



D-I
INDUSTRIAL CO., LTD.

**MARINE TRANSMISSION
STEERING SYSTEM
POWER TAKE OFF**

HYDRAULIC STEERING SYSTEMS



Hydraulic power steering system
Manual steering systems





Summary

1. **Address** : 13, Namgangro1367, Jinju, Gyeongnam, Republic of Korea (660-802)
2. **Home page** : www.d-i.co.kr
3. **Foundation of the company** : 14th May. 1990
4. **Foundation of R&D department** : 2005.May.10
5. **Product** : Marine transmission, Marine steering systems, PTO(Power take off), Integral shaft supporter.
6. **Capacity of production** : 6,000 units /year
7. **The 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 with the quality products through Maritime Total Solutions which can meet customized requirements.





CHALLENGE TO THE BEST SAILING!!

Rudder Torque Calculation

The hydraulic steering system shall be selected by the RUDDER TORQUE.
The formula calculation of rudder torque is as follows

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

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

"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

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

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

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

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

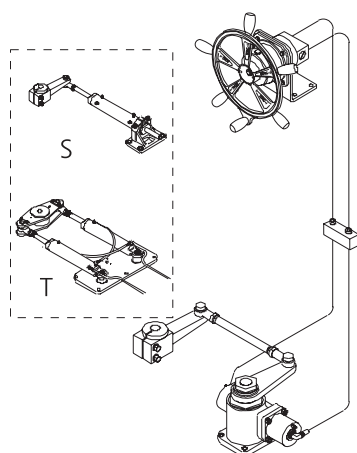
"e" is the value of the area of balance section divided by the total area of rudder

※Above calculation is made at rudder angle 35°

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



MANUAL & POWER STEERING SYSTEM SELECTION



Model		Numbers of turns lock to lock(74°)	HP	MAX.Torque (kg • 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 SELECTION

Model		Numbers of turns lock to lock(74°)	HP	MAX.Torque (kg • 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	DP-Y 120S	DOT 20
	DPS 160S	5.1	250	158.9	DHO 051	S 5019	DP-Y 120S	DOT 20
	DPS 160R	4.7	250	169.4	DHO 051	R 75	DP-Y 120S	DOT 20
	DPS 300S	6.4	350	295.3	DHO 080	S 6024	DP-Y 120S	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	DP-Y120-20	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	DP-Y120S	DOT 20
	DPS 300SW	6.4	175 x 2	295	DHO 080	S 6024	DP-Y 120S	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	DP-Y120-20	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

Capacity up to 7000kg•m(7t) compact design, high durability and easy installation !!



● One Straight Cylinder



Model	Cylinder Diameter	Cylinder Torque				Installation Dimension (LxWxH . cm)
		Manual Steering (60 kgf/cm)		PowerSteering (8.5 kgf/cm)		
		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 Cylinder



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



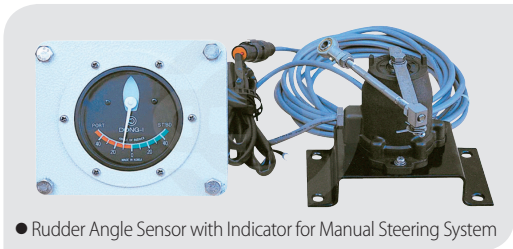
R75	Ø75	119	1,171	169	1,660	675 x 328 x 265
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● Twin Straight Cylinder for Two Rudder application



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	
TW 7000	Ø120	4,945	48,470	7,006	68,666	
TW 10028	Ø100	1,507	14,769	2,135	20,923	

OPTIONS



● Rudder Angle Sensor with Indicator for Manual Steering System



● Remote Control System Sol Block, Hand Switch, Joystick

STEERING WHEEL UNITS FOR STEERING SYSTEM

Simple, Easy & Various Application D-I Steering Wheel Units.



● Power Steering Wheel units



Model	Orbitrol Replacement	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	

● Power Steering Wheel units



DHM



DHP

Model	Orbitrol Replacement	Remarks
DHM 026	26 cc/rev	Helm pump with Steering wheel
DHM 030	30 cc/rev	
DHM 035	35 cc/rev	
DHM 040	40 cc/rev	
DHM 050	50 cc/rev	
DHP 050	50 cc/rev	Helm pump only 'option'
DHP 063	63 cc/rev	
DHP 077	77 cc/rev	Steering Wheel
DHP 098	98 cc/rev	
DHP 119	119 cc/rev	

Steering Wheel optional application

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	The type for APS	Stainless steel handle case in delux type.	Stainless steel handle case in delux type for APS	Stainless steel handle case in normal type. Option: Rudder angle indicator	The type without orbitrol case and the orbitrol designed to be inserted inside the wall	The type without orbitrol case and the orbitrol designed to be inserted inside the wal	The type without orbitrol case and the orbitrol designed to be inserted inside the wall

HYDRAULIC PUMP UNITS FOR STEERING SYSTEM

Hydraulic pumps with excellent durability that make your steering the best.



● Helm Pumps for Manual Steering



SHP



DHP

Model	CC/Rev	Application Wheel	Handle Shaft
SHP026	26	420mm	Taper Ø22
SHP030	30	420mm	Taper Ø22
SHP035	35	420mm	Taper Ø22
SHP040	40	420mm	Taper Ø22
SHP050	50	800mm	Taper Ø22
DHP050	50	800mm	Taper Ø22
DHP063	63	800mm	Taper Ø22
DHP077	77	800mm	Taper Ø22
DHP098	98	800mm	Straight 1"
DHP119	119	800mm	Straight 1"

● Pump Units for Power Steering



V20F

Model	Displacement cc/Rev.	Flow l/min	Maximum Pressure	minimum speed	maximum speed	Application pulley
DP-Y120S	19.5	20	85 kgf/cm	600 rpm	3,600 rpm	Standard 8" Option 7"
DP-V20F-6	19.5	19	85 kgf/cm	650 rpm	3,400 rpm	Standard 7" Option 6", 8"
DP-V20F-7	22.8	19	85 kgf/cm	650 rpm	3,000 rpm	
DP-V20F-8	26.5	30.3	85 kgf/cm	650 rpm	2,800 rpm	
DP-V20F-11	36.4	30.3	85 kgf/cm	650 rpm	2,500 rpm	

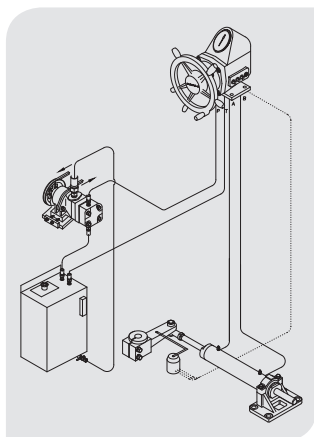
HYDRAULIC OIL SERVICE TANK



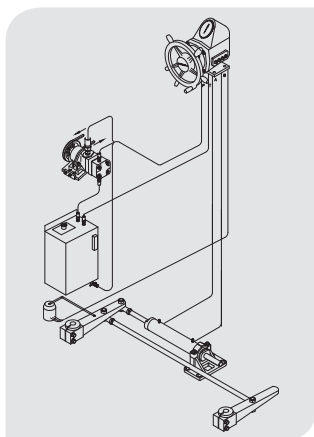
Model	Part No.	Volume
DOT 20	98065401 AS	20l
DOT 40	98167401 AS	40l
DOT 60	98150401 AS	60l

POWER STEERING APPLICATION DIAGRAM

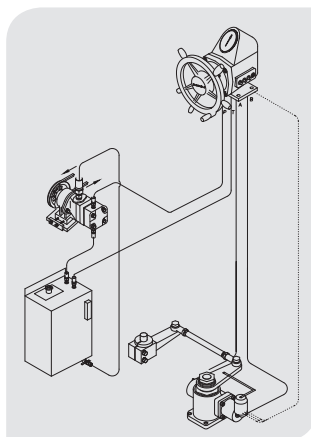
Product constitution compatible with all boats.



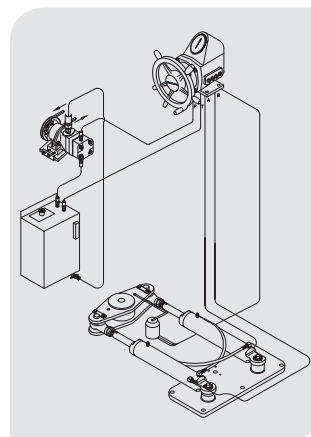
● Single Rudder Cylinder



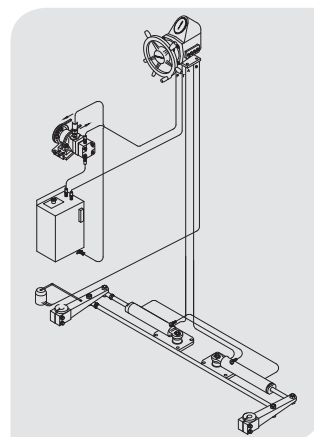
● Two Rudder Cylinder



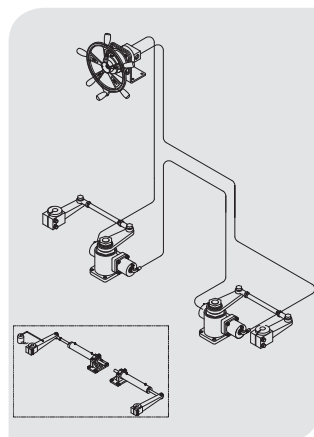
● Single Rudder Rotary Cylinder



● Single Rudder Cylinder

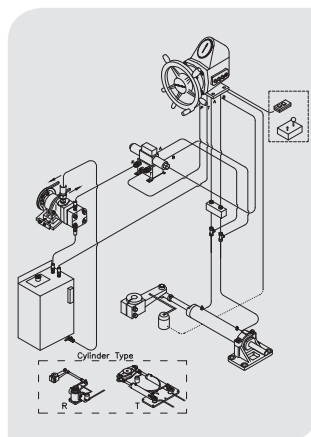


● Two Rudder Cylinder

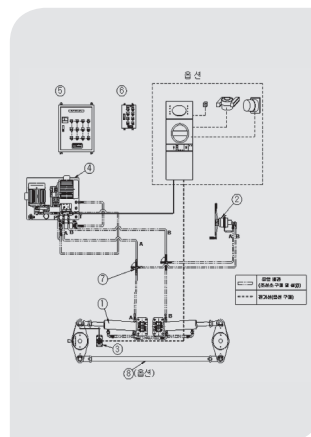


● Two Rudder Cylinder

※ If you want other systems, discuss them with us, please. We can help you.

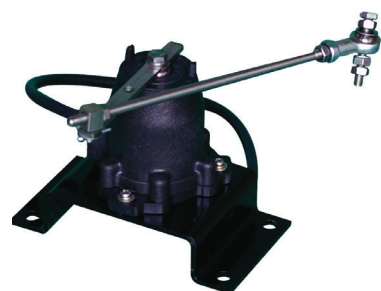


● Hand Switch / Joy Stick Remote control application



● Electronic & Hydraulic Steering System

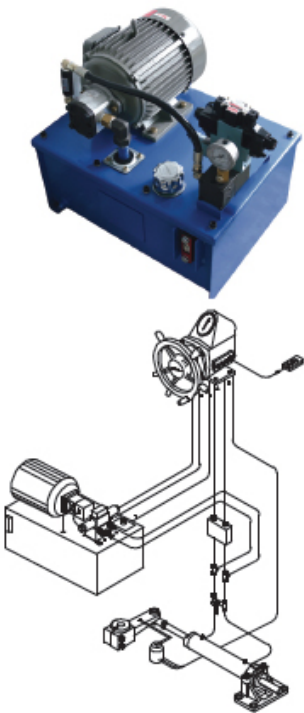
RUDDER ANGLE SENSOR



	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
For the autopilot	DRSA 5K1	98600006	S5015, S5019, S3218
	DRSA 5K2	98600010	T5019
	DRSA 5K3	98600013	S6024, T6024, S9020, T9020
	DRSA 5K4	98600019	T9028, T10028
	DRSA 5K5	98600022	R 75
	DRSA 5K6	98600026	T56024

POWER UNITS FOR HYDRAULIC SYSTEMS

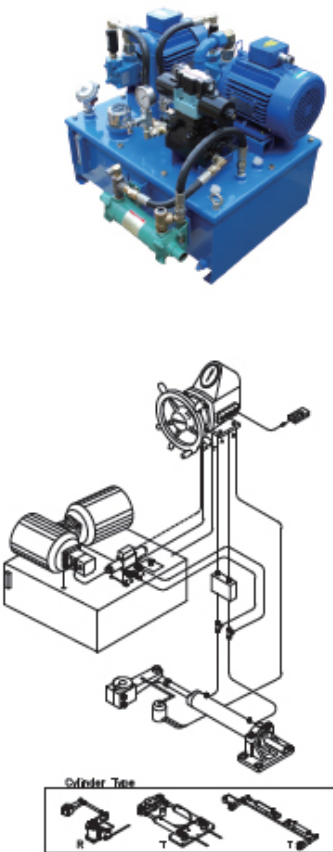
D-I makes the Power unit using their own technology.
It will give you both efficiency and usability.



● **Single Power unit**

Model	Flow Rate ℓ/min	AC Power	Voltage	Motor
DEPUS 5003	4.8	50Hz	AC 220/380	2.2kW
DEPUS 5007	9.6	50Hz	AC 220/380	2.2kW
DEPUS 5010	14.2	50Hz	AC 220/380	3.7kW
DEPUS 5014	19	50Hz	AC 220/380	3.7kW
DEPUS 5017	23.8	50Hz	AC 220/380	3.7kW
DEPUS 5020	28.3	50Hz	AC 220/380	3.7kW

DEPUS 6003	5.8	60Hz	AC 220/380	2.2kW
DEPUS 6007	11.6	60Hz	AC 220/380	2.2kW
DEPUS 6010	17.2	60Hz	AC 220/380	3.7kW
DEPUS 6014	22.9	60Hz	AC 220/380	3.7kW
DEPUS 6017	28.7	60Hz	AC 220/380	5.5kW
DEPUS 6020	34.1	60Hz	AC 220/380	5.5kW



● **Dual Power unit**

Model	Flow Rate ℓ/min			AC Power	Voltage	Motor		SOL
	①	②	①+②			A	B	
DDEPUS 5010	7.2	7.2	14.4	50Hz	AC 220/380	2.2kW	2.2kW	Included
DDEPUS 5013	9.55	9.55	19.1	50Hz	AC 220/380	2.2kW	2.2kW	Included
DDEPUS 5023	16.6	16.6	33.2	50Hz	AC 220/380	3.7kW	3.7kW	Included
DDEPUS 5027	19	19	38.0	50Hz	AC 220/380	3.7kW	3.7kW	Included

DDEPUS 6010	8.65	8.65	17.3	60Hz	AC 220/380	2.2kW	2.2kW	Included
DDEPUS 6020	17.15	17.15	34.3	60Hz	AC 220/380	3.7kW	3.7kW	Included
DDEPUS 6027	22.95	22.95	45.9	60Hz	AC 220/380	3.7kW	3.7kW	Included

SALES NETWORK

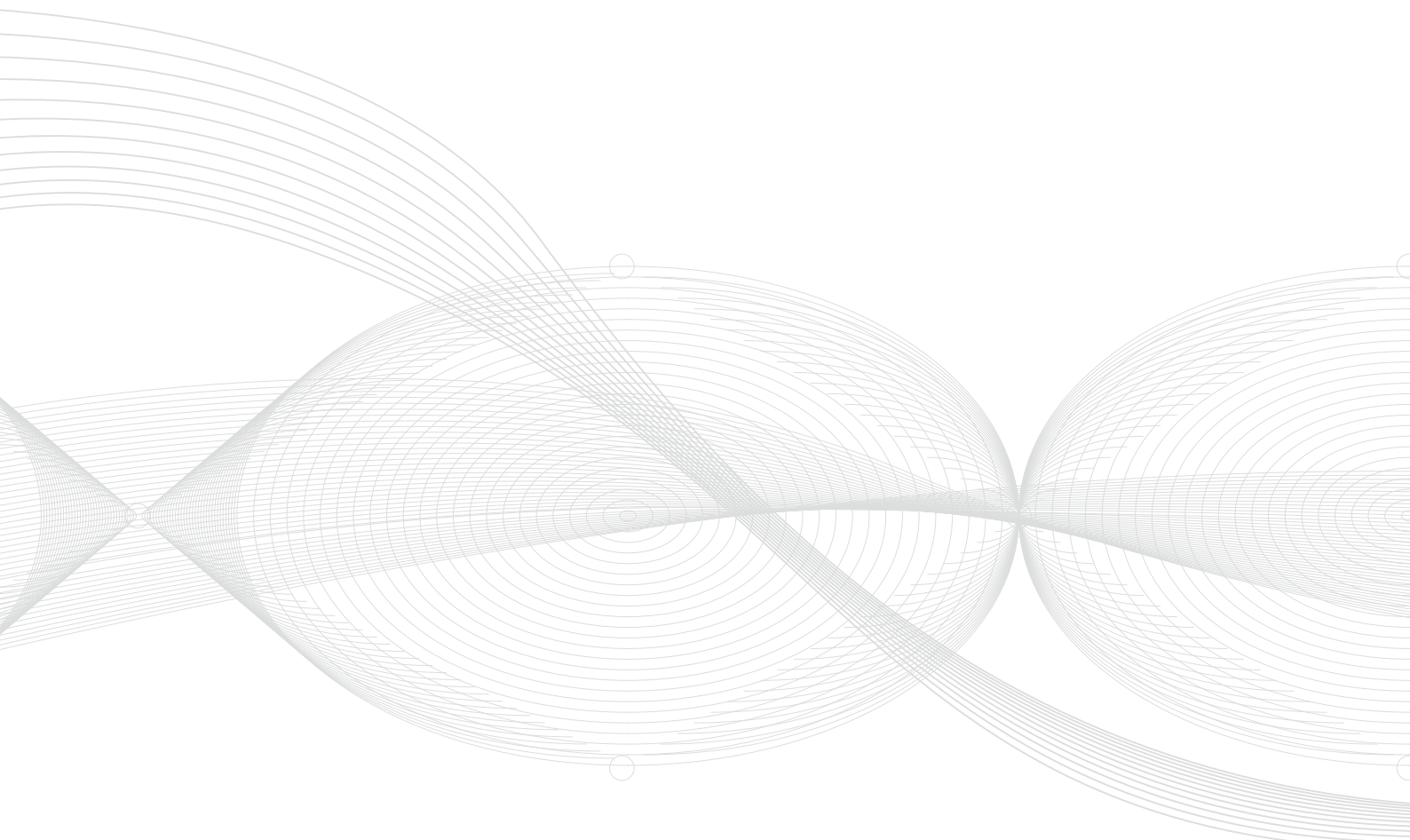
Export to total 60 countries

- Europe: Turkey, UK, Netherlands, etc 12 countries
- Middle East : U.A.E, Iran, etc 12 countries
- Asia: Japan, China, Singapore, etc 18 countries
- America & others : Canada, Rep of South Africa, Chile, etc 18 countries



SALES NETWORK
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[C 1204 N02 DPO]



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YOUR CONNECTION
TO THE RIGHT MACHINE