



D-I MARINE TRANSMISSION
STEERING SYSTEM
POWER TAKE OFF
INDUSTRIAL CO., LTD.

HYDRAULIC STEERING SYSTEMS





Summary

1. **Address** : 13, Namgangro1367, Jinju, Gyeongnam, Republic of Korea (52781)
2. **Home page** : www.d-i.co.kr
3. **Foundation** : 14th May. 1990
4. **Product** : Marine transmissions, Marine steering systems, PTOs(Power take off), Integral shaft supporters.
5. **Capacity of production** : 6,000 units /year
6. **Number of staffs** : 90





Business Fields

Marine Transmissions, PTOs(Power Take Offs), Hydraulic Steering Systems, Integral Shaft Supporters, Flexible Couplings, etc.

D-I INDUSTRIAL CO., LTD supports safe and convenient marine activities by supplying the quality products of Total Maritime Solutions.





ENJOY YOUR BEST SAILING !!

Rudder Torque Calculation

The hydraulic steering system can be selected from the rudder torque value.
The formula for calculating rudder torque is

$$\text{Rudder Torque (kgf} \cdot \text{m)} = P_n \times r$$

$$P_n = 31.2 \times A \times v^2 \times \sin G$$

"P_n" is the pressure value put on the rudder

"sinG" is the value of the maximum rudder angle from the starboard to the center or from port to center
(sin35° = 0.5736, sin40° = 0.6458)

$$A = a \times b (\text{m}^2)$$

"A" is the total surface area of the rudder in m²

$$V = \text{Maximum speed of the vessel in knots}$$

$$r = (0.195 + 0.305 \times \sin \Theta - e) \times a$$

"r" is the distance from the rudder stem to the center point where the pressure is put

$$e = (c \times b) / (a \times b)$$

"e" is the area of balance section divided by the total area of rudder

※Above calculation is made at rudder angle 35°

Please choose a steering system whose cylinder torque is larger than the calculated rudder torque.

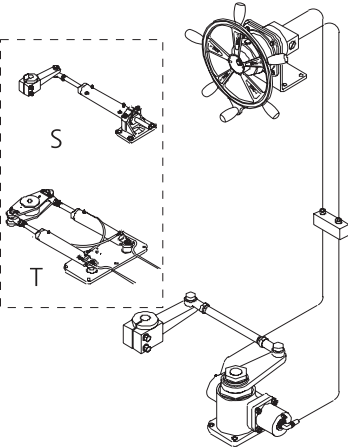


STEERING SYSTEM SELECTIONS



HYDRAULIC STEERING SYSTEMS ↓ **MANUAL & POWER STEERING SYSTEM**

MANUAL STEERING SYSTEM



Model		Number of turns lock to lock(74°)	HP	MAX.Torque (kgf • m)	Steering Wheel Unit	Cylinder Unit
Hydraulic Manual Steering System	DMS 090S	6.3	100	90.5	DHM 035	S5015
	DMS 100R	6.9	110	119.5	DHM 035	R75
	DMS 120S	7.9	180	112.2	DHM 035	S5019
	DMS200S	8.1	300	208.4	DHP 063	S6024
	DMS350S	8.9	400	356.7	DHP 098	S9020
	DMS 500S	10.2	550	497.2	DHP 119	S9028
	DMS 240T	9.5	350	245.3	DHP 063	T5019
	DMS461T	9.5	500	461.3	DHP 119	T6024

POWER STEERING SYSTEM

Model		Number of turns lock to lock(74°)	HP	MAX.Torque (kgf • m)	Steering Wheel Unit	Cylinder Unit	Pump Unit	Oil Tank
Hydraulic Power Steering System	DPS 130S	4.3	180	128.2	DHO 051	S 5015	HVTM42-6	DOT 20
	DPS 160S	5.1	250	158.9	DHO 051	S 5019	HVTM42-6	DOT 20
	DPS 160R	4.7	250	169.4	DHO 051	R 75	HVTM42-6	DOT 20
	DPS 300S	6.4	350	295.3	DHO 080	S 6024	HVTM42-6	DOT 20
	DPS 500S	5.5	550	505.3	DHO 160	S 9020	DP-V20F-8	DOT 40
	DPS 700S	7.6	650	704.4	DHO 160	S 9028	DP-V20F-8	DOT 40
	DPS 351T	5	400	347.5	DHO 120	T 5019	HVTM42-6	DOT 20
	DPS 651T	7.1	600	653.5	DHO 160	T 6024	DP-V20F-8	DOT 40
	DPS 1200T	8.2	1000	1236.2	DHO 277	T 9020	DP-V20F-11	DOT 60
	DPS 1600T	9.3	1200	1723.1	DHO 277	T 9028	DP-V20F-11	DOT 60
	DPS 2000T	11.5	1800	2135.1	DHO 277	T 10028	DP-V20F-11	DOT 60
	DPS 3500T	-	-	3503	-	T12034	-	-
	DPS 7000T	-	-	7006	-	-	-	-
	DPS 130SW	4.3	90 x 2	128	DHO 051	S 5015	HVTM42-6	DOT 20
	DPS 300SW	6.4	175 x 2	295	DHO 080	S 6024	HVTM42-6	DOT 20
	DPS 500SW	5.5	275 x 2	505	DHO 120	S 9020	DP-V20F-8	DOT 40
	DPS 700SW	7.6	325 x 2	704	DHO 160	S 9028	DP-V20F-8	DOT 40
	DPS 351TW	5	200 x 2	347.5	DHO 120	TW 5019	HVTM42-6	DOT 20
	DPS 651TW	7.1	300 x 2	653.5	DHO 160	TW 6024	DP-V20F-8	DOT 40
	DPS 1200TW	8.2	500 x 2	1236.2	DHO 277	TW 9020	DP-V20F-11	DOT 60
	DPS 1600TW	9.3	600 x 2	1723.1	DHO 277	TW 9028	DP-V20F-11	DOT 60
	DPS 2000TW	11.5	900 x 2	2135.1	DHO 277	TW 10028	DP-V20F-11	DOT 60
	DPS 3500TW	-	-	3503	-	T12034	-	-

CYLINDERS FOR STEERING SYSTEM

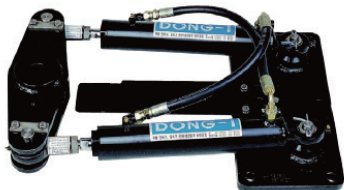


● One Straight Cylinders



Model	Cylinder Diameter	Cylinder Torque				Installation Dimension (LxWxH . cm)
		Manual Steering (60 kg/cm²)		PowerSteering (8.5 kg/cm²)		
		kgf·m	N·m	kgf·m	N·m	
S 3218	Ø32	46	450	65	637	944 x 286 x 150
S 5015	Ø50	90	886	128	1,254	844 x 288 x 150
S 5019	Ø50	112	1,099	158	1,557	914 x 288 x 150
S 6024	Ø60	208	2,042	295	2,893	1150 x 351 x 167
S 9020	Ø90	356	3,495	505	4,951	1099 x 358 x 217
S 9028	Ø90	497	4,872	704	6,903	1332 x 410 x 217

● Twin Straight Cylinders



T 5019	Ø50	245	2,403	347	3,405	810 x 440 x 128
T 6024	Ø60	461	4,520	653	6,404	924 x 484 x 151
T 9020	Ø90	872	8,551	1,236	12,114	968 x 474 x 195
T 9028	Ø90	1,216	11,919	1,723	16,886	1,125 x 584 x 180
T 10028	Ø100	1,507	14,769	2,135	20,923	1,125 x 584 x 180
T 12034	Ø120	2,473	24,235	3,503	34,329	1410 x 755 x 230

● Rotary Cylinder



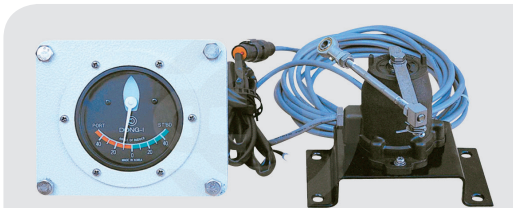
R75	Ø75	119	1,171	169	1,660	675 x 328 x 265
-----	-----	-----	-------	-----	-------	-----------------

● Twin Straight Cylinders for Two Rudder application



TW 5019	Ø50	245	2,403	347	3,405	
TW 6024	Ø60	461	4,520	653	6,404	
TW 9020	Ø90	872	8,551	1,236	12,114	
TW9028	Ø90	1,216	11,919	1,723	16,886	
TW 10028	Ø100	1,507	14,769	2,135	20,923	
TW 7000	Ø120	4,945	48,470	7,006	68,666	

OPTIONS



● Rudder Angle Sensor and Indicator for Manual Steering System



● Remote Control Components : Sol Block, Hand Switch, Joystick

STEERING WHEEL UNITS FOR STEERING SYSTEM



● Power Steering Wheel units



Model	Displacement	Remarks
DHO 051	51cc/rev	Steering Wheel with Orbitrol
DHO 080	80cc/rev	
DHO 120	120cc/rev	
DHO 160	160cc/rev	
DHO 200	200cc/rev	
DHO 240	240cc/rev	
DHO 277	277cc/rev	
DHO 320	320cc/rev	

● Manual Steering Wheel units



DHM



DHP

Model	Displacement	Remarks
DHM 026	26 cc/rev	Helm pump with Steering wheel
DHM 035	35 cc/rev	
DHM 044	44 cc/rev	
DHP 050	50 cc/rev	
DHP 063	63 cc/rev	Helm pump only Optional Steering wheel
DHP 077	77 cc/rev	
DHP 098	98 cc/rev	
DHP 119	119 cc/rev	

Steering Wheel Units with optional supplying

AI case	Auto AI case (for APS)	STS case	Auto STS case	Normal STS case	Flange type A	Flange type B	Flange type C
MODEL							
DH0 051 051-320	ADH0 051 051-320	LSHO 051 051-369	ASH0 051 051-369	GSH0 051 051-369	DHN051 051-369	DHF051 051-369	DHR051 051-369
Standard type. Option: joystick for the SOLV/V application	Type for APS	Stainless steel handle case in deluxe type.	Stainless steel handle case in deluxe type for APS	Stainless steel handle case in normal type. Option: Rudder angle indicator	No orbitrol case Available to insert inside the wall	No orbitrol case Available to insert inside the wall	No orbitrol case Available to insert inside the wall

HYDRAULIC PUMP UNITS FOR STEERING SYSTEM



● Helm Pumps for Manual Steering



NSH



DHP

Model	CC/Rev	Wheel Application	Handle Shaft
NSH026	26	420mm	Taper Ø19
NSH035	35	420mm	Taper Ø19
NSH044	44	420mm	Taper Ø19
DHP050	50	800mm	Taper Ø19
DHP063	63	800mm	Taper Ø19
DHP077	77	800mm	Straight 1"
DHP098	98	1000mm	Straight 1"
DHP119	119	1000mm	Straight 1"

● Pump Units for Power Steering



V20F

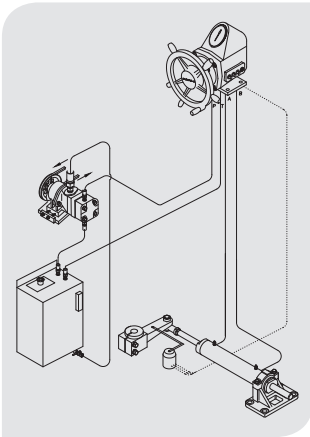
Model	Displacement cc/rev	Flow l/min	Maximum Pressure	Minimum Speed	Maximum Speed	Pulley Application
HVTM42-6	19.3	19	85 kg/cm ²	600 rpm	3,000 rpm	Standard 8" Option 6", 7"
DP-V20F-6	19.5	19	85 kg/cm ²	650 rpm	3,400 rpm	Standard 7" Option 6", 8"
DP-V20F-7	22.8	19	85 kg/cm ²	650 rpm	3,000 rpm	
DP-V20F-8	26.5	30.3	85 kg/cm ²	650 rpm	2,800 rpm	
DP-V20F-11	36.4	30.3	85 kg/cm ²	650 rpm	2,500 rpm	

HYDRAULIC OIL TANK

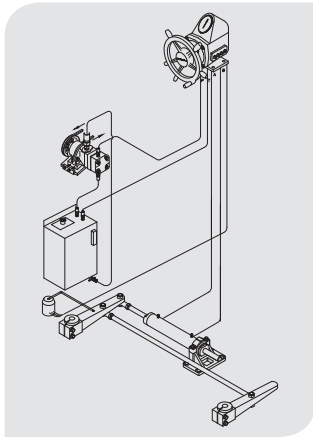


Model	Part No.	Volume
DOT 20	98065401 AS	20ℓ
DOT 40	98167401 AS	40ℓ
DOT 60	98150401 AS	60ℓ

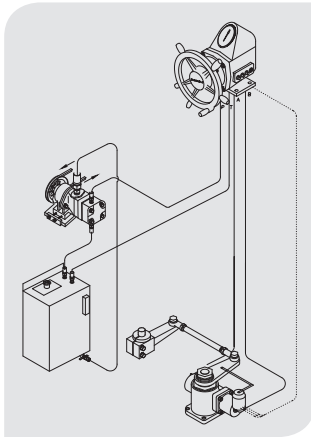
POWER STEERING APPLICATION DIAGRAM



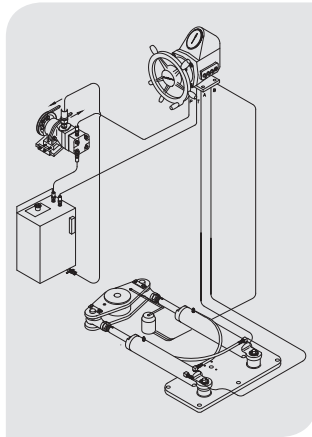
● Single Rudder Application with one straight cyl.



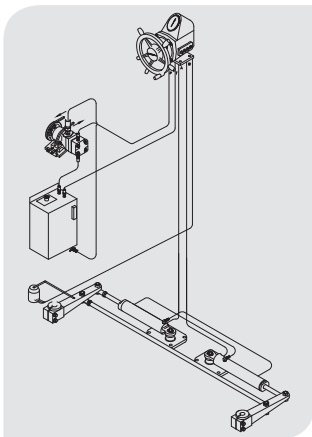
● Two Rudder Application with one straight cyl.



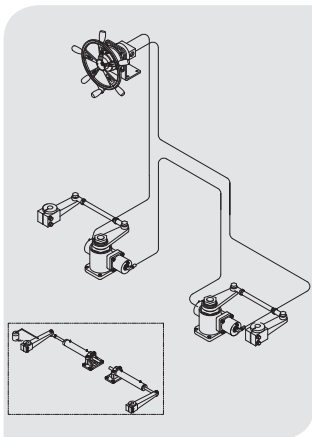
● Single Rudder Application with Rotary Cyl.



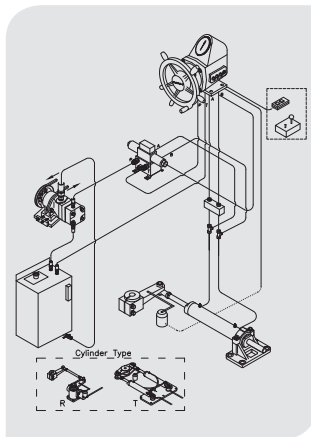
● Single Rudder Application with Twin straight cyl.



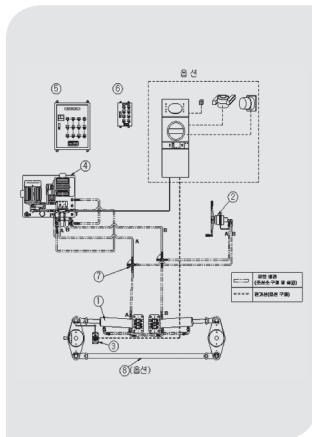
● Two Rudder Application with Twin Cyl.



● Catamaran Application

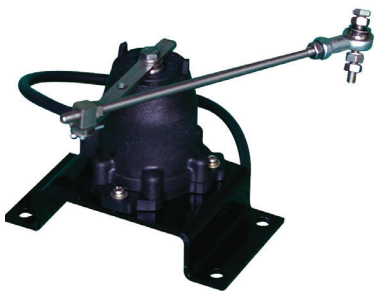


● Hand Switch / Joy Stick Remote control application



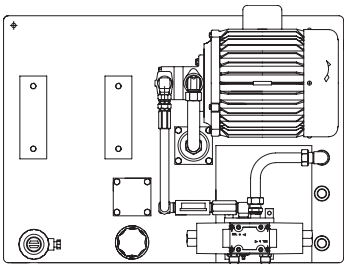
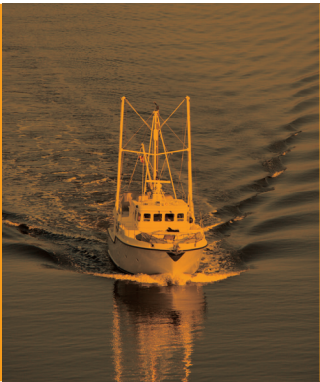
● Power Unit Application

RUDDER ANGLE SENSOR

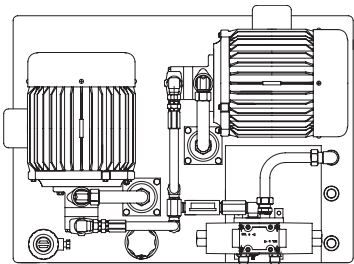


	Emphysema	No.	Cylinder type
General	DRSM 505	98600003	S Type
	DRSM 512	98600004	R Type
	DRSS 5K1	98600005	S5015, S5019, S3218
	DRSS 5K2	98600009	T5019
	DRSS 5K3	98600016	S6024, S9020, T9020
	DRSS 5K4	98600018	T9028, T11028
	DRSS 5K5	98600021	R 75
	DRSS 5K6	98600025	T6024

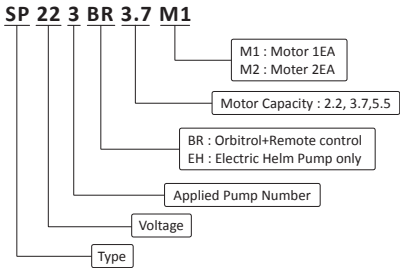
POWER UNITS FOR HYDRAULIC SYSTEMS



M1 TYPE



M2 TYPE



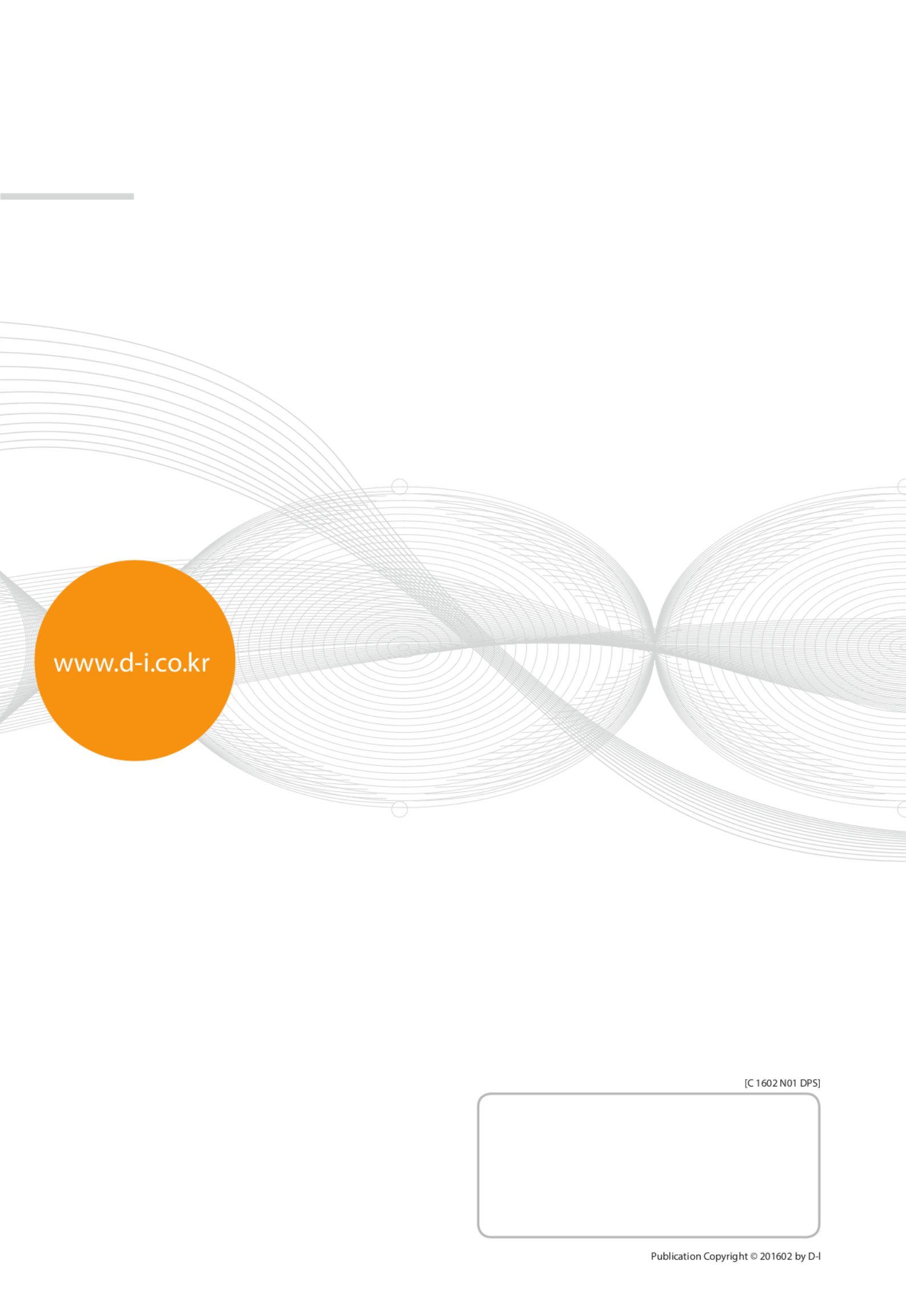
SP223BR3.7M1
SP - Single Power unit
22 - 220V only
3 - No.3 Vane pump
BR - Orbitrol+Remote control
3.7 - 3.7 Kw Motor
M1 - Motor 1EA

● **Single Power unit[60Hz]**

Model	Application	(AC220V)	(AC380V)	(AC400V)	(AC440V)	Flow Rate(l/min)	Motor(KW)
DPS351T	Orbitrol,Remote control	SP223BR3.7M1	SP383BR3.7M1	SP403BR3.7M1	SP443BR3.7M1	14.6	3.7
	Electric Helm Pump only	SP222EH2.2M1	SP382EH2.2M1	SP402EH2.2M1	SP442EH2.2M1	10.6	2.2
DPS651T	Orbitrol,Remote control	SP224BR3.7M1	SP384BR3.7M1	SP404BR3.7M1	SP444BR3.7M1	19.5	3.7
	Electric Helm Pump only	SP222EH2.2M1	SP382EH2.2M1	SP402EH2.2M1	SP442EH2.2M1	10.6	2.2
DPS1200T	Orbitrol,Remote control	SP226BR5.5M1	SP386BR5.5M1	SP406BR5.5M1	SP446BR5.5M1	22.0	5.5
	Electric Helm Pump only	SP224EH3.7M1	SP384EH3.7M1	SP404EH3.7M1	SP444EH3.7M1	23.0	3.7
DPS1600T	Orbitrol,Remote control	SP226BR5.5M1	SP386BR5.5M1	SP406BR5.5M1	SP446BR5.5M1	32.0	5.5
	Electric Helm Pump only	SP224EH3.7M1	SP384EH3.7M1	SP404EH3.7M1	SP444EH3.7M1	21.9	3.7
DPS2000T	Orbitrol,Remote control	SP226BR5.5M1	SP386BR5.5M1	SP406BR5.5M1	SP446BR5.5M1	32.0	5.5
	Electric Helm Pump only	SP224EH3.7M1	SP384EH3.7M1	SP404EH3.7M1	SP444EH3.7M1	30.0	3.7
DPS3500T	Orbitrol,Remote control	SP227BR5.5M1	SP387BR5.5M1	SP407BR5.5M1	SP447BR5.5M1	32.0	5.5
	Electric Helm Pump only	SP225EH5.5M1	SP382EH5.5M1	SP405EH5.5M1	SP445EH5.5M1	22.0	5.5
DPS7000T	Electric Helm Pump only	SP227EH5.5M1	SP387EH5.5M1	SP407EH5.5M1	SP447EH5.5M1	33.9	5.5

● **Single Power unit[50Hz]**

Model	Application	(AC220V)	(AC380V)	(AC400V)	(AC440V)	Flow Rate(l/min)	Motor(KW)
DPS351T	Orbitrol,Remote control	SP224BR3.7M1	SP384BR3.7M1	SP404BR3.7M1	SP444BR3.7M1	17	3.7
	Electric Helm Pump only	SP223EH3.7M1	SP383EH3.7M1	SP403EH3.7M1	SP443EH3.7M1	8.13	3.7
DPS651T	Orbitrol,Remote control	SP225BR3.7M1	SP385BR3.7M1	SP405BR3.7M1	SP445BR3.7M1	21.0	3.7
	Electric Helm Pump only	SP223EH3.7M1	SP383EH3.7M1	SP403EH3.7M1	SP443EH3.7M1	12.3	3.7
DPS1200T	Orbitrol,Remote control	SP226BR5.5M1	SP386BR5.5M1	SP406BR5.5M1	SP446BR5.5M1	32.0	5.5
	Electric Helm Pump only	SP223EH3.7M1	SP383EH3.7M1	SP403EH3.7M1	SP443EH3.7M1	12.3	3.7
DPS1600T	Orbitrol,Remote control	SP226BR5.5M1	SP386BR5.5M1	SP406BR5.5M1	SP446BR5.5M1	32.0	5.5
	Electric Helm Pump only	SP224EH3.7M1	SP384EH3.7M1	SP404EH3.7M1	SP444EH3.7M1	17	3.7
DPS2000T	Orbitrol,Remote control	SP226BR5.5M1	SP386BR5.5M1	SP406BR5.5M1	SP446BR5.5M1	32.0	5.5
	Electric Helm Pump only	SP224EH3.7M1	SP384EH3.7M1	SP404EH3.7M1	SP444EH3.7M1	17	3.7
DPS3500T	Orbitrol,Remote control	SP227BR5.5M1	SP387BR5.5M1	SP407BR5.5M1	SP447BR5.5M1	32.0	5.5
	Electric Helm Pump only	SP225EH5.5M1	SP385EH5.5M1	SP405EH5.5M1	SP445EH5.5M1	17	5.5
DPS7000T	Electric Helm Pump only	SP227EH5.5M1	SP387EH5.5M1	SP407EH5.5M1	SP447EH5.5M1	27.6	5.5



www.d-i.co.kr

[C 1602 N01 DPS]