DNV·GL

Certificate No:
TAS00001N9

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Rope Winches and Gearboxes - General Application

with type designation(s)
Slewing gears: ZHP 3.13 - 3.44
Rope winches and winch gears: ZHP 4.13 - 4.44
Planetary gears: ZHP 5.13 - 5.44

Issued to
Zollern GmbH & Co. KG
Herbertingen, Baden-Württemberg, Germany

is found to comply with
DNV GL standard DNVGL-ST-0377 – Standard for shipboard lifting appliances
DNV GL standard DNVGL-ST-0378 – Standard for offshore and platform lifting appliances

Application :

This Type Approval Certificate (TAC) covers the construction of the gearboxes, rope winches and the design approval / plan approval required for the certification of rope winches and gearboxes.

Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL.

Issued at **Hamburg** on **2019-01-02**
This Certificate is valid until **2024-01-01**.
DNV GL local station: **Augsburg**

Approval Engineer: **Frank Poetsch**

for **DNV GL**

Burkhard Lilienthal
Head of Section

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid.
The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

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Product description

Slewing gears, rope winch and gearbox planetary gears - type ZHP.

Application/Limitation

The ZHP - winches allowing an output torque of maximum 4000 kNm. The winches are suitable for hydraulic and electric power units and hoist their load with rope speeds exceeding 10 m/min.
The min. design temperature is -20°C.

Materials for all load-transmitting parts are shown on the attached matrix (Dis-No. 1000001315463). This materials shall be documented according to ZOLLERN material specifications and recognised national material standards. Corresponding material certificates acc. to EN 10204 or ISO 10474 (2013) / 3.1 shall be presented to the attending surveyor in case of "DNVGL Product Certification".
All unlisted components are specified in the conditions of delivery of ZOLLERN and are subject of ZOLLERN quality inspection. Traceability is given through ZOLLERN approved quality system acc. to ISO 9001.

DNVGL–RU-Ship Pt.2 Ch.4 Fabrication and testing - also applies.

The strength, function and support of the sprag clutch are not covered by our approval, but assumed to be according to the guidelines of the sprag manufacturer.

Our gear evaluation is based on that optimum hardening depths have been achieved according to recognised standards and manufacturer's experience. Material fatigue values based on 90% reliability of survival have been applied. Load distribution factors as stated by the manufacturer (based on his experience) have been used and we have not considered these.

The local DNV GL office is responsible for issuing DNV GL product certificates required by the above mentioned DNV GL Standards. Based on witnessing of testing and inspection the DNV GL surveyor shall sign the reports, stamp the units and issue necessary product certificates for the gear units considered acceptable.

Application:	Shipboard lifting appliances and offshore and platform lifting appliances
Materials:	For all load-transmitting parts (See DIS 1000001315463) are on common agreement between DNVGL and ZOLLERN according to material specification
Technical limitations:	<u>Gearbox:</u> Output stage shall always be the limiting stage with respect to expected lifetime given in number of hours. Permitted output torque on this stage is given from below torque tables, based on the given time classes and load spectra according to FEM Section I, 1.001 3rd edition revised 1998.10.01.
	<u>Brakes (normal working brake, hoisting and luffing):</u> Spring activated brakes, with hydraulic release. The brake torque is obtained by a correct choice of brake, number of lamellas and springs. The maximum torque for each brake is given in below table. Brakes are to exert a torque not less 80% in excess of the maximum torque on the brake caused by the loads being regarded as static loads. The permissible torque is also found in table below and is merely the maximum torque divided by 1.8. <u>Secondary brakes (apply to shipboard cranes and floating cranes which transport persons, man riding winch):</u> Sec. brakes are dimensioned to withstand loads for conveyance of persons in the harbour and of personnel at sea acc. DNVGL.

Certificates requirements for winches, manufactured on stock:

For winches -manufactured on stock / in storage- a product certificate (PC) is required.

Rating of ZHP winches acc. F.E.M. (European Federation of Materials Handling and Storage Equipment):

Load spectrum and classes of utilisation according to F.E.M. section I (1.001 3rd edition – Revised 1998.10.01) are defined below.

Time classes:

Group	T2	T3	T4	T5	T6	T7	T8
Hours	800	1600	3200	6300	12500	25000	50000

Load spectra defined as follows (collective coefficient k_m):

L1: k_m = 0,100
L2: k_m = 0,200
L3: k_m = 0,400
L4: k_m = 0,800

Zollern delivery standard / rating according to FEM section I:

Drive unit class **M5**
Load condition **L2** (P = const / n_{ab} = 15rpm)
Running time class **T5**

In other cases: re-calculation by Zollern.
The re-calculation is part of the survey. This re-calculation shall be presented to the surveyor and checked for plausibility. It is attached internally to the ZOLLERN-documentation.

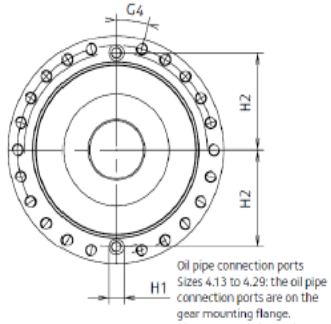
Job Id: **262.1-007070-9**
Certificate No: **TAS00001N9**

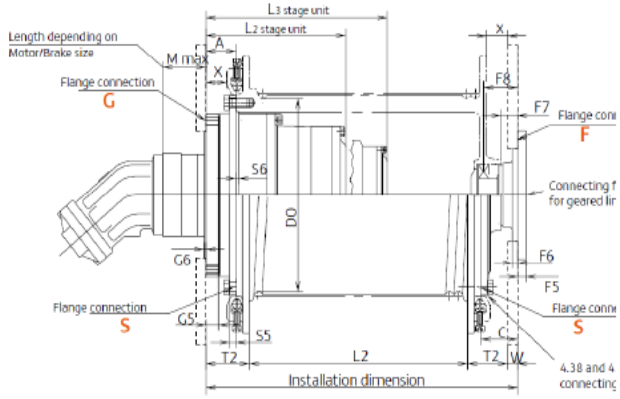
TYP	Nominal data rope winch						Gear connection							Rope drum connection							Flange connection										Assembly length = L2 + 2x T2 + W depending on design									
ZHP	Output torque *1		Max input speed	Typical line pull *2	rope diameter	D0 *3	G1	G2	G3	G4			G5	G6	S1	S2	S3	S4			S5	S6	F1	F2	F3	F4			F5	F6	F7	F8	A	C	M_{max}	min. T1		T2	W	L		X_{min}
EG	M_{dynout} i ≤ 70 i > 70	$M_{stat.ot}$ i ≤ 70 i > 70	n_{max}	F_{nenn}		ca.		±0,2							±0,2							±0,2													2-Stufig	3-Stufig			2-Stufig	3-Stufig	
	[Nm]	[Nm]	[1/min]	[kN]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[°]	[Stk.]	[-]	[mm]	[mm]	[mm]	[mm]	[°]	[Stk.]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[°]	[Stk.]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
4.13	1650	2650	Depending on motor and brake arrangement 2000 - 6500	17	Depending on kustomer requirement	180	125	145	167	30	12	M10	16	5	145	185	203	30	12	11	10	9	120	140	160	60	6	9	12	8	20	36	40	55	130	165	-	70	10	170	-	10
	1750	2800		18																																						
4.15	4000	6400		33		260	155	185	213	20	18	M12	24	5	225	245	265	20	18	11	10	9	150	175	200	60	6	11	15	8	25	50	55	70	140	185	255	85	15	225	295	15
	4150	6500		34																																						
4.19	7000	11200		46		300	190	225	255	20	18	M16	25	5	265	290	310	15	24	14	12	9	175	200	225	60	6	11	15	10	30	64	60	75	170	190	290	95	15	245	340	15
	7300	11700		48																																						
4.20	11200	18000		67		340	200	255	285	20	18	M16	25	5	295	320	340	15	24	14	12	9	175	200	225	60	6	11	15	10	30	64	60	75	140	225	295	95	15	270	350	15
	11600	18500		69																																						
4.22	18800	30000		95		390	230	280	315	15	24	M16	25	5	330	360	390	20	18	18	16	9	200	230	260	60	6	14	18	12	35	71	60	75	170	245	345	100	15	300	410	15
	19400	31000		98																																						
4.24	25000	40000		116		440	270	320	355	15	24	M16	25	5	370	400	430	15	24	18	16	9	200	230	260	60	6	14	18	12	35	71	60	80	170	270	405	100	20	325	460	20
	25500	41000		119																																						
4.25	35000	56000		143		480	300	350	385	15	24	M20	30	5	400	440	480	20	18	22	20	9	230	260	290	60	6	18	18	15	40	78	75	95	160	270	395	120	20	350	480	20
	36000	57500		147																																						
4.26	47000	75000		180		520	330	390	425	15	24	M20	30	5	440	480	520	15	24	22	20	9	260	310	360	60	6	22	25	15	50	92	75	95	210	305	445	120	20	375	510	20
	48000	77000		184																																						
4.27	61000	97500		213		570	355	420	460	15	24	M24	38	5	470	520	560	20	18	26	24	9	260	310	360	60	6	22	25	15	50	92	90	110	200	325	455	140	20	420	560	20
	63000	101000		220																																						
4.29	102000	163000		304		670	430	480	530	15	24	M24	38	5	550	590	630	15	24	26	24	9	300	350	400	60	6	22	30	15	50	104	90	115	200	370	520	145	25	465	620	25
	105000	168000		313																																						
4.31	150000	240000		395		770	515	656	615	15	24	M30	47	5	640	690	750	15	24	33	30	9	325	375	425	60	6	26	35	15	70	134	110	140	200	375	540	180	30	515	685	30
	155000	248000		408																																						
4.32	229000	366500		549		830	580	630	680	15	24	M30	47	5	700	755	815	15	24	33	30	9	325	375	425	60	6	26	35	15	70	134	110	140	150	465	695	180	30	590	815	30
	236000	377500		566																																						
4.33	300000	480000		637		930	670	720	770	12	30	M30	47	5	790	840	890	12	30	33	30	9	375	435	500	60	6	33	40	15	80	144	110	160	150	470	720	180	40	675	925	40
	311000	497500		660																																						
4.34	392000	627000		760		1080	720	770	820	10	36	M30	47	5	850	900	950	10	36	33	30	9	375	435	500	60	6	33	40	15	80	144	120	160	140	495	760	200	40	700	975	40
	406000	649500		787																																						
4.36	623000	997000		1038		1200	840	900	960	10	36	M36	56	5	1000	1055	1120	10	36	39	36	9	430	490	550	60	6	33	40	15	90	180	120	190	110	685	97	240	50	875	1160	50
	644000	1030500		1073																																						
4.38	1050000	1680000		1450		1360	1060	1140	1210	10	36	M30	78	26	1240	1320	1390	10	36	33	45	13	600	680	750	30	12	33	50	20	80	180	130	170	-	960	1320	230	60	1195	1555	50
	1100000	1760000		1520																																						
4.40	1400000	2240000		1820		1530	1160	1240	1310	10	36	M30	78	26	1340	1420	1490	10	36	33	45	13	600	680	750	30	12	33	50	20	80	180	130	170	-	1235	1650	195	60	1320	1735	50
	1500000	2400000		1950																																						
4.44	2400000	3840000		2540		1800	1250	1350	1441	7,5	48	M30	105	25	1630	1725	1820	7,5	48	33	55	25	750	850	950	15	24	33	60	25	110	230	115	210	-	-	1750	220	80	-	1690	70
	2500000	4000000		2650																																						

*1 Ratting according to FEM - Section I
M5 Drive unit class
L2 Load condition
T5 Running time class
Depending on the load spectrum, the output torque is adjust.

*2 This is a suggestion value and will be adapted to the required output torque.

*3 This is an approximate value and will be adapted to the reuqired line pull with drum calculation.





Type Approval documentation

Is based in the following drawings, verified with DNV GL plan approval - Job ID: A0594415-1, type ZHP4.24 (d.d. 2018-101-26) and more recently with DNV GL plan approval - Job ID: 423D362777-1, type ZHP 4-29, 4.31 and 4.33 (d.d. 2017-06-15)

Tests carried out

Load test d.d. 2018.12.17, for ZHP winch type 4.26 (1538622 man riding winch, 106.050N nominal load)

Marking of product

The product is to be marked with manufacturer's name or trademark, product type and serial number.

Periodical assessment

Type Approval Assessment Report Zollern (Herbertingen / Germany) dd. 2019-02-22.
Type Approval Assessment Report Zollern (Tianjin / China) No. N141S5H7 dd dd. 2019-02-18.

For retention of the Type Approval, a DNV GL surveyor shall perform an assessment after 2 years and after 3.5 years to verify that the conditions of the type approval are complied with. A renewal assessment will be performed at renewal of the certificate.

The objective of the Periodical Assessment is to verify that the conditions for the Type Approval are not altered since the Type Approval Certificate was issued. The main scope of the Periodical Assessment will normally include:

- Verification of the Type Approval applicant's production and quality system w.r.t. ensuring continued consistent production of the Type Approved products at the Type Approval applicant's own premises and at other companies that are given the responsibility for manufacturing of the products
- Review of the Type Approval documentation and that this is still used as basis for the production
- Review of possible changes to the design, the material and the performance of the product
- Verification of the product marking

In cases where the Type Approved product is manufactured at other companies, the Periodical Assessment shall verify that the Type Approval applicant has a quality control system for consistent production at their licensees/subcontractors. Furthermore Periodical Assessment shall be carried out randomly at these companies.

When a Type Approved product is manufactured at other companies, the Type Approval applicant takes the sole responsibility for the conformity of the product to the applicable requirements

Other conditions:

Places of production: Herbertingen/Germany and Tianjin/China

END OF CERTIFICATE