HKS

HYDRAULIC STEERING SYSTEMS

SCAM marine

GENERAL

The hydraulic steering system consists of one (or more) hydraulic pumps and cylinders interconnected through hoses which transfer the oil pressure from the pumps into the cylinder thereby turning the rudder blade in wanted direction.
Depending on requirements, a by-pass valve, dual non-return valve (if not already built into a pump) and pressure relief valve can be installed into the system.
By-pass valve is used for a quick change-over from hydraulic to manual steering in case of need and on vessels where regulations prescribe it (and it is also very practical for sailing boats). By opening by-pass valve the free flow of hydraulic oil is enabled from one to the other cylinder side and thereby a smooth tiller steering.
Pressure relief valve can be fitted to release excessive oil pressure to non-pressurized part of installation in case of some malfunction to prevent damages from potentially high pressure.

Dual non-return valve can be installed in a steering system with one steering place if needed, and it must be installed in systems with two or more steering places (if pumps are without built-in non-return valve). Its function is to allow the oil flow, when hydraulic pump is activated, and to block the return pressure that appears in the cylinder due to the rudder blade's resistance. In multiple steering positions systems this type of valve prevents the steering wheel, which is not being used, from unnecessary turning, and allows the automatic transfer of controls from one steering position to another.
Hoses can be flexible or rigid (steel or copper) depending on the size of the vessel and steering gear as well as design requirements.
All our hydraulic steering systems can be equipped with electro-hydraulic power units and automatic pilot devices. In this case please contact the nearest authorized dealer or manufacturer for additional information.

CERTIFICATE

All SCAM hydraulic steering gears have a type certificate of CROATIAN REGISTER OF SHIPPING and ISO 10592 (CE marking).

CE

ISO 9001 BUREAU VERITAS Certification

TORQUE CALCULATION

according to: EN ISO 12215-8
Small craft hull construction - Scantlings - Part 8; Rudder stocks and bearings

6.1.3 Maximum rudder force coefficient C_R

$$C_R=0{,}0276\cdot\Delta^3-0{,}2926\cdot\Delta^2+1{,}0583\cdot\Delta+0{,}2006$$

Where is: Δ - rudder geometric aspect ratio $\Delta=\frac{H_r^2}{A}$
H_r - average height of the rudder (m)
A - rudder area (m^2) $A=H_r\cdot c$
c - chord length at rudder force level (same as the centre of surface)

6.1.4 Side force on the rudder F (N)

$$F=135\cdot f_{WR}\cdot C_R\cdot v^2\cdot A$$

Where is: f_{WR} - design category factor for rudder
$f_{WR}=0{,}75$ sea - wave heights up to 2 m, wind 6 Bf or less
$f_{WR}=1$ sea - wave heights above 2 m, wind excess 6 Bf
v - boat speed for calculation (kn) $v_{MIN}=2{,}4\cdot\sqrt{L_{wl}}$
L_{wl} - length at waterline (m)

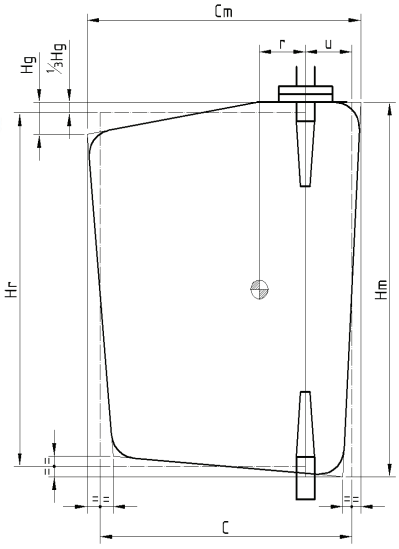
7.1.2 Design rudder stock torque T (Nm)

$$T=F\cdot r_p$$

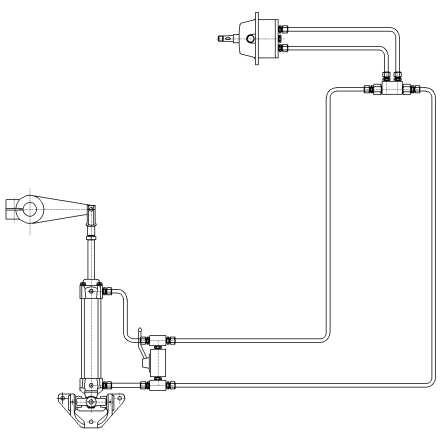
Where is: r - horizontal distance rudder force to stock axis
$r_p=$ $r=0{,}3\cdot c-u$ ili $r_{min}=0{,}1\cdot c$ take bigger value

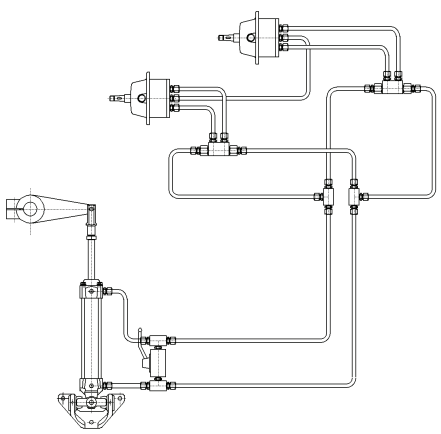
Type II - with carrier

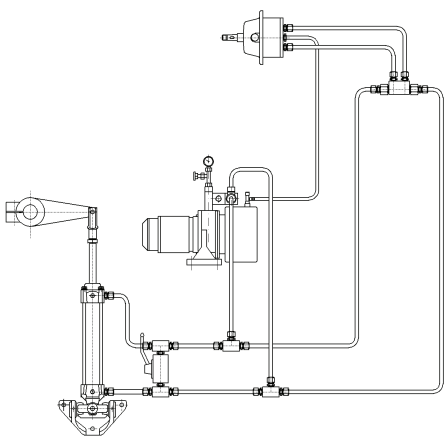
Type I - spade



HYDRAULIC SHEME







HYDRAULIC STEERING SYSTEM HKS 05

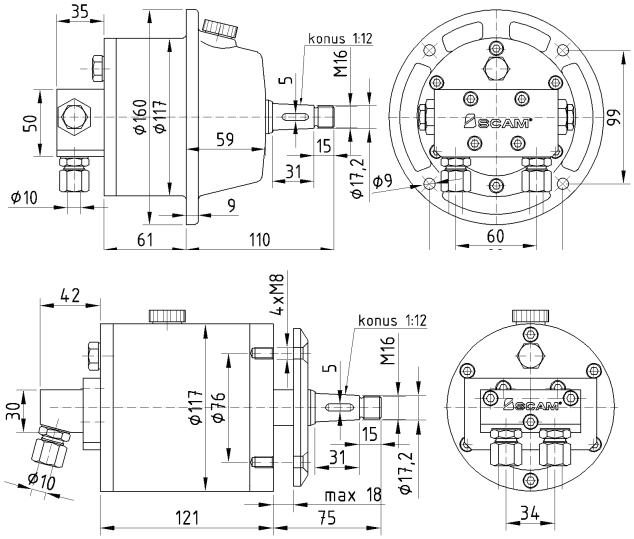
MAIN FEATURES HKS 05

Hydraulic steering systems HKS 05 are recommended in the following combinations: HP 05 with HC 400 and HC 550, HP 05 OB with HC 700 and HC 850 (or ev. HC 1050). They are designed for pleasure boats, sailing boats and for smaller work boats and fishing boats, length up to 9 m.
For fast boats and speedboats with outboard power up to 120 kW we recommend a combination of HP 05 OB cylinder HC OB.

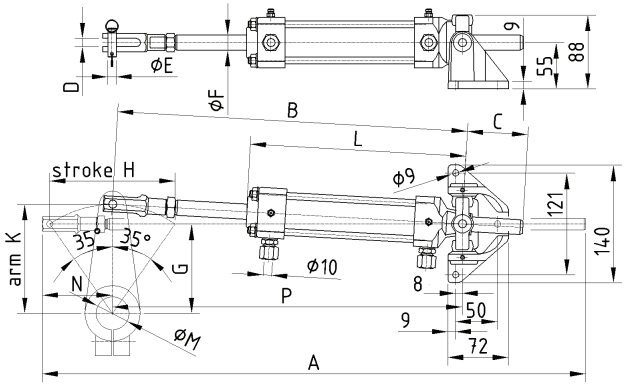
Pump HP 05 (OB) is an axial piston with 5 pistons of stainless steel, in the case of aluminum alloy, which is also the hydraulic oil tank. Cylinders HC 400-850 are made of stainless steel and bronze and are very easy to install and require no special maintenance. Hydraulic piping is made of thermoplastic or copper pipes No 10 (5/16 ").

HYDRAULIC PUMPS - HP 05, HP 05 E, HP 05 OB, HP 05 OB E

E

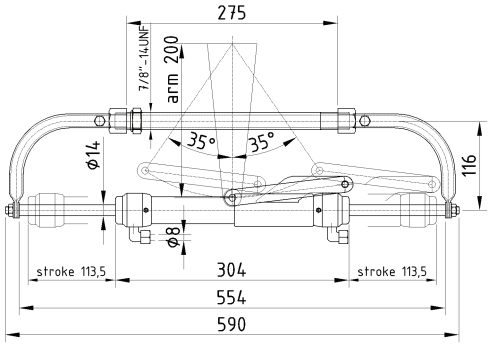


HYDRAULIC CYLINDERS - HC 400, HC 550, HC 700, HC 850



Type	A	B	C	D	E	F	G	H	K	L	M	N	P
HC 400	627	399	70	8	8	14	106,5	150	130	248	25; (30)	84	398
HC 550	761	466	92	8	8	14	139,5	195	170	293	(25); 30	106	465
HC 700	647	417	72	10	10	18	106,5	150	130	257	30; (35)	84	416
HC 850	782	484	95	10	10	18	139,5	195	170	302	(30); 35	106	483

HYDRAULIC CYLINDER - HCOB



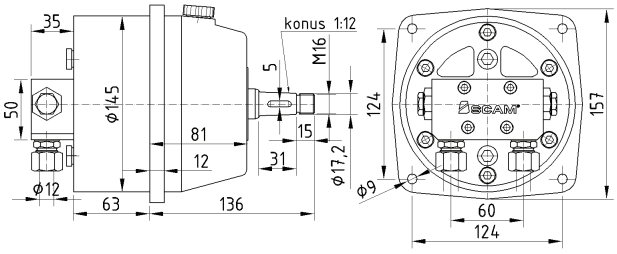
HYDRAULIC STEERING SYSTEM HKS 07

MAIN FEATURES HKS 07

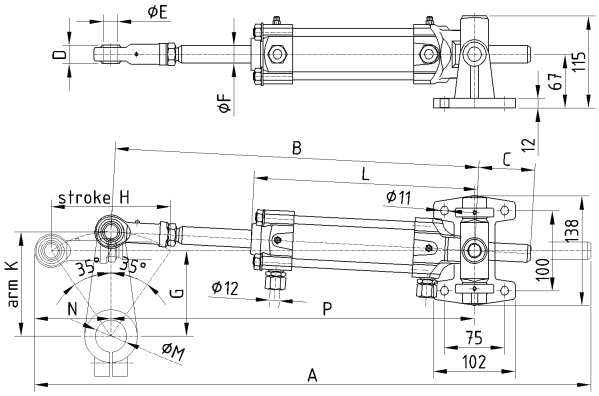
Hydraulic steering systems HKS 07 are recommended in the following combinations: HP 07 with HC 1050 or HC 1600. They are designed for pleasure boats, sailboats, yachts, and for working boats and fishing boats, length up to 13 m.
Pump HP 07 is an axial piston with 7 pistons of stainless steel, in the case of aluminum alloy, which is also the hydraulic oil tank.

Cylinders HC 1050 - 1600 are made of stainless steel and bronze and are very easy to install and require no special maintenance. Hydraulic piping is made of thermoplastic or copper pipes No 12 (3/8 ").

HYDRAULIC PUMPS - HP 07

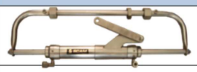


HYDRAULIC CYLINDERS - HC 1050, HC 1600



Type	A	B	C	D	E	F	G	H	K	L	M	N	P
HC 1050	694	454	70	23	18	22	106,5	150	130	279	35; (40)	96	453
HC 1600	824	520	89	23	18	22	139,5	195	170	325	35; (40)	118	519

Hydraulic steering systems HKS 05/ 07/ 09

boat lenght (m)	pumps / cylinders	HP 05	HP 05 OB	HP 07	HP 09/80	HP 09/100
up to 5,5 m	HC 400	3,6 turns of wheel				
5 - 6,5 m	HC 550	4,7 turns of wheel				
5 - 7 m	HC OB outboard		3,5 turns of wheel			
6 - 7,5 m	HC 700		4,2 turns of wheel			
7 - 9 m	HC 850		5,4 turns of wheel			
8,5 - 11 m	HC 1050		6,6 turns of wheel	4,8 turns of wheel		
10 - 13 m	HC 1600			6,2 turns of wheel		
12 - 15 m	HC 2100 (2 x HC 1050)				6,1 turns of wheel	4,9 turns of wheel
14 - 18 m	HC 3200 (2 x HC 1600)				7,9 turns of wheel	6,3 turns of wheel

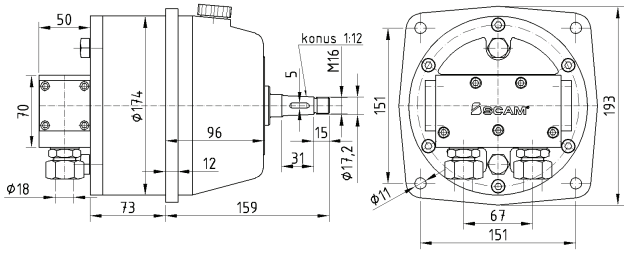
HYDRAULIC STEERING SYSTEM HKS 09

MAIN FEATURES HKS 09

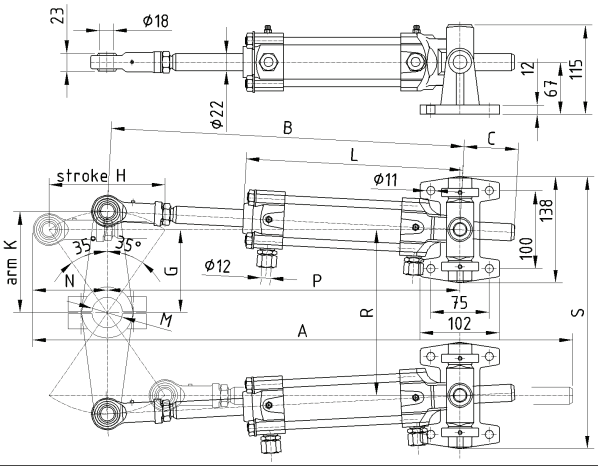
Hydraulic steering systems HKS 09 are recommended in the following combinations: HP 09/80 and HP 09/100 with HC 2100 or HC 3200. They are designed for pleasure boats, sailboats, yachts, and for working boats and fishing boats, length up to 18 m.
Pump HP 09 is an axial piston with 9 pistons of stainless steel, in the case of aluminum alloy, which is also the hydraulic oil tank.

Cylinders are made of stainless steel and bronze and are very easy to install in pairs as HC 2100 - 3200 and require no special maintenance.
Hydraulic piping is made of hydraulic rubber, or steel, or copper pipes No 15 (1/2 ").

HYDRAULIC PUMPS - HP 09/80, 09/100



HYDRAULIC CYLINDERS - HC 2100, HC 3200



Type	A	B	C	D	E	F	G	H	K	L	M	N	P	R	S
HC 2100	694	454	70	23	18	22	106,5	150	130	279	35; (45)	96	453	213	350
HC 3200	824	520	89	23	18	22	139,5	195	170	325	40; (50)	118	519	279	416

TECHNICAL SPECIFICATION HKS 05, 07, 09

Type of pump	HP 05, HP 05 E HP 05 DNV, HP 05 E DNV		HP 05 OB, HP 05OB E HP 05 OB DNV, HP 05OB E DNV			HP 07 HP 07 DNV		HP 09/80, HP 09/80 DNV	HP 09/100, HP 09/100 DNV
Pump capacity per rev [cm^3/rev]	23		36			50		78	98
Pump weight [kg]	3,9		4			7		12,2	12,4
Type of cylinder	**HC 400**	**HC 550**	**HC OB**	**HC 700**	**HC 850**	**HC 1050**	**HC 1600**	**HC 2100**	**HC 3200**
Cylinder capacity [cm^3]	83	108	126	150	195	238	309	476	618
Stroke [mm]	150	195	227	150	195	150	195	150	195
Rudder length [mm]	130	170	200	130	170	130	170	130	170
Max working pressure [bar]	65	65	55	65	65	60	60	60	60
Max torque [Nm]	400	550	500	700	850	1050	1600	2100	3200
Cylinder weight [kg]	3,7	4	3	5,2	5,6	8,9	10	17,8	20

HYDRAULIC STEERING SYSTEM

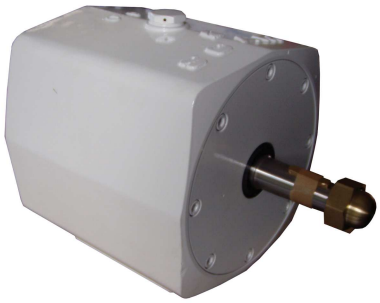
HKS 09 PRO

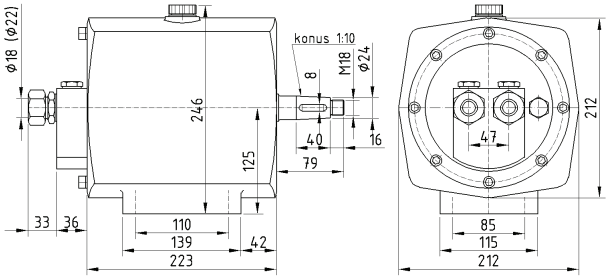
MAIN FEATURES HKS 09 PRO

Hydraulic steering systems HKS 09 PRO are recommended in the following combinations: HP 09/80 and HP 09/100 with HC 4500 or HC 6000 and HP 09/160 with HC 8000 or HC 12100. They are designed for yachts, as well as for professional ships, ferries, tourist and fishing vessels, length up to 30 m.
Pump HP 09 is an axial piston with 9 pistons of stainless steel, in the case of cast iron, which is also the hydraulic oil tank.

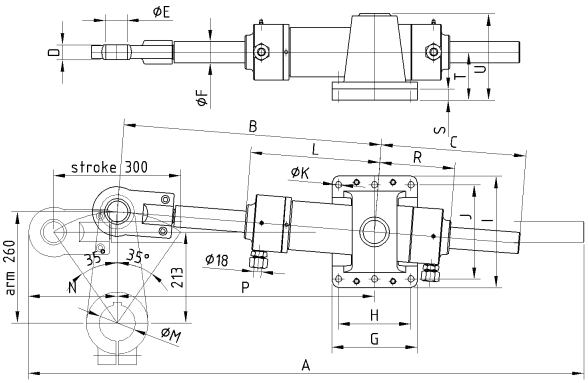
Cylinders HC 4500-12000 are made of stainless steel and steel, and the base of graphite cast iron castings and are very easy to install and require no special maintenance.
Hydraulic piping is made of hydraulic rubber or steel pipes No 18 (3/4 ").

HYDRAULIC PUMPS - HP 09/160





HYDRAULIC CYLINDERS - HC 4500, HC 6000, HC 8000, HC 12000



Type	A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	R	S	T	U
HC 4500	1248	585	315	28	40	30	160	130	225	195	13	309	45-70	199	583	151	20	86	156
HC 6000	1248	585	315	28	40	35	160	130	225	195	13	309	45-70	199	583	151	20	86	156
HC 8000	1302	605	340	35	50	40	200	170	261	221	16	304	50-90	208	603	176	26	112	202
HC 12000	1302	605	340	35	50	50	200	170	261	221	16	304	50-90	208	603	176	26	112	202

TECHNICAL SPECIFICATION HKS 09 PRO				
Type of pump	**HP 09/80 HP 09/80 DNV**	**HP 09/100 HP 09/100 DNV**	**HP 09/160 HP 09/160 + DNV**	
Pump capacity per rev [cm^3/rev]	78	98	163	
Pump weight [kg]	12,2	12,4	19	
Type of cylinder	**HC 4500**	**HC 6000**	**HC 8000**	**HC 12000**
Cylinder capacity [cm^3]	636	866	1131	1767
Stroke [mm]	300	300	300	300
Rudder length [mm]	260	260	260	260
Max working pressure [bar]	60 / 100	60 / 100	60 / 100	60 / 100
Max torque [Nm]	2710 / 4520	3690 / 6150	4820 / 8030	7530 / 12550
Cylinder weight [kg]	25	30	35	45

Hydraulic steering systems HKS 09 PRO				
boat lenght (m)	**pumps cylinders**	**HP 09/80**	**HP 09/100**	**HP 09/160**
16 - 20 m	**HC 4500**	8,2 turns of wheel	6,5 turns of wheel	
18 - 23 m	**HC 6000**	11,1 turns of wheel	8,8 turns of wheel	
22 - 26 m	**HC 8000**		11,5 turns of wheel	6,9 turns of wheel
25 - 30 m	**HC 12000**			10,8 turns of wheel

HYDRAULIC STEERING SYSTEM

EQUIPMENT

VALVES

Valve by-pass
BPV

Valve dual non-return
DNV

Valve double relief
DPV

Valve ball
KV

Dimensions: No 10 (5/16"); No 12 (3/8"); No 15 (1/2"); No 18 (3/4")

PIPE FITTINGS

Fitting for flexible TP hose
PTPC

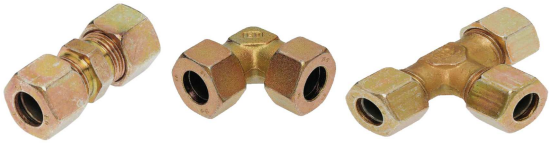
Fitting for flexible TP and Cu pipe
PTP-CuC

Fitting nuts and cutting ring
MP i UPP

Dimensions: No 10 (5/16"); No 12 (3/8"); No 15 (1/2")

FITTINGS

Fitting exstension (straight, elbow, T)
PNR, PNK, PNT



Fitting threaded (straight, elbow, T)
PUR, PUK, PUT

Dimensions: No 10 (5/16"); No 12 (3/8"); No 15 (1/2"); No 18 (3/4")

HYDRAULIC HOSES

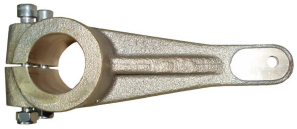
Hydraulic flexible hoses TP
R7

Copper hoses
Cu

Hydraulic flexible rubber hoses
R1T, R2T

Dimensions: No 10 (5/16"); No 12 (3/8"); No 15 (1/2"); No 18 (3/4")

RUDDER TILLER ARM



Dimensions (rudder axle diameter x length of tiller, mm):
A 25x130; A 25x170; A 30x130; A 30x170; A35x130; A 35x170; A 40x130; A 40x170

STEERING WHEEL

Tip 2

Tip 1

Tip 1A

Tip 3

Dimensions (outer diameter in cm):
30, 37, 42, 50, 60, 70, 80, 100, 120;

30, 37, 42, 50, 60, 70, 80

46, 55, 60, 70, 80;

42, 50, 60, 70, 80

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