OIL SOLUTIONS

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"For All Your Hydraulic Needs"

HYSTAT
Hydraulic Cylinders

Hydraulic Manufacturing Excellence since 1976

Technical Specifications

Offshore, Marine & Subsea Cylinders

Third Party Approved

Lloyd's Register DNV·GL ABS

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HYSTAT
Hydraulic Cylinders

Hystat have successfully supplied hydraulic cylinders to an array of marine industries since 1976. Within this time Hystat have typically dealt with large bespoke cylinders for large projects. Over this period we have attained an excellent reputation for product quality and reliability.

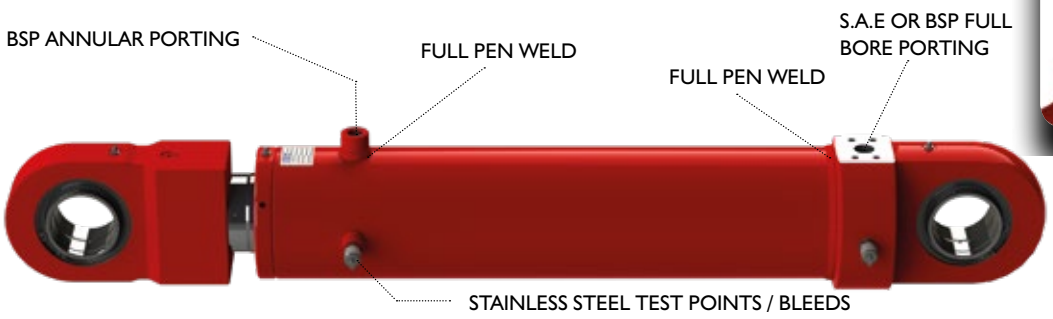
Due to demand we have implemented a standard range of both marine and offshore grade cylinders. All designs conform to Lloyds Register, DNV and ABS rules.

Our experienced team of design engineers have the skills and expertise to develop professional and cost effective solutions to meet your requirements. Using the latest in 3D CAD software and utilising Finite Element Analysis to check for any possible failure scenarios prior to manufacture.

Our in house machining capability means that we can turn up to 1.2m diameter and up to 8m in length. Our state of the art three, four and five axis CNC machines are able to produce complex components, such as bespoke manifold blocks in high quantities using the most efficient method.

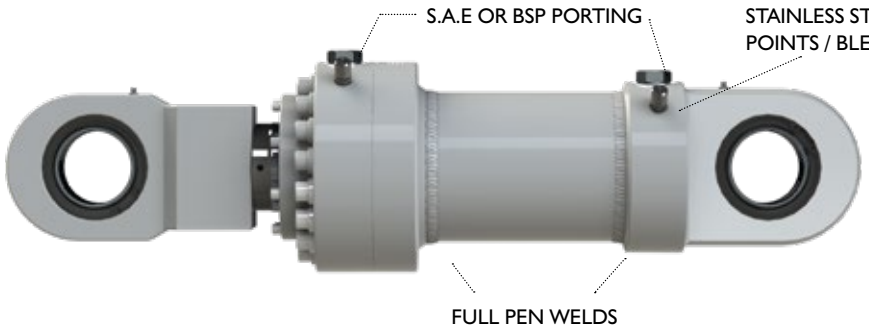
The benefits of using Hystat standard cylinders for your marine projects are a reputable product which guarantees quality, reliability and cost effectiveness. Whilst also offering highly certified products in larger volumes at much shorter lead times than our competitors.

STANDARD CONSTRUCTION



MANIFOLDS AND PIPEWORK CAN BE EASILY FITTED & SUPPLIED WITH STANDARD CYLINDERS ON REQUEST

- Screwed gland design on cylinders Ø20 - 200mm bore
- Bolted design available from Ø160mm + bore
- Screwed design - BSP full bore & annular porting or S.A.E full bore porting as standard
- Bolted design - BSP or S.A.E full bore & annular porting available as standard
- 3 rod sizes available per bore size
- Full penetration welds to the latest rules and regulations
- Rod seal purge points available upon request



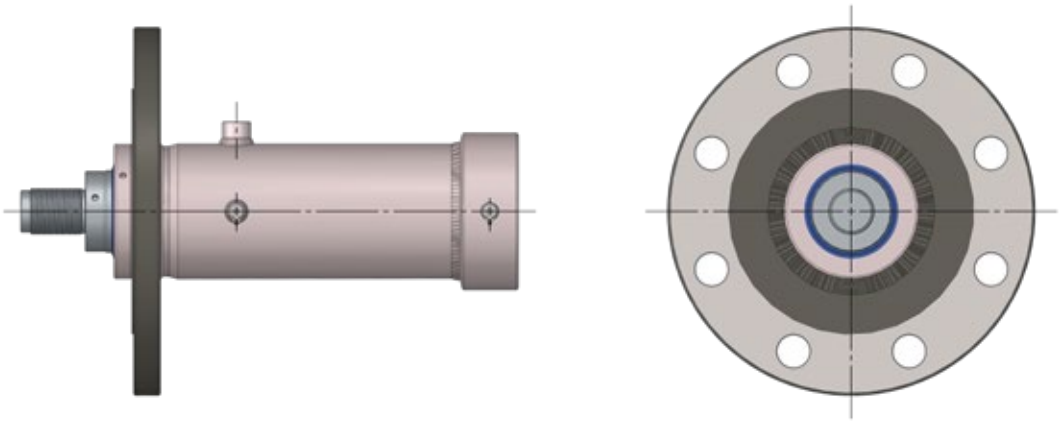
CYLINDER SPECIFICATION

HYSTAT Hydraulic Cylinders

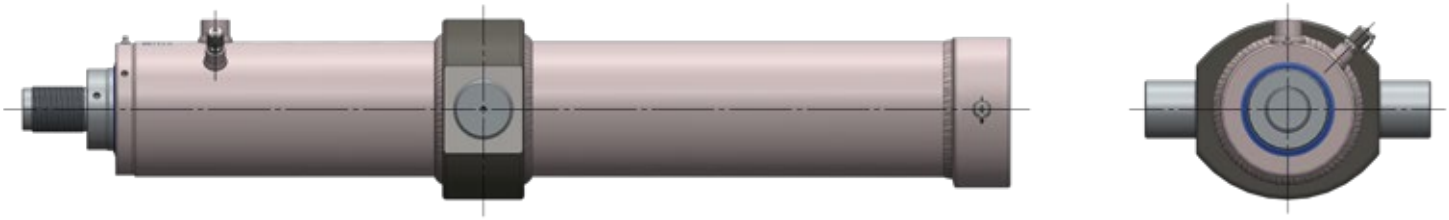
DESIGN PRESSURE:	250 BAR, 320 BAR
TEST PRESSURE:	375 BAR, 480 BAR
DESIGN TEMPERATURE:	Standard range -20°C to +50°C. Minimum -40°C to Maximum +120°C available on request
SEALING MATERIALS:	Standard range Nitrile Butadiene Rubber (NBR) & Polytefrafluoroethylene (PTFE).
FLUID MEDIUMS:	HFA – Fluids (5/95 water based), HFB – Fluids (60/40 invert emulsion), HFC – Fluids (water glycol), HETG – Fluids (vegetable oil) & Mineral Oil
MATERIAL CERTIFICATION:	All cylinders supplied as standard with traceability to BS EN10204 2004 Type 3.1. (Can be supplied to Type 3.2 on request).
THIRD PARTY CERTIFICATE:	Supplied with product certification from DNV. Design approval from any other certified body available on request.
PORTING OPTIONS:	Standard porting includes BSP, S.A.E (others available upon request).
MOUNTING:	Spherical eye mount construction.
SPHERICAL BEARING:	Maintenance free spherical plain bearings with a hard chrome sliding surface / PTFE-fabric as standard. Stainless steel and composite types are available on request.
PAINT:	Shot Blast SA2.5, Zinc Phosphate Primer, High Build Intermediate and 2 pack epoxy topcoat – Total DFT 200μm.

ALTERNATIVE MOUNTS

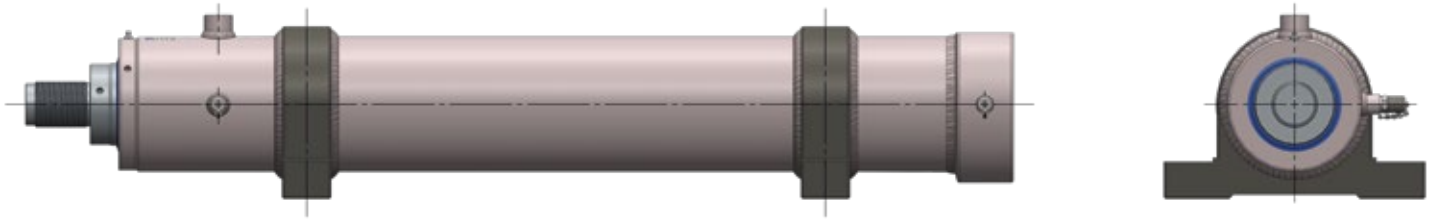
HYSTAT
Hydraulic Cylinders



FLANGE MOUNT – (FRONT OR REAR)



TRUNNION MOUNT



FOOT MOUNT

ALTERNATIVE FEATURES (IF REQUIRED)

- Front & Rear Cushioning
- Transducer (Internal Or External)
- Proximity Switches
- Sealing Material i.e. (Viton For High Temperature Sealing)
- Low Friction Seals
- Porting Options – (Other Than Specified)
- Manifolds & Pipework
- Rod Protective Bellows

THEORETICAL LOAD RATINGS – CYLINDER SELECTION

NOTE:- All standard cylinders are rated to a minimum of 90% efficiency due to the dynamic load ratings of the bearing sizes selected. Please note reduction in the standard bearing size may decrease the efficiency of the cylinder.

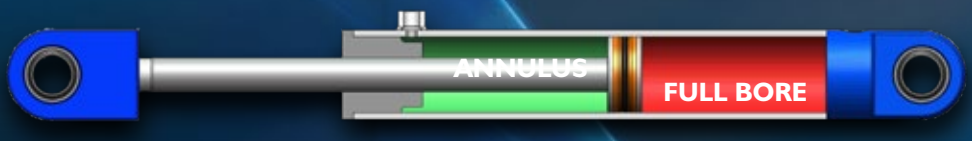
When selecting the size and type of bearing required please see pages 19-24 and refer to the corresponding load ratings.

		Theoretical forces at a mechanical efficiency of 100%					
		Pulling Force			Pushing Force		
BORE DIA mm	ROD DIA mm	100 BAR kN	250 BAR kN	320 BAR kN	100 BAR kN	250 BAR kN	320 BAR kN
50	28	13.5	33.7	43.1	19.6	49.1	62.8
	32	11.6	29.0	37.1			
	36	9.5	23.6	30.3			
63	36	21.0	52.5	67.2	31.2	77.9	99.8
	40	18.6	46.5	59.5			
	45	15.3	38.2	48.9			
80	45	34.4	85.9	110.0	50.3	125.7	160.8
	50	30.6	76.6	98.0			
	56	25.6	64.1	82.0			
100	56	53.9	134.8	172.5	78.5	196.3	251.3
	63	47.4	118.4	151.6			
	70	40.1	100.1	128.2			
125	70	84.2	210.6	269.5	122.7	306.8	392.7
	80	72.5	181.1	231.8			
	90	59.1	147.8	189.1			
140	80	103.7	259.2	331.8	153.9	384.8	492.6
	90	90.3	225.8	289.0			
	100	75.4	188.5	241.3			
160	90	137.4	343.6	439.8	201.1	502.7	643.4
	100	122.5	306.3	392.1			
	110	106.0	265.1	339.3			
180	100	175.9	439.8	563.0	254.5	636.2	814.3
	110	159.4	398.6	510.2			
	125	131.8	329.4	421.6			
200	110	219.1	547.8	701.2	314.2	785.4	1005.3
	125	191.4	478.6	612.6			
	140	160.2	400.6	512.7			
250	140	336.9	842.3	1078.2	490.9	1227.2	1570.8
	160	289.8	724.5	927.4			
	180	236.4	591.0	756.5			
320	180	549.8	1374.4	1759.3	804.2	2010.6	2573.6
	200	490.1	1225.2	1568.3			
	220	424.1	1060.3	1357.2			
400	220	876.5	2191.3	2804.8	1256.6	3141.6	4021.2
	250	765.8	1914.4	2450.4			
	280	640.9	1602.2	2050.8			
500	280	1347.7	3369.4	4312.8	1963.5	4908.7	6283.2
	320	1159.2	2898.1	3709.6			
	360	945.6	2364.0	3026.0			

For intermediate bore and rod sizes please use the formula below to attain the theoretical push and pull forces at 100% efficiency;

As a typical example take a Ø180 bore, Ø100 rod cylinder working at 320 bar.

HYSTAT Hydraulic Cylinders



Pull Force (N) = Annulus Area (mm^2) × Pressure (Pa) e.g..... $(180^2 - 100^2) \times 0.7854 \times 32 = 563 \times 10^3$ N

Push Force (N) = Full Bore Area (mm^2) × Pressure (Pa) e.g..... $180^2 \times 0.7854 \times 32 = 814 \times 10^3$ N

BUCKLING DIAGRAM

Depending upon the particular application it may be necessary to assess the resistance of a cylinder to buckling under the forces applied.

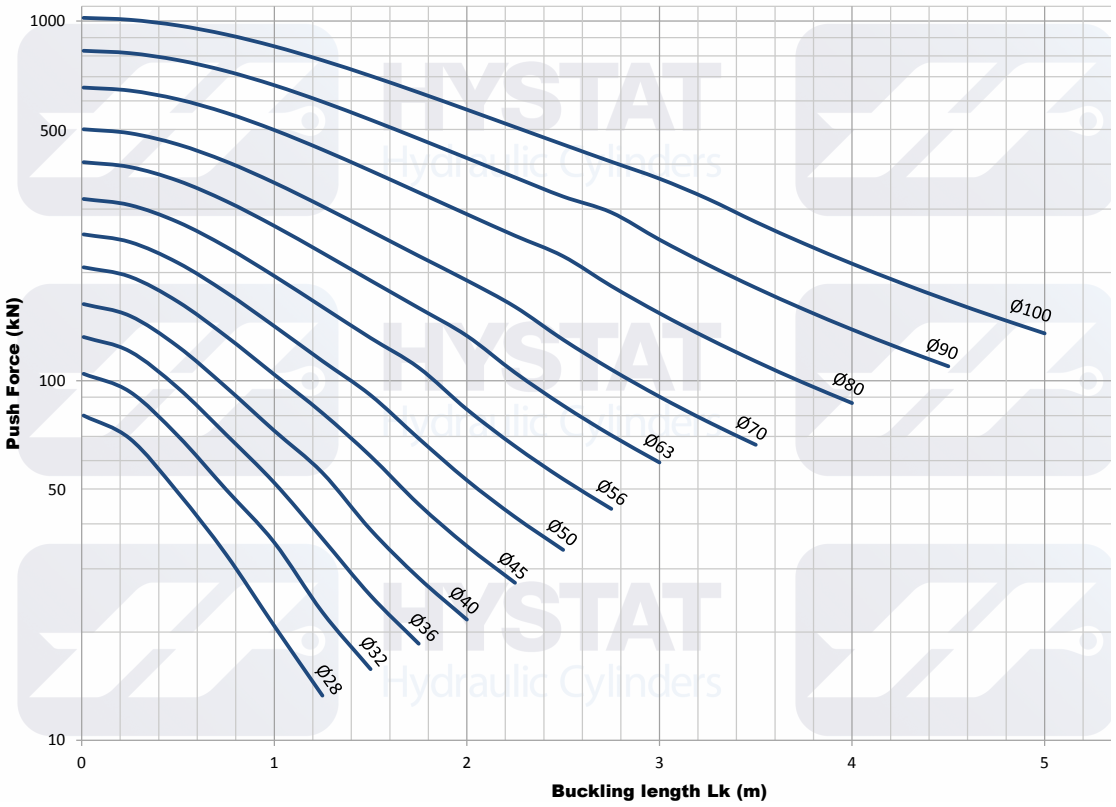
The graphs shown are intended to be used as a guide for normal applications where good alignment can be achieved. Special consideration should be given to unusual applications, and applications where shock loading may take place. Particularly if the cylinder is to be mounted in a horizontal position.

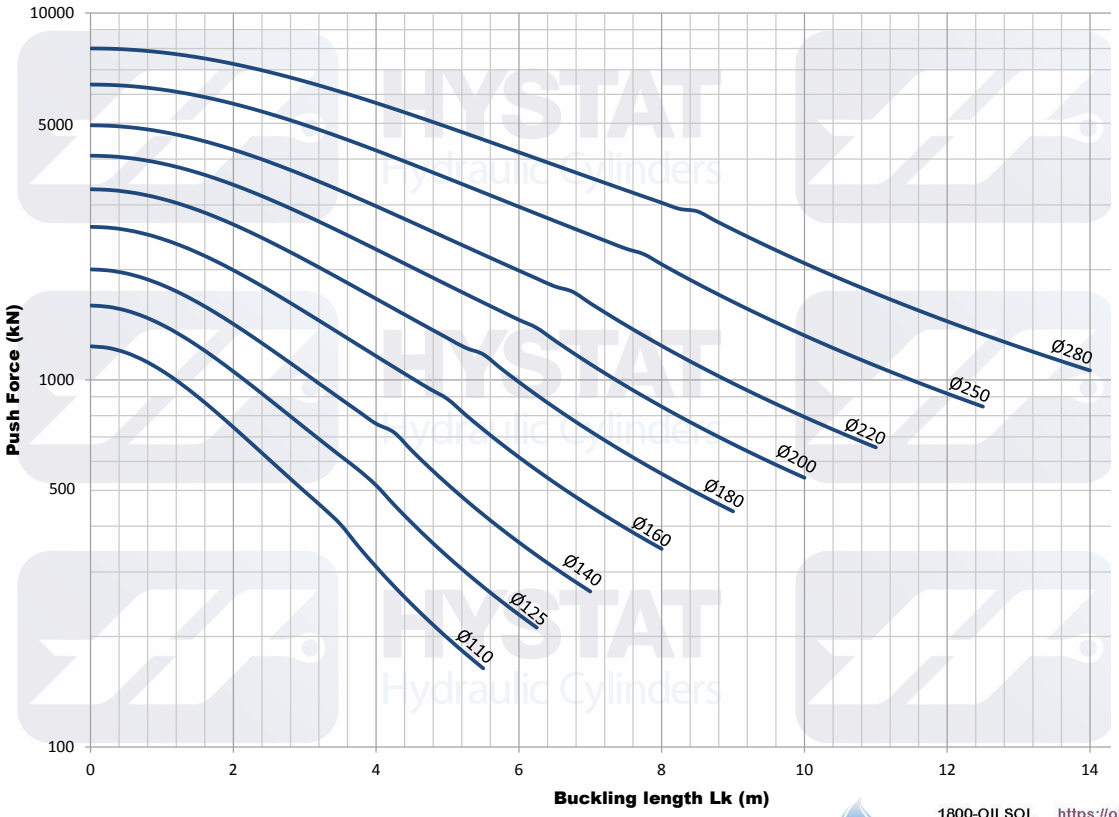
i. Determine the force applied to the cylinder and the H value required.

ii. If the intersection point is below the line of the desired rod size then buckling should not be a concern. (In some cases a smaller rod size could be considered).

iii. If the intersection point is above the line of the desired rod size then buckling may be an issue. (Refer to the rod size above).

Please note that the graphs shown are to be used as a guide only, for accurate application specific rod sizes please contact Hystat.

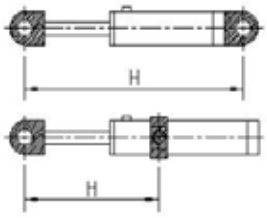




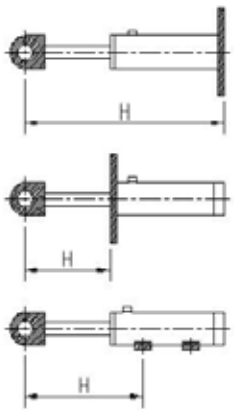
Safety Factor: Euler formula 3:1
Rankine formula 4:1

Modules of: elasticity E = 210000 Mpa

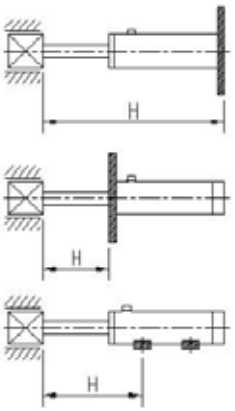
Yield: 520 N/mm² nominal



Lk = H (PINNED – PINNED)



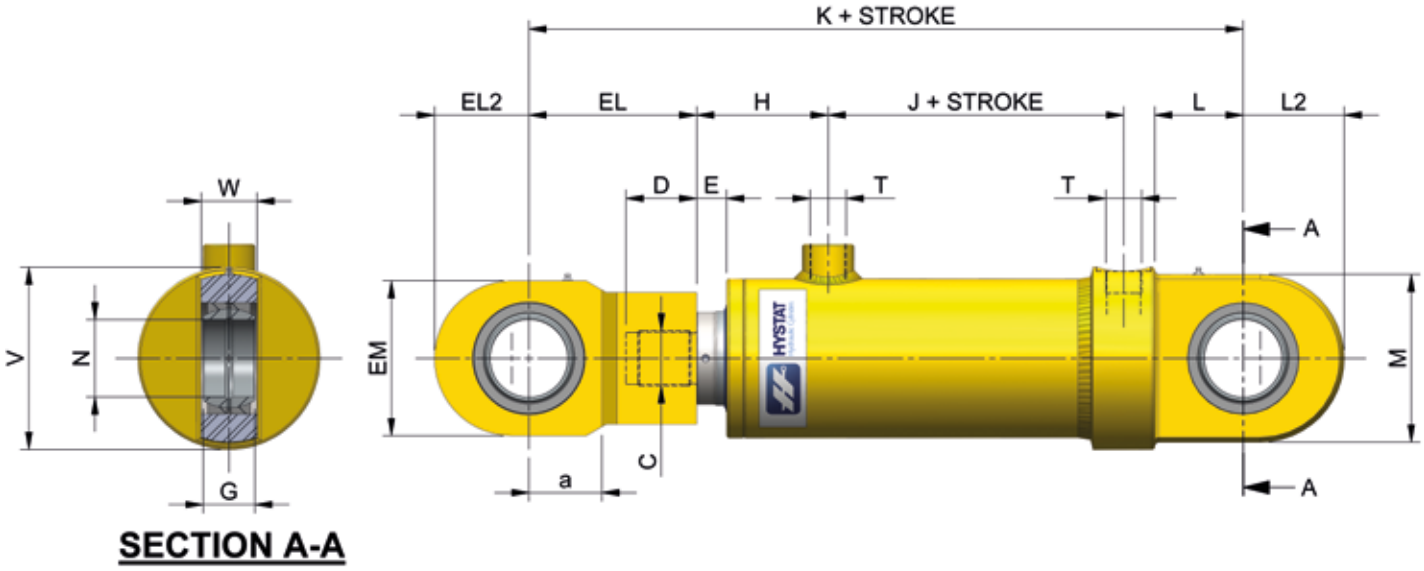
Lk = 0.7 X H (PINNED – FIXED)



Lk = 0.5 X H (FIXED – FIXED)

MARINE SPHERICAL EYE MOUNT
Screwed Gland Type - 250 Bar

HYSTAT Hydraulic Cylinders



FEATURES

- Not suitable for submersion
- Maintenance type bearings as standard
- BSP or S.A.E porting available as standard
- Full penetration welds to latest rules & regulation
- Rod seal purge points available upon request

TECHNICAL DETAILS

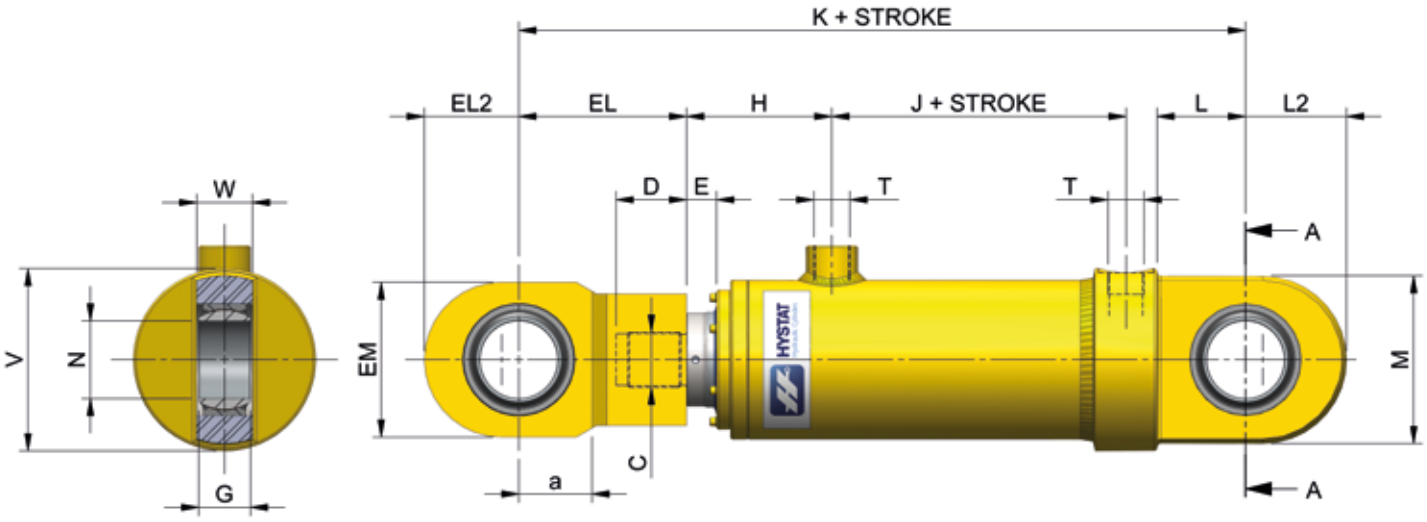
DESIGN PRESSURE: 250 BAR
TEST PRESSURE: 375 BAR
TEMPERATURE RANGE: -20°C TO +50°C
TRACEABILITY: BS EN10204 2004 TYPE 3.1

Bore Dia	Rod Dia	C	D	E	G	H	J	K	L	L2	M	N	T max.		V	W	EL	EL2	EM	a
													BSP	S.A.E 3000 SERIES						
50	28 32 36	M20 x 1.5P	38	18	22	84	79	301	40	43	75	30	G 1/2	-	75	27	80	40	70	32
63	36 40 45	M27 x 2P	46	21	28	86	87	350	50	50	90	40	G 3/4	1/2"	100	32	97	48	85	41
80	45 50 56	M33 x 2P	55	24	35	100	89	396	63	63	115	50	G 3/4	1/2"	115	40	120	55	100	50
100	56 63 70	M42 x 2P	66	27	44	116	95	451	71	80	140	60	G 1	3/4"	150	52	140	73	125	62
125	70 80 90	M48 x 2P	73	31	49	137	122	540	90	89	158	70	G 1	3/4"	174	57	160	80	140	70
140	80 90 100	M56 x 2P	79	35	55	157	130	591	90	104	178	80	G 1-1/4	1"	192	60	180	98	165	78
160	90 100 110	M64 x 3P	85	35	60	153	144	631	103	118	195	90	G 1-1/4	1"	212	65	195	110	180	85
180	100 110 125	M72 x 3P	100	40	70	169	150	697	112	135	230	100	G 1-1/4	1"	230	70	230	128	215	98
200	110 125 140	M80 x 3P	112	40	85	180	163	799	160	150	260	120	G 1-1/4	1"	260	90	260	150	260	120

NOTE: Alternative bearing types and sizes available, depending on the type chosen a reduction or increase in bearing size may be appropriate. Please see bearing datasheets on pages 19-24.

SUBSEA SPHERICAL EYE MOUNT
Screwed Gland Type - 250 Bar

HYSTAT Hydraulic Cylinders



SECTION A-A

FEATURES

- Additional sealing arrangements to reduce water ingression
- Suitable for submersion
- Maintenance free bearings as standard
- BSP or S.A.E porting available as standard
- Full penetration welds to latest rules & regulations

TECHNICAL DETAILS

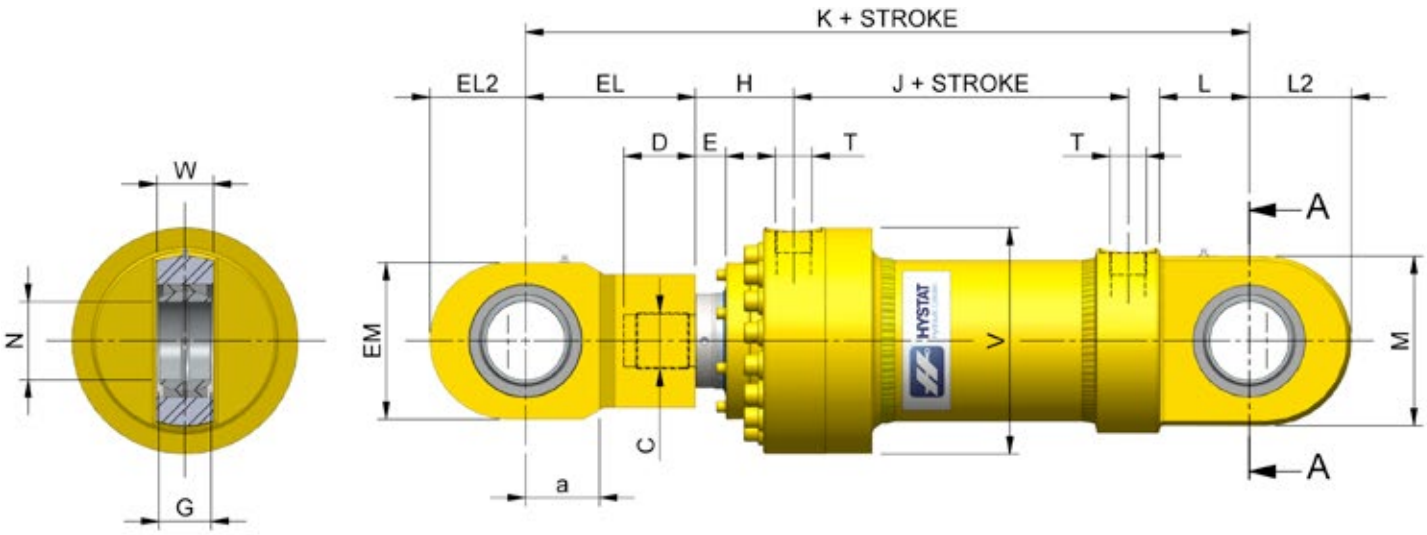
DESIGN PRESSURE: 250 BAR
TEST PRESSURE: 375 BAR
TEMPERATURE RANGE: -20°C TO +50°C
TRACEABILITY: BS EN10204 2004 TYPE 3.1

Bore Dia	Rod Dia	C	D	E	G	H	J	K	L	L2	M	N	T max.		V	W max.	EL	EL2	EM	a
													BSP	S.A.E 3000 SERIES						
50	28 32 36	M20 x 1.5P	38	18	22	84	79	301	40	43	75	30	G 1/2	-	75	27	80	40	70	32
63	36 40 45	M27 x 2P	46	21	28	86	87	350	50	50	90	40	G 3/4	1/2"	100	32	97	48	85	41
80	45 50 56	M33 x 2P	55	24	35	100	89	396	63	63	115	50	G 3/4	1/2"	115	40	120	55	100	50
100	56 63 70	M42 x 2P	66	27	44	116	95	451	71	80	140	60	G 1	3/4"	150	52	140	73	125	62
125	70 80 90	M48 x 2P	73	31	49	145	122	548	90	89	158	70	G 1	3/4"	174	57	160	80	140	70
140	80 90 100	M56 x 2P	79	35	55	160	130	594	90	104	178	80	G 1-1/4	1"	192	60	180	98	165	78
160	90 100 110	M64 x 3P	85	35	60	167	144	645	103	118	195	90	G 1-1/4	1"	212	65	195	110	180	85
180	100 110 125	M72 x 3P	100	40	70	184	150	712	112	135	230	100	G 1-1/4	1"	230	70	230	128	215	98
200	110 125 140	M80 x 3P	112	40	85	190	163	809	160	150	260	120	G 1-1/4	1"	260	90	260	150	260	120

NOTE: Alternative bearing types and sizes available, depending on the type chosen a reduction or increase in bearing size may be appropriate. Please see bearing datasheets on pages 19-24.

MARINE SPHERICAL EYE MOUNT
Bolted Type - 250 Bar

HYSTAT Hydraulic Cylinders



SECTION A-A

FEATURES

- Not suitable for submersion
- Maintenance type bearings as standard
- BSP or S.A.E porting available as standard
- Full penetration welds to latest rules & regulations
- Rod seal purge points available upon request

TECHNICAL DETAILS

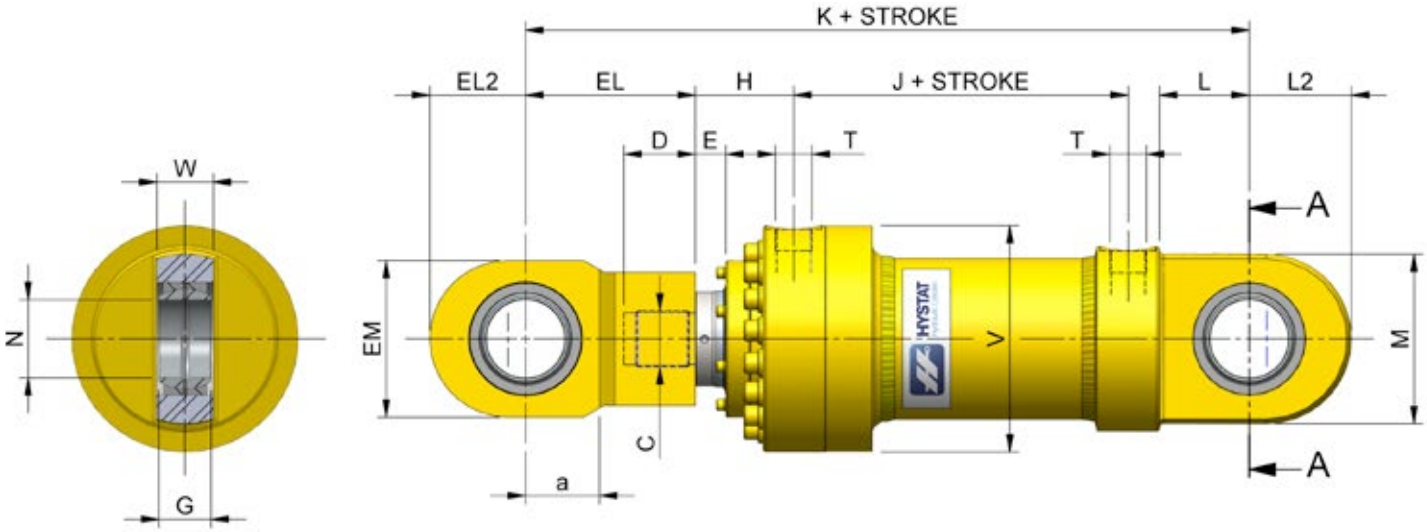
DESIGN PRESSURE: 250 BAR
TEST PRESSURE: 375 BAR
TEMPERATURE RANGE: -20°C TO +50°C
TRACEABILITY: BS EN10204 2004 TYPE 3.1

Bore Dia	Rod Dia	C	D	E	G	H	J	K	L	L2	M	N	T max.		V max.	W max.	EL	EL2	EM	a
													BSP	S.A.E 3000 SERIES						
160	90 100 110	M64 x 3P	85	35	60	115	182	631	103	118	195	90	G 1-1/4	1"	260	65	195	110	180	85
180	100 110 125	M72 x 3P	100	40	70	119	200	697	112	135	230	100	G 1-1/4	1"	280	70	230	128	215	98
200	110 125 140	M80 x 3P	112	40	85	126	217	799	160	150	260	120	G 1-1/4	1"	315	90	260	150	260	120
220	125 140 160	M90 x 3P	120	42	90	135	235 min.	890 min.	175	177	314	140	G 1-1/2	1-1/4"	360	114	295	177	314	140
250	140 160 180	M100 x 3P	130	42	90	145	265 min.	930 min.	175	177	314	140	G 1-1/2	1-1/4"	400	114	295	177	314	140
280	160 180 200	M110 x 3P	140	45	90	155	295 min.	970 min.	175	177	314	140	G 1-1/2	1-1/4"	440	114	295	177	314	140
320	180 200 220	M125 x 4P	150	48	105	175	325 min.	1090 min.	200	192	344	160	G 1-1/2	1-1/4"	480	130	340	192	344	160
360	200 220 250	M140 x 4P	160	48	130	185	355 min.	1265 min.	250	236	432	200	G 1-1/2	1-1/4"	520	162	420	236	432	200
400	220 250 280	M160 x 4P	170	53	130	200	385 min.	1315 min.	250	236	432	200	G 2	1-1/4"	560	162	420	236	432	200

NOTE: Alternative bearing types and sizes available, depending on the type chosen a reduction or increase in bearing size may be appropriate. Please see bearing datasheets on pages 19-24.

SUBSEA SPHERICAL EYE MOUNT
Bolted Type - 250 Bar

HYSTAT Hydraulic Cylinders



SECTION A-A

FEATURES

- Additional sealing arrangements to reduce water ingression
- Suitable for submersion
- Maintenance free bearings as standard
- BSP or S.A.E porting available as standard
- Full penetration welds to latest rules & regulations

TECHNICAL DETAILS

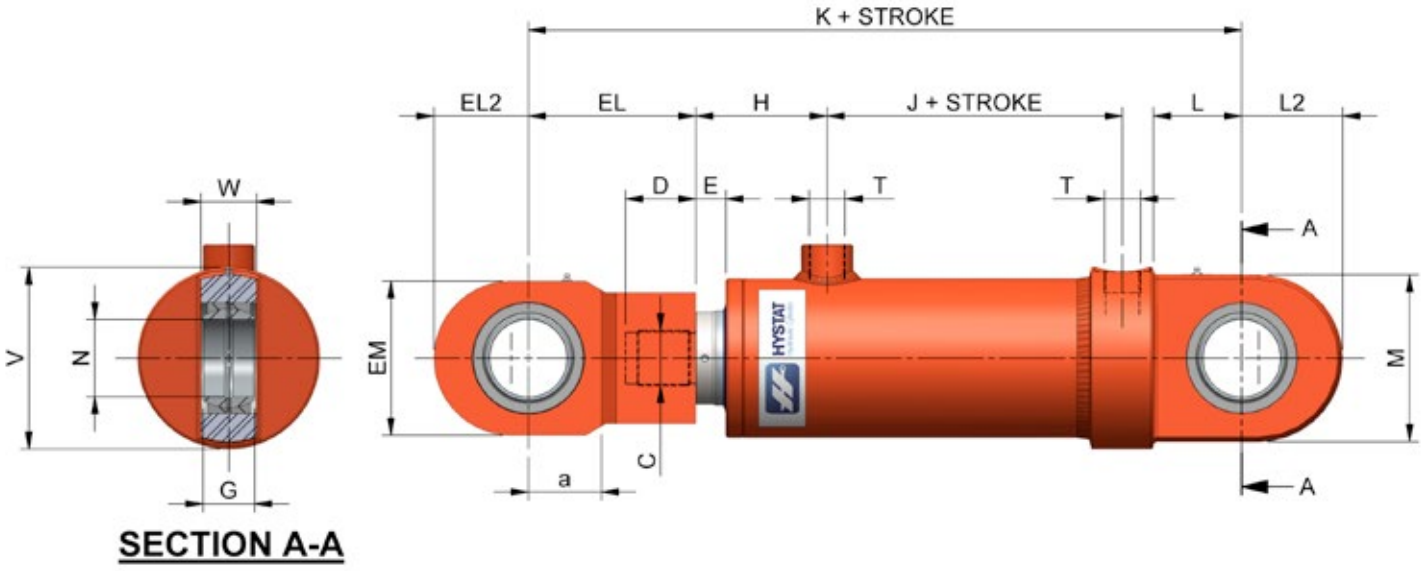
DESIGN PRESSURE: 250 BAR
TEST PRESSURE: 375 BAR
TEMPERATURE RANGE: -20°C TO +50°C
TRACEABILITY: BS EN10204 2004 TYPE 3.1

Bore Dia	Rod Dia	C	D	E	G	H	J	K	L	L2	M	N	T max.		V	W	EL	EL2	EM	a
													BSP	S.A.E 3000 SERIES						
160	90 100 110	M64 x 3P	85	35	60	129	182	645	103	118	195	90	G 1-1/4	1"	260	65	195	110	180	85
180	100 110 125	M72 x 3P	100	40	70	134	200	712	112	135	230	100	G 1-1/4	1"	280	70	230	128	215	98
200	110 125 140	M80 x 3P	112	40	85	136	217	809	160	150	260	120	G 1-1/4	1"	315	90	260	150	260	120
220	125 140 160	M90 x 3P	120	42	90	155	235 min.	910 min.	175	177	314	140	G 1-1/2	1-1/4"	360	114	295	177	314	140
250	140 160 180	M100 x 3P	130	42	90	165	265 min.	950 min.	175	177	314	140	G 1-1/2	1-1/4"	400	114	295	177	314	140
280	160 180 200	M110 x 3P	140	45	90	185	295 min.	1000 min.	175	177	314	140	G 1-1/2	1-1/4"	440	114	295	177	314	140
320	180 200 220	M125 x 4P	150	48	105	205	325 min.	1120 min.	200	192	344	160	G 1-1/2	1-1/4"	480	130	340	192	344	160
360	200 220 250	M140 x 4P	160	48	130	225	355 min.	1305 min.	250	236	432	200	G 1-1/2	1-1/4"	520	162	420	236	432	200
400	220 250 280	M160 x 4P	170	53	130	240	385 min.	1355 min.	250	236	432	200	G 2	1-1/4"	560	162	420	236	432	200

NOTE: Alternative bearing types and sizes available, depending on the type chosen a reduction or increase in bearing size may be appropriate. Please see bearing datasheets on pages 19-24.

MARINE SPHERICAL EYE MOUNT
Screwed Gland Type - 320 Bar

HYSTAT Hydraulic Cylinders



FEATURES

- Not suitable for submersion
- Maintenance type bearings as standard
- BSP or S.A.E porting available as standard
- Full penetration welds to latest rules & regulations
- Rod seal purge points available upon request

TECHNICAL DETAILS

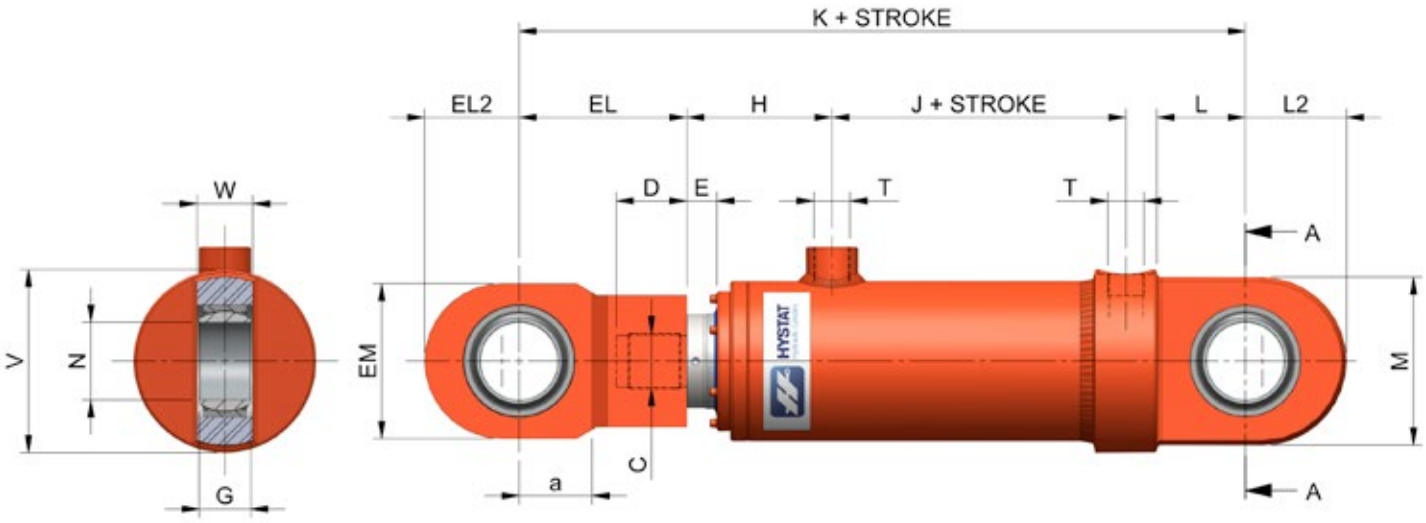
DESIGN PRESSURE: 320 BAR
TEST PRESSURE: 480 BAR
TEMPERATURE RANGE: -20°C TO +50°C
TRACEABILITY: BS EN10204 2004 TYPE 3.1

Bore Dia	Rod Dia	C	D	E	G	H	J	K	L	L2	M	N	T max.		V	W max.	EL	EL2	EM	a
													BSP	S.A.E 6000 SERIES						
50	28 32 36	M20 x 1.5P	38	18	22	84	79	301	40	43	75	30	G 1/2	-	75	27	80	40	70	32
63	36 40 45	M27 x 2P	46	21	28	86	87	350	50	50	90	40	G 3/4	1/2"	100	32	97	48	85	41
80	45 50 56	M33 x 2P	55	24	35	100	89	396	63	63	115	50	G 3/4	1/2"	115	40	120	55	100	50
100	56 63 70	M42 x 2P	66	27	44	116	95	451	71	80	140	60	G 1	3/4"	150	52	140	73	125	62
125	70 80 90	M48 x 2P	73	31	55	137	122	560	90	104	180	80	G 1	3/4"	180	60	180	98	165	78
140	80 90 100	M56 x 2P	79	35	60	157	130	619	103	118	195	90	G 1-1/4	1"	195	65	195	110	180	85
160	90 100 110	M64 x 3P	85	40	70	158	144	680	112	135	230	100	G 1-1/4	1"	230	70	230	128	215	98
180	100 110 125	M72 x 3P	100	40	85	169	150	775	160	150	260	120	G 1-1/4	1"	260	90	260	150	260	120
200	110 125 140	M80 x 3P	112	40	85	180	163	799	160	150	277	120	G 1-1/4	1"	277	90	260	150	260	120

NOTE: Alternative bearing types and sizes available, depending on the type chosen a reduction or increase in bearing size may be appropriate. Please see bearing datasheets on pages 19-24.

SUBSEA SPHERICAL EYE MOUNT
Screwed Gland Type - 320 Bar

HYSTAT Hydraulic Cylinders



FEATURES

- Additional sealing arrangements to reduce water ingression
- Suitable for submersion
- Maintenance free bearings as standard
- BSP or S.A.E porting available as standard
- Full penetration welds to latest rules & regulations

TECHNICAL DETAILS

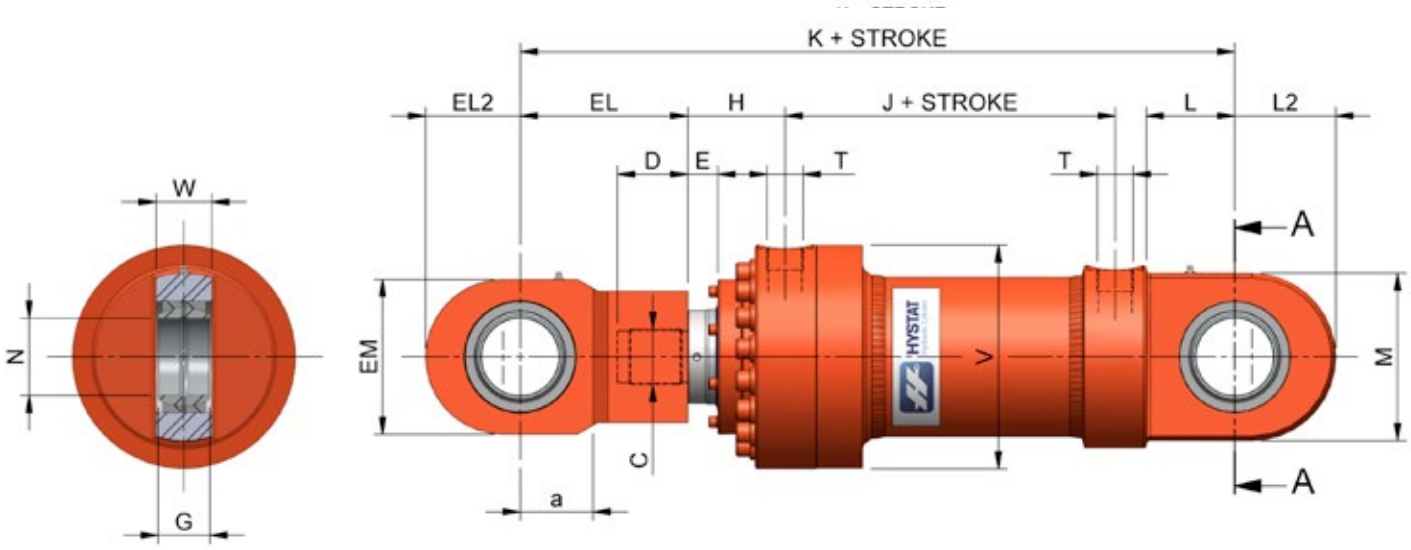
DESIGN PRESSURE: 320 BAR
TEST PRESSURE: 480 BAR
TEMPERATURE RANGE: -20°C TO +50°C
TRACEABILITY: BS EN10204 2004 TYPE 3.1

Bore Dia	Rod Dia	C	D	E	G	H	J	K	L	L2	M	N	T max.		V	W max.	EL	EL2	EM	a
													BSP	S.A.E 6000 SERIES						
50	28 32 36	M20 x 1.5P	38	18	22	84	79	301	40	43	75	30	G 1/2	-	75	27	80	40	70	32
63	36 40 45	M27 x 2P	46	21	28	86	87	350	50	50	90	40	G 3/4	1/2"	100	32	97	48	85	41
80	45 50 56	M33 x 2P	55	24	35	100	89	396	63	63	115	50	G 3/4	1/2"	115	40	120	55	100	50
100	56 63 70	M42 x 2P	66	27	44	116	95	451	71	80	140	60	G 1	3/4"	150	52	140	73	125	62
125	70 80 90	M48 x 2P	73	31	55	145	122	568	90	104	180	80	G 1	3/4"	180	60	180	98	165	78
140	80 90 100	M56 x 2P	79	35	60	160	130	622	103	118	195	90	G 1-1/4	1"	195	65	195	110	180	85
160	90 100 110	M64 x 3P	85	40	70	172	144	694	112	135	230	100	G 1-1/4	1"	230	70	230	128	215	98
180	100 110 125	M72 x 3P	100	40	85	184	150	790	160	150	260	120	G 1-1/4	1"	260	90	260	150	260	120
200	110 125 140	M80 x 3P	112	40	85	190	163	809	160	150	277	120	G 1-1/4	1"	277	90	260	150	260	120

NOTE: Alternative bearing types and sizes available, depending on the type chosen a reduction or increase in bearing size may be appropriate. Please see bearing datasheets on pages 19-24.

MARINE SPHERICAL EYE MOUNT
Bolted Type- 320 Bar

HYSTAT Hydraulic Cylinders



SECTION A-A

FEATURES

- Not suitable for submersion
- Maintenance type bearings as standard
- BSP or S.A.E porting available as standard
- Full penetration welds to latest rules & regulations
- Rod seal purge points available upon request

TECHNICAL DETAILS

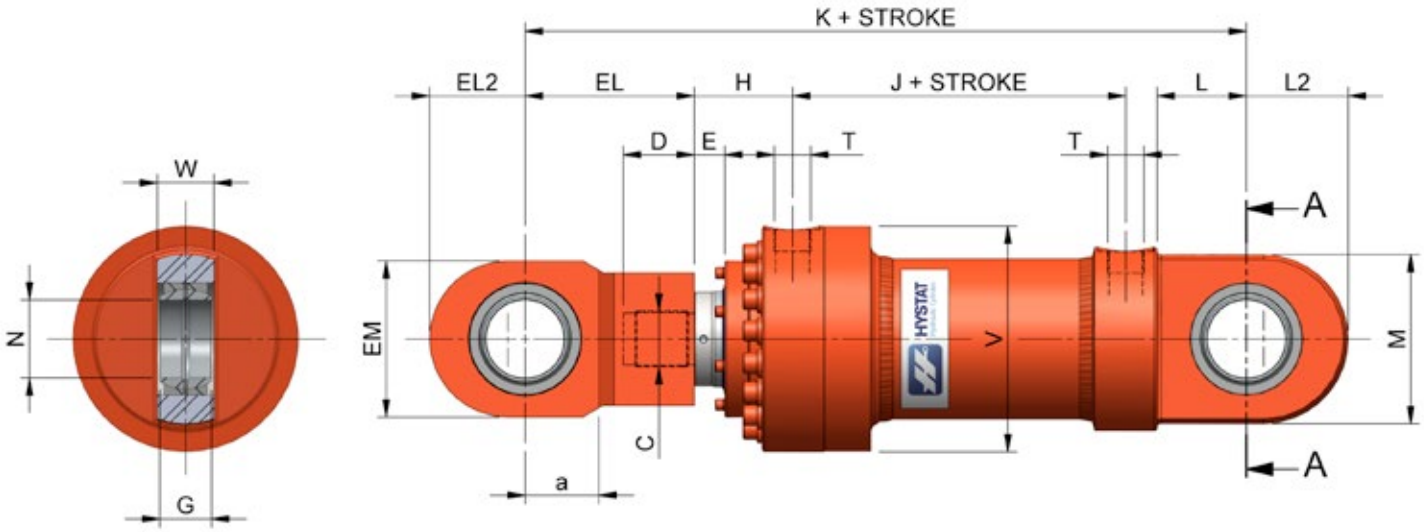
DESIGN PRESSURE: 320 BAR
TEST PRESSURE: 480 BAR
TEMPERATURE RANGE: -20°C TO +50°C
TRACEABILITY: BS EN10204 2004 TYPE 3.1

Bore Dia	Rod Dia	C	D	E	G	H	J	K	L	L2	M	N max.	T max.		V max.	W max.	EL	EL2	EM	a
													BSP	S.A.E 6000 SERIES						
160	90 100 110	M64 x 3P	85	40	70	119	182	680	112	135	230	100	G 1-1/4	1"	270	70	230	128	215	98
180	100 110 125	M72 x 3P	100	40	85	119	200	775	160	150	260	120	G 1-1/4	1"	290	90	260	150	260	120
200	110 125 140	M80 x 3P	112	40	85	126	217	799	160	150	277	120	G 1-1/4	1"	325	90	260	150	260	120
220	125 140 160	M90 x 3P	120	42	90	135	235 min.	890 min.	175	177	314	140	G 1-1/2	1-1/4"	370	114	295	177	314	140
250	140 160 180	M100 x 3P	130	42	90	145	265 min.	930 min.	175	177	314	140	G 1-1/2	1-1/4"	410	114	295	177	314	140
280	160 180 200	M110 x 3P	140	45	105	155	295 min.	1040 min.	200	192	344	160	G 1-1/2	1-1/4"	450	130	340	192	344	160
320	180 200 220	M125 x 4P	150	48	130	175	325 min.	1220 min.	250	236	432	200	G 1-1/2	1-1/4"	490	162	420	236	432	200
360	200 220 250	M140 x 4P	160	48	130	185	355 min.	1265 min.	250	236	432	200	G 1-1/2	1-1/4"	530	162	420	236	432	200
400	220 250 280	M160 x 4P	170	53	140	200	385 min.	1450 min.	300	276	512	240	G 2	1-1/2"	570	162	505	276	512	235

NOTE: Alternative bearing types and sizes available, depending on the type chosen a reduction or increase in bearing size may be appropriate. Please see bearing datasheets on pages 19-24.

SUBSEA SPHERICAL EYE MOUNT
Bolted Type - 320 Bar

HYSTAT Hydraulic Cylinders



SECTION A-A

FEATURES

- Additional sealing arrangements to reduce water ingression
- Suitable for submersion
- Maintenance free bearings as standard
- BSP or S.A.E porting available as standard
- Full penetration welds to latest rules & regulations

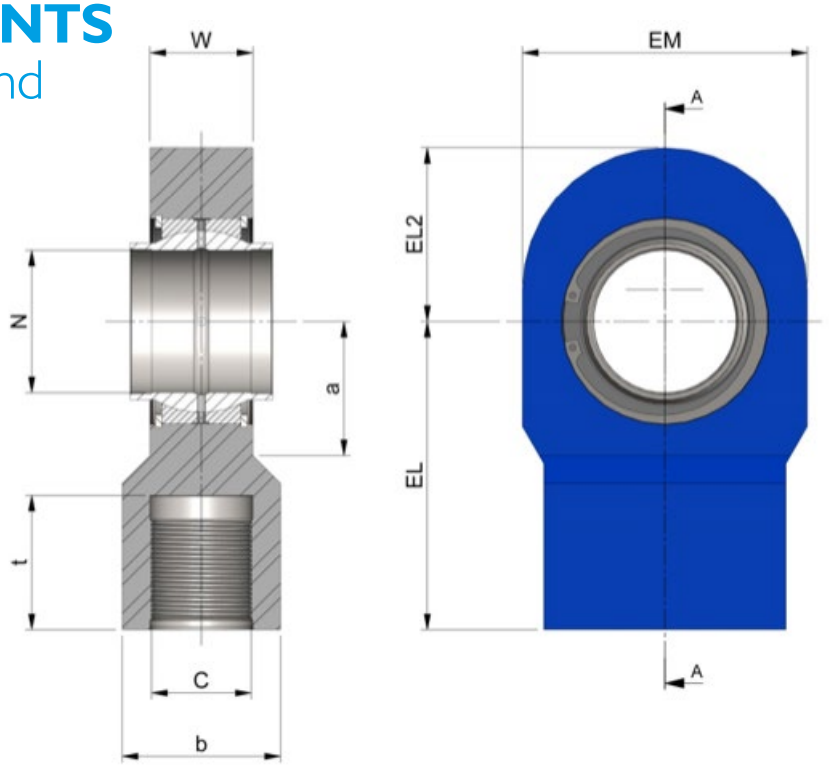
TECHNICAL DETAILS

DESIGN PRESSURE: 320 BAR
TEST PRESSURE: 480 BAR
TEMPERATURE RANGE: -20°C TO +50°C
TRACEABILITY: BS EN10204 2004 TYPE 3.1

Bore Dia	Rod Dia	C	D	E	G	H	J	K	L	L2	M	N max.	T max.		V max.	W max.	EL	EL2	EM	a
													BSP	S.A.E 6000 SERIES						
160	90 100 110	M64 x 3P	85	40	70	133	182	694	112	135	230	100	G 1-1/4	1"	270	70	230	128	215	98
180	100 110 125	M72 x 3P	100	40	85	134	200	790	160	150	260	120	G 1-1/4	1"	290	90	260	150	260	120
200	110 125 140	M80 x 3P	112	40	85	136	217	809	160	150	277	120	G 1-1/4	1"	325	90	260	150	260	120
220	125 140 160	M90 x 3P	120	42	90	155	235 min.	910 min.	175	177	314	140	G 1-1/2	1-1/4"	370	114	295	177	314	140
250	140 160 180	M100 x 3P	130	42	90	165	265 min.	950 min.	175	177	314	140	G 1-1/2	1-1/4"	410	114	295	177	314	140
280	160 180 200	M110 x 3P	140	45	105	185	295 min.	1070 min.	200	192	344	160	G 1-1/2	1-1/4"	450	130	340	192	344	160
320	180 200 220	M125 x 4P	150	48	130	205	325 min.	1250 min.	250	236	432	200	G 1-1/2	1-1/4"	490	162	420	236	432	200
360	200 220 250	M140 x 4P	160	48	130	225	355 min.	1305 min.	250	236	432	200	G 1-1/2	1-1/4"	530	162	420	236	432	200
400	220 250 280	M160 x 4P	170	53	140	240	385 min.	1490 min.	300	276	512	240	G 2	1-1/2"	570	162	505	276	512	235

NOTE: Alternative bearing types and sizes available, depending on the type chosen a reduction or increase in bearing size may be appropriate. Please see bearing datasheets on pages 19-24.

MOUNTS
Rod End



SECTION A-A

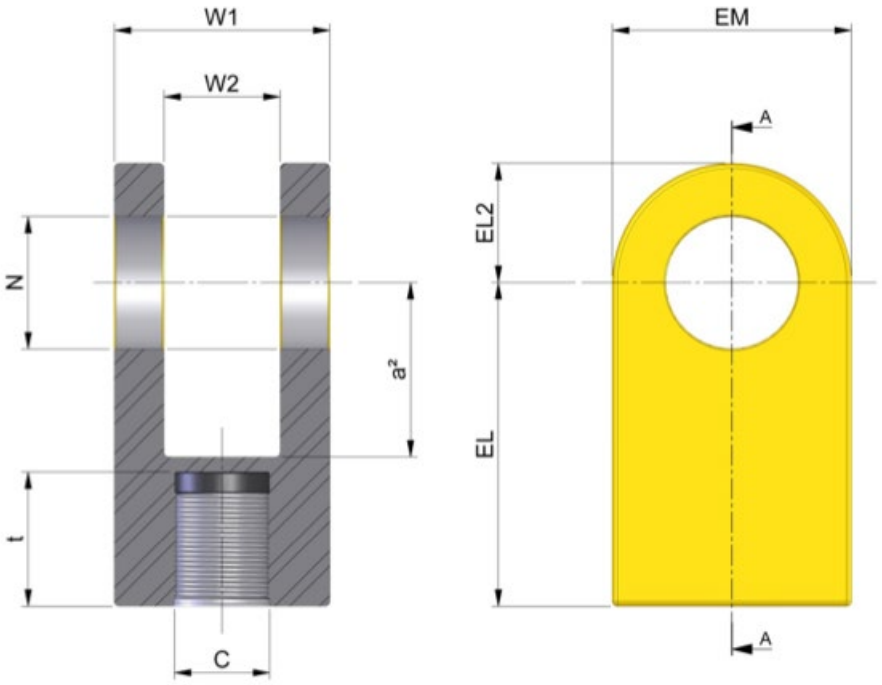
*Various bearing types are available – please refer to pages 19-24 and specify on order.

N	W	C	b	t	EL	EL2	EM	a	Load Rating (kN)
30	27	M20 x 1.5P	35	40	80	40	70	32	71
40	32	M27 x 2.P	45	48	97	48	85	41	85
50	40	M33 x 2P	55	57	120	55	100	50	115
60	52	M42 x 2P	70	68	140	73	125	62	203
70	57	M48 x 2P	75	75	160	80	140	70	223
80	60	M48 x 2P M56 x 2P	90	82	180	98	165	78	302
90	65	M56 x 2P M64 x 3P	100	85	195	110	180	85	352
100	70	M64 x 3P M72 x 3P	110	93	210	128	215	98	493
120	90	M72 x 3P M80 x 3P	130	115	260	150	260	120	756
140	114	M90 x 3P M110 x 3P	165 max.	140 max.	295	177	314	140	1166
160	130	M110 x 3P M125 x 4P	190 max.	150 max.	340	192	344	160	1457
180	130	M125 x 4P M140 x 4P	210 max.	160 max.	380	214	388	175	1636
200	162	M140 x 4P M160 x 4P	240 max.	170 max.	420	236	432	200	2185
220	162	M140 x 4P M160 x 4P	240 max.	170 max.	465	258	478	220	2432
240	162	M160 x 4P M170 x 4P	250 max.	180 max.	505	276	512	235	2647
260	179	M170 x 4P M180 x 4P	270 max.	190 max.	550	298	556	255	3163

- The load ratings specified relate to the rod end only, bearing load ratings can be found on pages 19-24.
- Please note that rod end load ratings may change if the standard bearing size shown is changed. It is advised when choosing a bearing size to never exceed the size shown in the existing profile so not to reduce the load rating of the eye.

MOUNTS
Rod End Clevis

HYSTAT
Hydraulic Cylinders



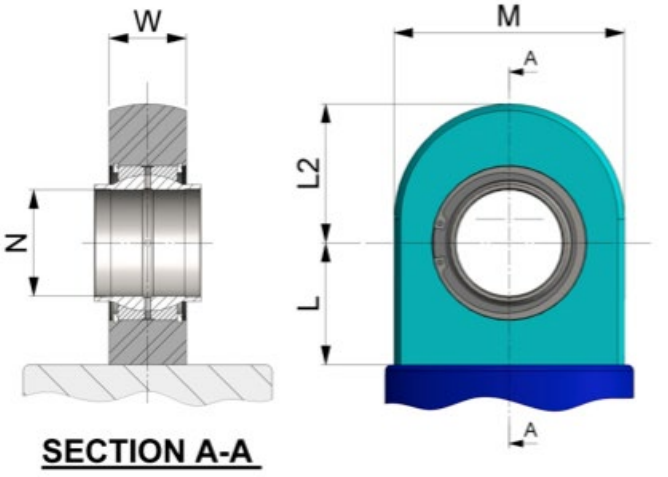
SECTION A-A

N	C	W1	W2	t	EL	EL2	EM	a^2	Load Rating (kN)
30	M20 x 1.5P	55	32	40	90	30	60	44	71
40	M27 x 2.P	65	40	48	105	37	73	52	85
50	M33 x 2P	85	50	57	120	42	84	59	115
60	M42 x 2P	105	63	68	160	57	113	80	203
70	M48 x 2P	115	70	75	180	62	123	94	223
80	M48 x 2P M56 x 2P	130	80	82	195	72	144	105	302
90	M56 x 2P M64 x 3P	150	90	85	220	76	152	125	352
100	M64 x 3P M72 x 3P	170	100	93	250	89	177	135	493
120	M72 x 3P M80 x 3P	210	125	115	290	106	212	163	756
140	M90 x 3P M110 x 3P	240	140	140 max.	340	135	270	185	1166
160	M110 x 3P M125 x 4P	270	160	150 max.	365	155	310	197	1457
180	M125 x 4P M140 x 4P	300	180	160 max.	400	168	335	222	1636
200	M140 x 4P M160 x 4P	340	200	170 max.	430	190	380	242	2185
220	M140 x 4P M160 x 4P	375	220	170 max.	460	200	400	272	2432
240	M160 x 4P M170 x 4P	410	240	180 max.	490	210	420	292	2647
260	M170 x 4P M180 x 4P	440	260	190 max.	520	230	460	312	3163

MOUNTS

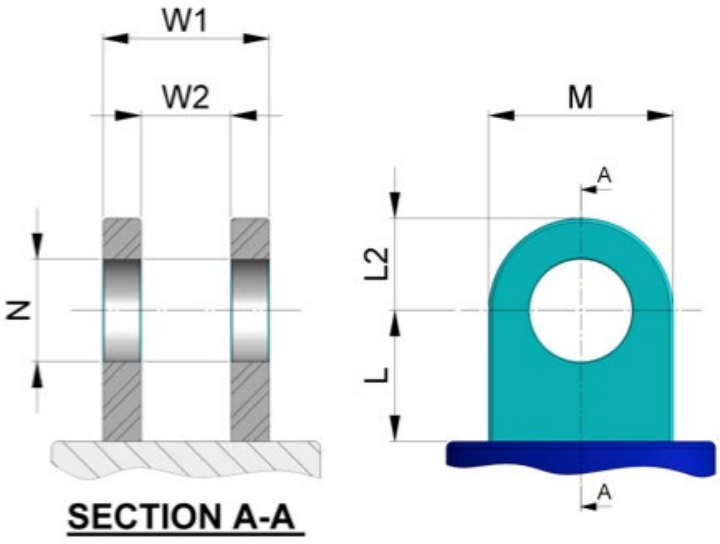
HYSTAT Hydraulic Cylinders

REAR SPHERICAL EYE



N	W	L	L2	M	Load Rating *kN)*
30	27	40	43	75	71
40	32	50	50	90	85
50	40	63	63	115	115
60	52	71	80	140	203
70	57	90	89	158	223
80	60	90	104	178	302
90	65	103	118	195	352
100	70	112	135	230	493
120	90	160	150	260	756
140	114	175	177	314	1166
160	130	200	192	344	1457
180	130	225	214	388	1636
200	162	250	236	432	2185
220	162	275	258	476	2432
240	162	300	276	512	2647
260	179	325	298	556	3163

REAR CLEVIS



N	W1	W2	L	L2	N	Load Rating *(kN)*
30	55	32	50	30	60	71
40	65	40	55	37	73	85
50	85	50	70	42	84	115
60	105	63	90	57	113	203
70	115	70	95	62	123	223
80	130	80	110	72	144	302
90	150	90	125	76	152	352
100	170	100	145	89	177	493
120	210	125	165	106	212	756
140	240	140	185	135	270	1166
160	270	160	200	155	310	1457
180	300	180	225	168	335	1636
200	340	200	245	190	380	2185
220	375	220	275	200	400	2432
240	410	240	295	210	420	2647
260	440	260	315	230	460	3163

- The load ratings specified relate to the rear eye only, bearing load ratings can be found on pages 19-24.
- Please note that rod end load ratings may change if the standard bearing size shown is changed. It is advised when choosing a bearing size to never exceed the size shown in the existing profile so not to reduce the load rating of the eye.

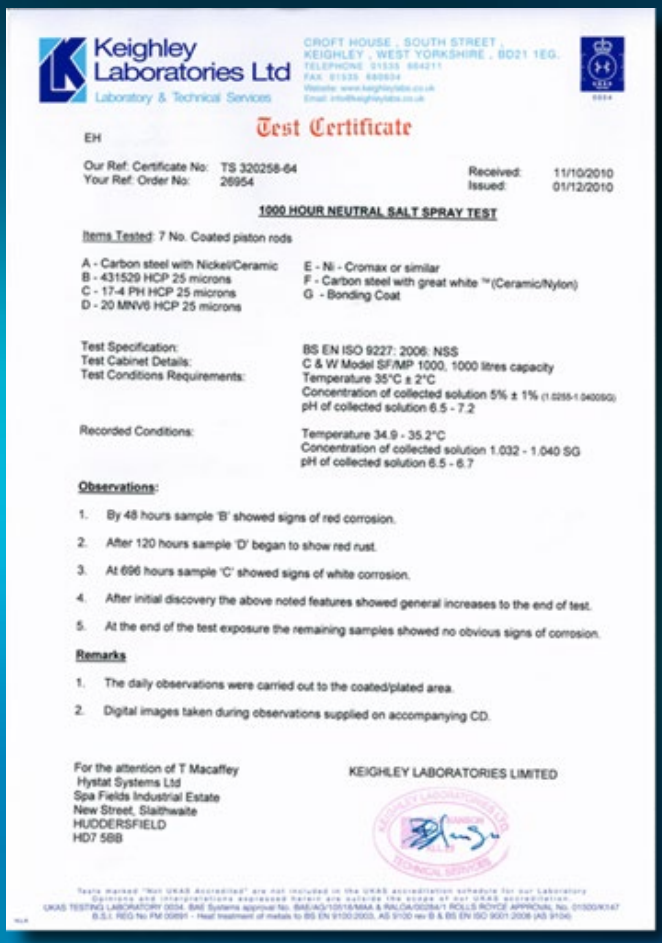
ROD MATERIAL / PLATING SPECIFICATIONS

HYSTAT Hydraulic Cylinders

The exposure of the rod to a marine environment significantly increases the risk of corrosion, and therefore the material selection process is paramount. Corrosion/pitting of the rod may result in seal damage, fluid contamination and eventual failure of the cylinder.

Hystat therefore conducted a series of controlled tests on typical rod materials, as well as an array of plating options.

(Please ask our sales team for a copy of results Ref: CT-DEV-062).



Keighley Laboratories Ltd
Laboratory & Technical Services
CROFT HOUSE , SOUTH STREET , KEIGHLEY , WEST YORKSHIRE , BD21 1EG.

Test Certificate

EH

Our Ref: Certificate No: TS 320258-64
Your Ref: Order No: 26954
Received: 11/10/2010
Issued: 01/12/2010

1000 HOUR NEUTRAL SALT SPRAY TEST

Items Tested: 7 No. Coated piston rods

A - Carbon steel with Nickel/Ceramic
B - 431529 HCP 25 microns
C - 17-4 PH HCP 25 microns
D - 20 MNV6 HCP 25 microns
E - Ni - Cromax or similar
F - Carbon steel with great white ™(Ceramic/Nylon)
G - Bonding Coat

Test Specification: BS EN ISO 9227: 2006: NSS
Test Cabinet Details: C & W Model SF/MP 1000, 1000 litres capacity
Test Conditions Requirements: Temperature 35°C ± 2°C
Concentration of collected solution 5% ± 1%
pH of collected solution 6.5 - 7.2

Recorded Conditions: Temperature 34.9 - 35.2°C
Concentration of collected solution 1.032 - 1.040 SG
pH of collected solution 6.5 - 6.7

Observations:

1. By 48 hours sample 'B' showed signs of red corrosion.
2. After 120 hours sample 'D' began to show red rust.
3. At 696 hours sample 'C' showed signs of white corrosion.
4. After initial discovery the above noted features showed general increases to the end of test.
5. At the end of the test exposure the remaining samples showed no obvious signs of corrosion.

Remarks

1. The daily observations were carried out to the coated/plated area.
2. Digital images taken during observations supplied on accompanying CD.

For the attention of T Macaffey
Hystat Systems Ltd
Spa Fields Industrial Estate
New Street, Slaithwaite
HUDDERSFIELD
HD7 5BB

KEIGHLEY LABORATORIES LIMITED

431S29T Chrome Plated Bar (25 microns)

168 hours

1008 hours

Clean and inspected

The table below can be used as a rough indication as to which rod material would be most suitable in varying marine atmospheres.

OIL SOLUTIONS

1800-OILSOL
1800-645765

https://oilsolutions.com.au/

sales@oilsolutions.com.au

MATERIAL	PLATING	
17-4PH	CHROME	HIGH EXPOSURE TO ATMOSPHERE
20MNV6	HVOF TUNGSTEN CARBIDE	
AISI-4130	NICKEL & CERAMIC	
20MNV6	NICKEL & CHROME	
20MNV6	NI-CROMAX	
* 431S29T	CHROME	
20MNV6	CHROME	MINIMAL EXPOSURE TO ATMOSPHERE

*NOTE: Full third party approval cannot be achieved with a rod material of 431S29T

i.e. 17-4PH hard chrome plate would be suitable for a cylinder which is submerged in sea water where the rod is exposed to the atmosphere regularly.

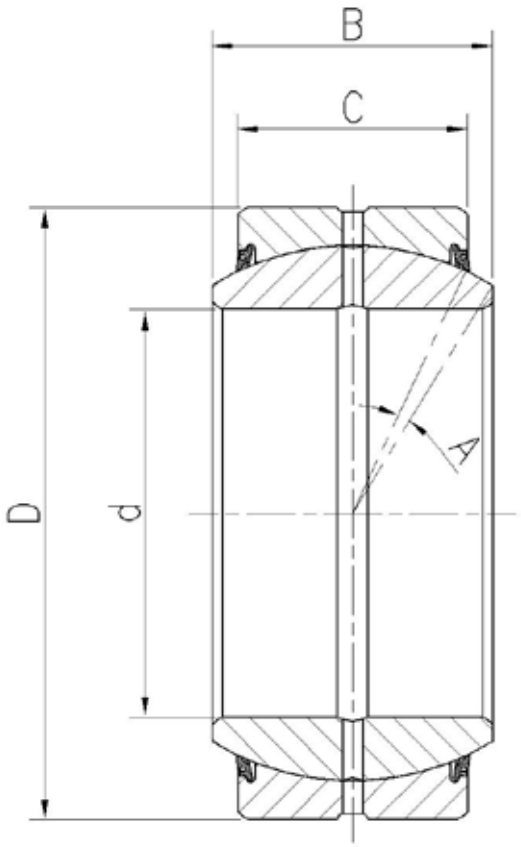
i.e 20MNV6 hard chrome plate would be suitable for a cylinder which is situated shipboard where the rod is rarely exposed to the atmosphere.

NARROW SPHERICAL BEARING

Requiring maintenance (Steel on steel)

To DIN ISO 12 240-1-series E

HYSTAT Hydraulic Cylinders



All Dimensions In mm Unless Stated

Shaft Ø	Product Code*	Dimensions					Max Load Ratings	
		d	D	B	C	A Deg	Dyn (kN)	Static (kN)
30	SPHGE030DO/A	30 -.010	47 -.011	22 -.012	18 -.024	6	62	310
40	SPHGE040DO/A	40 -.012	62 -.013	28 -.012	22 -.030	7	100	500
50	SPHGE050DO/A	50 -.012	75 -.013	35 -.012	28 -.030	6	156	780
60	SPHGE060DO/A	60 -.015	90 -.015	44 -.015	36 -.040	6	245	1220
70	SPHGE070DO/A	70 -.015	105 -.015	49 -.015	40 -.040	6	315	1560
80	SPHGE080DO/A	80 -.015	120 -.015	55 -.015	45 -.040	6	400	2000
90	SPHGE090DO/A	90 -.020	130 -.018	60 -.020	50 -.050	5	490	2450
100	SPHGE100DO/A	100 -.020	150 -.018	70 -.020	55 -.050	7	610	3050
110	SPHGE110DO/A	110 -.020	160 -.025	70 -.020	55 -.050	6	655	3250
120	SPHGE120DO/A	120 -.020	180 -.025	85 -.020	70 -.050	6	950	4750
140	SPHGE140DO/A	140 -.025	210 -.030	90 -.025	70 -.060	7	1080	5400
160	SPHGE160DO/A	160 -.025	230 -.030	105 -.025	80 -.060	8	1370	6800
180	SPHGE180DO/A	180 -.025	260 -.035	105 -.025	80 -.070	6	1530	7650
200	SPHGE200DO/A	200 -.030	290 -.035	130 -.030	100 -.070	7	2120	10600

Other Sizes Available Upon Request

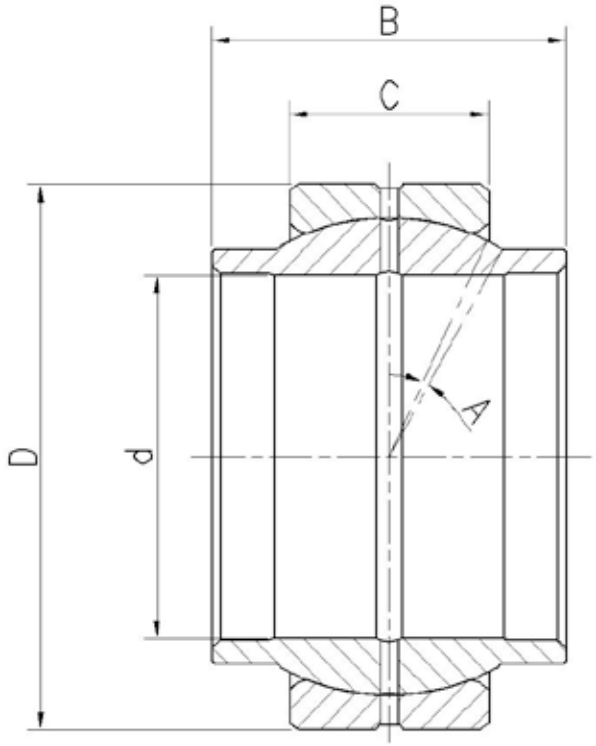
*Additional Seals = SPHGE...-DO-2RS/A

WIDE SPHERICAL BEARING

Requiring maintenance (Steel on steel)

To DIN ISO 12 240-1-series E

HYSTAT Hydraulic Cylinders



All Dimensions In mm Unless Stated

Shaft Ø	Product Code	Dimensions					Max Load Ratings	
		d	D	B	C	A Deg	Dyn (kN)	Static (kN)
32	SPHGE032LO/A	32 +.025	52 -.013	32 -.025	18 -.030	4	62	310
40	SPHGE040LO/A	40 +.025	62 -.013	40 -.025	22 -.030	4	100	500
50	SPHGE050LO/A	50 +.025	75 -.013	50 -.025	28 -.030	4	156	780
63	SPHGE060LO/A	63 +.030	95 -.015	63 -.030	36 -.040	4	255	1270
70	SPHGE070LO/A	70 +.030	105 -.015	70 -.030	40 -.040	4	315	1560
80	SPHGE080LO/A	80 +.030	120 -.015	80 -.030	45 -.040	4	400	2000
90	SPHGE090LO/A	90 +.035	130 -.018	90 -.035	50 -.050	4	490	2450
100	SPHGE100LO/A	100 +.035	150 -.018	100 -.035	55 -.050	4	610	3050
110	SPHGE110LO/A	110 +.035	160 -.025	110 -.035	55 -.050	4	655	3250
125	SPHGE125LO/A	125 +.040	180 -.025	125 -.040	70 -.050	4	950	4750
160	SPHGE160LO/A	160 +.040	230 -.030	160 -.040	80 -.060	4	1370	6800
200	SPHGE200LO/A	200 +.046	290 -.035	200 -.046	100 -.070	4	2120	10600

Other Sizes Available Upon Request

GENUINE INA OR SKF NARROW SPHERICAL BEARING

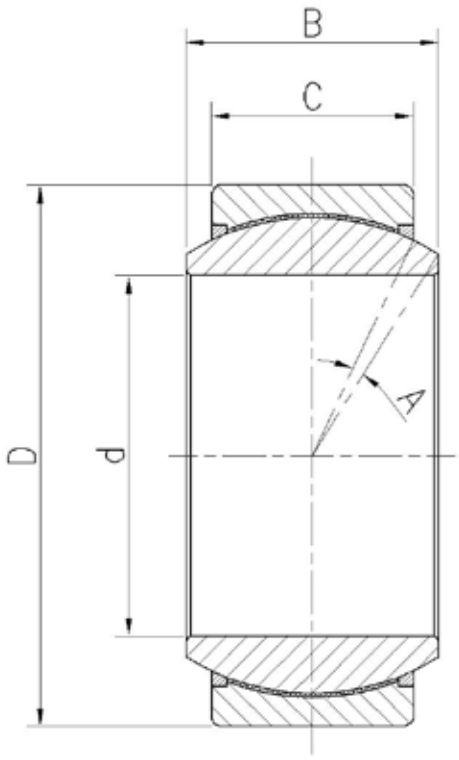
HYSTAT Hydraulic Cylinders

Maintenance free (self lubricating)

To DIN ISO 12 240-1-series E

Lip seals on both sides

Sliding contact surface – hard chromium / PTFE-fabric



All Dimensions In mm Unless Stated

Shaft Ø	Product Code	Dimensions					Max Load Ratings	
		d	D	B	C	A Deg	Dyn (kN)	Static (kN)
30	SPHGE030UK2RS/E	30 -.010	47 -.011	22 -.012	18 -.024	0	165	275
40	SPHGE040UK2RS/E	40 -.012	62 -.013	28 -.012	22 -.030	0	277	462
50	SPHGE050UK2RS/E	50 -.012	75 -.013	35 -.012	28 -.030	6	442	737
60	SPHGE060UK2RS/E	60 -.015	90 -.015	44 -.015	36 -.040	6	690	1150
70	SPHGE070UK2RS/E	70 -.015	105 -.015	49 -.015	40 -.040	6	885	1475
80	SPHGE080UK2RS/E	80 -.015	120 -.015	55 -.015	45 -.040	6	1125	1875
90	SPHGE090UK2RS/E	90 -.020	130 -.018	60 -.020	50 -.050	5	1380	2300
100	SPHGE100UK2RS/E	100 -.020	150 -.018	70 -.020	55 -.050	7	1717	2862
110	SPHGE110UK2RS/E	110 -.020	160 -.025	70 -.020	55 -.050	6	1845	3075
120	SPHGE120UK2RS/E	120 -.020	180 -.025	85 -.020	70 -0.50	6	2685	4475
140	SPHGE140UK2RS/E	140 -.025	210 -.030	90 -.025	70 -.060	7	3015	5025
160	SPHGE160UK2RS/E	160 -.025	230 -.030	105 -.025	80 -.060	8	3840	6400
180	SPHGE180UK2RS/E	180 -.025	260 -.035	105 -.025	80 -.070	6	4320	7200
200	SPHGE200UK2RS/E	200 -.030	290 -.035	130 -.030	100 -.070	7	6000	10000

Other Sizes Available Upon Request

ALTERNATIVE NARROW SPHERICAL BEARING

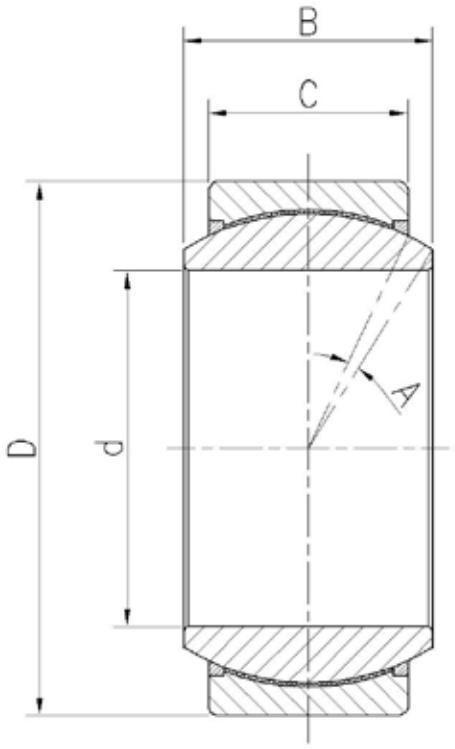
HYSTAT Hydraulic Cylinders

Maintenance free (self lubricating)

To DIN ISO 12 240-1-series E

Lip seals on both sides

Sliding contact surface – hard chromium / PTFE-fabric



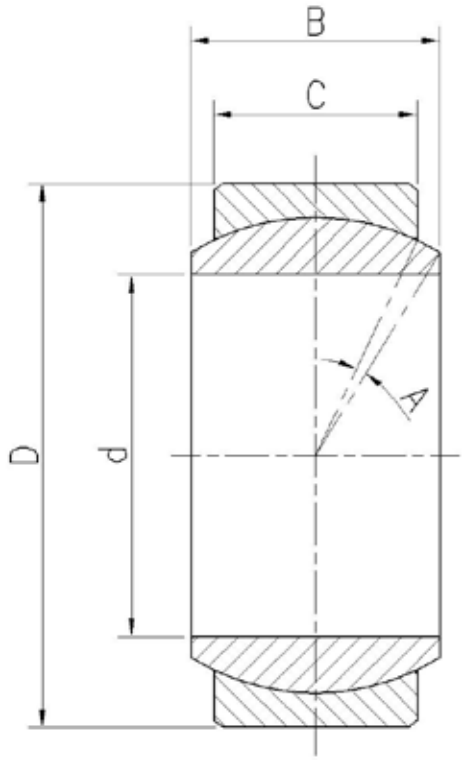
All Dimensions In mm Unless Stated								
Shaft Ø	Product Code	Dimensions					Max Load Ratings	
		d	D	B	C	A Deg	Dyn (kN)	Static (kN)
30	SPHGE030UK2RS/A	30 -.010	47 -.011	22 -.012	18 -.024	0	65	166
40	SPHGE040UK2RS/A	40 -.012	62 -.013	28 -.012	22 -.030	0	140	280
50	SPHGE050UK2RS/A	50 -.012	75 -.013	35 -.012	28 -.030	6	220	440
60	SPHGE060UK2RS/A	60 -.015	90 -.015	44 -.015	36 -.040	6	345	695
70	SPHGE070UK2RS/A	70 -.015	105 -.015	49 -.015	40 -.040	6	440	880
80	SPHGE080UK2RS/A	80 -.015	120 -.015	55 -.015	45 -.040	6	570	1140
90	SPHGE090UK2RS/A	90 -.020	130 -.018	60 -.020	50 -.050	5	695	1370
100	SPHGE100UK2RS/A	100 -.020	150 -.018	70 -.020	55 -.050	7	865	1730
110	SPHGE110UK2RS/A	110 -.020	160 -.025	70 -.020	55 -.050	6	930	1860
120	SPHGE120UK2RS/A	120 -.020	180 -.025	85 -.020	70 -.050	6	1340	2700
140	SPHGE140UK2RS/A	140 -.025	210 -.030	90 -.025	70 -.060	7	1500	3000
160	SPHGE160UK2RS/A	160 -.025	230 -.030	105 -.025	80 -.060	8	1930	3800
180	SPHGE180UK2RS/A	180 -.025	260 -.035	105 -.025	80 -.070	6	2160	4300
200	SPHGE200UK2RS/A	200 -.030	290 -.035	130 -.030	100 -.070	7	3000	6000
Other Sizes Available Upon Request								

MARINE TYPE NARROW SPHERICAL BEARING

HYSTAT Hydraulic Cylinders

Maintenance free (self lubricating)

Suitable for extreme marine and subsea applications
Bearing housing material – 17/4 PH stainless steel
Spherical bearing material – Phenolic resin composite



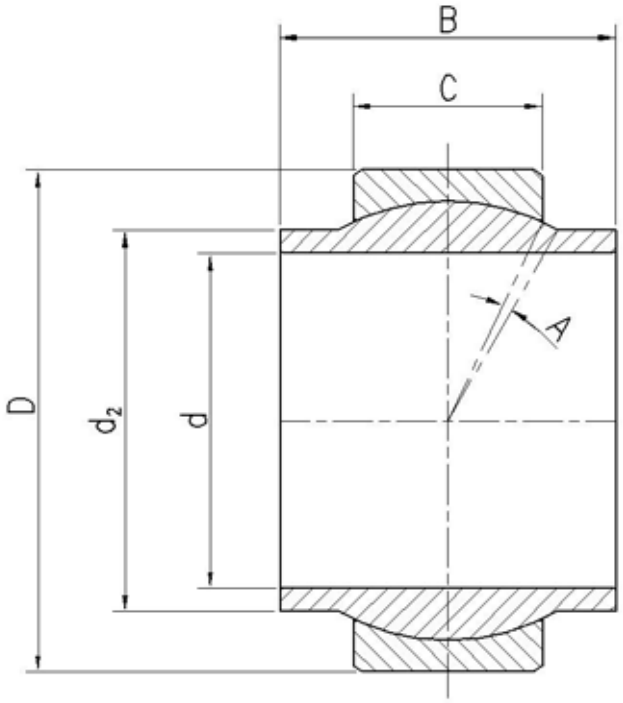
All Dimensions In mm Unless Stated								
Shaft Ø	Product Code	Dimensions					Max Load Ratings	
		d (H9)	D (h6)	B (-0.15)	C (-0.20)	A Degrees	Dyn (kN)	Static (kN)
50	SPHGE050-MSBN	50	75	35	28	6	106	254
60	SPHGE060-MSBN	60	90	44	36	6	166	395
70	SPHGE070-MSBN	70	105	49	40	6	212	505
80	SPHGE080-MSBN	80	120	55	45	6	272	648
90	SPHGE090-MSBN	90	130	60	50	5	331	789
100	SPHGE100-MSBN	100	150	70	55	7	412	981
110	SPHGE110-MSBN	110	160	70	55	6	443	1056
120	SPHGE120-MSBN	120	180	85	70	6	645	1536
140	SPHGE140-MSBN	140	210	90	70	7	726	1729
160	SPHGE160-MSBN	160	230	105	80	8	922	2195
180	SPHGE180-MSBN	180	260	105	80	6	1037	2469
200	SPHGE200-MSBN	200	290	130	100	7	1440	3430
Other Sizes Available Upon Request								

MARINE TYPE WIDE SPHERICAL BEARING

HYSTAT Hydraulic Cylinders

Maintenance free (self lubricating)

Suitable for extreme marine and subsea applications
Bearing housing material – 17/4 PH stainless steel
Spherical bearing material – Phenolic resin composite



All Dimensions In mm Unless Stated

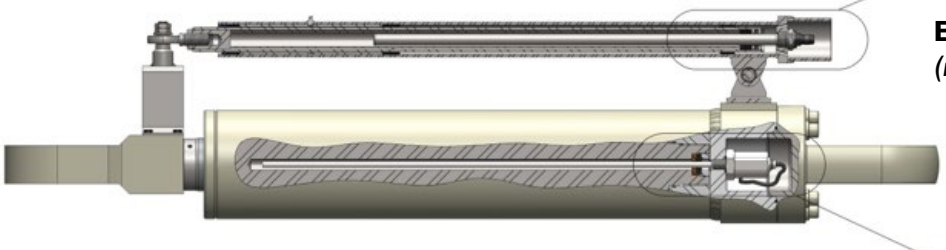
Shaft Ø	Product Code	Dimensions					Max Load Ratings	
		d (H7)	D (h6)	B (-0.15)	C (-0.20)	A Degrees	Dyn (kN)	Static (kN)
50	SPHGE050-MSBW	50	75	50	28	4	106	254
63	SPHGE063-MSBW	63	95	63	36	4	172	410
70	SPHGE070-MSBW	70	105	70	40	4	212	505
80	SPHGE080-MSBW	80	120	80	45	4	272	648
90	SPHGE090-MSBW	90	130	90	50	4	331	789
100	SPHGE100-MSBW	100	150	100	55	4	412	981
110	SPHGE110-MSBW	110	160	110	55	4	443	1056
125	SPHGE125-MSBW	125	180	125	70	4	645	1536
160	SPHGE160-MSBW	160	230	160	80	4	922	2195
200	SPHGE200-MSBW	200	290	200	100	4	1440	3430

Other Sizes Available Upon Request

POSITION FEEDBACK

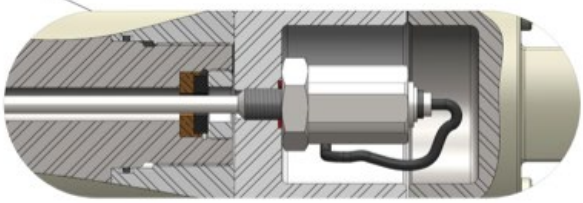
HYSTAT Hydraulic Cylinders

Mounting Options

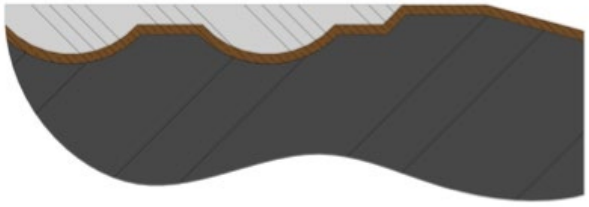


Externally Mounted Transducer
(max. stroke 10m)

Internal Position Transducer
(max. stroke 7.5m)



Speed & Position Sensor
For ceramic coated rods only (Infinite stroke)



Proximity Switch
(End of stroke sensing only)

Sensor Output Options

Interfaces	Output voltage/current	Operating Voltage	Operating Temp
Analog voltage	0…10 V, 10…0 V, -10…+10 V	20…28 V DC	-40…+85 °C
Analog current	4…20 mA, 0…20mA		
SSI	-		
SSI-SYNC	-		
CANopen	-		
PROFIBUS-DP	-		

ADDITIONAL OPTIONS

- Intrinsically Safe
- IP rating (up to IP69K)
- Stainless Steel
- ATEX approval
- Compact
- Armoured cabling

Typical Connectors

FEMALE CABLE CONNECTION

MOUNTABLE CONNECTION

NOTES

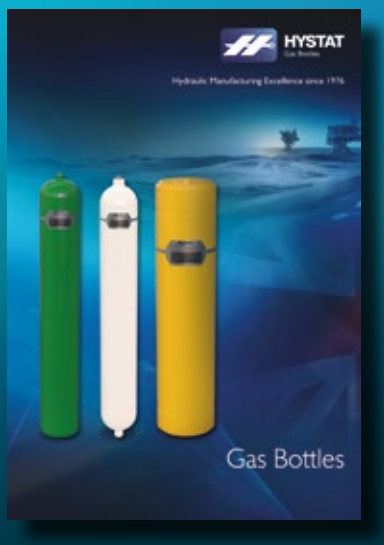
QUALITY ASSURANCE

The experienced and dedicated Hystat engineering team incorporates efficiency, reliability and safety into all of its products.

Our design and manufacturing process have achieved ISO 9001 & ISO 45001 accreditation, in addition to Lloyds approval to design and manufacture to the Pressure Equipment Directive 2014/68/EU. ATEX conformity also available.

- All products are 100% inspected
- Standard tests carried out with either mineral oils or water glycol fluids
- Continual test oil monitoring (minimum cleanliness on delivery to ISO4406:1999 Class 17/15/12)
- Third party (Lloyds, DNV, ABS etc.) design and test approval
- Products supplied with design, production and inspection documentation
- Component parts inspected and verified by a dedicated inspection team

HYSTAT
ACCUMULATORS



HYSTAT
GAS BOTTLES

HYSTAT
CYLINDER REPAIR

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