil Gear 626	Omala 68	Spartan DP 68	Degol BG 68	Meropa 68

HDUC speed reducers are designed for horizontal installation. For operation at 90° and 180° attitude, and for vertical installation, modification to relocate fill and drain plugs is required.

Vertical installation with the input shaft on top requires the unit to be fitted with a "Lift Cone." This is a simple cone which pumps oil by centrifugal action up to the Wave Generator bearing and splines. For the Lift Cone to be effective the input speed must be a minimum of 980 rpm. For lower speeds and installation with input shaft below, grease lubrication should be considered.

Oil Change

The first oil change should be after 100 hours of operation. Subsequent oil changes every 1,000 running hours or six months—whichever is sooner.

Oil temperature must not exceed 90°C.

Grease Lubrication

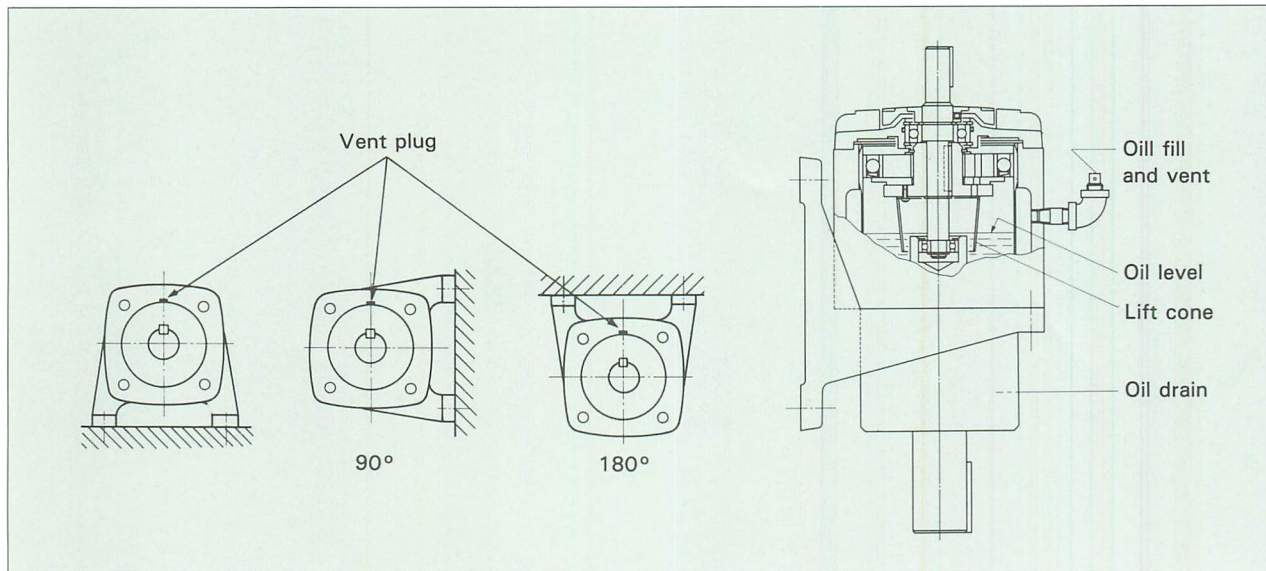
When specified, speed reducers will be grease lubricated at factory. Harmonic Grease HC-1 is recommended when continuous operation under rated torque is anticipated. The allowable maximum input speed for HC-1 grease-lubricated units operating in an environment below 40°C (100°F) are as follows:

HDUC w. HC-1	20	25	32	40	50	65	80	100
rpm	3,500	3,500	3,500	3,500	3,500	2,800	2,300	1,800

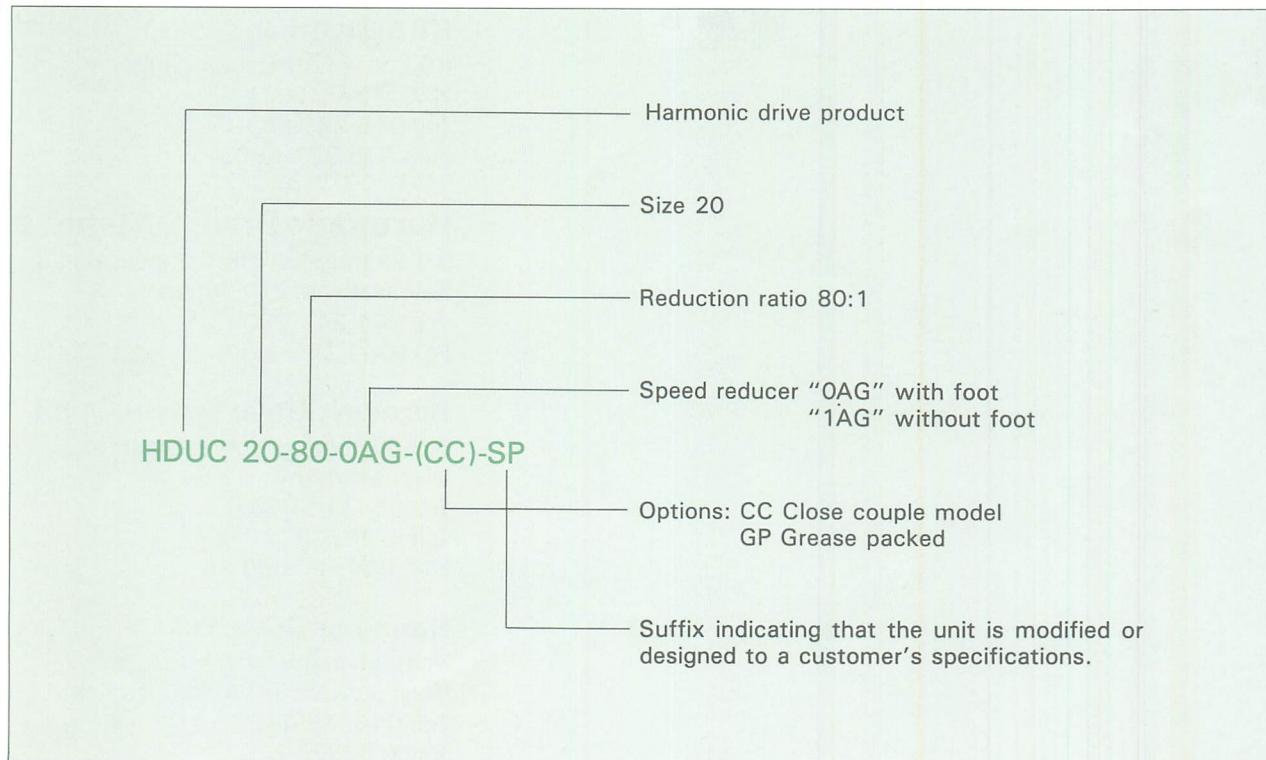
Where the duty cycle is less than 10 percent on-time and the length of running time does not exceed 10 minutes of continuous operation, Molub Alloy No. 2 grease may also be used. The maximum input speeds for units lubricated by this grease are given below:

HDUC w. Molub	20	25	32	40	50	65	80	100
rpm	2,800	2,200	1,700	1,400	1,100	850	700	550

MOUNTING ATTITUDE



ORDERING INFORMATION





HD Systems, Inc.

89 Cabot Court, Hauppauge,
N.Y. 11788, U.S.A.
Tel: 516-231-6630
Fax: 516-231-6803

Harmonic Drive Systems, Inc.

3-1 Ekimae-honchoh, Kawasaki-ku
Kawasaki-shi 210, Japan
Tel: 044-246-2500
Fax: 044-246-2511

Harmonic Drive System GmbH

6250 Limburg, Hoenbergstr. 14
West Germany
Tel: 06431-5008-0
Telex: 4821977
Fax: 06431-5008-18

Harmonic Drive, Ltd.

Myrtle Lane, Billingshurst,
West Sussex, RH14, 9SG, England
Tel: 040378-4865
Telex: 877759
Fax: 040378-4998