Certificate No:
TAS00001ZE

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Gears

with type designation(s)
E-series (incl. planetary gears, bevel gears, brakes and input and output sections)

Issued to
Dana Motion Systems Italia S.R.L.
Reggio Emilia RE, **Italy**

is found to comply with
DNV standard DNV-ST-0378 – Offshore and platform lifting appliances
DNV standard DNV-ST-0377 – Standard for shipboard lifting appliances
DNV standard DNV-ST-0358 – Offshore gangways
IMO SOLAS 1974 Convention, including 1996 Amendments
DNV-OS-E101 – Drilling facilities, Edition July 2021

Application :

Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV.
Planetary/bevel gear units with failsafe brakes for slew and hoist applications.
Design Temperature, Td, according to above standard equals -20 degrees Celsius.

Issued at **Høvik** on **2022-09-26**
This Certificate is valid until **2027-06-20**.
DNV local station: **Milan**

Approval Engineer: **Sorina Thompson**

for **DNV**

Per Esvall
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.

LEGAL DISCLAIMER: Unless otherwise stated in the applicable contract with the holder of this document, or following from mandatory law, the liability of DNV AS, its parent companies and their subsidiaries as well as their officers, directors and employees ("DNV") arising from or in connection with the services rendered for the purpose of the issuance of this document or reliance thereon, whether in contract or in tort (including negligence), shall be limited to direct losses and under any circumstance be limited to 300,000 USD.

Product description

E-series gearboxes including planetary gears, bevel gears, brakes, input and output section.

For more details about configurations/descriptions of E-Series, see 'E Series overview Items / Descriptions 06th February, 2019 rev.1' submitted by email dated 2018-01-01 (DNV's Ref.No. J-1).

Application/Limitation

- Output speed is 15 rpm. If other output speed is required, the rating values are to be interpolated. These new values will be provided by Dana. using their calculation program ISO BreCal2000.
- Bevel gears are calculated at 1500 rpm input speed.
- For each gearbox configuration, a comparison shall be needed between the output torque due to gears and the output torque due to the output shaft. The lowest value shall be the output torque for the complete gearbox. For SOLAS torque values, see on pages 8-9 of this document.
- Load spectrum and classes of utilisation according to F.E.M. (1.001 3rd edition – Revised 1998.10.01) are defined below.

L1 (km = 0.1)

Load	Time
100 %	4 %
50 %	35 %
30 %	61 %

L2 (km = 0.2)

Load	Time
100 %	8 %
60 %	27 %
50 %	33 %
40 %	32 %

L3 (km = 0.4)

Load	Time
100 %	20 %
70 %	46 %
50 %	34 %

L4 (km = 0.8)

Load	Time
100 %	59 %
80 %	41 %

Classes of utilisation

Class	T1	T2	T3	T4	T5	T6	T7	T8
Hours	400	800	1600	3200	6300	12500	25000	50000

E-series: Planetary gears

Output torque according to L1 [Nm]

Name	Gear Ratio	T1 M1	T2 M1	T3 M2	T4 M3	T5 M4	T6 M5	T7 M6	T8 M7	SOLAS gears
EL101	3,52	2083	1890	1709	1543	1392	1252	1126	1105	1686
EL101	4,07	1930	1752	1584	1428	1288	1157	1035	1004	1792
EL101	4,95	1808	1643	1486	1341	1210	1087	973	930	1669
EL101	5,88	1719	1564	1415	1277	1153	1037	929	880	1558
EL101	6,93	1601	1458	1320	1192	1076	965	837	715	1283
EL101	10,22	688	592	514	430	385	347	313	282	621
EL161	3,52	3260	2971	2704	2457	2234	2026	1840	1807	2369
EL161	4,07	3063	2791	2539	2306	2096	1900	1717	1670	2507
EL161	4,95	2864	2610	2375	2158	1962	1779	1608	1544	2340
EL161	6,19	2573	2347	2137	1943	1768	1604	1451	1347	1883
EL161	7,39	2360	2068	1804	1596	1418	1244	1081	930	1752
EL251	3,52	5428	4957	4522	4121	3758	3419	3116	3063	3766
EL251	4,07	5000	4564	4162	3790	3455	3141	2848	2772	4092
EL251	4,95	4676	4270	3894	3547	3233	2940	2666	2564	3793
EL251	5,88	4473	4086	3728	3397	3098	2818	2557	2272	3474
EL251	7,39	3668	3226	2825	2516	2237	1968	1713	1484	2863
EL301	3,52	6694	6109	5568	5068	4616	4194	3817	3751	4693
EL301	4,07	6167	5625	5124	4661	4243	3852	3487	3393	5096
EL301	4,95	5765	5260	4792	4360	3970	3605	3264	3137	4727
EL301	5,88	5515	5034	4588	4176	3781	3332	2909	2529	4329
EL301	6,53	4302	3930	3586	3268	2960	2616	2292	2000	3356
EL501	3,52	8624	7875	7183	6544	5967	5428	4945	4860	6025
EL501	4,07	7937	7245	6605	6014	5480	4981	4515	4395	6567
EL501	4,95	7451	6803	6204	5650	5150	4682	4245	4082	6060
EL501	5,88	7063	6451	5884	5360	4887	4379	3833	3341	5620
EL501	6,53	5581	5102	4659	4199	3748	3315	2907	2540	4290
EL801	3,52	15190	13894	12696	11591	10592	9658	8822	8675	10628
EL801	4,07	14055	12853	11742	10716	9789	8922	8112	7903	11219
EL801	4,95	13111	11992	10958	10002	9139	8332	7578	7295	10427
EL801	5,88	12243	11200	10235	9344	8539	7787	7045	6168	9420
EL1201	4,07	22627	20731	18978	17360	15898	14531	13253	12923	16866
EL1201	4,95	21093	19327	17695	16187	14826	13552	12362	11915	16338
EL1201	5,88	19623	17982	16464	15063	13797	12511	11062	9726	14804
EL1601	4,18	32588	29866	27350	25027	22928	20965	19130	18636	22309
EL1601	4,89	30799	28229	25854	23661	21679	19826	17772	15651	19759
EL1601	6	26498	23497	20906	18756	16734	14822	13071	11446	17817
EL2601	3,19	50627	46458	42607	39051	35838	32832	30522	30046	24127
EL2601	4,18	49667	45590	41823	38344	35201	32261	29512	28444	31615
EL2601	4,89	46933	43084	39527	36243	33275	29982	26619	23527	34731
EL2601	6	39949	35522	31765	28510	25477	22628	20018	17619	31169

Output torque according to L2 [Nm]

Name	Gear Ratio	T1 M1	T2 M2	T3 M3	T4 M4	T5 M5	T6 M6	T7 M7	T8 M8	SOLAS gears
EL101	3,52	1866	1707	1542	1389	1250	1126	1105	1083	1686
EL101	4,07	1724	1580	1428	1285	1156	1035	1004	984	1792
EL101	4,95	1617	1481	1341	1207	1086	973	930	912	1669
EL101	5,88	1540	1410	1277	1150	1036	929	880	777	1558
EL101	6,93	1436	1314	1191	1055	937	820	706	620	1283
EL101	10,22	575	497	425	383	347	313	282	270	621
EL161	3,52	2960	2703	2457	2229	2024	1840	1807	1775	2369
EL161	4,07	2773	2538	2306	2092	1898	1717	1670	1640	2507
EL161	4,95	2586	2374	2158	1958	1777	1608	1544	1516	2340
EL161	6,19	2321	2135	1943	1764	1602	1451	1339	1179	1883
EL161	7,39	2029	1772	1554	1369	1218	1068	923	826	1752
EL251	3,52	4947	4522	4121	3750	3416	3116	3063	2992	3766
EL251	4,07	4547	4161	3790	3447	3137	2848	2772	2724	4092
EL251	4,95	4246	3892	3547	3226	2937	2666	2564	2519	3793
EL251	5,88	4059	3726	3397	3091	2815	2557	2260	1983	3474
EL251	7,39	3169	2778	2449	2169	1933	1698	1474	1325	2863
EL301	3,52	6093	5567	5068	4606	4190	3817	3751	3686	4693
EL301	4,07	5598	5122	4661	4234	3848	3487	3393	3334	5096
EL301	4,95	5223	4790	4360	3961	3601	3264	3137	2985	4727
EL301	5,88	4992	4585	4135	3679	3281	2888	2516	2275	4329
EL301	6,53	3902	3584	3238	2876	2574	2275	1990	1768	3356
EL501	3,52	7858	7182	6544	5954	5422	4945	4860	4647	6025
EL501	4,07	7216	6603	6014	5468	4976	4515	4395	4319	6567
EL501	4,95	6764	6201	5650	5139	4677	4245	4082	3878	6060
EL501	5,88	6406	5881	5360	4840	4320	3810	3328	3015	5620
EL501	6,53	5071	4623	4099	3647	3265	2887	2528	2249	4290
EL801	3,52	13876	12696	11591	10570	9647	8822	8675	8103	10628
EL801	4,07	12823	11740	10716	9768	8912	8112	7903	7771	11219
EL801	4,95	11951	10955	10002	9120	8323	7578	7295	6810	10427
EL801	5,88	11151	10233	9344	8522	7778	7008	6153	5601	9420
EL1201	4,07	20704	18977	17360	15866	14516	13253	12923	12715	16866
EL1201	4,95	19288	17693	16187	14795	13538	12362	11915	10702	16338
EL1201	5,88	17935	16462	15063	13769	12404	11017	9726	8863	14804
EL1601	4,18	29829	27349	25027	22881	20943	19130	18636	16684	22309
EL1601	4,89	28180	25852	23661	21635	19805	17683	15615	13917	19759
EL1601	6	23166	20574	18276	16415	14677	13005	11423	10425	17817
EL2601	3,19	46446	42607	39051	35766	32799	30522	30046	29002	24127
EL2601	4,18	45558	41822	38344	35131	32228	29512	28388	25138	31615
EL2601	4,89	43041	39525	36243	33052	29721	26514	23486	21000	34731
EL2601	6	35049	31245	27816	25066	22447	19944	17619	16110	31169

Output torque according to L3 [Nm]

Name	Gear Ratio	T1 M2	T2 M3	T3 M4	T4 M5	T5 M6	T6 M7	T7 M8	T8 M8	SOLAS gears
EL101	3,52	1607	1487	1342	1204	1119	1098	1076	1055	1686
EL101	4,07	1485	1372	1241	1113	1017	997	977	958	1792
EL101	4,95	1394	1285	1165	1046	943	924	906	888	1669
EL101	5,88	1329	1222	1111	997	895	845	755	701	1558
EL101	6,93	1240	1139	996	864	761	655	600	557	1283
EL101	10,22	459	401	367	333	301	278	266	255	621
EL161	3,52	2585	2379	2160	1955	1829	1797	1738	1575	2369
EL161	4,07	2411	2231	2026	1833	1690	1660	1630	1601	2507
EL161	4,95	2249	2085	1896	1716	1562	1535	1507	1475	2340
EL161	6,19	2025	1876	1709	1548	1403	1267	1151	1081	1883
EL161	7,39	1695	1478	1279	1129	999	867	802	750	1752
EL251	3,52	4347	3996	3637	3304	3098	3046	2841	2582	3766
EL251	4,07	3977	3672	3342	3034	2804	2757	2709	2662	4092
EL251	4,95	3702	3434	3128	2840	2594	2549	2469	2331	3793
EL251	5,88	3541	3288	2997	2709	2428	2143	1938	1825	3474
EL251	7,39	2658	2326	2022	1798	1595	1392	1290	1208	2863
EL301	3,52	5341	4911	4465	4050	3795	3730	3648	3419	4693
EL301	4,07	4883	4513	4103	3719	3433	3374	3315	3256	5096
EL301	4,95	4545	4218	3839	3481	3174	3119	2920	2751	4727
EL301	5,88	4353	3924	3424	3062	2723	2383	2219	2083	4329
EL301	6,53	3408	3077	2694	2400	2144	1885	1726	1624	3356
EL501	3,52	6902	6345	5774	5244	4917	4833	4422	4145	6025
EL501	4,07	6308	5826	5301	4811	4446	4370	4294	4219	6567
EL501	4,95	5896	5470	4982	4523	4129	4059	3796	3582	6060
EL501	5,88	5588	5146	4504	4040	3598	3158	2945	2770	5620
EL501	6,53	4420	3894	3414	3047	2724	2398	2198	2069	4290
EL801	3,52	12240	11248	10258	9339	8773	8629	7711	7242	10628
EL801	4,07	11270	10394	9479	8626	7993	7860	7729	7599	11219
EL801	4,95	10474	9698	8850	8056	7377	7255	6675	6333	10427
EL801	5,88	9757	9057	8230	7431	6641	5863	5485	5198	9420
EL1201	4,07	18292	16857	15409	14064	13064	12856	12648	12326	16866
EL1201	4,95	16998	15714	14370	13118	12045	11438	10502	9978	16338
EL1201	5,88	15777	14606	12927	11692	10468	9272	8691	8250	14804
EL1601	4,18	26369	24305	22226	20295	18838	18042	16218	15413	22309
EL1601	4,89	24865	22975	20714	18654	16773	14905	13651	12963	19759
EL1601	6	19620	17339	15285	13799	12330	10884	10211	9677	17817
EL2601	3,19	41339	37960	34763	31806	30362	29894	27737	25784	24127
EL2601	4,18	40440	37270	34149	31257	29075	27150	24464	23282	31615
EL2601	4,89	38146	34924	30981	28002	25212	22463	20620	19609	34731
EL2601	6	29779	26402	23421	21180	18967	16809	15803	15006	31169

Output torque according to L4 [Nm]

Name	Gear Ratio	T1 M3	T2 M4	T3 M5	T4 M6	T5 M7	T6 M8	T7 M8	T8 M8	SOLAS gears
EL101	3,52	1385	1262	1131	1106	1085	1064	1043	1022	1686
EL101	4,07	1273	1165	1045	1005	986	967	947	928	1792
EL101	4,95	1193	1094	982	932	914	896	878	840	1669
EL101	5,88	1137	1042	937	882	779	725	672	622	1558
EL101	6,93	1062	954	808	700	618	573	531	490	1283
EL101	10,22	381	344	313	283	271	260	249	239	621
EL161	3,52	2237	2042	1847	1810	1778	1616	1520	1428	2369
EL161	4,07	2089	1914	1732	1672	1643	1614	1584	1556	2507
EL161	4,95	1946	1791	1621	1546	1519	1492	1424	1340	2340
EL161	6,19	1750	1614	1463	1332	1180	1110	1042	977	1883
EL161	7,39	1412	1220	1050	919	826	771	718	669	1752
EL251	3,52	3769	3446	3128	3067	2986	2646	2496	2353	3766
EL251	4,07	3451	3164	2871	2776	2729	2682	2636	2590	4092
EL251	4,95	3217	2961	2688	2567	2524	2389	2254	2126	3793
EL251	5,88	3075	2837	2532	2247	1986	1872	1762	1656	3474
EL251	7,39	2218	1926	1672	1471	1326	1243	1162	1085	2863
EL301	3,52	4627	4227	3832	3756	3693	3504	3306	3116	4693
EL301	4,07	4235	3881	3516	3398	3340	3282	3224	3166	5096
EL301	4,95	3945	3630	3291	3141	2991	2822	2658	2501	4727
EL301	5,88	3737	3258	2848	2513	2277	2141	2008	1881	4329
EL301	6,53	2930	2563	2234	1982	1770	1667	1567	1470	3356
EL501	3,52	5984	5470	4964	4867	4661	4248	4008	3779	6025
EL501	4,07	5474	5018	4552	4401	4327	4252	4178	4095	6567
EL501	4,95	5124	4715	4280	4087	3886	3672	3463	3264	6060
EL501	5,88	4849	4283	3758	3324	3019	2844	2674	2511	5620
EL501	6,53	3707	3247	2836	2519	2253	2123	1998	1877	4290
EL801	3,52	10633	9731	8855	8687	8113	7413	7012	6627	10628
EL801	4,07	9797	8988	8177	7914	7785	7656	7527	7142	11219
EL801	4,95	9116	8391	7638	7305	6826	6465	6115	5780	10427
EL801	5,88	8497	7820	6919	6153	5613	5309	5013	4730	9420
EL1201	4,07	15937	14637	13355	12941	12736	12533	11936	11323	16866
EL1201	4,95	14820	13648	12457	11932	10731	10183	9651	9142	16338
EL1201	5,88	13763	12254	10893	9715	8885	8421	7972	7541	14804
EL1601	4,18	22983	21117	19277	18661	16775	15729	14914	14133	22309
EL1601	4,89	21686	19676	17388	15578	13953	13231	12532	11861	19759
EL1601	6	16483	14506	12849	11424	10448	9883	9334	8809	17817
EL2601	3,19	36073	33073	30562	30085	29049	26341	25029	23772	24127
EL2601	4,18	35325	32491	29733	28268	25288	23750	22561	21421	31615
EL2601	4,89	33186	29423	26114	23450	21059	20007	18987	18010	34731
EL2601	6	25086	22166	19737	17609	16151	15317	14508	13732	31169

E-series: Bevel gears

Output torque according to L1 [Nm]

Name	Gear Ratio	T1 M1	T2 M1	T3 M2	T4 M3	T5 M4	T6 M5	T7 M6	T8 M7	SOLAS gears
BG02	3	522	482	474	467	461	454	448	442	643
BG02	4,89	509	464	418	377	340	306	291	278	579
BG04	3	1528	1411	1387	1367	1349	1330	1312	1290	1973
BG04	4,56	1546	1405	1266	1140	1028	926	880	842	1992
BG06	3	3675	3395	3335	3289	3245	3200	3155	3111	4804
BG06	4,56	3643	3365	3114	2804	2530	2279	2164	2071	4836

Output torque according to L2 [Nm]

Name	Gear Ratio	T1 M1	T2 M2	T3 M3	T4 M4	T5 M5	T6 M6	T7 M7	T8 M8	SOLAS gears
BG02	3	482	474	467	461	454	448	442	426	643
BG02	4,89	461	417	376	339	306	291	279	267	579
BG04	3	1411	1387	1367	1349	1330	1312	1292	1237	1973
BG04	4,56	1395	1263	1139	1026	926	880	843	807	1992
BG06	3	3395	3336	3289	3244	3200	3156	3112	3068	4804
BG06	4,56	3366	3106	2802	2525	2278	2166	2074	1985	4836

Output torque according to L3 [Nm]

Name	Gear Ratio	T1 M2	T2 M3	T3 M4	T4 M5	T5 M6	T6 M7	T7 M8	T8 M8	SOLAS gears
BG02	3	471	465	459	452	446	440	421	403	643
BG02	4,89	399	362	327	299	287	275	263	252	579
BG04	3	1380	1361	1343	1324	1306	1275	1222	1169	1973
BG04	4,56	1206	1096	990	905	868	832	797	763	1992
BG06	3	3321	3275	3230	3185	3142	3099	3032	2903	4804
BG06	4,56	2968	2696	2436	2227	2136	2047	1961	1877	4836

Output torque according to L4 [Nm]

Name	Gear Ratio	T1 M3	T2 M4	T3 M5	T4 M6	T5 M7	T6 M8	T7 M8	T8 M8	SOLAS gears
BG02	3	461	455	449	443	429	412	394	378	643
BG02	4,89	340	308	292	280	268	257	247	236	579
BG04	3	1351	1332	1314	1296	1245	1194	1144	1095	1973
BG04	4,56	1030	933	883	846	813	779	746	715	1992
BG06	3	3249	3205	3160	3117	3075	2963	2839	2719	4804
BG06	4,56	2535	2295	2172	2082	1999	1916	1836	1759	4836

Output torque for complete gearbox – specific to SOLAS

Name	Type	Output support code	Shaft Code	Output torque SOLAS
E10	FE	1302538	9019103	1252
	FCP	1303240	9019698	1252
	MP	1302499	9018888	1361
	MP1	1302510	9018893	1361
	FS	1302550	9018930	1361
	MPP1	1305442	9018893	1361
	ML	1308421	9028250	1361
	ML1	1308430	9025349	1361
E16	FE	1303301	9019807	2242
	FCP	1303499	9020073	2242
	MP	1303082	9019494	2438
	MP1	1303083	9019488	2438
	FS	1303197	9019581	2438
	MPP1	1306002	9019488	2438
	MP-010	1303146	9019336	1361
	MP1-010	1303147	9019533	2222
	MP-020	1303241	9019578	2453
	MP1-020	1303242	9019579	2453
E25	FE	1301138	9017426	3870
	FCP	1303342	9019703	3870
	FS	1300971	9016977	4249
	MPP1	1305840	9017829	4249
	MP	1301219	9017769	4249
	MP1	1300894	9016724	4249
E30	FE	1301138	9017426	3870
	FCP	1303342	9019703	3870
	FS	1300971	9016977	4249
	MPP1	1305840	9017829	4249
	MP	1301219	9017769	4249
	MP1	1300894	9016724	4249

Name	Type	Output support code	Shaft Code	Output torque SOLAS
E50	FE	1301124	9017426	3870
	FCP	1303327	9019811	3761
	MP	1006237	9011448	4249
	MP1	1300968	9017829	4249
	MPP1	1305380	9019073	4249
	FS-045	1302592	9016977	4249
	MP-045	1302590	9017769	4249
	MP1-045	1302591	9016724	4249
	MP-065	1302562	9019062	4249
	MP1-065	1302563	9019073	4249
E80	FE	1301130	9017420	7117
	FCP	1303580	9020159	7117
	MP-090	1304074	9020709	7681
	MP1-090	1304001	9020379	7681
	MP	1300964	9018866	7681
	MP1	1300980	9018884	7681
	FS	1300981	9018886	7681
	MPP1	1305992	9020379	7681
E120	FE	1301150	9017469	11080
	FCP	1303644	9020066	11080
	FS	1300989	9018963	11844
	MPP1	1306109	9018962	11844
	MP	1300987	9018961	11844
	MP1	1300988	9018962	11844
E160	FE	1305513	9021691	23624
	FS	1304824	9021556	17298
	ML	1304822	9021541	11785
	ML1	1304823	9021554	17298
	MP	1304664	9021492	17298
	MP1	1304767	9021548	17298
	FCP	1304666	9021325	16298
	MPP1	1306476	9023479	17298
E260	FE	1305584	9021738	50601
	FS	1305828	9022581	24162
	MP	1305781	9022564	24162
	MP1	1305762	9022571	24162
	FCP	1304606	9021397	22873
	MPP1	1308937	9022571	24162

Brakes

- Standard multidisc static brake design.
- Listed Static Torque values are the effective brake torque (with tolerance) for each configuration.
- When a gearbox is delivered for an application according to DNV-ST-0377 or 0378, the brake torque for the specific application shall be calculated taking into consideration the factor as given in [9.5.3.2] or [5.2.3.6], respectively.
  Factor: 1,8 or dynamic factor if this exceeds 1.8 for the application.
- Static Torque for the brake ≥ Factor * Nominal_Output_torque / i (gearbox overall ratio)

BRAKE SIZE	CONFIGURATION (external version)	Static Torque [Nm] min÷max
MB3	MB306.2C	30÷36
	MB309.2C	45÷54
	MB312.2C	61÷71
	MB309.4C	91÷107
	MB312.4C	121÷143
	MB310.6C	151÷179
	MB312.6C	182÷214
	MB315.6C	227÷268
	MB310.10C	252÷298
	MB315.8C	303÷357
	MB315.10C	379÷447
	MB315.12C	453÷536
MB5	MB512.4C	159 ÷ 186
	MB512D.4C	207 ÷ 240
	MB518.4C	239 ÷ 280
	MB512D.6C	310 ÷ 360
	MB518.6C	358 ÷ 419
	MB512D.8C	413 ÷ 481
	MB518D.6C	465 ÷ 541
	MB512D.10C	517 ÷ 601
	MB512.14C	557 ÷ 652
	MB518D.8C	620 ÷ 721
	MB518.12C	717 ÷ 838
MB5	MB518D.10C	775 ÷ 901
	MB518.14C	836 ÷ 978
	MB518D.12C	930 ÷ 1081
	MB518D.14C	1085 ÷ 1261
MB6	MB616D.8C	596 ÷ 720
	MB620D.8C	746 ÷ 900
	MB624D.8C	895 ÷ 1080
	MB618D.12C	1006 ÷ 1215
	MB618D.14C	1174 ÷ 1417
	MB624D.12C	1342 ÷ 1619
	MB618D.18C	1510 ÷ 1822
	MB620D.18C	1677 ÷ 2024
	MB622D.18C	1845 ÷ 2227
	MB624D.18C	2013 ÷ 2429

General Comments

- Materials with 3.1 certificates are to be used when manufacturing load carrying parts. Traceability is assumed taken care of by the manufacturer's quality system.
- Upon final installation of gear unit to foundation/frame the fastening bolts are to be pre-stressed according to procedures acceptable to the attending surveyor. We have assumed that the load carrying bolts are of 8.8 quality or higher.
- Our gear calculations are 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 according to the requirements for lifting appliances in our rules. Load distribution factors as stated by the manufacturer (based on his experience) have been used and we have not considered these.
- The bearing lifetime for the gear units are not evaluated in this Type Approval. It is assumed that the manufacturer delivers bearings with sufficient capacity for the class of utilisation they are intended for with respect to strength and materials.
- Output shafts are not part of this approval. These applications (output supports/shafts, and pinions when applicable) will be separately covered by case-by-case approval based on each installation. The approval will be according to the fatigue calculation method (FKM) and the safety factors as agreed with DNV.

Type Approval documentation

Drawings of sun wheels, planets, ring gears, planetary carriers, housing, brakes and shafts and calculations for all stages and brakes according to Dana's drawing list with the title 'E Series logical connections_A' submitted by email dated 2018-01-01 (DNV's Ref.No. J-1).

Tests carried out

For delivery according to DNV-ST-0377 or 0378, gear unit and winch or similar is to be function and load tested according to Section 13 or 14, respectively before a DNV product certificate can be issued.

For delivery according to SOLAS:

- Prototype test showing compliance with IMO Resolution MSC 81(70) "Testing Part I" has been carried out and witnessed by DNV Italy on 2022-03-16.
- a functional test is to be carried out showing compliances with IMO Resolution MSC 81(70) "Testing Part II" as amended.

Marking of product

The product to be marked with manufacturer's name/trademark and type number identification.

Periodical assessment

For retention of the Type Approval, a DNV Surveyor shall perform periodical assessment after two years (+/- 90 days) and after 3.5 years (+/- 90 days) to verify that the conditions for the approval are complied with. Reference is made to DNV-CP-0338.

END OF CERTIFICATE